# The genus *Cladosporium*

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**Abstract:** A monographic revision of the hyphomycete genus *Cladosporium s. lat.* (*Cladosporiaceae, Capnodiales*) is presented. It includes a detailed historic overview of *Cladosporium* and allied genera, with notes on their phylogeny, systematics and ecology. True species of *Cladosporium s. str.* (anamorphs of *Davidiella*), are characterised by having coronate conidiogenous loci and conidial hila, *i.e.,* with a convex central dome surrounded by a raised periclinal rim. Recognised species are treated and illustrated with line drawings and photomicrographs (light as well as scanning electron microscopy). Species known from culture are described *in vivo* as well as *in vitro* on standardised media and under controlled conditions. Details on host range/substrates and the geographic distribution are given based on published accounts, and a re-examination of numerous herbarium specimens. Various keys are provided to support the identification of *Cladosporium* species *in vivo* and *in vitro*. Morphological datasets are supplemented by DNA barcodes (nuclear ribosomal RNA gene operon, including the internal transcribed spacer regions ITS1 and ITS2, the 5.8S nrDNA, as well as partial actin and translation elongation factor 1-α gene sequences) diagnostic for individual species. In total 993 names assigned to *Cladosporium s. lat.*, including *Heterosporium* (854 in *Cladosporium* and 139 in *Heterosporium*), are treated, of which 169 are recognized in *Cladosporium s. str*. The other taxa are doubtful, insufficiently known or have been excluded from *Cladosporium* in its current circumscription and re-allocated to other genera by the authors of this monograph or previous authors.

**Key words:** biodiversity, cladosporioid hyphomycetes, *Davidiella* anamorphs, generic concept, keys, phylogeny, species concept, status quo, taxonomy.
**Taxonomic novelties:** *Cladosporium allicinum* (Fr. : Fr.) Bensch, U. Braun & Crous, comb. nov., *C. astroideum* var. *catalinense* U. Braun, var. nov., *Fusicladium tectonicola* (Yong H. He & Z.Y. Zhang) U. Braun & Bensch, comb. nov., *Septoidium uleanum* (Henn.) U. Braun, comb. nov., *Zasmidium adeniae* (Hansf.) U. Braun, comb. nov., *Zasmidium dianellae* (Sawada & Katsuki) U. Braun, comb. nov., *Zasmidium lythri* (Westend.) U. Braun & H.D. Shin, comb. nov., *Zasmidium wikstroemiae* (Petch) U. Braun, comb. nov.

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## INTRODUCTION

Species of *Cladosporium* are cosmopolitan in distribution and commonly encountered on all kinds of plant, fungal and other debris, are frequently isolated from soil, food, paint, textiles and other organic matters or colonise as secondary invaders leaf lesions caused by plant pathogenic fungi (Ellis 1971, 1976). Conidia of *Cladosporium* species also represent the most common fungal component isolated from air (Farr *et al.* 1989, Flannigan 2001, Mullins 2001). With their small conidia, usually formed in branched chains, they are well adapted to be spread easily in large numbers over long distances. Other species of this genus are plant pathogenic, *i.e.*, they are causal agents of leaf spots and other lesions (Schubert 2005b), or they occur as hyperparasites on other fungi (Heuchert *et al.* 2005). *Cladosporium* species are also known to be common endophytes (Riesen & Sieber 1985, Brown *et al.* 1998, El-Morsy 2000) as well as phylloplane fungi (Islam & Hasin 2000, de Jager *et al.* 2001, Inacio *et al.* 2002, Stohr & Dighton 2004, Levetin & Dorseys 2006). Some species have a medical relevance in clinical laboratories and may cause allergic lung mycoses (de Hoog *et al*. 2000). Because many *Cladosporium* species are cosmopolitan, are agents of decay, deterioration, or a cause of allergy or even plant or animal disease, and are often of high environmental impact, the genus is of interest to researchers in a wide variety of disciplines.

Moreover, *Cladosporium* is one of the largest and most heterogeneous genera of hyphomycetes, currently encompassing more than 772 names (Dugan *et al*. 2004). Until relatively recently, all kinds of unrelated dematiaceous hyphomycetes characterised by having amero- to phragmosporous conidia formed in acropetal chains had been assigned to *Cladosporium s. lat*., creating a considerable obstacle to a monograph of this genus. Therefore, *Cladosporium* was considered in most urgent need of critical revision by the International Commission on the Taxonomy of Fungi (Hawksworth 1986). Various authors discussed the heterogeneity of *Cladosporium s. lat*. and proposed new, more natural circumscriptions of this genus (*e.g.*, von Arx 1981, 1983, Morgan-Jones & Jacobsen 1988, McKemy & Morgan-Jones 1990, Morgan-Jones & McKemy 1990, Braun 1995b, Partridge & Morgan-Jones 2002, 2003). Based on re-assessments of morphological features and molecular data, various groups of cladosporioid anamorphs could be excluded from *Cladosporium s. str.*, *e.g.*, human pathogenic species [*Herpotrichiellaceae*] (de Hoog *et al.* 1995, Masclaux *et al.* 1995), *Venturia* anamorphs [*Venturiaceae*] (Schubert *et al.* 2003, Beck *et al.* 2005) and several heat-resistant fungi [*Teratosphaeriaceae*] (Seifert *et al.* 2004). David (1997) revised *Cladosporium* species previously referred to as *Heterosporium* and, using a scanning electron microscopic approach, demonstrated that the genus *Cladosporium* is well-characterised and easily recognisable by its unique structure of

the conidiogenous loci and conidial hila, which he classified as coronate, *i.e.*, composed of a central convex dome surrounded by a raised periclinal rim. David's (1997) approach was critical for enabling a revision of the genus *Cladosporium*. A few years later, the first attempts were made to revise and monograph *Cladosporium s. lat*. (Crous *et al.* 2001). Braun *et al*. (2003) published results of the first molecular examinations of *Cladosporium s. lat.*, clearly confirming the strong heterogeneity of this genus. Furthermore, they showed that the teleomorphs of *Cladosporium s. str*. species, previously referred to *Mycosphaerella*, warrant placement in a new separate genus, *Davidiella*. Although no clear morphological differences were reported between *Davidiella* and *Mycosphaerella*, a further study by Aptroot (2006) found ascospores of *Davidiella* to have characteristic irregular cellular inclusions (lumina), which are absent in species of *Mycosphaerella*, along with periphysoids and pseudoparaphyses (Schubert *et al*. 2007b). Furthermore, higher order phylogenetic studies, which employed DNA sequence data of four loci (SSU nrDNA, LSU nrDNA, EF-1α, RPB2), revealed that species of *Davidiella* cluster in a separate family [*Cladosporiaceae* (= *Davidiellaceae*)] from species of *Mycosphaerella* (*Mycosphaerellaceae*), with both families residing in *Capnodiales* (*Dothideomycetes*), and not *Dothideales* as always presumed (Schoch *et al*. 2006, 2009a, b, Crous *et al.* 2009b). In a series of papers, various *Cladosporium* species have been re-examined and reassessed, based on the new circumscription of the genus (Schubert & Braun 2004, 2005a, b, 2007, Schubert 2005a, Schubert *et al.* 2006, Braun & Schubert 2007, Braun *et al.* 2008a). Schubert (2005b) monographed foliicolous *Cladosporium* species, and Heuchert *et al.* (2005) published a morphotaxonomic treatment of fungicolous taxa. These papers were important steps towards a modern revision of *Cladosporium*. However, the recently published, comprehensive revisions of numerous cladosporioid genera, based on molecular sequence analyses, cultures and morphology (Crous *et al.* 2006, 2007a) provided the final necessary component required for the preparation of the present taxonomic study.

In the present treatment, a survey of *Cladosporium s. lat*. is given, *i.e.*, the current knowledge about the taxonomy of true species of *Cladosporium* (*s. str*.) is reflected, and excluded taxa, previously assigned to *Cladosporium s. lat*., are listed with reference to their current status and generic affinity. Taxa for which type specimens or any other authentic collections could not be traced, do not exist, or have not been available on loan are separately listed. Accepted species are described *in vivo* and, if data are available, also *in vitro*. However, only a small fraction of *Cladosporium* species is known from culture. Furthermore, the recently published revisions of *Cladosporium herbarum s. lat*. (Schubert *et al.* 2007b), *C. sphaerospermum s. lat*. (Zalar *et al*. 2007, Dugan *et al.* 2008) and *C. cladosporioides s. lat.* (Bensch *et al.* 2010) clearly showed that these saprobic species have to be considered as heterogeneous complexes, composed of several genetically and morphologically distinguished species. Unfortunately, the examination of the diversity, phylogeny and taxonomy of *Cladosporium s. str*. is still in an initial phase, and thus the present work should be seen as a handbook reflecting on the current taxonomic *status quo*.

## HISTORICAL OVERVIEW

Comprehensive reviews of the history of *Cladosporium* have been provided by David (1997), Heuchert *et al*. (2005) and Schubert (2005b), and are briefly discussed below. The genus *Cladosporium* was established in 1816 by Link, who described it as follows: "Thallus e floccis caespitosis, erectis simplicibus aut subramosis, apicibus in sporidia secedentibus. A Sporothricho et Oidio differt floccis non intricatis, ab Acladio, sporidiis apici primum innatis, dein delabentibus". Link (1816) included *C. herbarum* [introduced by Persoon (1794) as *Dematium herbarum* and later reclassified by Link (1809) as *Acladium herbarum*], *C. abietinum* [= *Trentepohlia abietina*, *fide* Hughes (1958)], *C. atrum* [= sterile fungus, *fide* Hughes (1958)] and *C. aureum* [= ?*Trentepohlia aurea*, lectotype of *Trentepohlia*]. Clements & Shear (1931) proposed *C. herbarum* as lectotype species, a decision followed by de Vries (1952) and Hughes (1958). *Cladosporium* became rapidly established in the literature, being used by Martius (1817), Nees (1817) and in Fries' "Systema mycologicum" (1821, 1832), and encompassed a steadily growing number of species. Link (1824) described seven species, Corda (1837) listed 15 species and Rabenhorst (1844) 23 species. This number grew to 110 in Saccardo (1886), who already noted this genus as being problematic. The steady increase in taxa continued, so that by 1931, 270 species had been described in the genus and listed in the various volumes of Saccardo's "Sylloge fungorum". Most of the original diagnoses of the species concerned are very brief and imprecise. Although available information of many of the older taxa has been rather meagre, description of new species has continued unabatedly. Since 1950, more than 130 new species have been added (Morgan-Jones & McKemy 1990). Prasil & de Hoog (1988) estimated *Cladosporium* to have around 540 species. A recently published checklist contains data for 772 *Cladosporium* names, *i.e.*, valid, invalid, legitimate and illegitimate species, varieties, *formae* as well as herbarium names (Dugan *et al*. 2004). Reasons for this vast number of taxa probably reside in the imprecise, wide circumscription of this genus in literature, the strong morphological variability of most species, and the occurrence of some species on a wide range of substrates.

De Vries (1952) examined *Cladosporium in vitro* and provided descriptions of nine species with a further 13 species as an appendix. Ellis (1971, 1976), who followed a very wide generic concept, treated 43 species. Morgan-Jones and McKemy initiated a series "Studies in the genus *Cladosporium sensu lato*", in which they dealt with selected species providing comprehensive descriptions of their features *in vivo* and *in vitro* (Morgan-Jones & McKemy 1990, McKemy & Morgan-Jones 1990, 1991a–c). Descriptions and an expanded key to the *Cladosporium* species available in culture was provided by Ho *et al*. (1999), but the authors followed a rather wide taxonomic concept, including species that belong to other genera. Zhang *et al*. (2003) published a monograph of the genera *Cladosporium*, *Fusicladium* and *Pyricularia* from China, including numerous new Chinese *Cladosporium* species previously published by Zhang and co-workers. Furthermore, they reported numerous old species introduced in the 19th or early 20th century to occur in China, but without having seen any type material of these taxa, so that these names have probably often been misapplied. Unfortunately, the access to type material and additional collections cited in this work, which are deposited at MHYAU, was refused and could therefore not be re-examined. Morphotaxonomic revisions of foliicolous as well as fungicolous *Cladosporium* species have recently been carried out by Schubert (2005b) and Heuchert *et al*. (2005), respectively.

The status of the genus *Heterosporium* has been controversial. Based on characteristically large, mostly phragmosporous conidia, usually formed singly, and mostly rather coarse, fasciculate conidiophores often emerging through stomata, several authors considered *Heterosporium* a genus distinct from *Cladosporium*

(*e.g.*, von Arx 1983, McKemy & Morgan-Jones 1990). De Vries (1952) concluded that a separation of the two genera based on the formation and septation of conidia is impractical and not tenable, since all kinds of transitions occur, and reduced *Heterosporium* to synonymy with the latter genus, a treatment supported by Hughes (1958). Ellis (1971, 1976) followed this arrangement and transferred the names of the remaining accepted species of *Heterosporium* to *Cladosporium*. Von Arx (1981) reinstated the use of *Heterosporium* and emphasised that the recognition of *Heterosporium* was a first step towards delineating homogenous genera in the *Cladosporium* complex. During the course of monographic studies in the genus *Heterosporium*, David (1997) examined *Cladosporium* and *Heterosporium* by means of scanning electron microscopy (SEM) and clearly demonstrated that the conidiogenous loci and conidial hila in the two genera are very similar, *i.e.*, they are coronate with a central convex dome and a raised periclinal rim. Based on these results, he again placed *Heterosporium* in *Cladosporium,* and proposed the combination *Cladosporium* subgen. *Heterosporium*. Braun *et al.* (2003) confirmed this treatment based on molecular data.

Masclaux *et al*. (1995), Untereiner (1997), Gerrits van den Ende & de Hoog (1999), Untereiner & Naveau (1999), Untereiner *et al*. (1999) and de Hoog *et al*. (2000) treated and revised former human pathogenic *Cladosporium* species, using molecular and physiological approaches. Based on comprehensive molecular sequence analyses and morphological re-assessments, Braun *et al*. (2003), Crous *et al*. (2006, 2007b–d), Schubert *et al*. (2007a) and Seifert *et al.* (2004, 2007), revised various parts of the heterogeneous complex of cladosporioid hyphomycetes, demonstrating that numerous groups of species previously referred to as *Cladosporium* have to be excluded since they do not agree with *Cladosporium s. str.* [*Capnodiales*, *Cladosporiaceae* (Schoch *et al*. 2006, 2009a, b, Crous *et al*. 2007b, 2009b)], neither morphologically nor genetically.

## GENERIC CONCEPT AND CIRCUMSCRIPTION OF *CLADOSPORIUM* BASED ON MORPHOLOGY AND PHYLOGENETIC DATA

Due to the very brief, imprecise circumscription of the genus *Cladosporium* in the past, numerous superficially similar pigmented, holoblastic hyphomycetes with amero- to phragmosporous conidia formed in acropetal chains have been placed in *Cladosporium s. lat.*, which made this genus very heterogeneous and polyphyletic. This heterogeneity has been recognised and discussed by several authors (von Arx 1981, McKemy & Morgan-Jones 1990, David 1997).

The circumscription and delimitation of *Cladosporium s. str.* has to be based on morphology and phylogeny of its type species, *C. herbarum*. David (1997) pointed out that *C. herbarum* and other genuine *Cladosporium* spp., including former *Heterosporium* spp., are well-characterised by having a unique type of conidiogenous locus and conidial hilum that he classified as coronate, *i.e.*, with a central convex dome, surrounded by a raised periclinal rim. *Cladosporium herbarum* and all other true *Cladosporium* spp. had been, as far as known, considered anamorphs of the ascomycete genus *Mycosphaerella*. Previous molecular studies employing rDNA ITS sequence data (Crous *et al.* 2001) had shown *Cladosporium*-like taxa clustering adjacent to the main monophyletic *Mycosphaerella* clade, suggesting a position apart of the latter genus. Braun *et al*. (2003) confirmed David's (1997) new circumscription of *Cladosporium* using molecular approaches, and introduced the new genus *Davidiella* for the former *Mycosphaerella* teleomorphs of *Cladosporium s. str.*, since they formed a well-supported sister clade of *Mycosphaerella s. str*., the latter having cercosporoid anamorphs. Aptroot (2006) found additional morphological characters for a better circumscription of *Davidiella* and an easier delimitation against *Mycosphaerella s. str*., which enabled him to refer some species of the former genus to *Davidiella* in spite of the lacking *Cladosporium* anamorphs. In a comprehensive phylogenetic treatment of *Dothideomycetes* based on the analysis of four nuclear loci, Schoch *et al.* (2006) assigned *Davidiella* with its *Cladosporium* anamorphs to the family *Cladosporiaceae,* which they placed in *Capnodiales*, together with *Mycosphaerellaceae*. A detailed morphological as well as molecular re-examination of *C. herbarum*, the type species of *Davidiella*, has been published by Schubert *et al*. (2007b).

Wirsel *et al*. (2002) and Park *et al*. (2004) carried out phylogenetic studies within *Cladosporium s. str*. Wirsel *et al*. (2002) analysed ITS data of strains isolated from common reeds in Germany, compared them with sequences from GenBank and cultures from the CBS (Utrecht, the Netherlands), and distinguished three species, *viz.*, *C. herbarum*, *C. oxysporum* and *Cladosporium* sp. Beside ITS sequences, they generated two additional phylogenies, *viz.*, analyses based on the differentiation of the fungi by their capacity to metabolise different carbon sources and a second approach, using actin gene sequences, in which they discovered a highly variable intron sequence. Species phylogenies based on this protein-encoding gene exhibited higher resolution compared with the ITS tree leading to further differentiation in terminal branches. Furthermore, it could be shown that all strains with smooth conidial surfaces clustered together, as did all isolates with rough-walled conidia, thus reflecting a possible division among plant-associated *Cladosporium* species based on conidial ornamentation. However, due to the limited dataset, including only few *Cladosporium* species, a final conclusion could not be drawn. Wirsel *et al*. (2002) emphasised that multilocal analyses of the genome, based on a larger number of isolates from different geographical regions are necessary to redefine species borders within *Cladosporium*. The weak resolution in phylogenetic trees based solely on ITS sequences, insufficient for molecular delimitation at species rank, was also pointed out by Braun *et al.* (2003). Schubert *et al.* (2007b) carried out comprehensive molecular and morphological analyses of the *C. herbarum* complex and demonstrated that a multilocal DNA approach, based on five genes, *viz*., rDNA ITS, actin, calmodulin, translation elongation factor (1-α) and histone H3, resulted in a much better resolution, appropriate for species analyses. In the study carried out by Park *et al*. (2004), the sequences of the D1/D2 regions of the LSU rDNA genes and the ITS regions of the rDNA were employed in order to establish molecular standards for the demarcation of the common airborne species *C. herbarum*, *C. cladosporioides* and *C. sphaerospermum*.

Based on re-assessments of morphological features and molecular data, various groups of cladosporioid anamorphs could be excluded from *Cladosporium s. str*., *e.g.*, human pathogenic species and *Venturia* anamorphs. Human pathogenic species, now known to be species of *Cladophialophora* (teleomorph: *Capronia*, *Herpotrichellaceae*) differ in their morphology (conidiophores lacking or semi-macronematous, hila not coronate, less pigmented) and physiology (inability to liquefy gelatine), differences confirmed by molecular data (de Hoog *et al*. 1995, Untereiner 1997, Untereiner *et al*. 1999, de Hoog *et al*. 2000). *Fusicladium* species

with catenate conidia have often been assigned to *Cladosporium*. The revision of the genus *Fusicladium* (teleomorph: *Venturia*, *Venturiaceae*) showed these species to be genuine members of the latter genus (Schubert *et al.* 2003), a conclusion confirmed by molecular data (Beck *et al*. 2005, Crous *et al*. 2007d). The structure of the conidiogenous loci and hila of the genus *Fusicladium* is quite distinct from those of *Cladosporium* in being more or less denticle-like, truncate to slightly convex (but non-coronate), unthickened, not darkened or only somewhat darkened-refractive. *Cladosporium malorum* (now *Chalastospora gossypii*) was shown to pertain to *Pleosporales* (Braun *et al*. 2003, Crous *et al.* 2009a).

Other species originally placed in *Cladosporium*, proved to be *Mycosphaerella* anamorphs belonging in *Passalora*, *Pseudocercospora*, *Stenella* and *Zasmidium* respectively (Crous & Braun 2003, Schubert & Braun 2005a, b, 2007, Braun & Schubert 2007). Species of the genus *Passalora* possess conspicuous, more or less truncate, somewhat thickened and darkened-refractive conidiogenous loci and hila, and *Pseudocercospora* is easily distinguishable by its inconspicuous, unthickened and usually not darkened conidiogenous loci (Crous & Braun 2003, Crous *et al*. 2007c). The genus *Stenella* has traditionally been linked to teleomorphs accommodated in *Mycosphaerella* (Crous & Braun 2003, Crous *et al.* 2004b, 2006). However, recent phylogenetic studies have shown that *Mycosphaerella* is polyphyletic (Crous *et al.* 2007b), and that many of these anamorph lineages represent distinct genera with *Mycosphaerella*-like teleomorphs, clustering in different families in *Capnodiales* (Crous *et al.* 2009a–c). *Stenella* is a cercosporoid hyphomycete genus for species characterised by having superficial, verruculose hyphae with solitary to aggregated conidiophores, conidiogenous cells with conspicuous conidiogenous loci (thickened, darkened and refractive), and conidia formed singly or in chains, with thickened, darkened and refractive hila (Crous & Braun 2003). In a subsequent study, *Zasmidium* with its type species *Z. cellare,* proved to be the oldest name for *Stenella*-like hyphomycetes within *Mycosphaerellaceae* (Arzanlou *et al.* 2007). However, the type species of *Stenella*, *S. araguata*, clusters within *Teratosphaeriaceae*, and differs in having pileate conidiogenous loci (versus planate, cercosporoid loci in *Zasmidium*). Taxa with a *Zasmidium*-like morphology appear to be paraphyletic within *Mycosphaerellaceae* (Crous *et al*. 2009a, b), and these taxa should be separated from *Stenella*, which has species with a different scar structure and belongs to *Teratosphaeriaceae* (Braun *et al.* 2008a). Hence, Braun *et al.* (2010) and Kamal (2010) reallocated most former *Stenella* species with planate, cercosporoid scars to *Zasmidium*.

On account of morphological, molecular and ecological features, Seifert *et al.* (2004) recently separated *Cladosporium staurophorum* from *Cladosporium s. str.* and introduced the new hyphomycete genus *Devriesia* (*Teratosphaeriaceae*, *Capnodiales*; Crous *et al*. 2007b) to accommodate a group of five heat-resistant species that is also *Cladosporium*-like in its general morphology. During the course of the morphotaxonomic revision of fungicolous *Cladosporium* species (Heuchert *et al*. 2005), two additional genera have been published, *viz.*, *Digitopodium* with *Digitopodium hemileiae* (basionym: *Cladosporium hemileiae*) as type species and *Parapericoniella* with its type species *Parapericoniella asterinae* (Figs 1, 2).

*Cladosporium musae*, a leaf-spotting fungus on banana leaves, has recently been assigned to the new genus *Metulocladosporiella*, an additional segregate of *Cladosporium s. lat.*, which differs from morphologically allied genera in having conidiophores which are pigmented, frequently branched in a metula-like manner, with much paler tips, forming paler, often subhyaline conidia. The conidiogenous loci are subconspicuous to conspicuous, *i.e.*, unthickened or almost so, but somewhat darkened-refractive (Crous *et al.* 2006). The introduction of this genus was phylogenetically supported, showing that it pertains to *Chaetothyriales*.

Comprehensive molecular and morphological re-examination of further complexes of cladosporioid hyphomycetes showed that numerous other taxa have to be excluded and reassessed (Crous *et al*. 2007a). Some former *Cladosporium* species have been assigned to the new genus *Penidiella* [anamorphs of *Teratosphaeria*, *Teratosphaeriaceae*, *Capnodiales* (Crous *et al*. 2007b)], other species have been placed in the new genera *Rachicladosporium* (*Capnodiales*, *incertae sedis*), *Toxicocladosporium* (*Capnodiales*, *incertae sedis*), *Verrucocladosporium* (*Capnodiales*, *incertae sedis*), *Hyalodendriella* (*Helotiales*, *incertae sedis*), *Ochrocladosporium* (*Pleosporales*, *incertae sedis*), and *Rhizocladosporium* (*Helotiales*, *incertae sedis*) (Crous *et al*. 2007c). Schubert *et al*. (2007a) introduced the new genus *Dichocladosporium* to accommodate the *Cladosporium* occurring on *Paeonia* spp. [*C. chlorocephalum*, *C. paeoniae*], for which, however, the older name *Graphiopsis* is available (Braun *et al*. 2008a). Seifert *et al*. (2007) revisited the creosote fungus (*Amorphotheca resinae*, anamorph *Cladosporium avellaneum*) and the resin fungus (*Hormodendrum resinae*, *Cladosporium resinae*, *Sorocybe resinae*), previously also confused with *Cladosporium* (Figs 1, 2).

## Generic concept and circumscription of *Cladosporium s. str.*

***Cladosporium*** Link, Ges. Naturf. Freunde Berlin Mag. Neuesten Entdeck. Gesammten Naturk. 7: 37. 1816 : Fr., Syst. mycol. 3(2): 368. 1832.

≡ *Sporocladium* Chev., Fl. gén. env. Paris 1. 1826.
= *Heterosporium* Klotzsch, Herb. Viv. Mycol., Cent. I, No. 69. 1832, *nom. inval.*
≡ *Heterosporium* Klotzsch ex Cooke, Grevillea 5: 122. 1877.
= *Myxocladium* Corda, Icon. fung. 1: 12. 1837.
= *Didymotrichum* Bonord., Handb. Mykol.: 89. 1851.
= *Acrosporella* Riedl & Ershad, Sydowia 29: 166. 1977 ["1976"].
= *Davidiella* Crous & U. Braun, Mycol. Progr. 2(1): 8. 2003
[teleomorph name, see notes below].
= *Mycosphaerella auct.* p.p.

*Type species*: *C. herbarum* (Pers. : Fr.) Link (Clements & Shear 1931: 395). *Lectotype*: *sine loco*, *sine dato* (L 910.225-733), selected by Prasil & de Hoog (1988). *Epitype*: the Netherlands, Wageningen, isolated from *Hordeum vulgare*, 2005, P.W. Crous, CBS H-19853, designated by Schubert *et al.* (2007b). *Isoepitype*: HAL 2022 F. *Ex-epitype cultures*: CPC 12100 = CBS 121621, CPC 12178, 12179, 12181, 12183.

*Lit.*: de Vries (1952), Hughes (1958), Ellis (1971), Domsch *et al*. (1980), Prasil & de Hoog (1988), David (1997), Samson *et al*. (2000), Schubert *et al*. (2007b).

*In vivo*: Dematiaceous hyphomycetes; anamorphs of *Davidiella*. *Colonies* punctiform to effuse, mostly olivaceous-brown to blackish brown or with a grey-olivaceous appearance, velvety, floccose or villose. *Mycelium* internal or external, superficial; *hyphae* branched, septate, subhyaline to usually pigmented, smooth, sometimes slightly rough-walled to verruculose. *Stromata* absent to sometimes well-developed. *Conidiophores* mononematous, usually macronematous, solitary, fasciculate, in small to large fascicles, loosely to densely caespitose, usually

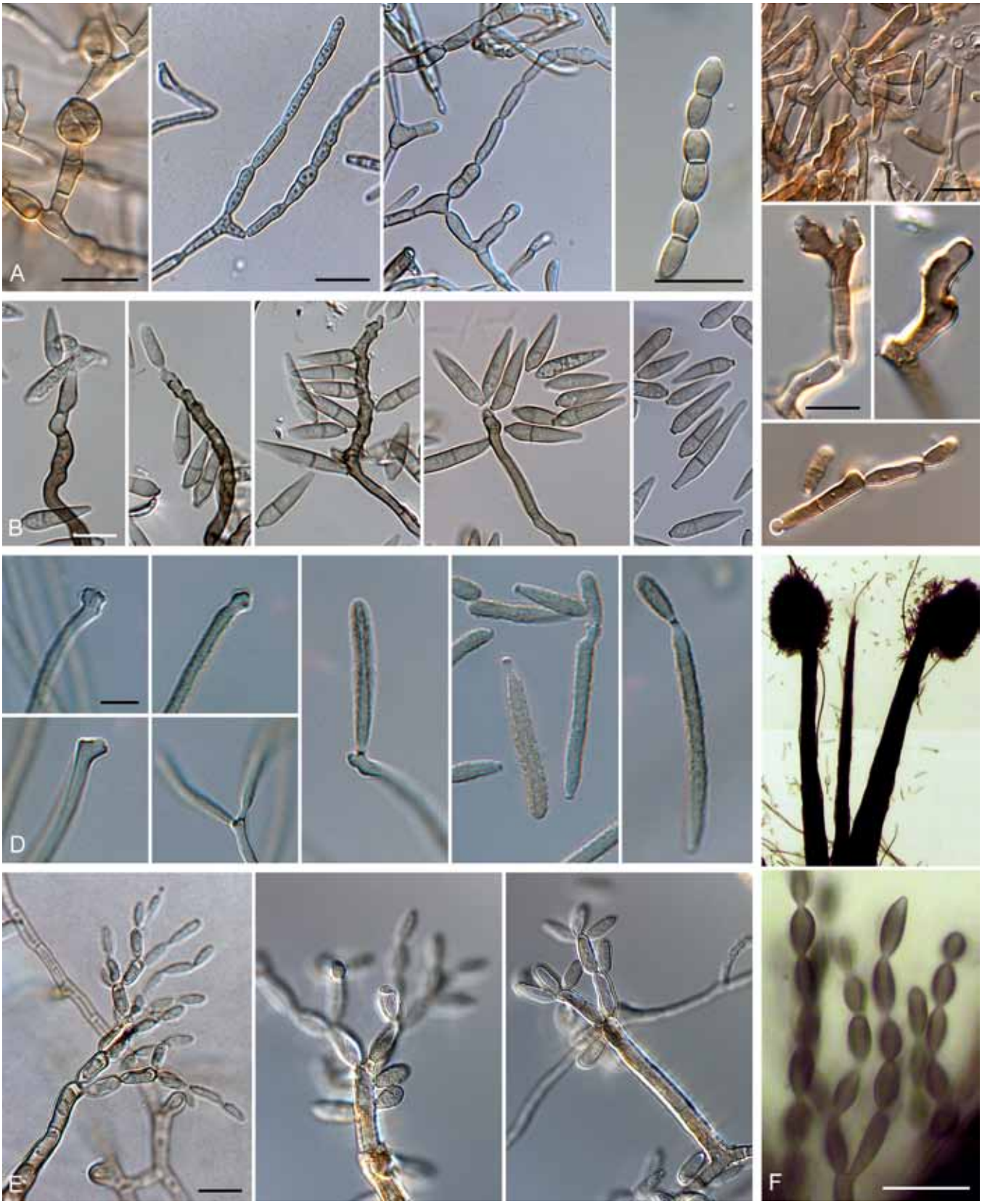



**Fig. 1 (Part 1).** *Cladosporium*-like genera. A. *Devriesia americana* (CBS 117726; *Crous et al.* 2007c). B. *Fusicladium proteae* (CBS 130599; Crous *et al.* 2011a). C. *Stenella araguata* (IMI 34905; *Crous et al.* 2007c). D. *Zasmidium cellare* (CBS 146.36; Arzanlou *et al.* 2007). E. *Rachicladosporium luculiae* (CBS 121620; Crous *et al.* 2007c). F. *Sorocybe resinae* (DAOM 11381; Seifert *et al.* 2007). Scale bars = 10 µm.

erect, occasionally subdecumbent, decumbent or repent, straight to flexuous, unbranched or branched, continuous to septate, subhyaline to usually distinctly pigmented, smooth to verruculose, proliferation holoblastic, occasionally enteroblastic (after a period when growth has stopped and then resumed), usually sympodial, rarely monopodial (sometimes leaving coarse annellations from repeated enteroblastic proliferation). *Conidiogenous cells* integrated, terminal or intercalary, monoblastic or usually polyblastic, mostly sympodially proliferating, more or less cylindrical, geniculate-sinuous or nodulose, sometimes with unilateral swellings, *conidiogenous loci* usually conspicuous, protuberant, composed of a central convex dome surrounded by a

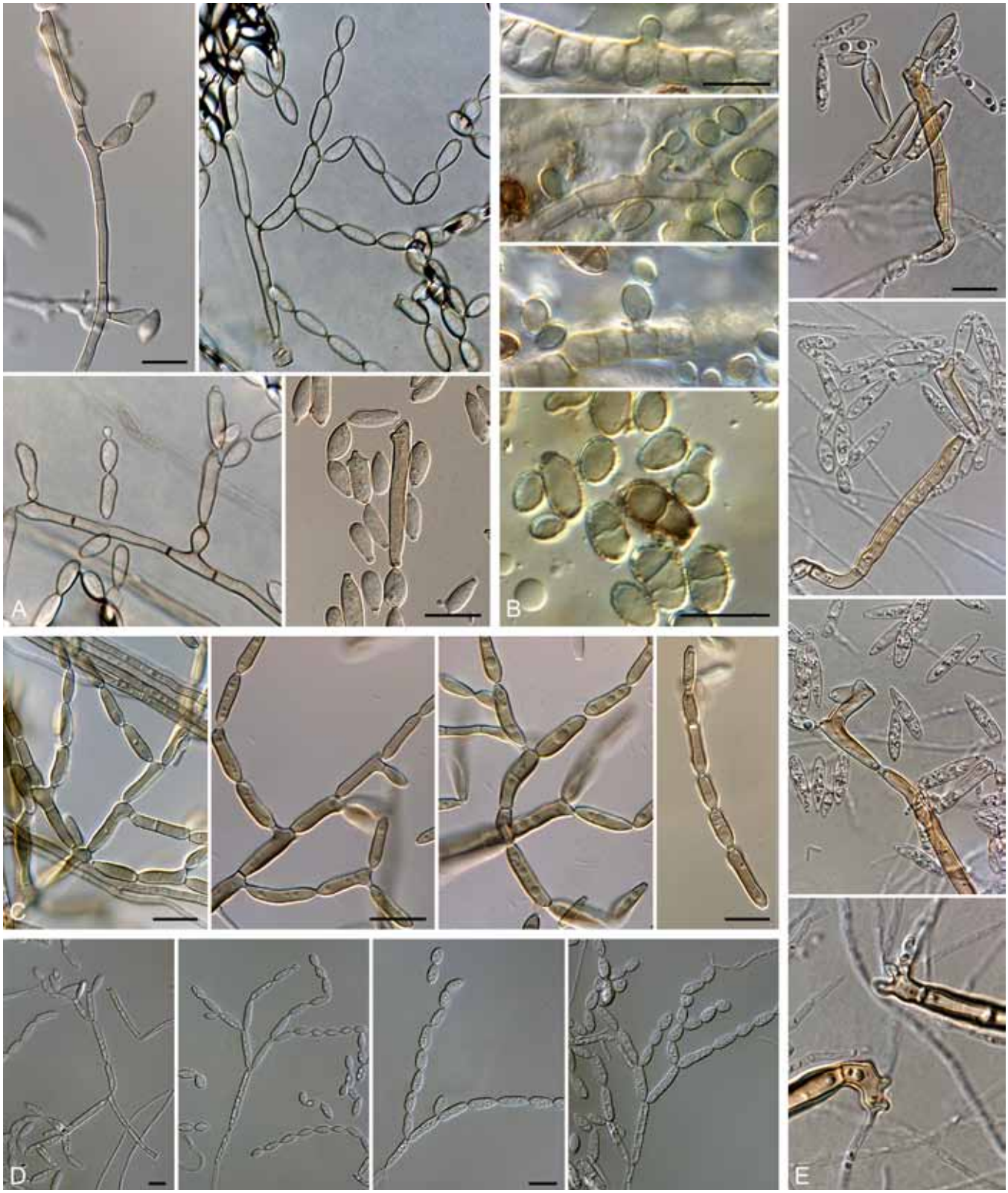



**Fig. 1 (Part 2).** *Cladosporium*-like genera. A. *Ochrocladosporium elatum* (CBS 146.33; Crous *et al*. 2007c). B. *Hortea thailandica* (CBS 125423; Crous *et al.* 2009b). C. *Penidiella columbiana* (CBS 486.80; Crous *et al.* 2007b). D. *Ramularia cynarae* (CBS 128912; Koike *et al.* 2011). E. *Rhizocladosporium argillaceum* (CBS 241.67; Crous *et al.* 2007c). Scale bars = 10 µm.

more or less raised periclinal rim (coronate), thickened, refractive or barely to distinctly darkened; conidial formation holoblastic. *Conidia* solitary or catenate, in unbranched or branched acropetal chains, amero- to phragmosporous, shape and septation variable, usually subglobose, ovoid, obovoid, ellipsoid, fusiform, limoniform to cylindrical, aseptate or with several transverse eusepta, rarely with a single longitudinal septum, subhyaline to usually pigmented, smooth, verruculose, verrucose, echinulate, cristate, *hila* protuberant, coronate, with a central convex dome and raised periclinal rim, thickened, refractive to darkened; microcyclic conidiogenesis often occurring.

*In vitro*: *Stromata* usually lacking. *Conidiophores* usually solitary, arising terminally or laterally from plagiotropous or ascending hyphae, often longer than *in vivo*. Micronematous conidiophores, lacking *in vivo*, are often formed in culture. Conidial chains often

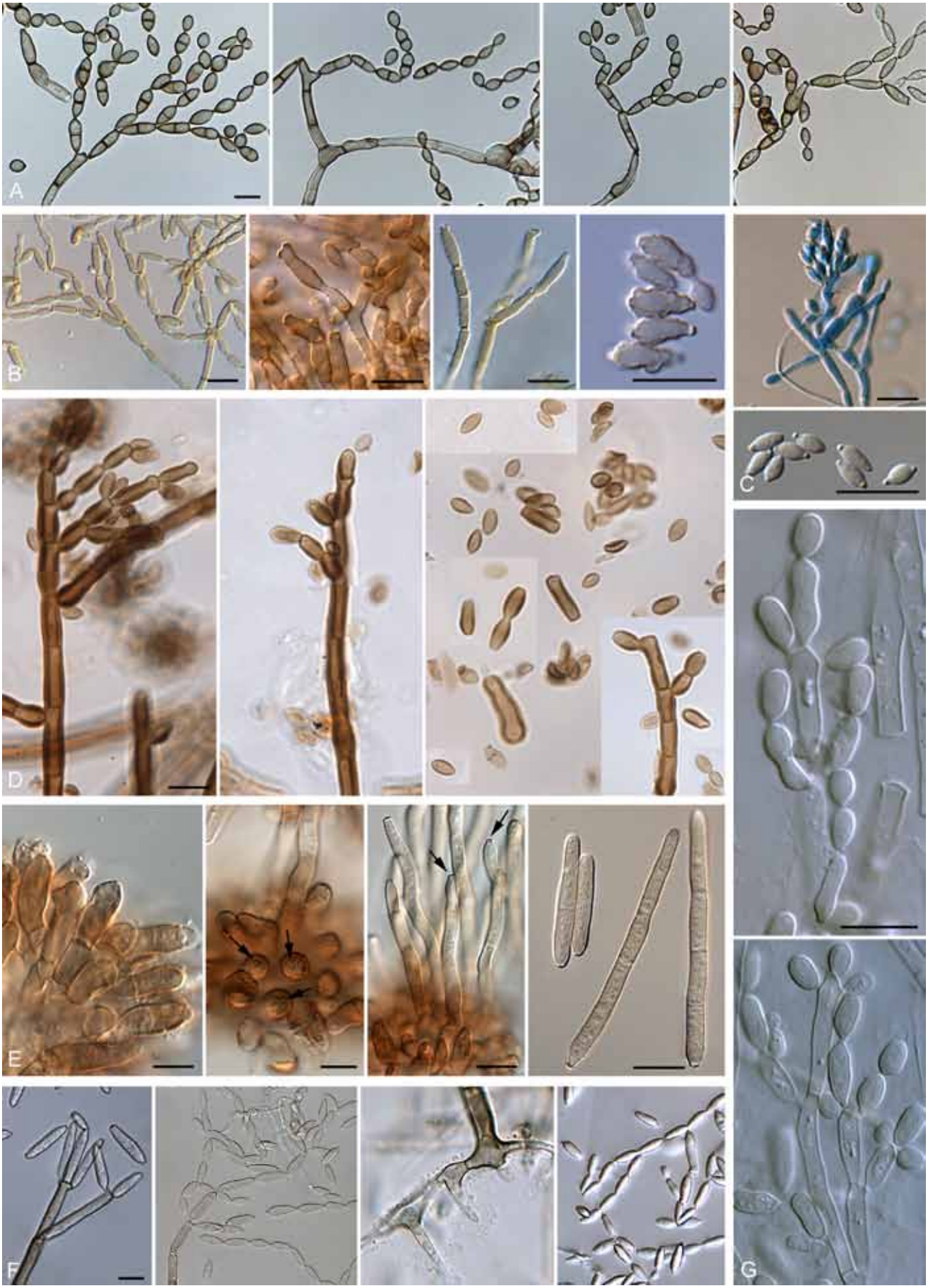



**Fig. 1 (Part 3).** *Cladosporium*-like genera. A. *Toxicocladosporium irritans* (CBS 185.58; Crous *et al*. 2007c). B. *Verrucocladosporium dirinae* (CBS 112794; Crous *et al.* 2007c). C. *Hyalodendriella betulae* (CBS 261.82; Crous *et al.* 2007c). D. *Hormodendrum resinae* (DAOM 41888; Seifert *et al.* 2007). E. *Passalora californica* (CBS 128857; Koike *et al*. 2011). F. *Metulocladosporiella musae* (CBS 121396; Crous *et al.* 2006). G. *Amorphotheca resinae* (DAOM 170427; Seifert *et al*. 2007). Scale bars = 10 µm.

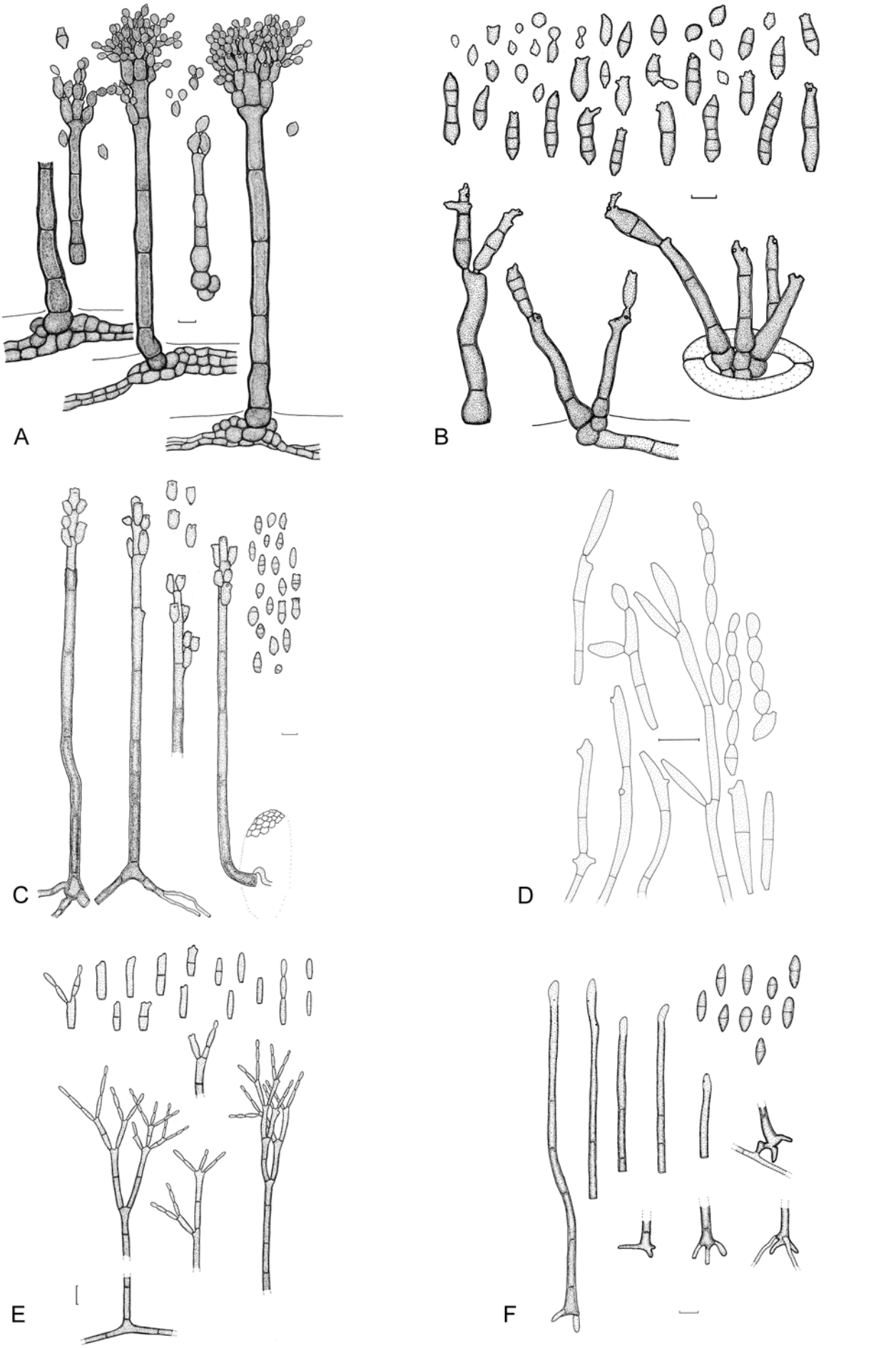



**Fig. 1 (Part 4).** *Cladosporium*-like genera. A. Periconioid morph of *Graphiopsis chlorocephalum* (HAL 1924 F). B. Cladosporioid morph of *Graphiopsis chlorocephalum* (HAL 2011 F). C. *Parapericoniella asterinae* (IMI 11851b). D. *Cladophialophora potulentorum* (CBS 115144). E. *Penidiella columbiana* (CBS 486.80). F. *Digitopodium hemileiae* (BPI 426854). Scale bars = 10 µm.

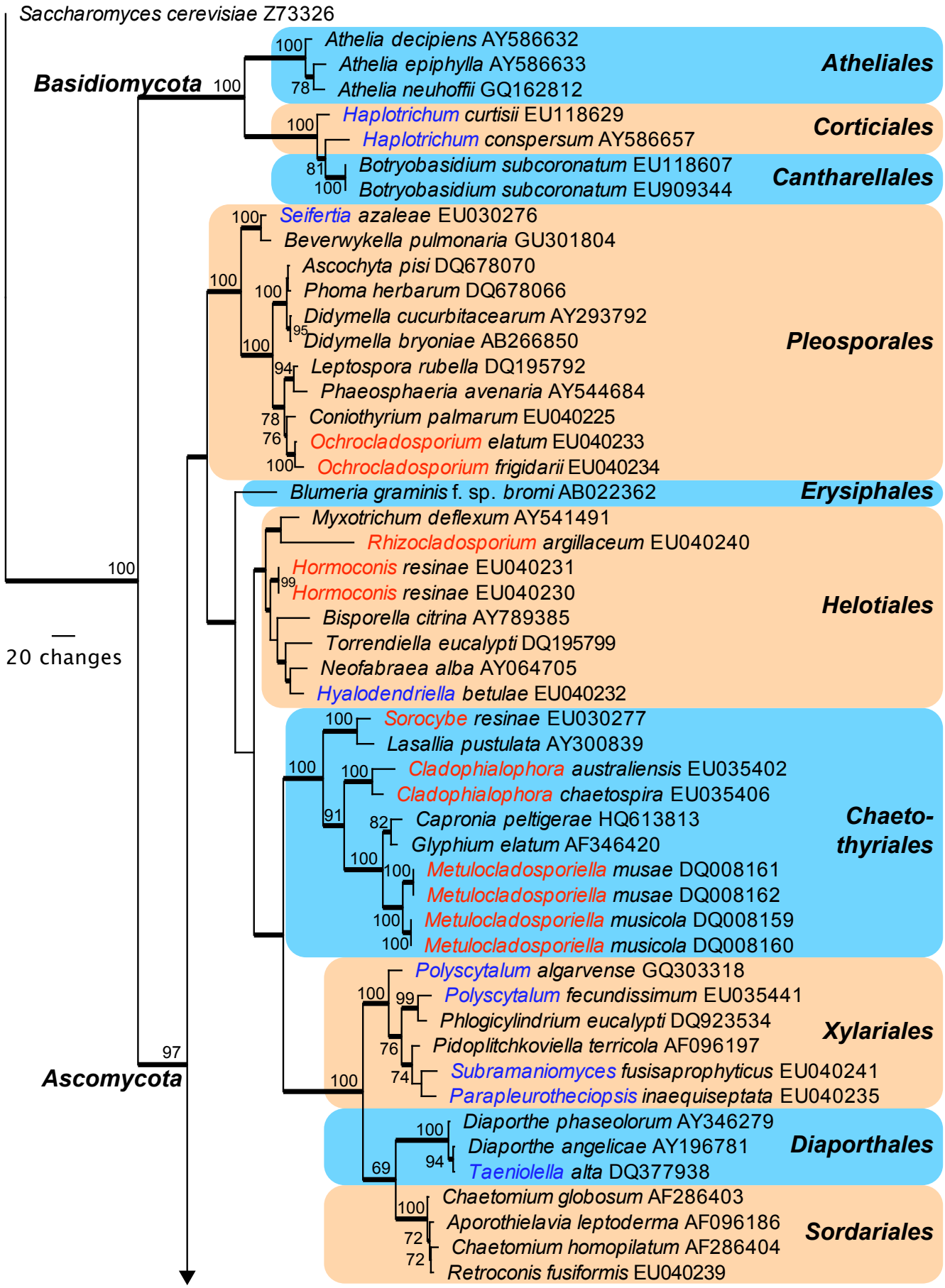



**Fig. 2.** The first of 528 equally most parsimonious trees obtained from a heuristic search with 100 random taxon additions of the LSU sequence alignment using PAUP v. 4.0b10. The scale bar shows 20 changes, and bootstrap support values from 1 000 replicates are shown at the nodes. Thickened lines indicate the strict consensus branches and orders are indicated to the right of the tree. Generic names in green belong to *Cladosporium s.str.*, those in red were in the past considered to be species of *Cladosporium* but were subsequently renamed and those genera in blue are morphologically similar to *Cladosporium* and can be confused with it. The tree was rooted to *Saccharomyces cerevisiae* (GenBank Z73326).

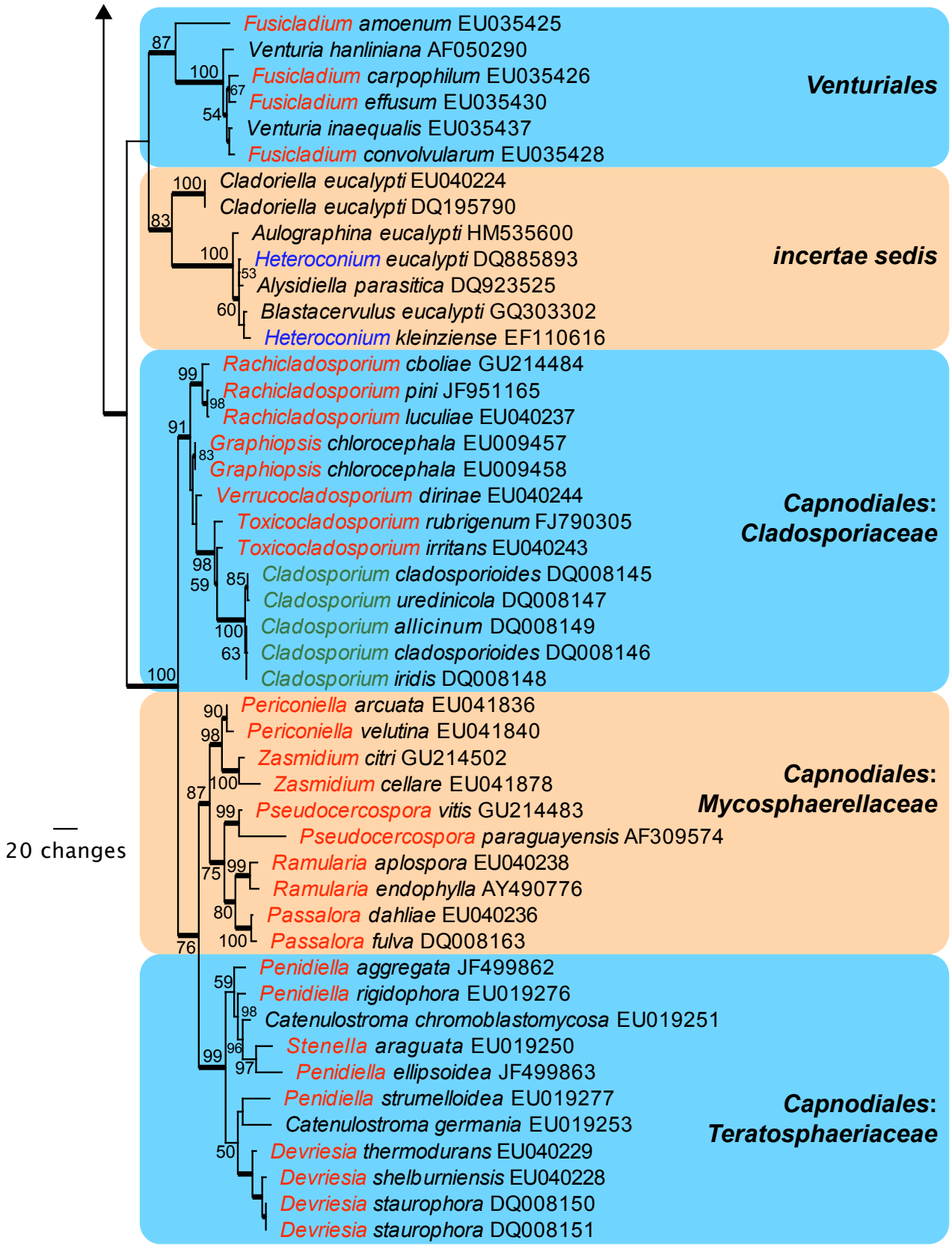



**Fig. 2.** (Continued).

longer than *in vivo* (species with solitary conidia are often capable of forming conidial chains in culture).

*Notes*: In this monograph, we follow the spirit of the "Amsterdam Declaration (Hawksworth *et al.* 2011), *i.e.* the proposal to apply the principle "one fungus one name" and the impacts of decisions made in Melbourne in July 2011 during the International Botanical Congress (Hawksworth 2011), in particular the abolishment of Art. 59 dealing with pleomorphic fungi. As all names, anamorph-typified as well as teleomorph-typified, will be nomenclaturally treated as equal in future, the name *Cladosporium* has priority over *Davidiella* at generic rank, and is also the more commonly used name in literature. Therefore, *Davidiella* is cited here as a synonym of *Cladosporium*. The abolishment of Art. 59 will come into effect only

in January 2013. Nevertheless we prefer to follow the new rules in advance. Nomenclatural consequences are not to be apprehended as any combinations of teleotypified names to anamorph-typified genera and *vice versa* result in valid names according to Art. 59 of the old ICBN.

According to Lindau (1907), *Mydonosporium* is synonymous with *Cladosporium*, a conclusion supported by de Vries (1952). However, this conclusion could not be confirmed since type material of its type species could not be examined since it is not preserved. Fries (1949) reallocated the type species of *Azosma* (Corda 1831), *A. helminthosporioides*, to *Cladosporium*, whereas Saccardo and Traverso (Saccardo 1913a) assigned it to *Macrosporium* (= *Alternaria*). The identity of *Azosma* remains doubtful and could not be proven since type material is not preserved. Von Arx (1983) considered *Acroconidiella* a synonym of *Heterosporium* and reduced *Stenella* to synonymy with *Cladosporium*. However, *Acroconidiella* possesses tretic conidiogenous cells and the structure of the conidiogenous loci and hila within the genus *Stenella s. lat.* is quite distinct from those of *Cladosporium* by being pileate (*Stenella s. str.*) to planate (former species of *Stenella s. lat.* now assigned to *Zasmidium*), *i.e.* in any case without dome and raised rim. Hence, the two genera have to be retained as separate genera (Crous & Braun 2003). Type material of *Acrosporella* (Riedl & Ershad 1977) has recently been examined and shown to be a synonym of *Cladosporium* (Braun 2009).

## Subgeneric concepts

Attempts to divide *Cladosporium* into subgeneric units are complicated due to the high degree of variability in the conidial size, shape, septation, pigmentation, surface ornamentation as well as in the conidiophore morphology and size of the particular species. The habit of *Cladosporium* species is often significantly influenced by external impacts, *e.g.*, substrate differences, climatic conditions, diverse geographic influences, *etc*. Colonies grown *in vitro* or in moisture chambers are often strongly deviating from those found on natural substrates.

Historical proposals to divide *Cladosporium* into smaller subunits are unsatisfactory and have been barely practical (David 1997). Saccardo (1886) introduced a system based on host preferences. On the basis of ecological and morphological characteristics and differences *in vitro*, Krangauz (1970) divided *Cladosporium* in three subgenera ("*Parasiticum*", "*Eucladosporium*" and "*Saprophyticum*"), which were, however, not validly published. Von Arx (1983) proposed four informal sections (excl. *Heterosporium*), again based on ecological preferences. David (1997) introduced a subgeneric classification on the basis of morphological differences, recognising the subgenera *Heterosporium* (conidia solitary or in short unbranched chains, without ramoconidia, conidia rather uniform), *Bistratosporium* (conidia in branched chains, ramoconidia present, walls of the conidia distinctly two-layered) and *Cladosporium* (conidia in branched chains, ramoconidia present, conidia polymorphous, walls always one-layered). The latter subgenus was separated into the sections *Cladosporium* (conidiophores proliferating) and *Hormodendropsis* (conidiophores determinate, not proliferating). These two types of conidiophore proliferation have previously been recognised by de Vries (1952) and McKemy & Morgan-Jones (1991c). However, Samson *et al.* (2000) mentioned that the two types could not always be sharply defined.

The phenomenon of two-layered, thickened conidial walls, giving conidia a somewhat zonate appearance, was initially described in *C. coryphae*, for which David (1997) introduced the subgenus *Bistratosporium*. A re-examination of type material revealed that the walls of the conidiophores are also often distinctly two-layered, which was not described and illustrated by David (1997). During the course of morphotaxonomic studies of fungicolous and foliicolous *Cladosporium* species several other species have been re-described, which possess conidia and conidiophores with two-layered walls, *e.g.*, *C. episclerotiale* (Heuchert *et al*. 2005), *C. ushuwaiense* and *C. oreodaphnes* (Schubert 2005b). Since the conidia of these species are much smaller, wall layers are not as conspicuous as in *C. coryphae* but nevertheless two distinct wall layers are visible. In several collections of *C. herbarum*, conidiophores and few conidia with thickened, two-layered walls have also been observed, *i.e.*, conidiophores and conidia with one- and two-layered walls are often mixed in particular species or even single collections of a species. Hence, *Bistratosporium* is undoubtedly not tenable at subgeneric rank.

The introduction of subgenera based on the three major species complexes is probably warranted. Schubert *et al.* (2007b) and Bensch *et al.* (2010) resolved the species complexes of *C. herbarum* and *C. cladosporioides*, which form well-supported subclades. Species of the *C. sphaerospermum* complex are well-characterised by having globose or subglobose, pigmented, almost smooth to verrucose terminal conidia and 0–3-septate, smooth or verruculose ramoconidia (Ellis 1971, Zalar *et al*. 2007) and share a similar ecology since they are often isolated from extreme ecological environments, but *C. sphaerospermum*-like species may not represent a single monophyletic group but belong to various species complexes within *Cladosporium* (Zalar *et al.* 2007). However, final conclusions about a subgeneric classification of *Cladosporium* are not yet possible. Additional molecular examinations of a wider range of species are necessary to see if more species complexes exist in the genus *Cladosporium*.

## Generic concept of the teleomorph, *Davidiella*

***Davidiella*** Crous & U. Braun, Mycol. Progr. 2: 8. 2003, *emend.* in Schubert *et al.* (2007b).

*Type species*: *Davidiella tassiana* (De Not.) Crous & U. Braun, Mycol. Progr. 2: 8. 2003.
*Basionym*: *Sphaerella tassiana* De Not., Sferiacei Italici 1: 87. 1863.

*Ascomata* pseudothecial, black to red-brown, globose, inconspicuous and immersed beneath stomata to superficial, situated on a reduced stroma, with 1(–3) short, periphysate ostiolar necks; periphysoids frequently growing down into cavity; wall consisting of 3–6 layers of *textura angularis*. *Asci* fasciculate, short-stalked or not, bitunicate, subsessile, obovoid to broadly ellipsoid or subcylindrical, straight to slightly curved, 8-spored. *Pseudoparaphyses* frequently present in mature ascomata, hyaline, septate, subcylindrical. *Ascospores* bi- to multiseriate, hyaline, obovoid to ellipsoid-fusiform, with irregular luminar inclusions, mostly thick-walled, straight to slightly curved; frequently becoming brown and verruculose in asci; at times covered in mucoid sheath. *Cladosporium* anamorph usually produced in culture, but not in all taxa.

*Notes*: The genus *Davidiella* (*Cladosporiaceae*) was recently introduced for teleomorphs of *Cladosporium s. str.* (Braun *et al*. 2003). The introduction of *Davidiella* was mainly based on

phylogenetic studies within *Mycosphaerellaceae* (Braun *et al*. 2003), where it could be demonstrated that "*Mycosphaerella*" species with *Cladosporium* anamorphs formed a sister clade to *Mycosphaerella* (Crous *et al*. 2000, 2001). Braun *et al*. (2003) transferred five species to *Davidiella* based on prior established anamorph-teleomorph connections, though no details were provided pertaining to morphological differences between *Davidiella* and *Mycosphaerella*. Aptroot (2006) transferred several additional species to *Davidiella*, and distinguished them from true *Mycosphaerella* species by the presence of distinct, irregular cellular inclusions (lumina) in their ascospores. Furthermore, Schoch *et al.* (2006, 2009a, b) placed *Davidiella* in a separate family [*Cladosporiaceae* (Nannizi 1934), which predates *Davidiellaceae* (2007)] in *Capnodiales*. During the course of the studies within the *Cladosporium herbarum* species complex (Schubert *et al.* 2007b), several fresh specimens of *Davidiella* spp. were collected or induced in culture, making it possible to give an emended circumscription of the genus with additional features to distinguish it from *Mycosphaerella*. The induced *Davidiella* states were all from homothallic species. The genus presently contains 33 names (www.MycoBank.org), of which only around five have acknowledged *Cladosporium* states.

## MORPHOTAXONOMY OF *CLADOSPORIUM S. STR.*

### Morphology *in vivo* and *in vitro*

#### *Mycelium*

The mycelium of foliicolous as well as saprobic *Cladosporium* species *in vivo* is often internal, but can also be both internal and external or exclusively external. The hyphae are consistently septate, mostly branched, smooth, occasionally somewhat rough-walled, and subhyaline, lightly pigmented to dark brown, thin-walled, but sometimes becoming thick-walled with age. Some species are characterised by having very wide hyphae, *e.g.*, *C. gentianae*, while others sometimes possess somewhat lobed hyphae, *e.g.*, *C. grech-delicatae* and *C. foliorum*, but these features are of little value for the delimitation of species. Particular hyphal cells are often somewhat swollen and form small to large, loose aggregations or dense stromata. However, the ability to form stromata is often variable and not diagnostic.

*In vitro*, stromata are usually lacking, and the mycelium is often very variable, ranging from narrow, subhyaline to much wider, distinctly pigmented hyphae, thin-walled, but sometimes even with somewhat thickened walls with age. Some species are able to form hyphal strands or expanded superficial hyphal ropes, *e.g.*, *C. angustisporum*, *C. australiense*, *C. perangustum* and *C. tenellum* while others form dimorphic hyphae as *C. antarcticum*. The mycelium in most of the *Cladosporium* species treated in the *C. cladosporioides* complex is more or less *Zasmidium* (*Stenella*-) -like *in vitro*, being verruculose or verrucose to irregularly rough-walled, an observation not previously documented from the natural hosts since the fungal hyphae are usually intercellular in host tissue (Bensch *et al.* 2010). In general, the features of the hyphae are of little diagnostic and taxonomic value.

#### *Conidiophores*

*In vivo* the conidiophores in species of the genus *Cladosporium* usually arise from internal or external hyphae, from small to large stromatic hyphal aggregation, but occasionally even from sterile or immature pseudothecium-like bodies [see Webster & Weber (2007: 485, figs 17, 23), Dugan & Rector (2007: 10, figs 1–4)]. They are mostly cylindrical, subcylindrical or filiform, but further differentiation is often due to sympodial proliferations causing geniculations with conidiogenous loci often situated on small lateral shoulders or terminal to intercalary swellings. Several species are well-characterised by having mildly to distinctly geniculate-sinuous conidiophores, *e.g.*, *C. hypophyllum*, *C. minusculum* and *C. varians*, but strongly geniculate-sinuous conidiogenous cells are also known, *e.g.* in *C. sinuosum.* Different degrees of intercalary and apical inflation of the conidiophores are possible, ranging from subnodulose to nodose. The swellings may be circumferential or unilateral. Small, unilateral swellings are known in *C. tenuissimum.* The term subnodulose is used when lateral shoulders become slightly increased. Nodulose conidiophores, as in *C. allicinum*, *C. herbarum*, *C. herbaroides*, *C. macrocarpum*, *C. subinflatum*, *C. trillii* and *C. variabile*, possess circumferential swellings around the stalks, such swellings often being formed in quick succession, giving conidiophores a somewhat gnarled or knotty appearance. Nodose conidiophores with distinct, regular, more pronounced swellings, clearly separated and distant from each other, are formed in *C. colocasiae* and *C. oxysporum*. The process of conidiogenesis within the latter two species has been described in detail by McKemy & Morgan-Jones (1991b).

As conidiophores become temporarily determinate, linear apical growth ceases. The conidiophores swell appreciably at the extreme apex and a few conidia are formed in close proximity to one another at the surface of the inflated portion. Following such conidiation, apical meristematic terminal growth resumes giving rise initially to a narrow, hypha-like extension above the fertile node. This grows to varying lengths, depending upon growing conditions. The extended distal portion usually becomes separated from the node below by a transverse septum and then ceases growth. Terminal swellings and conidiation then ensue at the higher level and the sequence of events is repeated a number of times to give rise to the characteristic nodose morphology. Whether the conidiogenous loci are confined to swellings or not, is also an important feature for the discrimination of species. Within a species the shape of the conidiophores is usually uniform, but in a few cases, *e.g.*, *C. fusicladiiformis* and *C. chrysophylli*, they are dimorphic: two different types of conidiophores are formed, which morphologically vary in their length, width, septation, pigmentation and sometimes in the thickness of the walls. Much smaller micronematous conidiophores are often formed in culture beside the common macronematous conidiophores (Schubert *et al*. 2007b, Bensch *et al.* 2010).

Peculiarities of the arrangement of conidiophores *in vivo* are often diagnostic in combination with other characteristics. The number of conidiophores per fascicle is mostly variable, but general circumscriptions, *e.g.* "conidiophores solitary or in small loose groups" or "conidiophores numerous, in dense fascicles", are workable and useful. A few species within the genus *Cladosporium* form conspicuous fascicles of conidiophores, *e.g.*, *C. soldanellae* and *C. oreodaphnes*. *In vitro* the conidiophores are almost consistently formed singly, arising from plagiotropous hyphae, *i.e.*, aggregations of conidiophores in fascicles or sporodochia are rarely formed in culture. Branched conidiophores occur in a number of species such as *C. diaphanum*, *C. rectangulare*, *C. sarmentorum*, *C. smilacicola* and *C. sphaerospermum*. The ramification of the conidiophores (presence, degree, topology) is an additional useful feature, but can be affected by age and environmental conditions. Conidiophores branched *in vivo* are usually also branched in culture. The length of the conidiophores is usually variable, often strongly influenced by external conditions, and must be applied with

caution. Some species are well-distinguished by having constantly short, fasciculate conidiophores under natural conditions, usually not longer than 60 µm, as in *C. lupiniphilum*, *C. praecox* and *C. rutae*. However, it has been reported by several authors (*e.g.*, Ellis 1971, Morgan-Jones & McKemy 1990) that conidiophore length can be extremely variable (sometimes twice as long as under field conditions), when incubated in a damp chamber or when grown *in vitro*. The width of conidiophores is usually less variable. The occurrence and number of septa depend on conidiophore length.

Under light microscopy the walls of the conidiophores can either be recognised as a single wall layer or when distinctly thickened, two layers can be observed, *e.g.*, in *C. apicale* and *C. ushuwaiense*. The outer wall, which can be ornamented, is often somewhat wider and paler than the inner wall layer. In combination with other characteristics the width of the conidiophore walls can be used as an additional feature to discriminate species. During periods of unfavourable conditions, in some cases the conidiophores of *Cladosporium* can stop growing and the walls become rigid. When these conditions are over, the conidiophores may resume growth to produce new conidiogenous cells. The apical conidiophore wall ruptures through the enteroblastic proliferation of an internal layer of the wall, visible as discontinuity in pigmentation and in thickness of the wall. David (1997), who described this phenomenon in detail, used the term enterogenous, but the term enteroblastic, expanded and applied by Minter *et al*. (1982) to mechanisms of budding in general, covering proliferations of conidiophores, conidiogenous cells and conidia, should be preferred. Enteroblastic proliferations are evident in *C. orchidiphilum* and *C. populicola*. In several species, the lumen of the conidiophore cells may be distinctly diminished or the protoplasm of the conidiophore cells appears to be somewhat aggregated at the septa (similar to distoseptation), giving septa and above all walls a somewhat thickened appearance, *e.g.*, in *C. fusicladiiformis*. This phenomenon could also be observed in a few species of the genera *Fusicladium* and *Passalora*, and reminds one of the features of the ascospores in *Davidiella* which are often also characterised by having distinct irregular luminar inclusions (Aptroot 2006, Schubert *et al*. 2007b).

### *Conidiogenous cells*

The conidiogenous cells are integrated, terminal or intercalary, or sometimes conidiophores are reduced to conidiogenous cells. De Vries (1952) recognised two types of conidial heads. The sympodial growth with regular prolongations of the conidiophores giving rise to new conidiogenous loci as in *C. herbarum* was referred to as the "*Cladosporium* type" and is common within the genus. In a few species, such as *C. tenuissimum* and *C. cladosporioides*, there is comparatively little, if any, sympodial conidiophore growth, no prolongations and thus a limited number of conidiogenous loci occur. A large diversity of conidia is formed as a result of the formation of primary, secondary and tertiary conidia. This second type was called the "*Hormodendrum* type". Recognition of these types and variation among them can be useful in better defining species concepts and in identification (McKemy & Morgan-Jones 1991c). De Vries (1952) considered these two types to occur commonly in any species of *Cladosporium* in culture. However, in some species conidiophores do not proliferate sympodially, so that the "*Hormodendrum* type" is a full expression of the potential of the species concerned (David 1997). David (1997) considered the distinction between proliferating and non-proliferating conidiophores to be more important than recognised by de Vries (1952) and introduced a sectional division of subgenus *Cladosporium* on the basis of types of conidiophore growth patterns. Section *Hormodendropsis* comprises *Cladosporium* species with determinate conidiophores and section *Cladosporium* is characterised by having indeterminate, sympodially proliferating conidiophores. Samson *et al*. (2000) mentioned that these two types could not always be sharply defined. In culture, Hennebert & Sutton (1994) recognised the phenomenon that some species may initially produce "*Hormodendrum* type" conidial heads but subsequently proliferate and thus become "*Cladosporium* type". The latter observations could be confirmed during the course of present monographic studies (Schubert 2005b). Differences in the proliferation of conidiogenous cells are, indeed, not clearly defined, and intermediate types occur. Hence, these features should not be used for the separation of *Cladosporium* into smaller units.

The structure of the conidiogenous loci and conidial hila is more or less uniform within the genus *Cladosporium*; differences noted between species are only minimal and gradual. This character is above all significant at the generic level as stated above. Roquebert (1981) carried out the first detailed SEM examinations of the scar structure. David (1997) followed the terminology introduced in the latter paper and published the first comprehensive circumscription of the conidiogenous loci and hila. They are protuberant, thickened, refractive to somewhat darkened and consist of a central convex dome, which is the slightly bulging half of the original septum, delimiting the conidium and the conidiogenous cell, after being cleft, and a raised periclinal rim, where the walls were joined prior to secession (coronate or "*Cladosporium* type" of scars according to Braun *et al.* 2003). The main source of variation is in the degree of thickening of the rim, size and protuberance can vary with age. The size of these structures is often not very variable between *Cladosporium* species (mostly 1–2 µm diam) and therefore of limited value for the discrimination of species.

Conidial secession in *Cladosporium* is schizolytic (David 1997), *i.e.*, the basal separating septum splits at the middle layer by cleavage. However, there are some peculiarities that distinguish this process and the resulting scar structure from other hyphomycete genera. The conidiogenous loci are distinctly protuberant and split in the middle, leaving a conspicuous fringe (raised periclinal rim). Mature conidia separate at the outer rim, but remain attached at the central dome, which secedes later. This process results in a conspicuous central papilla-like structure or dome (David 1997: 15, fig. 2A, Schubert *et al*. 2007b: 119, fig. 10B, 123, fig. 15C–F, 131, fig. 24D). David (1997) classified this unique scar type to be coronate, but since peculiar and confined to *Cladosporium s. str.* it is also appropriate to simply call it "*Cladosporium* type" (Braun *et al*. 2003).

### *Conidia*

All *Cladosporium* species have the potential to produce conidia in true acropetal chains. Species with solitary conidia on the host usually have the capacity to produce conidia in chains in culture. The formation of the conidia in chains or solitary is a useful feature to differentiate particular species, but it is not tenable at the generic level. Conidial chains within the genus *Cladosporium* are acropetal, sympodial and often profusely branched. The term ramoconidia has been used by several authors (*e.g.*, Ellis 1971, 1976, McKemy & Morgan-Jones 1991c, David 1997) for those conidia at the base of branches having more than one distal scar. Kirk *et al*. (2001) provided a definition of the term ramoconidium, describing it as a branch of a conidiophore, which secedes and functions as a conidium, which means that it represents a detached conidiogenous cell. In *Cladosporium*, they are characterised by

having a truncate or slightly convex, unthickened base, without any dome or raised rim, which could be confirmed by light and scanning electron microscopy (see Schubert 2005b: pl. 24, fig. E). Schubert (2005b) and Heuchert *et al*. (2005) used for these "true" ramoconidia the term "ramoconidia *s. str.*", and classified branched "normal" conidia occurring at the base or within the chains, characterised by having a basal coronate hilum and more than one distal scar, as ramoconidia *s. lat*. Due to the structure of the conidial base, both types are easily separable. However, Schubert *et al.* (2007b) redefined the different conidial types and followed Kirk *et al.* (2001) in confining the term "ramoconidium" to detached conidiogenous cells or short, fertile, terminal branches, and reclassified branched conidia (ramoconidia *s. lat.*, according to Heuchert *et al*. 2005 and Schubert 2005b) as secondary ramoconidia. The presence of ramoconidia is a feature of limited value for the characterisation of *Cladosporium* species, since these structures are often rarely formed or even lacking. If ramoconidia are present, a combination of length, width and septation of these structures may be useful for the discrimination of particular groups or distinct species.

The conidial shape is highly variable and only little differentiated between the species examined, ranging from subglobose, ovoid, ellipsoid, fusiform, limoniform to subcylindrical or cylindrical. The conidial length and the degree of septation are also often variable and depend on external conditions so that these characters can only be used in combination with other taxonomic features. The width of the conidia is, however, less variable and rather suitable for the delimitation of allied taxa.

The shape and size of conidia within long acropetal conidial chains of *Cladosporium* species is often strongly variable, differing from base to apex. Ramoconidia, if present, are often followed by septate secondary ramoconidia, smaller intercalary conidia and very small, usually aseptate terminal conidia. In order to enable more differentiated, precise descriptions of conidia in *Cladosporium* species, Schubert *et al*. (2007b) proposed a redefined conidium terminology (Fig. 3), applying the terms: ramoconidium, secondary ramoconidium, intercalary conidium and small terminal conidium.

Peculiarities of conidial surface ornamentation provide useful criteria for the separation of species, but must be judged with caution. A general grouping, *e.g.*, "conidia smooth or almost so", or "conidia verruculose or verrucose" is, however, workable. Species with verruculose or conspicuously verrucose-echinulate conidia are easily distinguishable from those with conidia that are smooth or almost so. However, in several species some variation in surface ornamentation can occur, *e.g.*, in *C. herbarum*. Conidia of the latter species are mainly verruculose, but sometimes a few smooth conidia may be intermixed. Older conidia of species with usually smooth conidia sometimes become somewhat rough-walled, *e.g.*, in *C. fusicladiiformis*, *C. lineolatum* and in *C. oncobae*. Surface ornamentation of conidia in the *C. cladosporioides* complex is quite variable ranging from smooth or almost so to irregularly verruculose-rugose, verrucose or rough-walled in some species. This is comparable with the *C. sphaerospermum* complex in which species with both smooth-walled as well as ornamented conidia are included (Zalar *et al.* 2007), whereas all species in the *C. herbarum* complex possess ornamented conidia with the ornamentation ranging from minutely verruculose to verrucose, echinulate or spiny (Fig. 4). The most prominent surfaces within the *C. cladosporioides* complex are formed by *C. acalyphae*, *C. exasperatum* and *C. verrucocladosporioides*. Under SEM the surface of their irregularly verruculose-rugulose conidia show irregularly reticulate structures or embossed stripes. This phenomenon was also described and illustrated for powdery mildew anamorphs (Cook *et al*. 1997, Braun

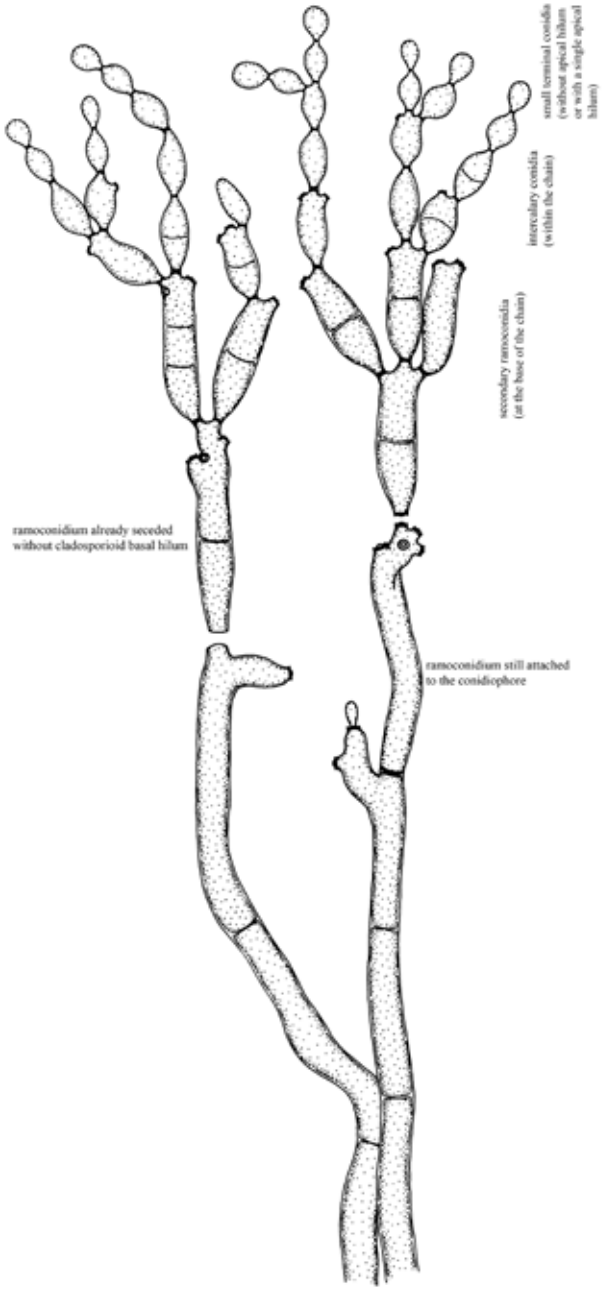



**Fig. 3.** Overview showing the different types of cladosporioid conidia. *Cladosporium* conidiophore with ramoconidia, secondary ramoconidia, intercalary conidia, and small, terminal conidia. Scale bar = 10 µm. K. Bensch *del*.

*et al*. 2002). *Cladosporium cladosporioides* usually forms smooth conidia (LM) but under SEM such wrinkled structures or embossed stripes are also visible. They are not as prominent as in *C. acalyphae* or *C. exasperatum* and therefore not to be seen when using light microscopy and seem to occur more commonly in older conidia. Several species are characterised by irregular ornamentation on the small terminal and intercalary conidia, whereas secondary ramoconidia are smooth or almost so, as in *C. inversicolor*, *C. acalyphae* and *C. rectoides*. Combined with additional taxonomic features, this characteristic can be used for species delimitation.

Since there are only few taxonomically relevant features within the genus *Cladosporium* and in hyphomycetes in general, attention has been paid to characteristic cell structures, hitherto barely used for taxonomic purposes. In several species, as in *C. arthrinioides*, *C. heliotropii* and in *C. minusculum*, the conidial cells are characterised by having a reduced, conspicuous lumen

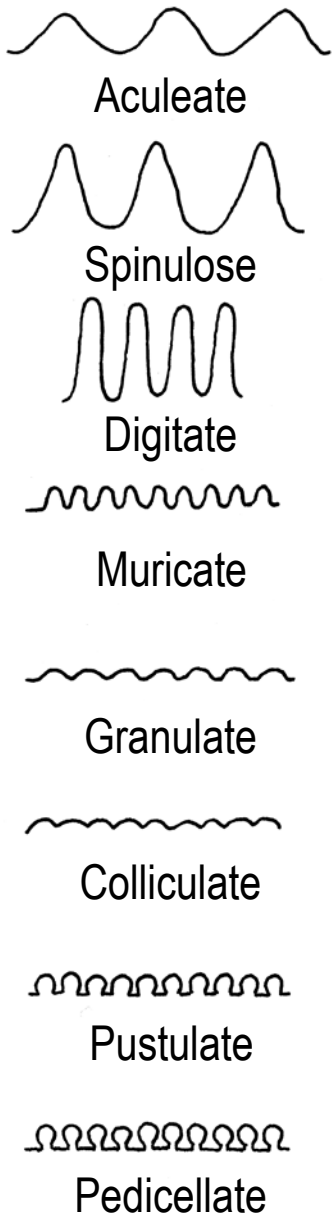



**Fig. 4.** Terms used to describe conidium wall ornamentation under the cryo-electron microscope. Adapted from David (1997).

(Schubert 2005b: figs 8, 33, 34, 45), reminiscent of the irregular luminar inclusions in ascospores of *Davidiella* (Aptroot 2006). This structure has been observed both in type material of *C. heliotropii*, described from Sweden, and in additional collections of this species collected in Alaska so that it may be used as distinctive feature. In some cases, the lumen of the conidial and also conidiophore cells often appears to be distinct, clearly separated from the inner wall (*e.g.*, in *C. syringicola* and *C. populicola*). Peculiarities of the cell structure are, however, little examined and probably of limited value at species level.

## SPECIES CONCEPT

The circumscriptions and delimitations of the species concerned are mainly based on quantitative as well as qualitative morphological features *in vivo* and *in vitro* and on molecular data if cultures were available. Host range and specialisation of biotrophic taxa as well as geographical distribution are also taken into consideration. All species are comprehensively compared with morphologically similar species as well as species which occur on host plants of the same plant family or the same substrate.

The following features proved to be diagnostic for the differentiation at species rank:

- Shape of the conidiophores (geniculate-sinuous, nodulose, location of the conidiogenous loci, dimorphism).
- Ramification of the conidiophores (presence, topology, degree).
- Width of the conidiophores.
- Formation of conidia (solitary or catenate, unbranched or branched chains).
- Conidial surface ornamentation.
- Symptoms, lesions, host specifity in biotrophic species.

The following features are only diagnostic in combination with other features:

- Mycelium (internal, external, both internal and external in biotrophic species).
- Arrangement of the conidiophores in biotrophic species (solitary, fasciculate).
- Length, septation and thickness of the conidiophore wall.
- Conidiogenous cells (terminal, intercalar, conidiophores reduced to conidiogenous cells; proliferation sympodial, enteroblastic; number and width of conidiogenous loci).
- Ramoconidia (presence, length, width, septation).
- Conidia (length, width, septation, shape, cell structure).

The following features are either more or less uniform or highly variable and thus less appropriate for the discrimination of species:

- Structure of the mycelium.
- Formation of stromata *in vivo*.
- Formation of conidiophores (arising from stromata or hyphae).
- Structure of the conidiogenous loci and hila (generic feature).
- Degree of pigmentation of conidiophores and conidia.

Phylogenetic features: Molecular sequence analysis is a helpful tool to differentiate closely allied, morphologically similar species, above all with regard to saprobic taxa. Less closely allied species with obvious morphological differences, *e.g.* species with smooth versus verruculose or echinulate conidia, are genetically usually clearly distinct and usually form clearly separate clusters, even in phylograms based on a single locus (*e.g.* rDNS ITS) (Braun *et al*. 2003). However, within complexes of morphologically similar, closely allied taxa, ITS data are often not sufficient to discriminate species, *i.e.*, the resolution is often too poor, resulting in trees with polytomous structures. During the course of detailed genetic as well as morphological examinations of the *Cladosporium herbarum* complex, it could be demonstrated that a multilocus DNA sequence approach, based on ITS, actin, calmodulin, translation elongation factor 1-α, and histone H3, led to a much better resolution and distinction of closely allied taxa (Schubert *et al*. 2007b). In Bensch *et al.* (2010) a combination of three loci was used to define species entities within the *C. cladosporioides* complex (Fig. 5).

## BIOLOGY, ECOLOGY AND DISTRIBUTION

*Cladosporium* species have an extremely wide ecological range, occurring on all kinds of substrates, and on a wide range of hosts, either biotrophically or on dead or senescing tissue. In contrast

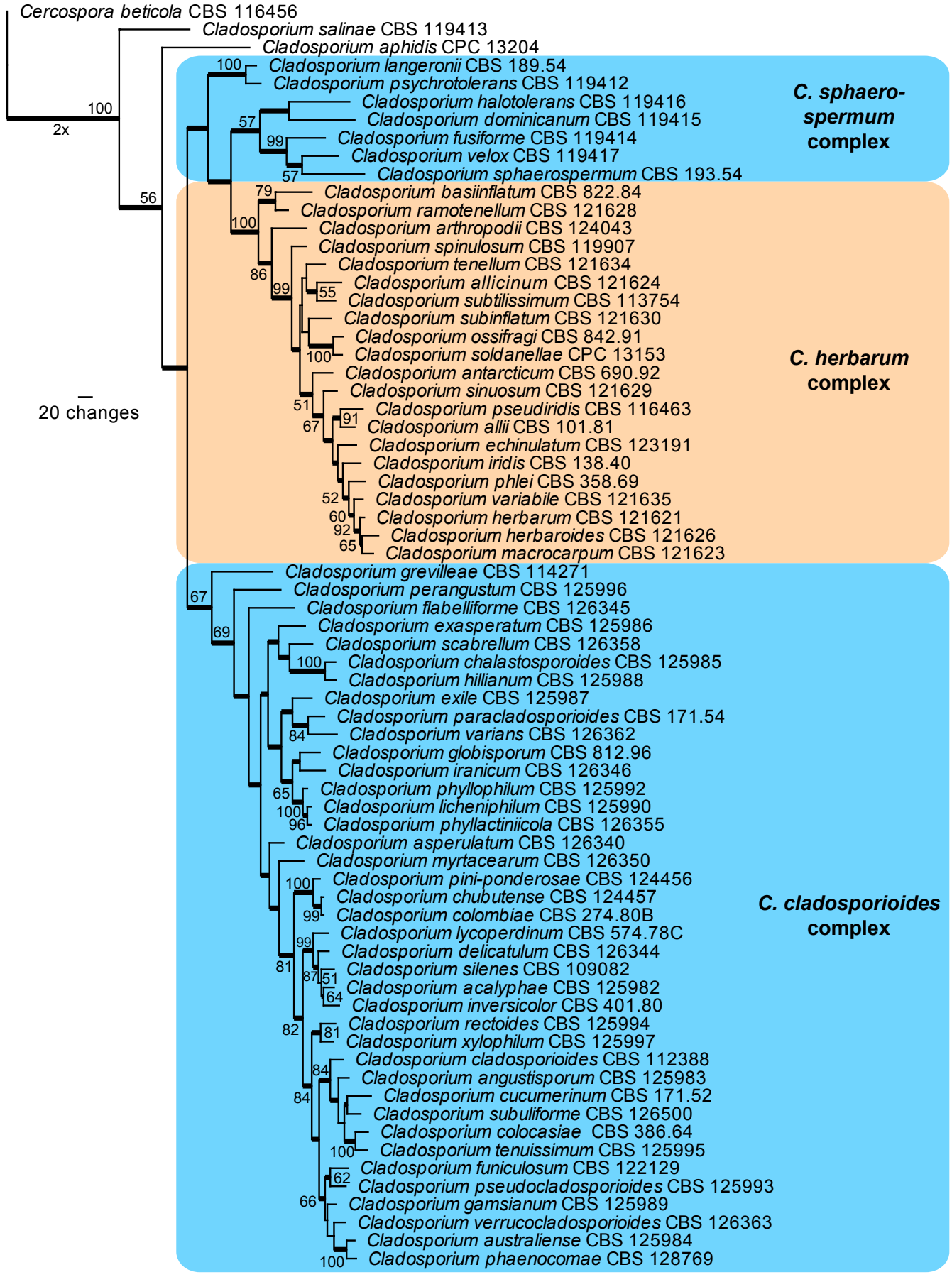



**Fig. 5.** The first of 12 equally most parsimonious trees obtained from a heuristic search with 100 random taxon additions of the combined ITS, EF-1α and ACT sequence alignment. The scale bar shows 20 changes, and bootstrap support values from 1 000 replicates are shown at the nodes. Thickened lines indicate branches present in the strict consensus tree and the major species complexes are indicated in coloured blocks. The tree was rooted to sequences of *Cercospora beticola* strain CBS 116456 (GenBank accession numbers AY840527, AY840494, AY840458, respectively).

to previous assumptions, only a limited number of species are plurivorous, widely distributed saprobic species, as *e.g. C. herbarum*, *C. cladosporioides* and *C. oxysporum*, which do not appear to have any strong environmental preferences. On the other hand, there are some saprobic species inhabiting particular, limited ecological niches. Schubert *et al*. (2007b) described, for instance, several new species of the *C. herbarum* complex from hypersaline environments, and Zalar *et al*. (2007) found various new halophilic and halotolerant *C. sphaerospermum*-like species. Some *Cladosporium* species are fungicolous using other fungi as substrate (Heuchert *et al*. 2005), but numerous species are biotrophic, often host-specific, causing typical leaf spots, discolorations, necrosis or shot hole symptoms on living or senescing leaves. Some of them may develop almost without any visible symptoms (*e.g.*, *C. obtectum*) or attack stems (*e.g.*, *C. grech-delicatae*). For these biologically specialised taxa the host range is an important feature. They usually follow the distribution of their hosts. Cultivated hosts are usually colonised wherever grown. The host ranges are usually more or less confined, not exceeding the limits of a single host family, mostly even narrower, often only covering few species of a single genus. However, there are some exceptions, *e.g.*, *C. allii*, *C. allii-cepae* and *C. victorialis* on various species of *Allium*. While *C. allii-cepae* is known to be confined to *Allium cepa* (Kirk & Crompton 1984), *C. allii* is reported to have a wider host range. David (1997) concluded that this may indicate that *C. allii-cepae* has evolved with its host to become distinct, whereas *C. allii* is the original form, known to occur on non-cultivated members of the genus *Allium*. *Cladosporium victorialis*, recorded from Korea and Russia, is morphologically quite distinct from the latter two species, so it could be assumed that *Allium* has been colonised twice.

A surprising finding from the molecular studies in the three species complexes recently studied (Schubert *et al.* 2007b, Zalar *et al.* 2007, Bensch *et al.* 2010) was the huge diversity in species and genotypes that exist in nature, be it in indoor environments, on fruit surfaces, or in extreme ecological niches such as salterns, *etc.* Several isolates from a single substrate in a single location, *e.g.*, chasmothecia of *Phyllactinia guttata* on leaves of an individual plant, *Corylus avellana* (Dugan & Glawe 2006; table 1, Bensch *et al.* 2010) or grapes in the USA (Schubert *et al.* 2007b) can be colonised by various genotypes representing several completely different species. The phenomenon of co-occurrence of many species on the same lesions on a single host in *Mycosphaerella* and *Teratosphaeria* leaf disease complexes has been frequently described and discussed (Crous 1998, Crous *et al.* 2004b, 2007a, 2008a, b, 2009e, Crous & Groenewald 2005, Burgess *et al.* 2007, Arzanlou *et al.* 2008, Cheewangkoon *et al.* 2008). Therefore, it is not surprising that co-occurring genotypes or species also exist in the related genus *Cladosporium* (also see Wirsel *et al.* 2002), suggesting that special care needs to be taken during the isolation and culturing of these taxa.

## MATERIAL AND METHODS

Microscopic examinations were carried out based on collections from numerous herbaria and fresh specimens. The collections examined are deposited at numerous herbaria: B, BPI, BRIP, CUP, DAOM, CBS, FH, HAL, HBG, IACM, ILL, IMI, INIFAT, K, KR, LBLM, LE, LEP, LPS, M, MA, NY, NYS, PAD, PC, PDD, PH, PPMH, PRM, S, SIENA, VPRI, W, WIS, *etc.* (abbreviations according to Holmgren *et al*. 1990). Details on other methods, like scanning electron microscopy and molecular sequence analyses are outlined in the papers concerned (see Braun *et al.* 2003, Heuchert *et al*. 2005, Schubert 2005b, Crous *et al*. 2007a, Schubert *et al.* 2007b, Bensch *et al.* 2010).

### Isolates and herbarium specimens

Microscopic examinations were carried out based on collections from numerous herbaria, some fresh specimens and hundreds of isolates. The collections examined are deposited at the following herbaria: B, BPI, BRIP, C, CBS, CUP, DAOM, DAR, FH, HAL, HBG, IACM, ILL, IMI, INIFAT, K, KR, LBLM, LE, LEP, LPS, M, MA, NY, NYS, PAD, PC, PDD, PH, PPMH, PRM, S, SIENA, VPRI, W, WIS (abbreviations according to Holmgren *et al.* 1990). Isolates included in this or previous studies were obtained from the culture collection of the Centraalbureau voor Schimmelcultures (CBS), Utrecht, the Netherlands, or were freshly isolated from a range of different substrates. Single-conidial and ascospore isolates were obtained using the techniques as explained in Crous (1998) for species of *Mycosphaerella* and its anamorphs. Isolates were inoculated onto 2 % potato-dextrose agar (PDA), synthetic nutrient-poor agar (SNA), 2 % malt extract agar (MEA) and oatmeal agar (OA) (Crous *et al.* 2009d), and incubated under continuous near-ultraviolet light at 25 °C to promote sporulation. All cultures obtained in this study are maintained in the culture collection of the CBS (Table 1). Nomenclatural novelties and descriptions were deposited in MycoBank (www.MycoBank.org; Crous *et al.* 2004a).

### DNA isolation, amplification and sequence analysis

Genomic DNA was extracted from mycelia of fungal colonies cultivated on MEA using the UltraCleanTM Microbial DNA Isolation Kit (Mo Bio Laboratories, Inc., Solana Beach, CA, USA) according to the manufacturer's instructions. The primers V9G (de Hoog & Gerrits van den Ende 1998) and LR5 (Vilgalys & Hester 1990) were used to amplify part of the nuclear rDNA operon (ITS) spanning the 3' end of the 18S nrRNA gene, the first internal transcribed spacer, the 5.8S nrRNA gene, the second ITS region and the first approximately 900 bp of the 5' end of the 28S nrRNA gene (LSU). The primers ITS4 (White *et al.* 1990) and LR0R (Rehner & Samuels 1994) or LSU1Fd (Crous *et al*. 2009b) were used as internal sequence primers to ensure good quality sequences over the entire length of the amplicon. To obtain resolution at species level for *Cladosporium*, the ITS region was supplemented with partial gene sequences of the translation elongation factor 1-α gene (EF-1α) using the primers EF1-728F and EF1-986R (Carbone & Kohn 1999) or EF-2 (O'Donnell *et al*. 1998) and the actin gene (ACT) using the primers ACT-512F and ACT-783R (Carbone & Kohn 1999). The PCR amplifications were performed on a GeneAmp PCR System 9700 (Applied Biosystems, Foster City, CA, USA) in a total volume of 12.5 µL solution containing 10–20 ng of template DNA, 1 × PCR buffer, 2.0 mM MgCl2, 2.5 pmol of each primer, 20 µM of each dNTP and 0.5 U BioTaq DNA polymerase (Bioline GmbH, Luckenwalde, Germany). For TEF, 0.7 µL of water with a similar volume of DMSO (Dimethyl sulfoxide) was found to increase the quality of the amplification reaction. PCR amplification conditions were set as follows: an initial denaturation temperature of 94 °C for 5 min, followed by 40 cycles of denaturation temperature of 94 °C for 45 s, primer annealing at 48 °C (52 °C for TEF and ACT) for 30 s, primer extension at 72 °C for 90 s and a final extension step at 72 °C for 6 min. The resulting fragments were sequenced using the PCR primers (and internal primers for the combined

**Table 1.** GenBank and culture collection accession numbers of *Cladosporium* species treated in the species phylogeny.

| Species | Culture accession number(s)[1] | Status of strain | GenBank accession numbers[2] | | | | | | | | Reference |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | ITS | TEF | ACT | HIS | CAL | LSU | TUB | SSU | |
| *C. acalyphae* | CBS 125982; CPC 11625 | Ex-type from holotype | HM147994 | HM148235 | HM148481 | — | — | — | — | — | Bensch *et al.* (2010) |
| *C. allicinum* | CBS 121624; CPC 12211 | Ex-type from neotype | EF679350 | EF679425 | EF679502 | EF679655 | EF679578 | — | — | — | Schubert *et al.* (2007b) |
| *C. allii* | CBS 101.81; ATCC 200948; PD 80/165 | Reference strain | JN906977 | JN906983 | JN906996 | — | — | — | — | — | Present study |
| *C. angustisporum* | CBS 125983; CPC 12437 | Ex-type from holotype | HM147995 | HM148236 | HM148482 | — | — | — | — | — | Bensch *et al.* (2010) |
| *C. antarcticum* | CBS 690.92 | Ex-type from holotype | EF679334 | EF679405 | EF679484 | EF679636 | EF679560 | EF679334 | — | — | Schubert *et al.* (2007b) |
| *C. aphidis* | CPC 13204 | Ex-type from epitype | JN906978 | JN906984 | JN906997 | — | — | — | — | — | Present study |
| *C. arthropodii* | CBS 124043; CPC 16160 | Ex-epitype from epitype | JN906979 | JN906985 | JN906998 | — | — | — | — | — | Present study |
| *C. asperulatum* | CBS 126340; CPC 14040 | Ex-type from holotype | HM147998 | HM148239 | HM148485 | — | — | — | — | — | Bensch *et al.* (2010) |
| *C. australiense* | CBS 125984; CPC 13226 | Ex-type from holotype | HM147999 | HM148240 | HM148486 | — | — | — | — | — | Bensch *et al.* (2010) |
| *C. basiinflatum* | CBS 822.84 | Ex-type from holotype | HM148000 | HM148241 | HM148487 | — | — | — | — | — | Bensch *et al.* (2010) |
| *C. chalastosporoides* | CBS 125985; CPC 13864 | Ex-type from holotype | HM148001 | HM148242 | HM148488 | — | — | — | — | — | Bensch *et al.* (2010) |
| *C. chubutense* | CBS 124457; CPC 13979; CIEFAP 321 | Ex-type from holotype | FJ936158 | FJ936161 | FJ936165 | — | — | — | — | — | Schubert *et al.* (2009) |
| *C. cladosporioides* | CBS 112388 | Ex-type from neotype | HM148003 | HM148244 | HM148490 | — | — | — | — | — | Bensch *et al.* (2010) |
| *C. colocasiae* | CBS 386.64; ATCC 200944; MUCL 10084 | Ex-type from holotype | HM148067 | HM148310 | HM148555 | — | — | AY342121 | — | — | Bensch *et al.* (2010) |
| *C. colombiae* | CBS 274.80B | Ex-type from holotype | FJ936159 | FJ936163 | FJ936166 | — | — | — | — | — | Schubert *et al.* (2009) |
| *C. cucumerinum* | CBS 171.52; MUCL 10092 | Ex-type from epitype | HM148072 | HM148316 | HM148561 | — | — | — | — | — | Bensch *et al.* (2010) |
| *C. delicatulum* | CBS 126344; CPC 11389 | Reference strain | HM148081 | HM148325 | HM148570 | — | — | — | — | — | Bensch *et al.* (2010) |
| *C. dominicanum* | CBS 119415; EXF-732; dH 16386 | Ex-type from holotype | DQ780353 | JN906986 | EF101368 | — | — | — | EF101415 | — | Zalar *et al.* (2007) |
| *C. echinulatum* | CBS 123191; CPC 15386 | Reference strain | JN906980 | JN906987 | JN906999 | — | — | — | — | — | Present study |
| *C. exasperatum* | CBS 125986; CPC 14638 | Ex-type from holotype | HM148090 | HM148334 | HM148579 | — | — | — | — | — | Bensch *et al.* (2010) |
| *C. exile* | CBS 125987; CPC 11828 | Ex-type from holotype | HM148091 | HM148335 | HM148580 | — | — | — | — | — | Bensch *et al.* (2010) |
| *C. flabelliforme* | CBS 126345; CPC 14523 | Ex-type from holotype | HM148092 | HM148336 | HM148581 | — | — | — | — | — | Bensch *et al.* (2010) |
| *C. funiculosum* | CBS 122129; ATCC 38010; IFO 6537; JCM 10683 | Ex-type from type | HM148094 | HM148338 | HM148583 | — | — | AY342129 | — | — | Bensch *et al.* (2010) |
| *C. fusiforme* | CBS 119414; EXF-449; dH 16387 | Ex-type from holotype | DQ780388 | JN906988 | EF101372 | — | — | — | EF101446 | DQ780935 | Zalar *et al.* (2007) |
| *C. gamsianum* | CBS 125989; CPC 11807 | Ex-type from holotype | HM148095 | HM148339 | HM148584 | — | — | — | — | — | Bensch *et al.* (2010) |
| *C. globisporum* | CBS 812.96 | Ex-type from holotype | HM148096 | HM148340 | HM148585 | — | — | — | — | — | Bensch *et al.* (2010) |
| *C. grevilleae* | CBS 114271; CPC 2913 | Ex-type from holotype | JF770450 | JF770472 | JF770473 | — | — | JF770462 | — | — | Crous *et al.* (2011b) |
| *C. halotolerans* | CBS 119416; EXF-572 | Ex-type from holotype | DQ780364 | JN906989 | EF101397 | — | — | — | EF101424 | DQ780929 | Zalar *et al.* (2007) |
| *C. herbaroides* | CBS 121626; CPC 12052; EXF-1733 | Ex-type from holotype | EF679357 | EF679432 | EF679509 | EF679662 | EF679585 | — | — | — | Schubert *et al.* (2007b) |
| *C. herbarum* | CBS 121621; CPC 12177 | Ex-epitype from epitype | EF679363 | EF679440 | EF679516 | EF679670 | EF679592 | — | — | — | Schubert *et al.* (2007b) |
| *C. hillianum* | CBS 125988; CPC 15459 | Ex-type from holotype | HM148097 | HM148341 | HM148586 | — | — | — | — | — | Bensch *et al.* (2010) |
| *C. inversicolor* | CBS 401.80; ATCC 200941 | Ex-type from holotype | HM148101 | HM148345 | HM148590 | — | — | AY342114 | — | — | Bensch *et al.* (2010) |

**Table 1.** (Continued).

| Species | Culture accession number(s)[1] | Status of strain | GenBank accession numbers[2] | | | | | | | | Reference |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | ITS | TEF | ACT | HIS | CAL | LSU | TUB | SSU | |
| *C. iranicum* | CBS 126346; CPC 11554 | Ex-type from holotype | HM148110 | HM148354 | HM148599 | — | — | — | — | — | Bensch *et al.* (2010) |
| *C. iridis* | CBS 138.40 | Ex-epitype from epitype | EF679370 | EF679447 | EF679523 | EF679677 | EF679599 | DQ008148 | — | EU167591 | Schubert *et al.* (2007b) |
| *C. langeronii* | CBS 189.54 | Ex-type from neotype | DQ780379 | JN906990 | EF101357 | — | — | — | EF101435 | DQ780932 | Zalar *et al.* (2007) |
| *C. licheniphilum* | CBS 125990; CPC 13224 | Ex-type from epitype | HM148111 | HM148355 | HM148600 | — | — | — | — | — | Bensch *et al.* (2010) |
| *C. lycoperdinum* | CBS 574.78C; VKM F-2759 | Reference strain | HM148115 | HM148359 | HM148604 | — | — | — | — | — | Bensch *et al.* (2010) |
| *C. macrocarpum* | CBS 121623; CPC 12755 | Ex-neotype from neotype | EF679375 | EF679453 | EF679529 | EF679684 | EF679606 | — | — | — | Schubert *et al.* (2007b) |
| *C. myrtacearum* | CBS 126350; CPC 14567 | Ex-type from epitype | HM148117 | HM148361 | HM148606 | — | — | — | — | — | Bensch *et al.* (2010) |
| *C. ossifragi* | CBS 842.91 | Ex-epitype from epitype | EF679381 | EF679459 | EF679535 | EF679689 | EF679611 | EF679381 | — | — | Schubert *et al.* (2007b) |
| *C. paracladosporioides* | CBS 171.54; ATCC 11278, 200943; IFO 6369; IMI 049626; MUCL 917; NCTC 4097 | Ex-type from holotype | HM148120 | HM148364 | HM148609 | — | — | — | — | — | Bensch *et al.* (2010) |
| *C. perangustum* | CBS 125996; CPC 13815 | Ex-type from holotype | HM148121 | HM148365 | HM148610 | — | — | — | — | — | Bensch *et al.* (2010) |
| *C. phaeocomae* | CBS 128769; CPC 18223 | Ex-type from holotype | JF499837 | JF499875 | JF499881 | — | — | JF499857 | — | — | Crous & Groenewald JZ (2011) |
| *C. phlei* | CBS 358.69 | Ex-epitype from epitype | JN906981 | JN906991 | JN907000 | — | — | — | — | — | Present study |
| *C. phyllactiniicola* | CBS 126355; CPC 11830 | Ex-type from holotype | HM148153 | HM148397 | HM148642 | — | — | — | — | — | Bensch *et al.* (2010) |
| *C. phyllophilum* | CBS 125992; CPC 11333 | Ex-type from epitype | HM148154 | HM148398 | HM148643 | — | — | — | — | — | Bensch *et al.* (2010) |
| *C. pini-ponderosae* | CBS 124456; CPC 13980; CIEFAP 322 | Ex-type from holotype | FJ936160 | FJ936164 | FJ936167 | — | — | — | — | — | Schubert *et al.* (2009) |
| *C. pseudiridis* | CBS 116463; LYN 1065; ICMP 15579 | Ex-type from holotype | EF679383 | EF679461 | EF679537 | EF679691 | EF679613 | — | — | — | Schubert *et al.* (2007b) |
| *C. pseudocladosporioides* | CBS 125993; CPC 14189 | Ex-type from holotype | HM148158 | HM148402 | HM148647 | — | — | — | — | — | Bensch *et al.* (2010) |
| *C. psychrotolerans* | CBS 119412; EXF-391; dH 16390 | Ex-type from holotype | DQ780386 | JN906992 | EF101365 | — | — | — | EF101442 | — | Zalar *et al.* (2007) |
| *C. ramotenellum* | CBS 121628; CPC 12043; EXF-454 | Ex-type from holotype | EF679384 | EF679462 | EF679538 | EF679692 | EF679614 | — | — | — | Schubert *et al.* (2007b) |
| *C. rectoides* | CBS 125994; CPC 11624 | Ex-type from holotype | HM148193 | HM148438 | HM148683 | — | — | — | — | — | Bensch *et al.* (2010) |
| *C. salinae* | CBS 119413; EXF-335; dH 16389 | Ex-type from holotype | DQ780374 | JN906993 | EF101390 | — | — | — | EF101405 | DQ780931 | Zalar *et al.* (2007) |
| *C. scabrellum* | CBS 126358; CPC 14976; HJS 1031 | Ex-type from holotype | HM148195 | HM148440 | HM148685 | — | — | — | — | — | Bensch *et al.* (2010) |
| *C. silenes* | CBS 109082 | Ex-type from holotype | EF679354 | EF679429 | EF679506 | EF679659 | EF679582 | JF770463 | — | — | Crous *et al.* (2011b) |
| *C. sinuosum* | CBS 121629; CPC 11839; ICMP 15819 | Ex-type from holotype | EF679386 | EF679464 | EF679540 | EF679694 | EF679616 | — | — | — | Schubert *et al.* (2007b) |
| *C. soldanellae* | CPC 13153 | Ex-neotype from neotype | JN906982 | JN906994 | JN907001 | — | — | — | — | — | Present study |
| *C. sphaerospermum* | CBS 193.54; ATCC 11289; IMI 49637 | Ex-neotype from neotype | DQ780343 | EU570261 | EU570269 | — | — | AY342104 | EF101406 | DQ780925 | Zalar *et al.* (2007) |
| *C. spinulosum* | CBS 119907; CPC 12040; EXF-334 | Ex-type from holotype | EF679388 | EF679466 | EF679542 | EF679696 | EF679618 | — | EF101450 | — | Schubert *et al.* (2007b) |
| *C. subinflatum* | CBS 121630; CPC 12041; EXF-343 | Ex-type from holotype | EF679389 | EF679467 | EF679543 | EF679697 | EF679619 | — | EF101448 | — | Schubert *et al.* (2007b) |
| *C. subtilissimum* | CBS 113754 | Ex-type from holotype | EF679397 | EF679475 | EF679551 | EF679705 | EF679627 | — | — | — | Schubert *et al.* (2007b) |
| *C. subuliforme* | CBS 126500; CPC 13735 | Ex-type from holotype | HM148196 | HM148441 | HM148686 | — | — | — | — | — | Bensch *et al.* (2010) |
| *C. tenellum* | CBS 121634; CPC 12053; EXF-1735 | Ex-type from holotype | EF679401 | EF679479 | EF679555 | EF679709 | EF679631 | — | — | — | Schubert *et al.* (2007b) |

**Table 1.** (Continued).

| Species | Culture accession number(s)[1] | Status of strain | GenBank accession numbers[2] | | | | | | | | Reference |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | ITS | TEF | ACT | HIS | CAL | LSU | TUB | SSU | |
| *C. tenuissimum* | CBS 125995; CPC 14253 | Ex-type from epitype | HM148197 | HM148442 | HM148687 | — | — | — | — | — | Bensch *et al.* (2010) |
| *C. variabile* | CBS 121635; CPC 12751 | Ex-epitype from epitype | EF679402 | EF679480 | EF679556 | EF679710 | EF679632 | — | — | — | Schubert *et al.* (2007b) |
| *C. varians* | CBS 126362; CPC 13658 | Ex-type from holotype | HM148224 | HM148470 | HM148715 | — | — | — | — | — | Bensch *et al.* (2010) |
| *C. velox* | CBS 119417; CPC 11224; dH 16388 | Ex-type from holotype | DQ780361 | JN906995 | EF101388 | — | — | — | EF101456 | DQ780937 | Zalar *et al.* (2007) |
| *C. verrucocladosporioides* | CBS 126363; CPC 12300 | Ex-type from holotype | HM148226 | HM148472 | HM148717 | — | — | — | — | — | Bensch *et al.* (2010) |
| *C. xylophilum* | CBS 125997; CPC 12403 | Ex-type from holotype | HM148230 | HM148476 | HM148721 | — | — | — | — | — | Bensch *et al.* (2010) |

[1]ATCC: American Type Culture Collection, Virginia, U.S.A.; CBS: CBS-KNAW Fungal Biodiversity Centre, Utrecht, The Netherlands; CIEFAP: Centro de Investigación y Extensión Forestal Andino Patagónico, Argentina; CPC: Culture collection of Pedro Crous, housed at CBS; dH: Culture collection of Sybren de Hoog, housed at CBS; EXF: Culture Collection of Extremophilic Fungi, Biotechnical Faculty, Ljubljana, Slovenia; HJS: Personal culture collection of Hans-Josef Schroers, Slovenia; ICMP: International Collection of Micro-organisms from Plants, Landcare Research, Private Bag 92170, Auckland, New Zealand; IFO: Institute for Fermentation, Osaka, Japan; JCM: Japan Collection of Microorganisms, RIKEN BioResource Center, Saitama, Japan; MUCL: Mycotheque de l'Universite catholique de Louvain, Laboratoire de Mycologie Systematique et Appliquee, Universite catholique de Louvain, Louvain-la-Neuve, Belgium; NCTC: National Collection of Type Cultures, PHLS Central Public Health Laboratory, London, U.K.; PD: Plant Protection Service, nVWA, Division Plant, Wageningen, The Netherlands; VKM: All-Russian Collection of Microorganisms, Institute of Biochemistry and Physiology of Microorganisms, Russian Academy of Sciences, Moscow region, Russian Federation.

[2]ITS: internal transcribed spacer regions with 5.8S nrRNA gene, TEF: partial translation elongation factor 1-alpha gene, ACT: partial actin gene, HIS: partial histone H3 gene, CAL: partial calmodulin gene, LSU: partial 28S nrRNA gene, TUB: partial beta-tubulin gene, SSU: partial 18S nrRNA gene.

ITS + LSU fragment) together with a BigDye Terminator Cycle Sequencing Kit v. 3.1 (Applied Biosystems, Foster City, CA) and analysed on a 3730xl DNA Sequencer (Perkin-Elmer, Norwalk, CN, USA). Consensus sequences were computed using SeqMan v. 9 from the Lasergene package (DNA-STAR, Madison, WI).

The generated sequences were compared with other fungal DNA sequences from NCBI's GenBank sequence database using a blast search; sequences with high similarity were added to the alignments. The LSU alignment is primarily based on the alignment of Crous *et al*. (2007c) and the combined alignment for the species tree was compiled using the published sequences linked to earlier publications of the respective species (see Table 1). The sequences were aligned using the online version of MAFFT (mafft.cbrc.jp/alignment/server/index.html; Katoh *et al.* 2002), followed by manual correction by eye using Sequence Alignment Editor v. 2.0a11 (Rambaut 2002). The phylogenetic analyses of the aligned sequence data were performed using PAUP (Phylogenetic Analysis Using Parsimony) v. 4.0b10 (Swofford 2003) and consisted of neighbour-joining analyses with the uncorrected ('p'), the Kimura 2-parameter and the HKY85 substitution models. Alignment gaps were treated as missing data and all characters were unordered and of equal weight. Any ties were broken randomly when encountered. For parsimony analyses, alignment gaps were treated as a fifth character state and all characters were unordered and of equal weight. Maximum parsimony analysis was performed using the heuristic search option with 100 random simple taxa additions and tree bisection and reconstruction (TBR) as the branch-swapping algorithm. Branches of zero length were collapsed and all multiple, equally parsimonious trees were saved. The robustness of the trees obtained was evaluated by 1 000 bootstrap replications (Hillis & Bull 1993). Tree length (TL), consistency index (CI), retention index (RI) and rescaled consistency index (RC) were calculated and the resulting trees were printed with Geneious v. 5.5.4 (Drummond *et al.* 2011) and layout was done in Adobe Illustrator CS v. 5.1. New sequences were lodged in GenBank and the alignments and phylogenetic trees in TreeBASE (www. treebase.org).

## Morphology

### *Light microscopy (LM)*

For herbarium specimens a stereomicroscope was used to select colonised portions of samples, to excise colonies and mount them in water on a slide. Staining was usually not necessary, since *Cladosporium* species are pigmented. To avoid drying of the preparations, permanent slides were prepared by sealing the cover-glasses with Canada balm (SERVA, Heidelberg) and by putting them into a desiccator for 24 h. Microscopic observations were made with oil immersion (1000×). Where possible, 30 conidiophores, conidia and other structures were measured in each collection, and a representative range was depicted. Some collections were very poor, so that only a smaller number of these structures could be measured. Drawings were done free hand. Digital photographs were taken using a ZEISS AxioCam HR attached to a ZEISS Axioskop 2 and occasionally optimised with the software ZEISS AxioVision (Schubert 2005b, Heuchert *et al*. 2005).

Microscopic observations of isolates were made from colonies cultivated for 7 d under continuous near-ultraviolet light at 25 °C on SNA. Preparations were mounted in Shear's solution (Crous *et al.* 2009d). To study conidial development and branching patterns of conidial chains, squares of transparent adhesive tape (Titan

Ultra Clear Tape, Conglom Inc., Toronto, Canada) were placed on conidiophores growing in the zone between the colony margin and 2 cm inwards, and mounted between two drops of Shear's solution under a glass cover slip. Conidial terminology follows Schubert *et al.* (2007b). Wherever possible, 50 measurements (× 1 000 magnification, differential interference contrast microscopy, Zeiss Axioscope 2 PLUS) were made of conidia with outliers given in parentheses. For culture characteristics colonies were cultivated on PDA, SNA, OA and MEA for 14 d at 25 °C in the dark, after which the surface and reverse colours were rated using the charts of Rayner (1970).

### *Low-temperature scanning electron microscopy (SEM)*

SEM examinations of herbarium specimens, conducted at the Institute of Zoology of the Martin-Luther-University in Halle, were carried out to determine details of scar morphology and conidial surface ornamentation. Specimens were excised from the host, attached to aluminium pin stubs and then coated with a thin layer of gold using a sputter coater SCD 004 (200 s in an argon atmosphere of 20 mA, 30 mm distant from the electrode). Observations and micrographs were made with a HITACHI S-2400 scanning electron microscope with integrated camera (film: ILFORD PLUS 125).

Isolates of *Cladosporium* spp. were grown on SNA with 30 g agar/L for 3–4 d at room temperature under black light. Relevant parts of the small colonies with conidiophores and conidia were selected under a binocular (× 10–50 magnification, Nicon SMZ 1500), excised with a surgical blade as small agar blocks (3 × 3 mm), and transferred to a copper cup for snap-freezing in nitrogen slush. Agar blocks were glued to the copper surface with frozen tissue medium (KP-Cryoblock, Klinipath, Duiven, Netherlands) mixed with 1 part colloidal graphite (Agar Scientific, Stansted, UK). Samples were examined in a JEOL 5600LV scanning electron microscope (JEOL, Tokyo, Japan) equipped with an Oxford CT1500 Cryostation for cryo-electron microscopy (cryoSEM). Electron micrographs were acquired from uncoated frozen samples, or after sputter-coating by means of a gold/palladium target for 3 times during 30 s. Micrographs of uncoated samples were taken at an acceleration voltage of 3 kV, and consisted of 30 averaged fast scans (SCAN 2 mode), at 5 kV in case of the coated samples (PHOTO mode).

## KEYS



### Key to *Cladosporium* and morphologically similar genera

[Genera bearing simple or branched acropetal chains of amero- to phragmosporous blastoconidia; based on Crous *et al*. (2007c), Braun & Crous in Seifert *et al.* (2011)]

*Notes*: Genera that have to be considered segregations of *Cladosporium s. lat.* as previously comprehended and genera often confused with the latter genus, *i.e.* to which species belong that have originally been assigned to *Cladosporium s. lat.*, are marked by an asterisk (*).

1 Conidiophores and conidia hyaline ..... **2**
1* At least conidiophores pigmented ..... **4**
2 Conidia in simple chains ..... ***Hormiactis***
2* Conidia in branched chains ..... **3**
3 Conidiogenous cells mostly sympodial, with distinct conidiogenous loci (scars), thickened and darkened; conidia amero- to phragmosporous; plant pathogenic, leaf-spotting fungi (*Mycosphaerella* anamorphs; *Mycosphaerellaceae*, *Capnodiales*) ..... ***Ramularia****
[forming synnematous conidiomata; saprobic, see *Sphaeridium*]
3* Terminal conidiogenous cells with denticle-like loci, giving rise to ramoconidia which form simple or branched conidial chains; lignicolous ..... ***Hyalodendron***
[Conidiophores dimorphic; mycelium, conidiophores and conidia at first hyaline, later turning pale brown; conidia in short chains, see *Hyalodendriella*]
4(1) Conidia distoseptate, in simple chains ..... ***Lylea***
4* Conidia aseptate or euseptate ..... **5**
5 Conidiophores little differentiated, micronematous to semi- macronematous; conidiogenous loci undifferentiated, truncate, neither distinctly thickened nor darkened or only very slightly so ..... **6**
5* Conidiophores well-differentiated, semimacronematous (but conidiogenous cells multilocal and/or conidiogenous loci well-differentiated) to macronematous ..... **12**
6 Conidiophores and conidia delicate, thin-walled, in long, easily disarticulating chains ..... **7**
6* Conidiophores and conidia robust, wall thickened, dark, conidial chains often seceding with difficulty ..... **9**
7 Conidiophores semimacronematous, simple to often irregularly branched; conidia delicate, narrow, 1–3 µm wide, hyaline to pale olivaceous ..... ***Polyscytalum***
7* Conidiophores unbranched, micronematous, integrated in ordinary hyphae, forming minute, lateral, monoblastic, determinate, peg-like protuberances to semimacronematous, forming short lateral branches (conidiophores) with several inconspicuous to denticle-like loci ..... **8**
8 Phialidic synanamorphs often present, but sometimes also lacking; saprobic, rarely plant pathogenic, often human pathogenic (*Herpotrichiellaceae*, *Chaetothyriales*) ..... ***Cladophialophora****
8* Without phialidic synanamorphs; saprobic or plant pathogenic (*Venturia*, *Venturiaceae*) ..... ***Fusicladium*** *s. lat.* (incl. *Pseudocladosporium*)*
[similar, barely distinguishable taxa, also clustering in the *Venturiaceae*, but apart from the *Venturia* clade are tentatively referred to as *Anungitea* until this genus will be resolved by sequencing of its type species]
9(6) Conidia aseptate, rarely 1-septate; lignicolous, on dead wood ..... ***Xylohypha***
9* Conidia septate ..... **10**
10 Conidia 1-septate, with a dark brown to blackish band at the septum; on dead wood ..... ***Bispora***
10* Conidia at least partly 2- to pluriseptate and/or without a dark brown to blackish band at the septum ..... **11**
11 Conidia branched ..... ***Taeniolina***
11* Conidia unbranched ..... ***Taeniolella***
12(5) Conidiogenous loci and conidial hila distinctly coronate, *i.e.*composed of a central convex dome surrounded by a periclinal raised rim, mostly at least somewhat protuberant (*Davidiella* anamorphs, *Davidiellaceae*, *Capnodiales*) ..... ***Cladosporium*** *s. str.*
12* Conidiogenous loci non-coronate (either inconspicuous, thickened and darkened or denticle-like) ..... **13**

13 Mycelium, conidiophores and conidia at first hyaline or sub-hyaline, later turning pale brown; conidiophores dimorphic, either conidiogenous cells with a single conidiogenous locus (A-anamorph), giving rise to an ellipsoid cell (conidium?) which mostly remains attached, base truncate, apex subacutely rounded, at times forming chains of such cells; or conidiophores with numerous aggregated loci, inconspicuous to subdenticulate (B-anamorph); conidia in short chains, of mostly 2–3; isolated from *Alnus* in Europe ..... ***Hyalodendriella****

13* Fruiting different; at least conidiophores consistently pigmented or conidiophores uniform or loci distinct; conidia mostly in long, often branched chains ..... **14**

14 Conidiophores with verruculose conidiogenous apices, otherwise smooth; conidia distinctly verruculose-verrucose; conidiogenous loci and conidial hila inconspicuous ..... **15**

14* Conidiophores either smooth throughout or verruculose below and smooth above or verruculose throughout; and/or conidiogenous loci conspicuous, *i.e.*, thickened and darkened or denticle-like ..... **16**

15 Conidiophores macronematous, unbranched, base swollen, with percurrent regenerative proliferations unrelated to conidiation; conidiogenous cells terminal, occasionally also subterminal; conidia terminally and laterally formed, aseptate; saprobic on leaves ..... ***Castanedaea****

15* Conidiophores little differentiated, semimacronematous, unbranched or only with short lateral branchlets, base undifferentiated, without percurrent proliferations; conidiogenous cells terminal and occasionally intercalary-pleurogenous; conidia terminally and subterminally formed, 0–2-septate; lignicolous, on decorticated wood ..... ***Websteromyces***

16(14) Conidiophores unbranched, with a simple terminal conidio-genous cell, non-geniculate-sinuous, subcylindrical to somewhat inflated at the tip; conidiogenous loci terminal and lateral, inconspicuous or subconspicuous, neither thickened nor darkened, non-protuberant; conidia attached with a very narrow, pointed hilum ..... **17**

16* Conidiophores with a branched terminal conidiogenous apparatus, composed of conidiogenous cells and/or ramoconidia or conidiophores unbranched, with a single terminal conidiogenous cell or additional intercalary ones, but conidiogenous loci different, conspicuous, thickened and darkened or denticle-like ..... **18**

17 Conidiophores with a distinct rhizoid-digitate base; tips of the conidiogenous cells somewhat swollen, usually unilaterally swollen or somewhat curved; conidia solitary or only in very short unbranched chains; hyperparasitic on rusts ..... ***Digitopodium****

17* Conidiophores without rhizoid-digitate base; tips of the conidiogenous cells subcylindrical to somewhat swollen, but swellings not unilateral and not curved; conidia solitary and in simple or branched chains; associated with leaf spots ..... ***Rachicladosporium****

18(16) Conidiophores in synnematous conidiomata ..... **19**

18* Synnemata lacking ..... **20**

19 Conidiogenous cells with a single or several truncate to sub-denticulate, relatively broad conidiogenous loci; conidia with truncate, flat hila; on wood, resin ..... ***Sorocybe****

19* Conidiogenous loci with few, mostly 1–2 conidiogenous loci formed as minute spicules; conidia with narrow hila (shallowly apiculate); plant pathogenic, causing bud blast and twig blight ..... ***Seifertia***

20(18) Conidiophores unbranched or occasionally branched; conidio-genous cells distinctly inflated, ampulliform, doliiform or clavate, non-denticulate; conidia at least partly globose, dark brown when mature; colonies effuse, dark; wood-inhabiting ..... ***Phaeoblastophora***

20* Conidiogenous cells not inflated, if somewhat inflated, loci denticle-like or conidia non-globose ..... **21**

21 Conidiophores penicillate, *i.e.*, with an unbranched stipe and distinct terminal branched 'head' composed of branchlets, conidiogenous cells and/or ramoconidia ..... **22**

21* Conidiophores non-penicillate, *i.e.*, irregularly and loosely branched, branchings not confined to the apical portion, sometimes only with short lateral branchlets, or unbranched ..... **27**

22 Penicillate apex simple, only composed of a single terminal conidiogenous cell giving rise to several ramoconidia which form secondary ramoconidia and conidia ..... ***Penidiella*** p.p. [*P. strumelloidea*]*

22* Penicillate apex more complex, composed of true branchlets and/or conidiogenous cells and ramoconidia ..... **23**

23 Conidiophores with a compact, dense, subglobose to broadly ovoid head; conidiogenous loci and conidial hila unthickened or almost so, but distinct by being darkened-refractive [fruiting dimorphic, periconioid branched conidiophores formed on overwintered stems of *Paeonia* spp., unbranched cladosporioid conidiophores on leaf spots, biotrophic] (belonging to the *Capnodiales*) ..... ***Graphiopsis****

23* Penicillate apex looser, neither compact nor subglobose ..... **24**

24 Branched head composed of short branchlets and conidiogenous cells; ramoconidia lacking; conidiogenous cells subcylindrical to subclavate, non- or only slightly geniculate; conidiogenous loci usually numerous and aggregated, terminal and lateral, non-protuberant, flat, conspicuous, thickened and darkened, at least around the rim; conidia solitary or in short chains ..... ***Periconiella***

24* Ramoconidia present; conidiogenous cells distinct, sympodial, somewhat geniculate or subdenticulate; conidiogenous loci inconspicuous or somewhat protruding, denticle-like, unthickened or almost so, not or somewhat darkened-refractive; conidia in long, often branched chains ..... **25**

25 Branched apex composed of short branchlets consisting of conidiogenous cells or ramoconidia, in pairs or whorls of 3–4, mostly distinctly constricted at the base; hyperparasitic on *Asterina* spp. ..... ***Parapericoniella****

25* Branched apex distinct, composed of branchlets, conidio-genous cells and/or ramoconidia; if true branchlets lacking, conidiogenous cells and ramoconidia not in whorls and not distinctly constricted at the base; saprobic or biotrophic ..... **26**

26 Penicillate apex of the conidiophores loosely to densely ranched, occasionally metula-like, base of the conidiophores simple, undifferentiated; saprobic or biotrophic (*Teratosphaeriaceae*, *Capnodiales*) ..... ***Penidiella****

26* Penicillate apex always dense, metula-like, base of the conidio-phores swollen or lobed, often with rhizoid hyphae; plant pathogenic [on banana] (*Chaetothyriales*) ..... ***Metulocladosporiella****

27(21) Conidiophores simple or branched; septa of the conidiophores and conidia becoming thick-walled and dark; conidiogenous loci

subdenticulate, somewhat thickened and conspicuously darkened-refractive; cultures producing ample amounts of volatile metabolites causing skin irritation after exposure to the fungus; saprobic (isolated from mouldy paint) ..... ***Toxicocladosporium****

27* Without conspicuously thickened-darkened septa; cultures without toxic, volatile metabolites ..... **28**

28 Conidiogenous loci conspicuous, distinctly thickened and darkened (visible as small dark circles when viewed upon the scar), sometimes on small shoulders formed by sympodial proliferation, but not distinctly denticulate (*Capnodiales*) ..... **29**

28* Conidiogenous loci inconspicuous or conspicuous by being denticle-like, not or barely thickened, not darkened or at most upper truncate end very slightly thickened and somewhat darkened-refractive ..... **32**

29 Mycelium smooth; conidiophores and conidia smooth or almost so, at most faintly rough-walled; conidiophores solitary, fasciculate, sporodochial to synnematous; biotrophic, usually leaf-spotting (*Mycosphaerella* anamorphs, *Mycosphaerellaceae*, *Capnodiales*) ..... ***Passalora*** *emend.* (incl. *Mycovelosiella*, *Phaeoramularia*, *etc.*)*

29* At least mycelium distinctly verruculose ..... **30**

30 Mycelium, conidiophores and conidia coarsely verruculose-verrucose; conidial shape variable, often irregular; isolated from a lichen [*Dirina*] ..... ***Verrucocladosporium****

30* Mycelium verruculose; conidiophores often smooth, sometimes somewhat rough-walled, but not coarsely verruculose-verrucose; conidia smooth to distinctly verruculose; biotrophic, often leaf-spotting ..... **31**

31 Conidiogenous loci and conidia hila truncate, planate ..... ***Zasmidium****

31* Conidiogenous loci and conidia hila pileate ..... ***Stenella s. str.****

32(28) Conidiophores with swollen, often lobed base ..... **33**

32* Base of the conidiophores not swollen, at most slightly swollen, but not lobed ..... **36**

33 Conidia septate ..... **34**

33* Conidia aseptate ..... **35**

34 Conidiophores with a single, terminal, monoblastic, determinate conidiogenous cell giving rise to a single ramoconidium that forms simple or branched chains of conidia ..... ***Parapleurotheciopsis****

34* Terminal conidiogenous cells polyblastic, with several denticle-like conidiogenous loci ..... ***Anungitea*** p.p. (*e.g.*, *A. longicatenata*)

35(33) Conidiogenous cells terminal, monoblastic, with a single ramoconidium giving rise to conidial chains or occasionally with 2(–3) denticle-like loci; base of the conidiophores often with rhizoid hyphae ..... ***Rhizocladosporium****

35* Conidiogenous cells polyblastic, with two or several denticle-like loci; base of the conidiophores without rhizoid hyphae ..... ***Subramaniomyces***

36(32) Conidiophores unbranched, with a terminal monoblastic conidiogenous cell, determinate or percurrent ..... **37**

36* Conidiophores branched or unbranched, but conidiogenous cells at least partly polyblastic ..... **39**

37 Conidiogenous cell giving rise to a single ramoconidium which forms simple or branched chains of 0(–1)-septate secondary conidia ..... ***Parapleurotheciopsis*** p.p. (*P. coccolobae*)

37* Conidiogenous cells giving rise to simple conidial chains without ramoconidia; conidia septate ..... **38**

38 Conidiophores sometimes with percurrent proliferations; conidiophores and conidia with somewhat thickened, dark walls; conidia 1–10-septate, width usually exceeding 4 µm ..... ***Heteroconium***

38* Percurrent proliferations lacking; conidiophores and conidia delicate, thin-walled and paler; conidia usually 0–1(–3)-septate and narrow, usually below 4 µm wide (*Chaetothyriales*) ..... ***Cladophialophora*** p.p. (*e.g., C. chaetospira*)* [similar anamorphs of the *Venturiaceae*, see *Fusicladium* (incl. *Pseudocladosporium*)]

39(36) Conidiophores often branched; conidiogenous loci distinctly denticle-like or subdenticulate; conidia aseptate; lignicolous, on dead wood, resin or isolated from hydrocarbone-rich substrates (jet-fuel, cosmetics, *etc.*) ..... **40**

39* Either with unbranched conidiophores or conidiogenous loci not distinctly denticle-like, or conidia septate, or on other substrates ..... **43**

40 Conidiogenous cells distinctly denticulate; conidia rather broad, about 7–13 µm ..... ***Haplotrichum***

40* Conidiogenous cells non-denticulate or at most subdenticulate; conidia narrower, about 3–6 µm ..... **41**

41 Colonies effuse, dense, but felted, black, brittle and appearing carbonaceous when dry; conidiophores solitary, brown; conidiogenous cells terminal and pleurogenous; conidia pale to dark brown, lateral walls conspicuously thicker than the hila; on conifer resin ..... ***Sorocybe*** (mononematous form, *Hormodendrum resinae*)*

41* Colonies effuse, dense, resupinate, hypochnoid, powdery, chocolate-brown and/or conidiophores lightly pigmented; conidia subhyaline to lightly pigmented and/or lateral walls not thickener than poles; on dead wood or isolated from hydrocarbone-rich substrates (jet-fuel, cosmetics, *etc.*) ..... **42**

42 Colonies effuse, dense, resupinate, hypochnoid, powdery, chocolate-brown; conidiophores smooth; conidia subhyaline to very pale yellowish, hila very thin; on dead wood ..... ***Parahaplotrichum***

42* Colonies neither resupinate nor hypochnoid; conidiophores warty; lateral walls of the conidia not thicker than the hila; isolated from hydrocarbone-rich substrates (jet-fuel, cosmetics, *etc.*), creosote fungus ..... ***Amorphotheca*** anamorph (*Cladosporium avellaneum*, '*Hormoconis*')*

43(39) Conidiophores simple or branched; conidiogenous cells monoblastic or occasionally polyblastic; conidiogenous loci subdenticulate, neither thickened nor darkened, forming simple or branched chains of regular conidia, uniform in shape, size and septation ..... ***Septonema****

43* Conidia not uniform in shape, size and septation; conidiogenous loci flat-tipped, subdenticulate, unthickened or slightly so, not to somewhat darkened-refractive ..... **44**

44 Conidiophores simple or branched; in culture forming abundant chlamydospores; mostly soil-borne and heat-resistant (*Teratosphaeriaceae*, *Capnodiales*) ..... ***Devriesia****

44* Without chlamydospores in culture; phylogenetically distinct ..... **45**
45 Conidiophores dimorphic; conidia mostly aseptate, hila inconspicuous, neither thickened nor darkened (*Pleosporales*) ..... ***Ochrocladosporium****
45* Conidiophores either uniform or conidia at least partly septate or hila more conspicuous by being slightly thickened or at least somewhat darkened-refractive; phylogenetically distinct ..... **46**
46 Phialidic synanamorphs often present, but sometimes also lacking; saprobic, rarely plant pathogenic, often human pathogenic (*Herpotrichiellaceae*, *Chaetothyriales*) ..... ***Cladophialophora****
46* Without phialidic synanamorphs; saprobic or plant pathogenic; phylogenetically different ..... **47**
47 Conidiophores usually unbranched (*Venturia*, *Venturiaceae*) ..... **48**
47* Conidiophores simple to often irregularly branched; conidia delicate, narrow, 1–3 µm wide, hyaline to pale olivaceous (not belonging to the *Venturiaceae*) ..... ***Polyscytalum***
48 Saprobic species forming long conidial chains ..... ***Pseudocladosporium***
48* Biotrophic usually leaf spotting species, conidia formed singly or in rather short chains ..... ***Fusicladium****
[similar, barely distinguishable taxa, also clustering in the *Venturiaceae*, but apart from the *Venturia* clade are tentatively referred to as *Anungitea* until this genus will be resolved by sequences of its type species]

## Keys to saprobic *Cladosporium* species

### *Key to saprobic Cladosporium species in vivo and in vitro*

1 Forming large stromata *in vivo*, 20–100 µm diam, later expanding or confluent, up to 500 µm diam; conidiophores very numerous, in large, dense fascicles, 100–250 × 3–7 µm, straight to geniculate-subnodulose; conidia solitary or in simple chains, 8–25 × 5–10 µm, coarsely verrucose, verrucae distant, up to 2.5 µm, and up to 1 µm diam; on dead stems of *Zinnia* ..... ***C. oblongum***
1* Stromata lacking or much smaller; conidiophores shorter or narrower, or conidia narrower, in branched chains, or smooth, or echinulate, or densely verruculose to verrucose ..... **2**
2 Conidiophores distinctly torulose-nodulose with conidiogenous loci confined to swellings or conidiophores strongly geniculate-sinuous, subnodulose due to unilateral swellings at lateral shoulders caused by sympodial proliferations (geniculations) ..... **3**
2* Conidiophores non-nodulose, sometimes geniculate, but geniculations not so strong, without distinct unilateral swellings ..... **10**
3 Conidia smooth or almost so (light microscopy); conidiophores up to about 400 µm long and 4–5 µm wide, swellings usually numerous, regular and distant, *ca.* 6–8 µm diam; conidia up to 25 × 3–8 µm ..... ***C. oxysporum***
3* Conidia distinctly verruculose to verrucose or spinulose ..... **4**
4 Conidiophores strongly geniculate-sinuous, subnodulose due to unilateral swellings at lateral shoulders caused by sympodial proliferations (geniculations); conidiophores *in vitro* uniformly macronematous; conidia solitary or only in short unbranched chains of up to three conidia, 9–21 × (5–)6–8 µm ..... ***C. sinuosum***
4* Conidiophores *in vitro* both macronematous and micronematous, macronematous conidiophores distinctly torulose-nodulose; conidia in long, often branched chains, if solitary conidia wider, up to 12(–15) µm ..... **5**
5 Macronematous conidiophores *in vivo* up to 8 µm wide, nodulose swellings 5–12 µm diam; secondary ramoconidia *in vitro* (5–)6–9 (–10) µm wide, *in vivo* (6–)7–12(–15) µm, *in vivo* at least with some very broad conidia formed singly or only in very short, unbranched chains, unchanged with age ..... ***C. macrocarpum***
5* Macronematous conidiophores somewhat narrower, *in vitro* (1.5–)2.5–5 µm, nodulose swellings also somewhat narrower, 3–8 µm diam; conidia narrower, 2.5–8 µm wide, or conidia 3–6 µm wide, but with age becoming wider, (3.5–)5–9(–11) µm, darker and more thick-walled ..... **6**
6 Swellings of the macronematous conidiophores 3–6.5 µm diam; conidia 4–17(–22) µm long, ornamentation variable, but usually densely echinulate, with spines up to 0.8 µm long ..... ***C. subinflatum***
6* Swellings of the macronematous conidiophores (4–)5–8(–9) µm diam; conidia longer, up to 25(–35) µm, ornamentation verruculose to verrucose, but not echinulate ..... **7**
7 Conidia formed by macronematous conidiophores 3–33 × (2–)3–6(–7) µm, with age becoming wider, (3.5–)5–9(–11) µm, darker and more thick-walled ..... ***C. herbaroides***
7* Conidia formed by macronematous conidiophores uniform, with age not becoming wider, darker and more thick-walled ..... **8**
8 Conidiophores with a single or usually numerous nodulose swellings in short succession, giving the stalk a knotty/gnarled appearance; small terminal conidia 4–10 × 3–5(–6) µm; intercalary conidia 6–16 × 4–6 µm; secondary ramoconidia 12–25(–35) × (3–)5–7(–9) µm, 0–1(–3)-septa ..... ***C. herbarum***
8* Conidia narrower, secondary ramoconidia 10–25(–30) × 3–5(–7) or 4–27 × 3–6.5 µm, but then up to 6-septate ..... **9**
9 Conidiophores *in vivo* uniform, not dimorphic, unbranched, usually with small, terminal, head-like swellings, sometimes also with additional intercalary swellings; small terminal conidia 4–9 × 2.5–3.5 µm; secondary ramoconidia and occasionally formed ramoconidia 10–25(–30) × 3–5(–7) µm ..... ***C. allicinum* (= *C. bruhnei*)**
9* Conidiophores *in vivo* dimorphic, with very short as well as long conidiophores, unbranched or branched, with several swellings; ramoconidia absent; secondary ramoconidia 4–27 × 3–6.5 µm, 0–6-septate ..... ***C. dieffenbachiae***
10(2) Small terminal conidia globose to subglobose-ovoid, almost smooth to verruculose; conidiophores simple or frequently branched, or conidia echinulate-digitate, spines up to 1.3 µm long, formed by unbranched conidiophores (mainly *C. sphaerospermum* complex) ..... **11**

10* Small terminal conidia non-globose, rather ellipsoid-ovoid, obovoid, fusiform, limoniform or short subcylindrical (if with some intermixed subglobose conidia, conidiophores unbranched or even micronematous) ..... **17**
11 Conidia echinulate-digitate, spines up to 1.3 µm long, formed by unbranched conidiophores ..... ***C. spinulosum***
11* Conidia smooth or almost so to verruculose or verrucose ..... **12**
12 Secondary ramoconidia 0–3(–4)-septate, septa thickened and darkened ..... **13**
12* Secondary ramoconidia 0–1(–2)-septate, septa neither thickened nor darkened ..... **14**
13 Conidiophores *in vitro* 2–3.5(–5.5) µm wide, usually unbranched; small terminal conidia 2–5(–6) × 2–3(–5) µm; secondary ramoconidia 7–25(–31) × 2–3.5(–6.5) µm; ramoconidia sporadically formed ..... ***C. halotolerans***
13* Conidiophores mostly somewhat wider, 2.5–4.5(–6) µm, *in vitro* and *in vivo* often branched; small terminal conidia mostly wider, (2–)3–5(–7) × (2–)3–3.5(–4.5) µm; secondary ramoconidia (4–)8–22(–37.5) × (2–)3–4(–5) µm; ramoconidia often formed, up to 40 µm long, with up to five septa, commonly beaked (alternarioid) on MEA and PDA ..... ***C. sphaerospermum***
14(12) Conidia and secondary ramoconidia irregularly verruculose to sometimes loosely verrucose; radial growth on PDA at 25 °C after 14 d typically less than 5 mm ..... ***C. langeronii***
14* Conidia and secondary ramoconidia smooth to minutely verruculose; radial growth on PDA at 25 °C after 14 d typically more than 10 mm ..... **15**
15 Conidiophores (3–)3.5–4(–7.5) µm wide, thick-walled; conidiogenous loci and conidial hila 0.5–2 µm diam; ramoconidia sometimes formed (with truncate base, up to 2 µm wide, *i.e.*, base without coronate hilum); no growth observed after 14 d at 30 °C on MEA ..... ***C. psychrotolerans***
15* Conidiophores usually narrower, 2–4 µm wide, wall less thickened; conidiogenous loci and conidial hila 0.5–1.5 µm diam; ramoconidia rarely formed; colonies showing at least weak growth after 14 d at 30 °C on MEA ..... **16**
16 Secondary ramoconidia (4–)6.5–13(–24.5) µm long; no visible colony growth after 14 d at 10 °C on MEA ..... ***C. dominicanum***
16* Secondary ramoconidia (3.5–)5.5–19(–42) µm long; radial growth of colonies after 14 d at 10 °C on MEA more than 5 mm ..... ***C. velox***
17(10) Conidiophores *in vitro* micronematous, little differentiated, short, (5–)10–50(–60) µm long ..... ***C. salinae***
17* Conidiophores *in vitro* micronematous as well as macronematous or only macronematous, *in vivo* usually only macronematous ... **18**
18 Conidiophores very long, up to about 500 µm, unbranched, filiform-setiform, pluriseptate, wall somewhat thickened, not pale, at least medium brown; conidiogenous cells terminal, mostly somewhat swollen, often unilaterally swollen; conidia smooth to minutely verruculose ..... ***C. tenuissimum***
18* Conidiophores much shorter, not filiform-setiform, or conspicuously geniculate, or with terminal as well as intercalary conidiogenous cells and loci ..... **19**
19 Conidia smooth, rarely some conidia minutely rough-walled ..... **20**
19* Conidia verruculose to verrucose or echinulate ..... **27**
20 Conidiophores 15–500 × 2.5–9(–11) µm, arising from superficial hyphae, pluriseptate, frequently dichotomously or subdichotomously branched; conidiogenous cells usually terminal and somewhat swollen; conidia 2–32 × 2–7 µm, 0–3(–4)-septate ..... ***C. varians***
20* Conidiophores shorter, not dichotomously branched or conidia smaller or with fewer septa ..... **21**
21 Conidiophores usually cylindrical-filiform, non-geniculate-sinuous, *in vivo* usually arising from immersed hyphae or swollen hyphal cells, usually only with a single terminal conidiogenous cell, not or barely swollen, but occasionally subdenticulate, only with a single or few conidiogenous loci; conidia usually 2–5 µm wide and 0–1-septate ..... ***C. cladosporioides*** complex (see below)
21* Conidiophores geniculate-sinuous or with intercalary conidiogenous cells and conidiogenous loci, or terminal conidiogenous cells distinctly swollen, or conidia different, wider or with more septa ..... **22**
22 Conidiophores fasciculate, usually strongly geniculate-sinuous, 50–300 × 3–8 µm; ramoconidia present, 8–18 × 3–7 µm, with truncate base, 2–4 µm wide, 0–3-septate; conidia 3–15 × 2.5–5.5 µm, 0–1-septate; only known from dead leaves of *Magnolia* ... ***C. delectum***
22* Conidiophores straight, subcylindrical to slightly geniculateinuous; ramoconidia lacking ..... **23**
23 Conidiophores 7–126 × 3–5(–6) µm; conidia 2–6 µm wide, 0–1-septate, thin-walled, smooth; cells without distinct lumens ..... ***C. pannosum***
23* Conidiophores up to 250(–300) × 3–9(–10) µm; conidia (2–)3–10 µm wide, 0–5-septate, wall thickened; cells of the hyphae, conidiophores and conidia often with distinct, subglobose to irregular lumens ..... **24**
24 *In vivo* mycelium internal and external, superficial; conidiophores arising from immersed hyphae or swollen hyphal cells or solitary, arising from superficial hyphae, 10–120 × 3–8 µm; conidia 8–40 × 5–10 µm ..... ***C. astroideum*** var. ***astroideum***
24* *In vivo* mycelium mostly internal; conidiophores only arising from immersed hyphae, swollen hyphal cells or stromatic hyphal aggregations, 20–250(–300) µm long; conidia narrower, (2–)3–7(–9) µm ..... **25**
25 Conidiophores often branched, especially in the upper portion frequently branched ..... ***C. sarmentorum***
25* Conidiophores usually unbranched ..... **26**
26 Conidia (2–)3–6(–7) µm; conidiogenous loci and hila 0.5–1.5(–2) µm diam ..... ***C. delicatulum***
26* Conidia 3–8(–10) µm wide; conidiogenous loci and hila 1–2(–2.5) µm diam ..... ***C. nigrellum***
27(19) Conidia at first smooth, but later mixed with verruculose conidia; cells of the hyphae, conidiophores and conidia often with distinct, subglobose to irregularly shaped lumens ..... **28**
27* All conidia verruculose to verucose or echinulate ..... **29**
28 *In vivo* mycelium internal and external, superficial; conidiophores arising from immersed hyphae or swollen hyphal cells or solitary, arising from superficial hyphae, 10–120 × 3–8 µm; conidia 8–40 × 5–10 µm ..... ***C. astroideum*** var. ***astroideum***
28* *In vivo* mycelium internal; conidiophores only arising from immersed hyphae, swollen hyphal cells or stromatic hyphal aggregations, 20–250(–300) µm long; conidia narrower, (2–)3–7(–8) µm ..... ***C. delicatulum***

29(27) Conidia with distinctly echinulate, spiny ornamentation, spines 0.5–1.3 µm long; hila usually situated on small peg-like prolongations or denticles ..... ***C. spinulosum***
29* Conidia verruculose to verrucose ..... **30**
30 Conidiophores *in vivo* fasciculate, 10–70 × 3–7 µm, arising from stromata, 10–60 µm diam, later enlarged or confluent, up to 150 µm diam; conidia solitary or in unbranched chains, 5–26 × 3–5.5 µm, 0–3-septate; on dead legumes of *Phaseolus* ..... ***C. leguminicola***
30* Stromata lacking or much smaller; conidia in branched chains ..... **31**
31 Conidiophores cladosporioides-like, 100–400 × 3–8 µm, usually filiform, non-geniculate-sinuous, only with a single terminal unswollen conidiogenous cell, with a single or few conidiogenous loci, occasionally subdenticulate; conidia (5–)8–15 × 3–6 µm; secondary ramoconidia up to 25 × 8.5 µm ..... ***C. auriculae***
31* Conidiophores much shorter, geniculate-sinuous, with terminal as well as intercalary or pleurogenous conidiogenous cells ..... **32**
32 Conidiophores 10–120 × 3–6 µm, frequently verruculose, at least towards the base; conidia (5–)8–35(–40) × 3–9 µm, 1–4(–6)-septate, thick-walled, often with constrictions at the septa, occasionally with oblique to longitudinal septa ..... ***C. astroideum*** var. ***catalinense***
32* Conidia 2–6(–7) µm wide, 0–3(–4)-septate, thin-walled, not or barely constricted at the septa, all septa vertical, not longitudinal .... **33**
33 Mycelium *in vitro* dimorphic, narrow hyphae 1–3 µm wide, hyaline or subhyaline, thin-walled, hyphae of the second type wider, 3.5–8 (–9) µm wide, pale to dark greyish olivaceous to olivaceous-brown, thick-walled, wall sometimes even two-layered, 1(–1.5) µm wide, hyphae appearing consistently enveloped in polysaccharide-like material or covered by a slime coat; conidiophores usually several times slightly to usually distinctly geniculate towards the apex, with up to 14 conidiogenous loci; secondary ramoconidia 13–20 × 4–5 µm, 0–3-septate; isolated from a lichen, probably lichenicolous ..... ***C. antarcticum***
33* Mycelium *in vitro* not dimorphic; neither enveloped in polysaccharide-like material nor covered by a slime coat [if hyphae with extracellar polysaccharide-like material, secondary ramoconidia much smaller, (5–)6–11(–22) × 2.5–3 µm, 0(–1) µm]; or only known *in vivo* (on dead leaves of *Typha*), secondary ramoconidia 15–30 × 4–6(–7) µm, (0–)1–3(–4)-septate, conidiophores non or only slightly geniculate, with few conidiogenous loci; saprobic species ..... **34**
34 Small terminal conidia ellipsoid-subcylindrical, narrowly obovoid, limoniform to fusiform, but not globose ..... **35**
34* Small terminal conidia globose to subglobose ..... **37**
35 Terminal conidia ellipsoid-subcylindrical, septate conidia and secondary ramoconidia 15–30 × 4–6(–7) µm, (0–)1–3(–4)-septate; saprobic on dead leaves of *Typha* ..... ***C. heleophilum***
35* Terminal conidia narrowly obovoid, limoniform to fusiform, secondary ramoconidia narrower, 2.5–5 µm, 0–1(–2)-septate ..... **36**
36 Small terminal conidia variable, narrowly obovoid, limoniform to fusiform; secondary ramoconidia (13–)17–32(–37) × 3–5(–6) µm, 0–1(–2)-septate; *in vitro* mycelium without extracellar polysaccharide-like material ..... ***C. subtilissimum***
36* Small terminal conidia fusiform; secondary ramoconidia smaller, (5–)6–11(–22) × 2.5–3 µm, 0(–1)-septate; *in vitro* mycelium with extracellar polysaccharide-like material ..... ***C. fusiforme***
37(34) Conidiophores usually with numerous conidiogenous loci forming sympodial clusters of pronounced scars at the apex, sometimes up to 10 or even more denticle-like loci; conidia 3–20(–28) × 2.5–5(–6) µm, 0–1(–2)-septate, often with several apically crowded hila, up to 7(–9) ..... ***C. tenellum***
37* Conidiophores usually only with few conidiogenous loci, mostly 1–3; conidia longer and narrower, 2.5–32 × 2–4(–5) µm, 0–3-septate, usually only with 1–3 distal hila ..... ***C. ramotenellum***

### *Key to species in the C. cladosporioides complex (in vitro)*

Morphological features used in the key to distinguish the species treated in this study were determined by light microscopy after 7 to 9 d growth at 25 ºC on SNA, and culture characteristics after 14 d incubation on PDA. *Cladosporium uredinicola* and *C. vignae* are not included in the key because of problems with type material, identity of putatively representative specimens, and since isolates of these species did not sporulate during the course of the examinations (Bensch *et al.* 2010), and measurements given in literature were made only on PDA and are therefore only partly comparable. Terminology used for conidial types, scars and surface ornamentation follow Schubert *et al*. (2007b). To reflect the morphological variability of some of the species, especially with regard to surface ornamentation of conidia, these species are listed twice or up to three times in the key, *e.g. C. exile*. The *C. cladosporioides s. lat.* complex (see couplet 35 in the key), includes species that are morphologically close to *C. cladosporioides* but still distinguishable due to a combination of subtle features as well as *C. cladosporioides s. str.* and morphologically indistinguishable but phylogenetically distinct lineages of the latter species. Lineages of *C. cladosporioides s. lat.* are phylogenetically closer to some of the species covered below than they are to *C. cladosporioides s. str.*, even though they are morphologically not distinguished from *C. cladosporioides s. str.* (Bensch *et al.* 2010, fig. 1).

1 Conidia finely verruculose to coarsely verrucose or irregularly rough-walled ..... **2**
1* Conidia smooth or almost smooth ..... **15**
2 Conidia distinctly ornamented, verruculose to coarsely verrucose or irregularly rough-walled ..... **3**
2* Conidia less ornamented, almost smooth to asperulate or minutely verruculose, sometimes irregularly rough-walled ..... **7**
3 Conidia frequently septate, with 0−3 septa; surface with coarse verrucae up to 1 µm high ..... ***C. verrucocladosporioides***
3* Conidia mainly 0−1-septate, occasionally with a second septum; verrucae lower, only up to 0.5 µm high ..... **4**
4 Conidiophores up to 430 µm long, smooth; small terminal conidia globose, subglobose or obovoid, broad, 4.5−6 µm wide ..... ***C. acalyphae***
4* Conidiophores shorter, up to 200 µm long, usually shorter, almost smooth to minutely verruculose or irregularly rough-walled; small

terminal conidia obovoid, ellipsoid, ovoid, rarely subglobose, 2.5−4.5 µm wide ..... **5**

5 Conidiophores macronematous, (2.5−)3.5−5.5 µm wide, walls thickened, 0.5−1(−1.5) µm wide, sometimes even appearing to be two-layered; small terminal conidia 5−6 µm long ..... ***C. pini-ponderosae***

5* Conidiophores macro-, semimacro- and micronematous, narrower, (1.5−)2.5−4 µm wide, walls unthickened or only slightly thickened, about 0.5 µm wide; small terminal conidia longer, 4−9 µm long ..... **6**

6 Ramoconidia 4−5 µm wide, aseptate; conidia finely verruculose to usually verruculose, occasionally distinctly verrucose; conidiogenous loci and hila (0.5−)0.8−2(−2.2) µm diam ..... ***C. chubutense***

6* Ramoconidia narrower, 2.8−4 µm, 0−2-septate; conidia mostly distinctly verruculose-rugose or irregularly rough-walled; conidiogenous loci and hila narrower, 0.5−1.5 µm diam ..... ***C. exasperatum***

7(2) Terminal unbranched part of the branched conidial chains usually very long with up to 8(−10), sometimes up to 17 conidia ..... **8**

7* Conidia in densely branched chains, terminal unbranched part of the chains much shorter with 1−4 conidia ..... **11**

8 Conidia inversely coloured with small terminal and intercalary conidia being slightly darker than secondary ramoconidia, ramoconidia and conidiophores; small terminal conidia (3−)5−8.5 µm long, intercalary conidia (5−)7−20 µm long; small terminal and intercalary conidia in delicate, loose chains, minutely verruculose or irregularly rough-walled, rugose, secondary ramoconidia and ramoconidia smooth ..... ***C. inversicolor***

8* Conidia not inversely coloured, small terminal and intercalary conidia paler or concolorous with secondary ramoconidia, ramoconidia and conidiophores; small terminal and intercalary conidia shorter, 4−7(−8) µm and (5−)6.5−10(−12) µm, respectively; no differences in ornamentation between smaller conidia and secondary ramoconidia ..... **9**

9 Conidiophores 45−210(−360) µm long, pluriseptate, with up to 12 septa; secondary ramoconidia (7.5−)9−26(−37) × (2.5−)3−5 µm, 0(−1)-septate ..... ***C. asperulatum***

9* Conidiophores shorter, up to 100(−115) µm long, 0−4(−5)-septate; secondary ramoconidia somewhat shorter and narrower, 8−20(−23) × (2.5−)3−4 µm, 0−1(−2)-septate ..... **10**

10 Conidiophores macronematous, (2.5−)3.5−4.5(−5) µm wide, thick-walled, walls up to 1 µm wide; conidiogenous cells geniculate, subnodulose with unilateral swellings or occasionally nodulose, with up to six loci crowded at the apex; conidia smooth or almost so to finely verruculose; on *Myrtaceae* ..... ***C. myrtacearum***

10* Conidiophores macro- and micronematous, slightly narrower, 2−4(−4.5) µm wide, walls slightly thickened, up to 0.5 µm; conidiogenous cells non-nodulose, occasionally geniculate, usually with a single apical scar, sometimes with 2−3 conidiogenous loci at the apex; conidia smooth to minutely verruculose or often irregularly rough-walled; on *Cortaderia* ..... ***C. colombiae***

11(7) Macronematous conidiophores 2.5−5(−6) µm wide; secondary ramoconidia 5−17 (−24) × (2−)3−4.5 µm ..... ***C. phyllactiniicola***

11* Macronematous conidiophores narrower, (1.5−)2−4(−5) µm; secondary ramoconidia longer and/or narrower, 10−30(−34) × 2−3.5(−4) µm ..... **12**

12 Conidiophores (1.5−)2−3.5(−4) µm wide, subhyaline, pale olivaceous to pale olivaceous-brown; conidiogenous loci and hila narrow, (0.8−)1−1.5(−1.8) µm diam ..... **13**

12* Conidiophores somewhat wider, (2−)3−4(−5) µm, and darker, pale to medium olivaceous-brown; secondary ramoconidia somewhat wider, 2.5−3.5(−4) µm; conidiogenous loci and hila, 0.5−2 µm diam ..... **14**

13 Ramoconidia 25−45 × 2.5−3(−4.5) µm; secondary ramoconidia 6−30(−34) × 2−3(−3.5) µm, 0−1(−3)-septate, 4−16(−19) × 2−3(−3.5) µm ..... ***C. perangustum***

13* Ramoconidia 17–20(–28) × (2–)3(–4) µm, secondary ramoconidia (5–)10–15(–20) × (3–)3.5(–4) µm, aseptate ..... ***C. phaenocomae***

14 Ramoconidia 17−41 µm long with a broadly truncate base, 2.5−3 µm wide; small terminal conidia 3.5−5(−5.5) × 2−3 µm, intercalary conidia (4−)5−8(−9) µm long; conidiogenous loci and hila 0.5−2 µm diam ..... ***C. exile***

14* Ramoconidia up to 34 µm, base 2−2.5 µm wide; small terminal conidia 3.5−4.5(−5) × 2−2.2(−2.5) µm, intercalary conidia longer, 5−13 µm; conidiogenous loci and hila slightly narrower, 0.5−1.8 µm diam ..... ***C. scabrellum***

15(1) Macronematous conidiophores nodulose or nodose with swellings usually being quite apart from each other; conidiogenous loci usually restricted to swellings ..... **16**

15* Macronematous conidiophores non-nodulose or only occasionally subnodulose due to geniculate proliferation; conidiogenous loci not confined to swellings ..... **18**

16 Conidia solitary or in short unbranched or branched chains, 5−8(−9) µm wide; phytopathogenic, causing leaf spots on *Colocasia* ..... ***C. colocasiae***

16* Conidia always catenate, usually in densely branched chains, (1.5−)2−4(−5) µm wide; saprobes occurring on numerous substrates ..... **17**

17 Conidiophores up to 720 µm or even longer, always nodulose to nodose with conidiogenous loci restricted to swellings (on SNA and *in vivo*; on PDA and OA conidiophores without swellings ..... ***C. oxysporum***

17* Conidiophores up to 310(−460) µm long, often subnodulose or nodulose with a head-like swollen apex and sometimes few additional nodes on a lower level, but most conidiophores neither geniculate nor nodulose, loci often situated on swellings but not restricted to them, in intercalary conidiogenous cells loci often sitting at about the same level round about the stalk, but not connected with swellings as in *C. oxysporum*; on PDA and OA conidiophores darker, often with swellings ..... ***C. tenuissimum***

18(15) Conidiophores 4−7(−8) µm wide at the base, attenuated towards the apex, 3−4 µm wide, medium to dark brown, often with a foot-like swollen base ..... ***C. basiinflatum***

18* Conidiophores different, narrower or not distinctly attenuated towards the apex, paler, not dark brown, without a foot-like swollen base ..... **19**

19 Conidiophores up to 100 µm long, rarely longer and secondary ramoconidia up to 20 µm long, occasionally longer ..... **20**

19* Conidiophores up to 330 µm, and secondary ramoconidia up to 30 µm long ..... **27**

20 Conidia in long unbranched or loosely, mostly dichotomously branched chains ..... **21**
20* Conidia usually in densely branched chains both at the base of the chain and intercalary ..... **24**
21 Conidiophores (3−)3.5−4.5 µm wide; conidia 0−3-septate; forming subglobose or globose, dense pseudoparenchymatous conglomerations of swollen hyphal cells ..... ***C. hillianum***
21* Conidiophores 2.5−3.5(−4) µm; conidia 0−1(−2)-septate; without pseudoparenchymatous conglomerations ..... **22**
22 Conidial chains flabellate, characteristically spread in a fan-like manner, secondary ramoconidia 11−27 µm long, 0(−1)-septate ..... ***C. flabelliforme***
22* Conidial chains not flabellate, secondary ramoconidia 7−19(−23) µm, 0−1(−2)-septate ..... **23**
23 Conidial chains very long, with up to 18 conidia; small terminal conidia 5−9 × 2−2.5 µm; cladosporioid scar structure with dome and rim not clearly visible using light microscopy ..... ***C. chalastosporoides***
23* Conidial chains shorter, with up to 8(−14) conidia; small terminal conidia shorter and narrower, 2.5−5 × 1.5−2 µm; dome and rim clearly visible ..... ***C. funiculosum***
24(20) Conidiophores with monopodial rejuvenations having a single terminal rather inconspicuous annellation; conidia 1−3(−3.5) µm wide; conidiogenous loci and hila 0.5−1.5(−1.8) µm diam ..... ***C. gamsianum***
24* Conidiophores without monopodial rejuvenations; conidia 3−5(−6) µm; conidiogenous loci and hila 0.5−2 µm diam ..... **25**
25 Conidiophores mostly 1−3-septate; small terminal and intercalary conidia 2−3 µm wide, secondary ramoconidia 3−4 µm wide; conidiogenous loci and hila 0.8−1.8(−2) µm diam; on *Myrtaceae* ..... ***C. myrtacearum***
25* Conidiophores pluriseptate; small terminal and intercalary conidia 2−4(−4.5) µm, secondary ramoconidia (2.5−)3−5(−6) µm; conidiogenous loci and hila slightly wider; fungicolous or lichenicolous ..... **26**
26 Mycelium minutely verruculose to irregularly rough-walled; conidiophores 2.5−5(−6) µm wide; conidia smooth or almost so to finely asperulate; fungicolous, occurring on chasmothecia of *Phyllactinia* ..... ***C. phyllactiniicola***
26* Mycelium dimorphic, fertile hyphae irregularly rough-walled, sterile hyphae smooth; conidiophores narrower, 3−4 µm wide; conidia smooth; on lichens ..... ***C. licheniphilum***
27(19) Conidia 1.5−3(−3.5) µm wide ..... **28**
27* Conidia up to 5(−7) µm, mostly 3−4 µm ..... **30**
28 Conidiophores (8−)12−130(−150) µm long; conidia smooth or almost so to finely verruculose ..... ***C. perangustum***
28* Conidiophores longer, up to 330 µm long; conidia smooth or almost so ..... **29**
29 Conidiophores subulate, formed like an awl with a swollen base and distinctly attenuated towards the apex, 2−3 µm wide at the apex; small terminal conidia 2.5−4.5(−5.5) × 2−2.5 µm ..... ***C. subuliforme***
29* Conidiophores not subulate, somewhat wider and not distinctly attenuated towards the apex, (1.5−)2−4 µm wide; small terminal conidia 3−6.5 × 1.5−2 µm ..... ***C. angustisporum***
30(27) Conidia 0−3-septate ..... **31**
30* Conidia 0−1-septate, rarely with an additional septum ..... **35**
31 Conidiophores (2−)3−4(−5) µm wide; conidia smooth to sometimes asperulate or minutely verruculose ..... **32**
31* Conidiophores (2.5−)3−6(−6.5) µm; conidia smooth or almost so ..... **33**
32 Conidia 3−5 µm wide, 0−3-septate, septa often darkened; mycelium dimorphic ..... ***C. paracladosporioides***
32* Conidia 2−3.5(−4) µm wide, 0−1(−3)-septate, septa not darkened; mycelium not dimorphic ..... ***C. exile***
33(31) Ramoconidia 24−43 × 3−3.5 µm; conidia in long loosely branched chains, often dichotomously branched, up to 10(−14) conidia in the terminal unbranched part of the chain, small terminal conidia 4−8(−10) µm long; phytopathogenic on *Cucurbitaceae* ..... ***C. cucumerinum***
33* Ramoconidia longer and wider; conidia in branched chains, branching in all directions, up to five conidia in the terminal unbranched part of the chain, small terminal conidia (2−)3.5−5 µm long ..... **34**
34 Intercalary conidia (2−)2.5−3(−4) µm wide, secondary ramoconidia (2.5−)3−4(−5) µm wide; conidiogenous loci and hila 0.5−2(−2.5) µm diam; attaining 50−70 mm diam after 14 d on PDA, MEA and OA; occurring on ascomycetes and fruiting bodies of different basidiomycetous fungi ..... ***C. lycoperdinum***
34* Intercalary conidia (2.5−)3−4(−4.5) µm, secondary ramoconidia (2.5−)3−6 µm; conidiogenous loci and hila 0.8−3 µm diam; slower growing on all media, attaining 17−32 mm diam after 14 d; saprobic and possibly endophytic ..... ***C. varians***
35(30) Small terminal conidia (2.5−)3−4 µm wide, usually globose or subglobose, secondary ramoconidia (3−)4−5(−6) µm wide ..... ***C. globisporum***
35* Small terminal conidia narrower, up to 3 µm wide, subglobose, obovoid, ovoid or limoniform, but not globose, secondary ramoconidia usually narrower ..... **36**
36 Macronematous conidiophores 4−5(−6) µm wide, erect or decumbent; fungicolous, occurring on species of *Taphrina* ..... ***C. phyllophilum***
36* Macronematous conidiophores narrower, usually 2.5−4 µm wide, usually erect, not decumbent; on different substrates (*cladosporioides s. lat.* complex) ..... **37**
37 Conidia inversely coloured with small terminal and intercalary conidia being slightly darker than secondary ramoconidia, ramoconidia and conidiophores; small terminal conidia (3−)5−8.5 µm long ..... ***C. inversicolor***
37* Conidia not inversely coloured, small terminal and intercalary conidia paler or concolorous with secondary ramoconidia, ramoconidia and conidiophores; small terminal conidia (2−)3−5(−6) µm ..... **38**
38 Conidiophores usually with a head-like swollen apex and sometimes a few additional swellings on a lower level and/or conidiophores slightly to often distinctly sympodially proliferating, growth or branching proceeding in an angle of 45° to almost 90°; in intercalary conidiogenous cells loci sitting at about the same level round about the stalk, garland-like (*tenuissimum s. lat.*) ..... **39**

38* Conidiophores different, without apical or intercalary swellings, at most subnodulose, growth not proceeding in an angle of 45° to almost 90° ..... **40**

39 Conidiophores usually with a head-like swollen apex, uni- or multilateral, and sometimes with few additional nodules on a lower level; ramoconidia 22−41 µm long; conidia smooth, occasionally irregularly rough-walled ..... ***C. tenuissimum***

39* Conidiophores without head-like swollen apex; ramoconidia 16−56 µm; the outer walls of small terminal conidia and intercalary conidia often seem to detach, irregular, somewhat refractive ..... ***C. rectoides***

40(38) Ramoconidia 3−5 µm wide; secondary ramoconidia 10−30(−38) µm long (av. approx. 19−21), small terminal conidia in long unbranched chains, up to 10 conidia in the terminal part of the chain ..... **41**

40* Ramoconidia up to 4 µm wide; secondary ramoconidia shorter, 7−25 µm long (av. approx. 15−16), occasionally few conidia longer, terminal conidial chains shorter, up to six, mainly up to four conidia in the terminal unbranched part of the chain ..... **42**

41 Secondary ramoconidia 0−1(−2)-septate, intercalary conidia subrostrate or rostrate ..... ***C. iranicum***

41* Secondary ramoconidia usually aseptate, occasionally 1-septate, intercalary conidia not rostrate ..... ***C. cladosporioides*** [including morphologically indistinguishable but phylogenetically distinct lineages]

42(40) Conidiogenous loci and hila 0.5−1.5(−1.8) µm ..... ***C. pseudocladosporioides***

42* Conidiogenous loci and hila somewhat wider, 0.5−2 µm ..... **43**

43 Conidia almost smooth to often asperulate, loosely verruculose or irregularly rough-walled, especially in small terminal and intercalary conidia ..... **44**

43* Conidia smooth or almost so ..... **45**

44 Intercalary conidia and secondary ramoconidia with numerous distal hila crowded at the apex, in intercalary conidia with 2−4(−6) hila, in secondary ramoconidia with up to 6(−9) hila at the apex, small terminal conidia 2−4 µm long (av. 3.5), intercalary conidia 5−12 µm long (av. 7.9), aseptate ..... ***C. xylophilum***

44* Intercalary conidia and secondary ramoconidia with only few distal hila, in intercalary conidia with 1−2(−3) hila, in secondary conidia with up to three hila, small terminal conidia 3.5−5(−5.5) µm (av. 4.4), intercalary conidia (4−)5−8(−9) µm long (av. 6.3), 0−1-septate ..... ***C. exile***

45(43) Mycelium often forming dense ropes, hyphae 1−5 µm wide; conidiophores macronematous, often very long, up to 285 µm; due to the special cell structure conidiophores and conidia often with disto-septa ..... ***C. australiense***

45* Mycelium not forming ropes, hyphae (0.5–)1−3(−4) µm; conidiophores macronematous 50−165 µm long, micronematous 19−75(−100) µm long; conidiophores and conidia without disto-septa ..... ***C. delicatulum***

## Key to biotrophic and common saprobic foliicolous *Cladosporium* species *in vivo* based on morphology and ecology

Beside the foliicolous *Cladosporium* species, this key contains some common, widespread saprobic species often occurring as secondary invaders on living or fading leaves, *i.e.*, on lesions caused by other fungi. Descriptions of surface ornamentations, *e.g.*, smooth, verruculose, *etc.*, refer to light microscopy if not otherwise stated.

1 Conidia solitary, occasionally few conidia in very short un..branched chains, 20–75 × 5–10 µm, 1–6-septate, smooth or almost so; on *Ranunculus* ..... ***C. ferox***

1* Conidia solitary or in short unbranched chains, but distinctly verruculose to verrucose or echinulate, or conidia in long, often branched chains, if conidia smooth, much shorter, with few septa ..... **2**

2 Conidia 13–30(–45) × 7–12 µm, very thick-walled, distinctly 2–3-layered; conidiophores 120–300(–400) µm long; on *Corypha* ..... ***C. coryphae***

2* Conidial wall one-layered or conidiophores much shorter or conidia narrower ..... **3**

3 Stromata well-developed, 20–100 µm diam, later expanded, up to 500 µm diam, pustulate; conidiophores 100–250 µm long, straight to geniculate-subnodulose; conidia 8–25 × 5–10 µm, 0–3-septate, coarsely and distantly verrucose, verrucae up to 1 µm diam, distance up to 2.5 µm; on dead stems of *Zinnia* ..... ***C. oblongum***

3* Stromata lacking or much smaller, or conidiophores shorter, and/or conidia smooth or with distinct ornamentation of the surface ..... **4**

4 Conidia solitary or only some conidia in short, mostly unbranched chains, very broad, 6–25 µm, average ≥ 8 µm (conidia sometimes dimorphic, broad conidia mixed with some narrower ones) ..... **5**

4* Conidia solitary, but narrower, less than 8 µm wide, or conidia in long, often branched chains ..... **24**

5 Conidiophores strongly geniculate-sinuous, terminally often coralloid, with distinct protuberances or denticulate, 20–145 × 4.5–8 µm; conidia solitary or in short unbranched, rarely branched chains, 9–35 × (8.5–)10–15 µm, 0–1(–2)-septate; on *Melosperma* ..... ***C. melospermae***

5* Conidiophores distinctly torulose-nodulose to geniculate-nodulose or non- to only slightly geniculate, but not coralloid ..... **6**

6 Conidiophores distinctly torulose-nodulose or geniculate-nodulose, often with constrictions at the septa ..... **7**

6* Conidiophores straight to somewhat geniculate-sinuous, but neither torulose-nodulose nor geniculate-nodulose ..... **16**

7 Conidia 40–65 × (15–)18–25 µm, strongly constricted at the septa; on *Polygonatum* ..... ***C. polygonati***

7* Conidia narrower, on the average less than 20 µm and/or not constricted at the septa ..... **8**

8 Conidia dimorphic, large conidia formed singly or only in very short, unbranched chains, 8–18 µm wide, mixed with narrower catenate conidia, 5–8 µm wide ..... **9**

8* Conidia uniformly large, above all wide ..... **10**

9 Large conidia 22–45 × 8.5–18 µm; biotrophic on *Robinia* ..... ***C. robiniae***
9* Large conidia *in vivo* up to 30 × 8–12(–15) µm wide; saprobic ..... ***C. macrocarpum***
10(8) Conidia (10–)15–30 × 10–14 µm, (0–)1–septate; on *Brassica* ..... ***C. brassicae***
10* Conidia larger, above all longer, or pluriseptate ..... **11**
11 *In vitro* with twisted aerial hyphae; conidia *in vivo* 8–11(–12) µm wide; on *Spinacia* ..... ***C. variabile***
11* Without twisted aerial hyphae *in vitro*; conidia wider ..... **12**
12 Conidia ellipsoid-cylindrical, usually somewhat attenuated towards the base, short obconically truncate ..... **13**
12* At least some conidia laterally gradually narrowed, solei-form (sole-shaped), sometimes distinctly bulbose at the base which is broadly rounded, *i.e.*, not attenuated ..... **14**
13 Conidia (15–)20–55(–60) × 9–15(–17) µm, (0–)1–3(–4)-septate, often constricted at the primary septum, wall coarsely verrucose-pustulate; on *Narthecium* ..... ***C. lacroixii***
13* Conidia up to 70 × 15 µm, with up to six septa, without any constrictions, wall verrucose-digitate; on *Gagea* and *Ornithogalum* ..... ***C. ornithogali***
14(12) Conidia about 25–55 × 12–15 µm, (1–)2–4(–6)-septate; conidiophores often with small side branches; on *Dianthus* and possibly other members of the *Caryophyllaceae* ..... ***C. echinulatum***
14* Conidia only 0–3-septate or larger, up to 75 × 20 µm; conidiophores without any side branches; on *Iris* ..... **15**
15 Conidia 30–75 × 10–20(–25) µm, (0–)2–6(–7)-septate, wall up to 1 µm wide ..... ***C. iridis***
15* Conidia 15–55 × (9–)11–19(–21) µm, 0–3-septate, wall thicker, up to 2 µm, usually somewhat zonate ..... ***C. pseudiridis***
16(6) Conidiophores uniformly short, 8–40 × 4–10 µm; conidia 15–30 × 8–13 µm, 0–2-septate; on *Haplophyllum* ..... ***C. haplophylli***
16* Conidiophores much longer, on the average > 40 µm ..... **17**
17 Conidia (11–)20–60 × (5–)7–12 µm; conidiophores fasciculate, arising from substomatal stromata, 20–50 µm diam; on *Arthropodium* ..... ***C. arthropodii***
17* Conidia shorter or wider, or substomatal stromata lacking ..... **18**
18 At least some conidia gradually narrowed in the middle, solei-form, at the base often somewhat swollen, broadly rounded; on *Allium* ..... **19**
18* Conidia subglobose, subclavate, ellipsoid-ovoid to short cylindrical, base not swollen, but somewhat attenuated ..... **20**
19 Conidia (20–)30–60(–80) µm long; conidiogenous loci protuberant, 'peg-like'; on various *Allium* spp. ..... ***C. allii***
19* Conidia longer, (40–)60–90(–120) µm; conidiogenous loci non-protuberant, ≤ 1 µm high, not 'peg-like'; on *Allium cepa* and *A. fistulosa* ..... ***C. allii-cepae***
20(18) Conidia *in vivo* (10–)15–30(–35) × (6–)7–9(–11) µm, width on the average < 9 µm, *in vitro* even narrower; on *Narthecium* ..... ***C. ossifragi***
20* Conidia *in vivo* wider, 6–14 µm, on the average > 9 µm ..... **21**
21 Conidia in short, unbranched, rarely branched chains ..... **22**
21* All or almost all conidia formed singly ..... **23**
22 Conidia (0–)1–5-septate; on *Trillium* ..... ***C. trillii***
22* Conidia 0–1(–2)-septate; on *Agoseris* ..... ***C. agoseridis***
23(21) Conidia 0–1-septate, base somewhat attenuated; on *Alopecurus* ..... ***C. alopecuri***
23* Conidia 0–3-septate, base broadly rounded; on *Phleum* ..... ***C. phlei***
24(4) Conidiophores dimorphic, forming two types different in shape, size, septation, pigmentation and sometimes thickness of the wall ..... **25**
24* Conidiophores uniform, not distinctly dimorphic ..... **28**
25 Conidiophores up to 300 µm long, protoplasm of the conidiophore cells often conspicuously aggregated at the septa forming a paler cavity (lumen) in the centre of the cells; conidia usually 0–1-septate; on *Eriobotrya* ..... ***C. fusicladiiformis***
25* Conidiophores usually shorter, protoplasm of the cells not aggregated at the septa; conidia 0–2(–6)-septate ..... **26**
26 Conidiophores 3–6 µm wide, often distinctly nodulose; conidia 3–27 × 3–6.5 µm, 0–6-septate; on *Dieffenbachia*, probably saprobic ..... ***C. dieffenbachiae***
26* Conidiophores 3–8 µm wide, subnodulose or slightly geniculate-sinuous, but not distinctly nodulose; conidia shorter and somewhat narrower, 2.5–19(–28) × 2–5(–6.5) µm, 0–2(–5)-septate ..... **27**
27 Conidiophores with numerous crowded conidiogenous loci, apex of conidiogenous cells appearing somewhat rugose, periconiella-like, walls of the conidiophores thickened, up to 1(–1.25) µm wide, smooth, cells often with distinct clearly delineated lumen; ramoconidia occasionally occurring; on *Syringa* ..... ***C. syringicola***
27* Apex of conidiogenous cells not periconiella-like, walls of conidiophores up to 2 µm wide, with age outer wall seemingly detaching irregularly, cells without distinct lumen; no ramoconidia; on *Chrysophyllum* ..... ***C. chrysophylli***
28(24) Conidiophores distinctly nodulose or nodose, conidiogenous loci usually confined to swellings ..... **29**
28* Conidiophores non-nodulose or occasionally only subnodulose due to geniculate proliferations, but conidiogenous loci not confined to swellings, or only tips of the conidiophores somewhat swollen ..... **35**
29 Conidia usually smooth or almost so ..... **30**
29* Conidia with different surface ornamentation, minutely to distinctly verruculose or verrucose, asperulate or irregularly rough-walled ..... **32**
30 Conidiophores 40–105 µm long, nodulose, swellings not regular, neither clearly separated nor distant from each other, in quick succession; on *Borassus* ..... ***C. borassi***
30* Conidiophores longer, up to 250 µm long or even longer, occasionally up to 500 µm long, straight, nodose with distinct, regular

swellings, clearly separated and distant from each other ..... **31**
31 Conidia 0–1(–2)-septate, subglobose, ovoid, limoniform or ellipsoid, 3–6 µm wide; saprobic, on numerous substrates, also as a secondary invader on leaf spots caused by other fungi ..... ***C. oxysporum***
31* Conidia 0–3(–5)-septate, broadly ellipsoid-subcylindrical to cylindrical, wider, (5–)6–9(–10) µm; on *Colocasia* ..... ***C. colocasiae***
32(29) Conidiophores unbranched to often branched; conidia almost smooth to minutely asperulate or irregularly rough-walled, walls sometimes even two-layered, with unusual cell structure (cells with a paler cavity in the centre of the cells); on *Ocotea* ..... ***C. oreodaphnes***
32* Conidiophores mostly unbranched, rarely branched; conidia usually minutely to distinctly verruculose or verrucose, walls usually not two-layered, without unusual cell structure ..... **33**
33 Conidiophores often with a single head-like, terminal swelling; conidia (2.5–)3–6.5 µm wide, 0–2(–3)-septate, usually minutely verruculose, occasionally smooth; on *Galium* ..... ***C. galii***
33* Conidiophores with several or numerous intercalar and terminal swellings; conidia usually wider, up to 12(–15) µm, with up to five septa, usually distinctly verruculose to verrucose ..... **34**
34 Conidia (5–)11–36(–41) µm long, (0–)1–4(–5)-septate; on *Trillium* ..... ***C. trillii***
34* Conidia much shorter, mostly up to 25 µm long and 0–3-septate; saprobic, on numerous substrates, also as a secondary invader on leaf spots caused by other fungi ..... ***C. macrocarpum***
35(28) Conidiophores usually in small to moderately large, loose to dense fascicles, usually arising from stromata, stromatic hyphal aggregations or swollen hyphal cells, emerging through stomata or erumpent through the cuticle, occasionally solitary ..... **36**
35* Conidiophores solitary or occasionally in loose groups but not fasciculate, usually arising from hyphae or swollen hyphal cells ..... **75**
36 Conidia smooth or almost so, rarely few conidia faintly rough-walled ..... **37**
36* Conidia minutely to distinctly verruculose-echinulate, rarely few conidia smooth ..... **53**
37 Conidiophores up to 100 µm long, but usually much shorter ..... **38**
37* Conidiophores usually longer than 100 µm ..... **49**
38 Conidia 10–45(–68) µm long, occasionally up to 180 µm in length, 0–4(–7)-septate; conidiogenous loci and hila (1–)1.5–3(–4) diam; on *Allium* ..... ***C. victorialis***
38* Conidia usually much shorter, with up to three septa; conidiogenous loci and hila usually narrower ..... **39**
39 Conidia 0–1-septate, rarely with two septa ..... **40**
39* Conidia 0–3(–4)-septate ..... **44**
40 Conidiophores often branched ..... **41**
40* Conidiophores usually unbranched ..... **42**
41 Conidia often distinctly constricted at the septa; on *Corymbia* ..... ***C. myrtacearum***
41* Conidia not constricted at the septa; on *Cycas* ..... ***C. cycadis***
42(40) Conidia up to 25 µm long and 7 µm wide; on *Passiflora* ..... ***C. maracuja***
42* Conidia shorter, up to 18 µm long, 2–5(–6) µm wide ..... **43**
43 Conidiophores fasciculate as well as solitary, arising from internal and external hyphae, often with percurrent, enteroblastic proliferations; conidiogenous loci and hila very small, up to 1 µm diam; ramoconidia sometimes occurring; conidia up to 11 µm long; on *Cassia* and *Chamaecrista* ..... ***C. cassiae-surathensis***
43* Conidiophores usually fasciculate, arising from stromata or stromatic hyphal aggregations, mycelium not external, conidiophores without enteroblastic proliferations; conidiogenous loci and hila 0.5–1.5(–2) µm diam; ramoconidia absent; conidia somewhat longer, 1.5–18 µm; on *Rhododendron* ..... ***C. rhododendri***
44(39) Conidia (3–)4–18(–20) µm long ..... **45**
44* Conidia longer, up to 30 µm ..... **48**
45 Conidiophores fasciculate as well as solitary, arising from internal and external hyphae; ramoconidia occasionally occurring; conidia 2–14(–16) µm long; on *Capparis* ..... ***C. lineolatum***
45* Conidiophores usually fasciculate; mycelium not external; ramoconidia absent; conidia somewhat longer ..... **46**
46 Conidiophores erect to decumbent, unbranched or often branched; on *Manihot* ..... ***C. nigrelloides***
46* Conidiophores always erect, not decumbent, usually unbranched, rarely branched ..... **47**
47 Conidiophores 10–58 × 3.5–5 µm, often distinctly paler at the apex, almost hyaline; on *Jacaranda* ..... ***C. jacarandicola***
47* Conidiophores 15–70 × 3–6 µm, not distinctly paler at the apex; on *Citrus* ..... ***C. corrugatum***
48(44) Conidiophores erect to decumbent, fasciculate or solitary, arising from creeping hyphae, also on trichomes; conidia (8–)10–30(–35) × 2.5–6 µm; on *Gynoxys* ..... ***C. inopinum***
48* Conidiophores always erect, arising from stromatic hyphal aggregations, not from creeping hyphae, not on trichomes; conidia somewhat wider, 6–28 × 4–8 µm; on *Lupinus* ..... ***C. lupiniphilum***
49(37) Conidiophores 2.5–5 µm wide; conidia smooth to often minutely verruculose; on *Smilax* ..... ***C. smilacicola***
49* Conidiophores usually much wider, (3–)4–11(–16) µm; conidia usually smooth under light microscopy ..... **50**
50 Conidia (0–)1–6-septate, 9–45 × 4–8 µm; on *Photinia* ..... ***C. diaphanum***
50* Conidia with up to three septa, up to 20 µm long ..... **51**
51 Ramoconidia present, truncate at the base, 2–4 µm wide; conidiophores 50–300 × 3–8 µm; saprobic on leaves of *Magnolia* ..... ***C. delectum***
51* Ramoconidia lacking ..... **52**
52 Conidiophores 50–175 × (4–)5–8(–11) µm, walls thickened, (0.5–)1–2 µm wide, cells often with a distinct small inner lumen clearly separated from the inner wall; conidia 4–14 µm long, 0–1(–2)-septate, smooth or almost so, but mostly minutely verruculose when

viewed by SEM; on *Populus* ..... ***C. populicola***

52* Conidiophores (23–)150–360 µm or even longer, 6–11(–16) µm wide at the base, distinctly attenuated towards the apex, (2–)3–5.5 µm wide, walls thickened, 0.75–3 µm wide, protoplasm of the cells somewhat aggregated at the septa; conidia 2–22 µm long, 0–3-septate, smooth, with an unusual cell structure (with paler cavity in the centre of the cells); on *Cycas* ..... ***C. apicale***

53(36) Conidiophores up to 100(–120) µm long, but usually much shorter ..... **54**

53* Conidiophores usually longer than 100 µm ..... **67**

54 Conidia solitary or in simple chains; stromata large, at first 10–60 µm diam, later enlarged or confluent, up to 150 µm diam; on legumes of *Phaseolus* ..... ***C. leguminicola***

54* Conidia at least partly in branched chains; stromata smaller ..... **55**

55 Conidiophores up to 10 µm wide, distinctly rough-walled; hyphae up to 13 µm wide ..... **56**

55* Conidiophores narrower, up to 7 µm wide (at the very base occasionally wider), usually smooth; hyphae much narrower ..... **57**

56 Conidiophores 10–60 µm long; conidia without distinct small central lumen; on *Aesculus* ..... ***C. asperistipitatum***

56* Conidiophores up to 120(–180) µm long; conidia often with distinct visible central lumen; on *Gentiana* ..... ***C. gentianae***

57(55) Conidia up to 22 µm long ..... **58**

57* Conidia usually longer, up to 30 µm long ..... **64**

58 Conidiogenous loci and hila small, usually 0.5–1.5 µm diam ..... **59**

58* Conidiogenous loci and hila wider, 1–2.5 µm diam ..... **61**

59 Conidiophores only slightly geniculate-sinuous; conidia without distinct lumen; on *Rhododendron* ..... ***C. rhododendri***

59* Conidiophores usually distinctly geniculate-sinuous or sub-nodulose; conidia often with distinct lumen ..... **60**

60 On living leaves, but without leaf spots; conidia 0–1(–3)-septate; on *Salix* ..... ***C. minusculum***

60* Forming distinct brown leaf spots; conidia 0–3(–4)-septate; on *Eriobotrya* ..... ***C. eriobotryae***

61(58) Conidiophores few to often numerous, in small to moderately large, loose to dense fascicles ..... **62**

61* Conidiophores solitary or few in loose fascicles ..... **63**

62 Conidiophores up to 125 µm long, 4–6.5 µm wide, usually unbranched without distinct constrictions; conidia 2–5(–6.5) µm wide; on *Chamaerops* ..... ***C. chamaeropis***

62* Conidiophores up to 80 µm long, 3–8 µm wide, often branched with distinct constrictions at the septa; conidia 3–7 µm wide; on *Yucca* ..... ***C. yuccae***

63 Conidiophores up to 75 µm long; conidia ellipsoid-ovoid to cylindrical, ends rounded or only slightly attenuated, conidia 0–3-septate, usually distinctly verruculose; on *Oncidium* ..... ***C. orchidearum***

63* Conidiophores 10–40 µm long; catenate conidia distinctly fusiform, with attenuated, pointed ends, 0–1-septate, almost smooth to verruculose; on *Ruta* ..... ***C. rutae***

64(57) Hyphae radiating, forming loose to dense stromatic hyphal plates (fusicladium-like growth), hyphal cells sometimes irregularly lobed; conidiophores unbranched or once branched; on *Angelica* ..... ***C. foliorum***

64* Hyphae not radiating, without fusicladium-like growth, hyphal cells not irregularly lobed; conidiophores unbranched, only very rarely branched ..... **65**

65 Conidiogenous loci and hila 1–1.5 µm diam; conidia 2–5 µm wide, 0–1-septate, almost smooth to verruculose; on *Ilex* ... ***C. cheonis***

65* Conidiogenous loci and hila (1–)1.5–2.5 µm diam; conidia (3–)4–8(–9) µm wide, 0–3(–4)-septate ..... **66**

66 Conidiophores 8–54 µm long, 0–1(–2)-septate; conidia 0–1(–3)-septate, faintly to conspicuously verruculose-echinulate; on *Tragopogon* ..... ***C. praecox***

66* Conidiophores up to 100 µm long, 0–4(–6)-septate; conidia 0–3(–4)-septate, verruculose; on *Vinca* ..... ***C. vincicola***

67(53) Conidiophores in large, dense fascicles, at the base of the conidiomata more or less parallel, synnema-like; stromata large, 40–150 µm wide, sometimes confluent and even larger, several layers deep; on *Soldanella* ..... ***C. soldanellae***

67* Conidiophores in small to moderately large, loose to dense fascicles, but conidiomata not synnema-like; stromata smaller ..... **67**

68 Conidiophores 2.5–7 µm wide ..... **69**

68* Conidiophores usually wider, at least up to 10 µm ..... **73**

69 Conidia *in vivo* (6–)7–9(–11) µm wide (*in vitro* 5–8 µm); on *Narthecium* ..... ***C. ossifragi***

69* Conidia *in vivo* narrower, 2.5–6(–7) µm ..... **70**

70 Conidiophores often with percurrent, enteroblastic proliferations; conidiogenous cells with numerous, often crowded conidiogenous loci, loci and hila small, 1–1.5 µm diam; conidia 3–15(–19) µm long, with an unusual cell structure (with distinct, central paler lumen in the centre of the cells); on *Cypripedium* ..... ***C. orchidiphilum***

70* Conidiophores only sporadically with enteroblastic proliferations; conidiogenous cells with a single or several conidiogenous loci, neither numerous nor crowded, loci and hila usually somewhat wider, 1–2(–2.5) µm diam; conidia usually longer, without an unusual cell structure ..... **71**

71 Conidiophores usually unbranched; conidiogenous loci arranged on about the same level, like a garland; conidia usually 0–4(–5)-septate; on *Stanhopea* ..... ***C. stanhopeae***

71* Conidiophores unbranched or often branched, once or several times; conidiogenous loci not arranged like a garland; conidia usually 0–3-septate ..... **72**

72 Conidia 3.5–26 × 3–7(–8) µm, with age becoming longer and wider, distinctly swollen, up to 36 µm long or even longer and up to 11 µm wide, with up to seven septa, forming secondary conidiophores; without ramoconidia; on *Dracaena* and *Cordyline* ..... ***C. dracaenatum***

72* Conidia shorter and narrower, 2–18(–21) × 1.5–5(–6) µm, with age neither longer and wider nor swollen; ramoconidia occasionally occurring, up to 26 µm long, 0(–1)-septate; on *Smilax* ..... ***C. smilacicola***

73(68) Conidiophores up to 310 µm long or even longer, 5–15 µm wide near the base, distinctly attenuated towards the apex, 3–5(–6) µm wide; conidia with an unusual cell structure (with paler lumen in the centre of the cells); hyphae 2–4 µm wide; on *Berberis* ..... ***C. ushuwaiense***
73* Conidiophores shorter, up to 180 µm long, not distinctly attenuated towards the apex, up to 10 µm wide; conidial cells without small lumen in the centre, but lumen often distinct, clearly separated from the inner wall; hyphae up to 11 µm wide or even wider ..... **74**
74 Conidia 3.5–23 × 3–6(–8) µm, almost smooth to often verruculose or irregularly rough-walled; on *Gentiana* ..... ***C. gentianae***
74* Conidia 4–14 × 3–5(–5.5) µm, smooth or almost so to slightly verruculose (light microscopy), but most conidia minutely verruculose when viewed by SEM; on *Populus* ..... ***C. populicola***
75(35) Conidiophores characteristically branched, right-angled; on *Epidendrum* ..... ***C. rectangulare***
75* Conidiophores unbranched or branched, but not right-angled ..... **76**
76 Conidiophores always with a conspicuously swollen bulbous base, up to 16 µm wide; on *Rivina* ..... ***C. rivinae***
76* Base of conidiophores not distinctly swollen, not bulbous ..... **77**
77 Mycelium external; conidiophores consistently arising from superficially growing hyphae ..... **78**
77* Mycelium consistently internal or sometimes both internal and external; conidiophores usually arising from swollen hyphal cells or internal hyphae, occasionally also from external creeping hyphae ..... **93**
78 Conidiophores very long, 15–500 µm, often dichotomously branched, tips (conidiogenous cells) often somewhat swollen; probably saprobic ..... ***C. varians***
78* Conidiophores either much shorter or unbranched to irregularly branched ..... **79**
79 Web-like mycelial colonies or patches on green leaves attacked by aphids or only with honey dew, without any lesions, formed by germinated conidia; mycelium without any nutritive contact to the host leaves, *i.e.*, completely superficial; hyphae 2–6 µm wide, but often with swollen cells, up to 10 µm diam, monilioid, conidiophores 10–120(–300) × 3–8.5 µm; conidia 3–20 × 2–5 µm; secondary ramoconidia 8–25 × 3–8.5 µm, 0–3-septate, cells often with a distinct central lumen ..... ***C. aphidis***
79* Either biotrophic species, causing lesion, or saprobic species ..... **80**
80 Conidiophores usually 2–6 µm wide ..... **81**
80* Conidiophores usually wider, 3–9(–11) µm ..... **89**
81 Conidia narrow, usually 2–5 µm wide, on the average < 5 µm ..... **82**
81* Conidia usually wider, up to 8 µm ..... **86**
82 Conidiogenous loci and hila small, 0.5–1.5 µm diam ..... **82**
82* Conidiogenous loci and hila wider, up to 2.5 µm diam ..... **85**
83 Conidiophores erect to decumbent; conidia 3–23(–27) µm long, 0–3(–4)-septate; on *Heterophragma* ..... ***C. heterophragmatis***
83* Conidiophores always erect; conidia usually shorter, usually 0–1-septate, only occasionally with up to three septa sometimes with an unusual cell structure ..... **84**
84 Mycelium smooth to mostly more or less verruculose or irregularly rough-walled; conidia 4–17(–19) µm long, with age becoming distinctly enlarged, longer and wider, 5–7 µm wide, lumen often distinct, clearly separated from the inner wall; on *Ulmus* ..... ***C. hypophyllum***
84* Mycelium smooth; conidia 4–14(–20) µm long, not distinctly enlarged with age, lumen of the cells not distinct; on *Styrax* ..... ***C. inconspicuum***
85(82) Conidiophores 0–3-septate; conidia 0–2-septate; on *Mimulus* ..... ***C. mimulicola***
85* Conidiophores pluriseptate, with up to 11 septa; conidia 0–4(–5)-septate; on *Nerium* ..... ***C. neriicola***
86(81) Conidiophores 5–50 µm long, 0–3-septate; conidia 5–8 µm wide, 0–5-septate, often 3-septate; on *Artemisia* ..... ***C. obtectum***
86* Conidiophores 20–200(–250) µm, pluriseptate; conidia (2.5–)3–6.5 µm wide ..... **87**
87 Conidia usually 0–1(–2)-septate, 2–18 µm long, only with age becoming longer and more frequently septate, with up to four septa, with paler reduced lumen in the centre of the cells; on *Bougainvillea* ..... ***C. arthrinioides***
87* Conidia 0–4(–5)-septate, 5–35(–55) µm long, cells without distinct lumen ..... **88**
88 Conidiophores and conidia verruculose; on *Euonymus* ..... ***C. subobtectum***
88* Conidiophores and conidia smooth; on *Caragana* ..... ***C. caraganae***
89(80) Conidiophores 5–50 µm long, 3–5(–7) µm wide, 0–3-septate; on *Artemisia* ..... ***C. obtectum***
89* Conidiophores much longer, pluriseptate ..... **90**
90 Conidiophores often several times mildly to distinctly geniculate-sinuous, walls often distinctly two-layered; ramoconidia frequently formed, 17–60 × 4.5–8 µm, 0–3(–5)-septate; on *Ulmus* and other hosts, probably saprobic ..... ***C. varians***
90* Conidiophores usually not geniculate-sinuous, walls more or less thickened, but not distinctly two-layered; ramoconidia absent .... **91**
91 Stromata (external) composed of more or less isodiametrical cells, forming a *textura angularis*; conidiophores 15–300 × 2.5–8 µm, arising solitarily from creeping hyphae or in loose groups from stromata; conidia 0–2(–5)-septate, walls unthickened or almost so; on *Piper* ..... ***C. pipericola***
91* Stromata lacking ..... **92**
92 Conidiophores 5–150(–210) × (2–)3–6 µm, solitary, often also formed secondarily (microcyclic conidiogenesis); conidia 0–1(–3)-septate, with age becoming distinctly swollen, longer and wider, up to 12 µm wide or even wider, pluriseptate, often constricted at the septa and thick-walled, sometimes even two-layered; hyphae, conidiophores and conidia sometimes with paler lumen in the centre of the cells; on *Heliotropium* ..... ***C. heliotropii***
92* Conidiophores 20–300 µm long, 2.5–5 µm wide above and 4–10 µm wide below, wall 0.5–1 µm thick, one-layered; conidia 0–3(–5)-septate, unchanged with age, thin-walled; conidiophores and conidia without paler lumen; on pods of *Butea* .... ***C. buteicola***
93(77) Conidiophores narrow, usually 2–5 µm wide ..... **94**

93* Conidiophores usually somewhat wider, 3–8(–11) µm ..... **102**
94 Conidia 0–4(–7)-septate, commonly 3-septate, septa usually thickened and distinctly darkened; on *Cenchrus* and *Chaetochloa* ..... ***C. spongiosum***
94* Conidia with up to three septa, but septa neither conspicuously thickened nor darkened ..... **95**
95 Conidiophores solitary, arising from internal and external hyphae or in small loose fascicles ..... **96**
95* Conidiophores always solitary, non-fasciculate ..... **100**
96 Conidia usually 0–1-septate ..... **97**
96* Conidia 0–3-septate ..... **99**
97 Conidiophores 20–100 µm long, often with percurrent, enteroblastic proliferations; conidiogenous loci and hila very small, up to 1 µm diam; conidia 3–11 × 2–4 µm; on *Cassia* and *Chamaecrista* ..... ***C. cassiae-surathensis***
97* Conidiophores up to 250 µm long, without percurrent, enteroblastic proliferations; conidiogenous loci and hila 0.5–2.5 µm diam; conidia 3–30 × 2–5(–7) µm ..... **98**
98 Conidiophores often distinctly geniculate-sinuous with numerous densely aggregated conidiogenous loci, conidiogenous cells both terminal and intercalary; on *Pisum* ..... ***C. pisicola***
98* Conidiophores filiform or subcylindrical, neither distinctly geniculate-sinuous nor nodulose with 1–3, rarely more conidiogenous loci; conidiogenous cells usually terminal; saprobic ..... ***C. cladosporioides***
99(96) Conidiogenous loci and hila 0.5–1.5(–2) µm diam; conidia 2–4.5 µm wide; on *Capparis* ..... ***C. lineolatum***
99* Conidiogenous loci and hila 1–2 µm diam; conidia 3.5–8.5 µm wide ..... ***C. gleditschiae***
100(95) Conidiophores 14–150 µm long, unbranched or once branched, arising from internal and external, creeping hyphae; without microcyclic conidiogenesis; on *Quercus* ..... ***C. fumagineum***
100* Conidiophores usually unbranched, always arising from internal hyphae or swollen hyphal cells, longer, up to 275 µm ..... **101**
101 Microcyclic conidiogenesis often occurring; conidia 3.5–23(–31) × 2–5(–7) µm, 0–2(–3)-septate, pale, hyaline, subhyaline to very pale brown; on *Xyris* ..... ***C. xyridis***
101* Microcyclic conidiogenesis lacking; conidia shorter and wider, 8–14 × 4–8 µm, usually aseptate; on *Carpesium* ..... ***C. carpesii***
102(93) Conidia 0–6(–8)-septate, conidial cells sometimes with paler lumen in the centre; on *Boscia* ..... ***C. bosciae***
102* Conidia 0–4-septate, conidial cells without paler lumen in the centre ..... **103**
103 Ramoconidia often occurring, 15–23 × 5–7.5 µm, 0(–1)-septate; mycelium sometimes irregularly lobed; on *Ranunculus* ..... ***C. grech-delicatae***
103* Ramoconidia absent or only rarely formed; mycelium not irregularly lobed ..... **104**
104 Conidia 3–15(–20) µm long ..... **105**
104* Conidia up to 35 µm long or even longer ..... **107**
105 Conidiophores (4–)5–8(–11) µm wide, often with percurrent, enteroblastic proliferations, walls (0.5–)1–2 µm wide, cells often with distinct, small inner lumen clearly separated from the inner wall; conidia smooth or almost so to somewhat verruculose (when viewed by SEM most conidia minutely verruculose), cells sometimes with distinct inner lumen; on *Populus* ..... ***C. populicola***
105* Conidiophores (3.5–)4–7 µm wide, usually without enteroblastic proliferations, walls up to 1 µm wide, cells without distinct inner lumen, but protoplasm somewhat aggregated at the septa; conidia smooth, cells without distinct inner lumen ..... **106**
106 Conidia (2.5–)3.5–6(–7) µm wide; on *Liriodendron* ..... ***C. liriodendri***
106* Conidia (2–)3–4.5(–6) µm wide; on *Annona* ..... ***C. annonae***
107(104) Immersed hyphae often with a slime coat; on *Cucurbitaceae* ..... ***C. cucumerinum***
107* Hyphae without slime coat ..... **108**
108 Conidia 3.5–8.5(–9) µm wide ..... **109**
108* Conidia narrower, 2.5–6(–7) µm ..... **110**
109 Conidiophores often subnodulose, with unilateral swellings, but conidiogenous loci not confined to swellings; all structures with oil droplets; on *Arabis* ..... ***C. subsclerotioideum***
109* Conidiophores geniculate-sinuous, but non-nodulose; without oil droplets; on *Gleditsia* ..... ***C. gleditschiae***
110(108) Conidiogenous cells almost consistently terminal, conidiophores non or barely geniculate; saprobic species ..... **111**
110* Conidiogenous cells terminal, but also intercalary; biotrophic leaf-spotting species ..... **113**
111 All conidia distinctly verruculose to verrucose; mycelium internal and external; solitary conidiophores arising from superficial hyphae present ..... ***C. auriculae***
111* Conidia consistently smooth or smooth to faintly rough-walled ..... **112**
112 Conidiophores very long and filiform-setiform, mostly 100–500 µm long, pluriseptate, pigmented, mostly medium to medium dark brown or olivaceous-brown and thick-walled (up to 1.5 µm), tips often unilaterally swollen; conidia smooth to verruculose ..... ***C. tenuissimum***
112* Conidiophores up to about 250 µm long, mostly much shorter, paler and thin-walled, ≤ 1 µm, tips not swollen, at most sudenticulate; conidia usually consistently smooth, only occasionally with a few faintly rough-walled conidia ..... ***C. cladosporioides***
113(110) Conidia 3–23(–25) µm long ..... **114**
113* Conidia longer, up to 30 µm long or even longer ..... **115**
114 Walls of the conidiophores 0.5–1 µm wide; on *Alnus*, Europe ..... ***C. alneum***
114* Walls of the conidiophores (0.5–)1–2 µm wide; on *Oncoba*, New Zealand ..... ***C. oncobae***
115(113) Mycelium both internal and external ..... **116**
115* Mycelium only internal; walls of the conidiophores mostly only slightly thickened, not two-layered; conidia mostly 0–1-septate, very rarely with a second septum, usually smooth ..... **117**

116 Conidiophores with thickened walls, sometimes even two-layered; conidia 0–2(–3)-septate, smooth to minutely verruculose; on *Fraxinus* ..... ***C. fraxinicola***
116* Conidiophores thin-walled and one-layered; conidia 0–4(–5)-septate, smooth; on *Caragana* ..... ***C. caraganae***
117 Ramoconidia occasionally formed; conidiogenous loci and hila 0.5–2 µm diam; on *Lespedeza* and *Vigna* ..... ***C. vignae***
117* Ramoconidia absent; conidiogenous loci and hila 1–3 µm diam; on *Psoralea* ..... ***C. psoraleae***

## Tabular key to foliicolous *Cladosporium* species based on host families and genera

Several probably biotrophic *Cladosporium* species have recently been described from China by Z.Y. Zhang and co-workers (types deposited at MHYAU). Unfortunately, the type collections of the species concerned could not be re-examined since type material was not available on loan, and even attempts to examine the specimens in the herbarium MHYAU failed, *i.e.* the access was refused. Hence, it was necessary to place the species concerned in the list of not examined, doubtful taxa, above all since Z.Y. Zhang and co-workers used a rather broad concept of *Cladosporium s. lat.* Nevertheless, the potentially biotrophic *Cladosporium* species concerned are listed in this tabular key, but they are cited in square brackets.

***Acanthaceae***
[*Strobilanthes* ..... ***C. strobilanthis***]

***Amaryllidaceae***
1 Conidia solitary or in short unbranched or branched chains, subcylindrical-fusiform to often cylindrical, 10–45(–68) × (3–)4.5–8(–9) µm, occasionally up to 180 µm in length, 0–4(–7)-septate, smooth or almost so; on *Allium* ..... ***C. victorialis***
1* Conidia solitary, wall coarsely ornamented, verrucose-digitate ..... **2**
2 Conidiophores 60–150(–250) × 4–19 µm, conidia (40–)60–90(–120) µm long; on *Allium cepa* and *A. fistulosum* ..... ***C. allii-cepae***
2* Conidiophores usually shorter, up to 120 µm long, and somewhat narrower, 4–13 µm; on various other *Allium* spp. and *Narcissus* ..... **3**
3 Conidiogenous loci distinctly peg-like, up to 2 µm high, 1.5–2.5(–3) µm wide; on *Allium* spp. ..... ***C. allii***
3* Conidiogenous loci up to 1 µm high, not peg-like, 1.5–3.5 µm wide; on *Narcissus* ..... ***C. lacroixii***

***Anacardiaceae***
*Rhus* ..... ***C. verrucocladosporioides***

***Annonaceae***
*Annona* ..... ***C. annonae***

***Apiaceae***
*Angelica* ..... ***C. foliorum***

***Apocynaceae***
1 Conidiophores in small to moderately large fascicles, arising from substomatal stromatic hyphal aggregations, 3–7.5 µm wide, at the very base sometimes up to 10 µm wide; on *Vinca* ..... ***C. vincicola***
1* Conidiophores solitary, arising terminally or laterally from hyphae, narrower, 2.5–5 µm wide ..... **2**
2 Conidia 2.5–5(–6) µm wide, 1–4(–5)-septate; on *Nerium* ..... ***C. neriicola***
2* Conidia 6.4–7.7 µm wide, 0–1-septate, rarely 2–3-septate; on *Metaplexis* ..... [***C. metaplexis***]

***Aquifoliaceae***
*Ilex* ..... ***C. cheonis***

***Araceae***
1 Conidia (5–)6–9(–10) µm wide, smooth; biotrophic on *Colocasia* ..... ***C. colocasiae***
1* Conidia narrower, 2–6.5 µm wide, smooth to verruculose; saprobic on dead leaves of *Dieffenbachia* ..... ***C. dieffenbachiae***

***Araliaceae***
[*Tetrapanax* ..... ***C. tetrapanacis***]

***Arecaceae***
1 Conidia 13–30(–44) × 7–12 µm, 2–4(–5)-septate, conidial wall distinctly 2–3-layered; on *Corypha* ..... ***C. coryphae***
1* Conidia much narrower, 2–6 µm wide, wall one-layered ..... **2**
2 Conidiophores nodulose, with conidiogenous loci often confined to swellings; conidia 3–10(–14) µm long, 0–1-septate, smooth; conidiogenous loci and hila small, 0.5–1(–1.5) µm diam; on *Borassus* ..... ***C. borassi***
2* Conidiophores non-nodulose, without swellings; conidia longer, up to 20 µm, 0–1(–3)-septate, usually minutely verruculose; conidiogenous loci and hila wider, (0.5–)1–2(–2.5) µm diam; on *Chamaerops* ..... ***C. chamaeropis***

***Aristolochiaceae***

[*Aristolochia* ..... ***C. aristolochiae***]

***Asparagaceae***

1 Conidia solitary or in short unbranched chains ..... **2**
1* Conidia catenate, in branched chains ..... **4**
2 Conidiophores 80–250(–300) × 5–16 µm; conidiogenous loci and hila 3–4 µm wide and 1.5–2 µm high; conidia (35–)40–70 × 18–24 µm; on *Polygonatum* ..... ***C. polygonati***
2* Conidiophores shorter and narrower, (12–)25–130(–200) × (3–)4.5–12 µm; conidiogenous loci narrower; conidia (10–)20–60(–75) × (5–)7–15(–16) µm ..... **3**
3 Conidiophores (3–)4.5–8(–10) µm; loci 1.5–2.5(–3.5) µm diam; conidia (5–)7–12 µm wide, (0–)1–3(–5)-septate, echinulate (digitate under SEM); on *Arthropodium*..... ***C. arthropodii***
3* Conidiophores (7–)8–12 µm, loci (2–)3(–4) µm diam; conidia (7–)9–15(–16) µm wide, (0–)2–6(–7)-septate, verrucose to coarsely verrucose; on *Ornithogalum*..... ***C. ornithogali***
4 Conidiophores solitary ..... **5**
4* Conidiophores in small to very large, loose to dense fascicles ..... **6**
5 Conidia 2.8–15.4 long; on *Ophiopogon* ….. ..... [***C. ophiopogonis***]
5* Conidia 3.1–20.6 long; on *Polygonatum* ..... [***C. polygonaticola***]
6 Conidiophores 20–80 × 3–8 µm; conidia 4–18 µm long, 0–1-septate, on *Yucca* ..... ***C. yuccae***
6* Conidiophores 20–240 × 3–5(–5.5) µm; conidia 3.5–26 µm long, 0–3-septate; on *Cordyline*, *Dracaena* ..... ***C. dracaenatum***

***Aspleniaceae***

[*Neottopteris* ..... ***C. neottopteridis***]

***Asteraceae***

1 Mycelium internal; conidia loosely to densely verruculose or faintly to distinctly verrucose-echinulate ..... **2**
1* Mycelium mainly external; conidia usually smooth, only occasionally some conidia verruculose or faintly rough-walled ..... **6**
2 With well-developed, large stromata, at first 20–100 µm diam, later expanded, pustulate, up to 500 µm diam; conidiophores in dense fascicles, 100–250 µm long; conidia coarsely verruculose, warts up to 1 µm diam, distant (up to 2.5 µm); on dead stems of *Zinnia* ..... ***C. oblongum***
2* Stromata lacking or almost so; conidiophores solitary or in small, loose fascicles; conidia almost smooth to densely and finely verruculose or verruculose-echinulate ..... **3**
3 Conidial hila 1–1.5 µm diam; conidia (5–)10–15(–20) µm long ..... **4**
3* Conidial hila wider 1–3.5(4.5) µm diam; conidia distinctly longer ..... **5**
4 Conidiophores 48–250 × 3.4–5.8 µm; conidia 8–14 × 4–8 µm; on *Carpesium* ..... ***C. carpesii***
4* Conidiophores 60–100(–200) × 2.5–3 µm; conidia (3–)4–15(–20) 2–3.5(–4) µm; on *Phaenocoma* ..... ***C. phaenocomae***
5 Conidiophores 20–90(–110) × (3–)4–10(–13) µm, 0–4-septate; conidia (10–)12–40(–50) × (5–)6–13(–15) µm; conidiogenous loci and hila (1.5–)2–3.5(–4.5) µm diam; on *Agoseris* ..... ***C. agoseridis***
5* Conidiophores shorter and narrower, 8–54 × (2.5–)3.5–6(–7) µm, 0–1(–2)-septate; conidia shorter and narrower, (6.5–)12–26(–31) × 4–7(–8) µm; conidiogenous loci and hila narrower, 1–2.5 µm diam; on *Tragopogon* ..... ***C. praecox***
6 Conidiophores solitary to often fasciculate, arising from small stromata or creeping hyphae, 10–120 µm long; conidia 2.5–6 µm wide; on *Gynoxys* ..... ***C. inopinum***
6* Conidiophores solitary or in loose to dense groups, but non-asciculate, arising from pluriseptate, external, creeping hyphae or stromatic hyphal aggregations, much shorter, 5–50 µm long; conidia wider, (3–)5–8 µm; on *Artemisia* ..... ***C. obtectum***

***Berberidaceae***

*Berberis* ..... ***C. ushuwaiense***

***Betulaceae***

*Alnus* ..... ***C. alneum***

***Bignoniaceae***

1 Conidiophores arising from swollen hyphal cells and superficial hyphae, 15–500 µm long, frequently dichotomously or subdichotomously branched; on leaves of *Catalpa* but also on different hosts ..... ***C. varians***
1* Conidiophores much shorter, unbranched or irregularly branched ..... **2**
2 Mycelium external; conidiophores solitary, arising from swollen hyphal cells or superficially growing, creeping hyphae, 4–113(–190) µm long, often growing like and confusable with hyphae; conidia 3–23(–27) µm long; on *Heterophragma* ..... ***C. heterophragmatis***
2* Mycelium internal, usually substomatal; conidiophores usually fasciculate, arising from stromata, emerging through stomata, shorter, 10–58 µm long, not growing like and not confusable with hyphae; conidia shorter, 4–18 µm long; on *Jacaranda* ..... ***C. jacarandicola***

***Boraginaceae***
*Heliotropium* ..... ***C. heliotropii***

***Brassicaceae***
1 Conidia catenate, in longer chains, 6–33(–44) × 4–8(–9) µm, 0–4-septate; on *Arabis* ..... ***C. subsclerotioideum***
1* Conidia solitary or in short chains, 10–14 µm wide; on *Brassica* and *Thelypodium* ..... ***C. brassicae***

***Campanulaceae***
[*Platycodon* ..... ***C. platycodonis***]

***Capparaceae***
1 Mycelium internal; stromata intraepidermal; conidiophores cylindrical-oblong, unbranched, rarely branched, 35–130 × 4.5–7(–9) µm; conidia polymorphous, 4–40 × 4.5–8 µm, 0–6(–8)-septate; conidiogenous loci and hila 1–2.5 µm diam; on *Boscia* ..... ***C. bosciae***
1* Mycelium at first internal, later also external; stromata lacking; conidiophores filiform, unbranched or branched, sometimes slightly furcate, shorter and narrower, 8–70(–90) × 2.5–5(–6) µm; conidia shorter and narrower, 2–14(–16) × 2–4.5 µm, 0–3-septate; conidiogenous loci and hila narrower, 0.5–1.5(–2) µm diam; on *Capparis* ..... ***C. lineolatum***

***Caricaceae***
[*Carica* ..... ***C. caricinum***]

***Caryophyllaceae***
1 Conidia solitary or only in very short uubranched chains, (15–)25–55(–65) × (10–)12–15(–17) µm, echinulate; on *Dianthus* and possibly other hosts of this family ..... ***C. echinulatum***
1* Conidia in branched chains, much smaller and narrower, < 20(–25) × 7 µm, smooth ..... **2**
2 Life cycle both sexual and asexual; ramoconidia 3–4(–4.5) µm wide; on *Silene* ..... ***C. silenes***
2* Life cycle only asexual; ramoconidia 4.6–7.2 µm wide; on *Lychnis* ..... [***C. lychnidis***]

***Celastraceae***
*Euonymus* ..... ***C. subobtectum***

***Chenopodiaceae***
*Spinacia* ..... ***C. variabile***

***Cucurbitaceae***
*Citrullus*, *Coccinia*, *Cucumis*, *Cucurbita*, *Lagenaria*, *Luffa*, *Momordica*, *Sechium* ..... ***C. cucumerinum***

***Cycadaceae***
*Cycas*
1 Conidiophores very long, usually 150–360 µm ..... ***C. apicale***
1* Conidiophores much shorter, 20–60 µm ..... ***C. cycadis***

***Dryopteridaceae***
[*Cyrtomium* ..... ***C. cyrtomii***]

***Ericaceae***
*Rhododendron* ..... ***C. rhododendri***

***Euphorbiaceae***
1 Conidiophores 10–90 × 2.5–6 µm; conidia 4–18 µm long, smooth or almost so; on *Manihot* ..... ***C. nigrelloides***
1* Conidiophores 150–430 × 3–4 µm; conidia 4.5–25 (–29), smooth to loosely verruculose, irregularly verruculose-rugose or rough-walled; on *Acalypha* ..... ***C. acalyphae***

***Fabaceae***
1 Conidia dimorphic, with large, above all wide conidia, .23–37 × 8.5–13.5 µm, 0–6-septate, and smaller conidia, only 12.5–25 × 5–8.5 µm; on *Robinia* ..... ***C. robiniae***
1* Conidia not distinctly dimorphic, narrower, < 10 µm wide ..... **2**
2 Conidiophores at least partly solitary, arising from superficial hyphae ..... **3**
2* Conidiophores not arising from superficial hyphae ..... **6**
3 Conidiophores and conidia smooth to distinctly rough-walled or rugose ..... **4**
3* Conidiophores and conidia smooth ..... **5**
4 Conidiophores 20–300 µm long, 4–10 µm wide below and 2.5–5 µm wide in the upper half; on pods of *Butea* ..... ***C. buteicola***

4* Conidiophores 16–105 × (3.5–)4–6 µm; on *Gleditsia* ..... ***C. gleditschiae***
5 Conidiophores 30–200(–250) µm long; conidia 5–35(–55) × (2.5–)3.5–6.5(–7.5) µm, 0–4(–5)-septate; conidiogenous loci and hila 1–2 µm diam; on leaves of *Caragana* ..... ***C. caraganae***
5* Conidiophores 20–100 µm long; conidia 3–11 × 2–4 µm, 0–1-septate; conidiogenous loci and hila up to 1 µm diam; on *Chamaecrista* and *Senna* ..... ***C. cassia-surathensis***
6 Conidiophores with nodulose swellings, short, *ca.* 20–55 µm long; conidia smooth, 0–1-septate; on *Lathyrus* ..... [***C. lathyri***]
6* Conidiophores without swellings ..... **7**
7 Conidia in short chains, *ca.* 5.5–9.5 µm wide, 0–3-septate, distinctly verruculose; on *Pisum* ..... [***C. qinghaiense***]
7* Conidia in long, branched chains, or narrower, or only smooth to faintly rough-walled ..... **8**
8 Conidiophores solitary or mostly loosely fasciculate, relatively short, 10–80 µm long; conidiogenous cells terminal, with only few conidiogenous loci; conidia 0–3-septate ..... **9**
8* Conidiophores solitary or in small loose groups, but non-fasciculate, longer, up to 180 µm; conidiogenous cells terminal and intercalary, often with numerous conidiogenous loci; conidia 0–1(–3)-septate ..... **10**
9 Stromata small, *ca.* 10 µm diam; conidia smooth; on *Lupinus* ..... ***C. lupiniphilum***
9* Stromata well-developed, 10–60 µm diam, later expanded, up to 150 µm wide; conidia verruculose; on dead legumes of *Phaseolus vulgaris* ..... ***C. leguminicola***
10 Conidiophores 3–7(–8) µm wide; conidiogenous loci and hila 0.5–2 µm diam; ramoconidia occasionally formed, base up to 3.5 µm wide; conidia 3–22(–29) µm long; on *Vigna* ..... ***C. vignae***
10* Conidiophores somewhat narrower, 3–6 µm wide; conidiogenous loci and hila somewhat wider, 1–3 µm diam; ramoconidia not occurring; conidia usually somewhat longer, 5–30 ..... **11**
11 Conidiophores 22–130 × 3–6 µm, slightly geniculate-sinuous; conidiogenous loci and hila 1–3 µm diam; conidia 5–30 × 3.5–7 µm; on *Psoralea* ..... ***C. psoraleae***
11* Conidiophores 20–180 × 3–5(–7) µm, often distinctly geniculate-sinuous; conidiogenous loci and hila 1–2.5 µm diam; conidia 3–26 × 3–5(–7) µm; on *Pisum* ..... ***C. pisicola***

***Fagaceae***
*Quercus* ..... ***C. fumagineum***

***Gentianaceae***
*Gentiana* ..... ***C. gentianae***

***Hydrangeaceae***
[*Hydrangea* ..... ***C. hydrangeae***]

***Iridaceae***
*Iris*
1 Conidia (18–)30–75(–87) × (7–)10–16(–18) µm, (0–)2–6(–7)-septate, wall thickened, above all in older conidia, up to 1 µm wide ..... ***C. iridis***
1* Conidia shorter and wider, 15–55 × (9–)11–19(–21) µm, 0–3-septate, wall thicker, up to 2 µm wide ..... ***C. pseudiridis***

***Lamiaceae***
[*Teucrium* ..... ***C. teucrii***]

***Lauraceae***
*Ocotea* ..... ***C. oreodaphnes***

***Liliaceae***
[*Liliaceae s. lat.* see also *Amaryllidaceae* (*Allium*) and *Asparagaceae* (*Arthropodium*, *Ornithogalum*, *Polygonatum*)] ..... ***C. ornithogali***

***Magnoliaceae***
1 Stromata developed, 15–40 µm diam; conidiophores solitary or in small loose groups; ramoconidia lacking; causing leaf-spots on *Liriodendron* ..... ***C. liriodendri***
1* Stromata lacking or almost so; conidiophores solitary or in small to moderately large fascicles; ramoconidia present; on dead leaves of *Magnolia* ..... ***C. delectum***

***Malvaceae***
[*Corchorus* ..... ***C. corchori***]

***Melanthiaceae***
*Trillium* ..... ***C. trillii***

***Myrtaceae***

1 Conidial chains flabellate, spread in a fan-like manner, conidia 2.5–3(–3.5) µm wide, aseptate, smooth; on *Melaleuca* ..... ***C. flabelliforme***

1* Conidial chains not flabellate, branching in all directions, occasionally dichotomously branched, conidia somewhat wider, (2–)2.5–4 µm wide, 0–2-septate, finely verruculose, irregularly rough-walled or slightly to distinctly irregularly verruculose-rugose ..... **2**

2 Conidiophores asperulate or irregularly rough-walled; conidia 4–30(–37) × (2.5–)3.5–4.5(–5) µm, slightly to distinctly verruculose-rugose; on *Eucalyptus* ..... ***C. exasperatum***

2* Conidiophores smooth or almost so; conidia 5–20(–25) × 3–4(–4.5) µm, smooth to finely verruculose or somewhat irregularly rough-walled; on *Corymbia* and *Eucalyptus* ..... ***C. myrtacearum***

***Nartheciaceae***

*Narthecium* ..... ***C. ossifragi***

***Nyctaginaceae***

*Bougainvillea* ..... ***C. arthrinioides***

***Oleaceae***

1 Conidiophores dimorphic; conidiogenous cells with numerous subdenticulate, often crowded conidiogenous loci, apex appearing somewhat rugose (periconiella-like); conidia 2.5–18 × 2–5(–6.5) µm; on *Syringa* ..... ***C. syringicola***

1* Conidiophores non-dimorphic; conidiogenous cells with a single to several conidiogenous loci, not crowded, apex not periconiella-like ..... **2**

2 Conidiophores up to 265 µm long, (2.5–)4–9 µm wide; on *Fraxinus* ..... ***C. fraxinicola***

2* Conidiophores much shorter and narrower, *ca.* 20–70 × 4.4–5.9 µm; on *Forsythia* ..... [***C. forsythiae***]

***Onagraceae***

[*Circaea* ..... ***C. circaeae***]

***Orchidaceae***

1 Conidiophores characteristically branched, right-angled; on *Epidendrum* ..... ***C. rectangulare***

1* Conidiophores unbranched, rarely sparingly branched, but not right-angled ..... **2**

2 Conidiophores solitary, rarely in small groups, not emerging through stomata; on *Stanhopea* ..... ***C. stanhopeae***

2* Conidiophores loosely to densely fasciculate, rarely solitary, usually emerging through stomata ..... **3**

3 Conidiophores 50–175 µm long, pluriseptate, often entero-blastically proliferating, often nodulose with small intercalary swellings; conidiogenous cells terminal and intercalary, with numerous, crowded conidiogenous loci; conidia subglobose, broadly ovoid, ellipsoid to somewhat irregular, smooth to minutely verruculose; loci and hila 0.5–1.5 µm wide; on *Cypripedium* ..... ***C. orchidiphilum***

3* Conidiophores shorter, 20–75 µm long, 0–3-septate, not enteroblastically proliferating, without swellings; conidiogenous cells terminal, only few conidiogenous loci, not crowded; conidia obovoid, ellipsoid to subcylindrical, usually verruculose; loci and hila wider, (1–)1.5–2.5 µm diam; on *Oncidium* ..... ***C. orchidearum***

***Passifloraceae***

*Passiflora* ..... ***C. maracuja***

***Phrymaceae***

*Mimulus* ..... ***C. mimulicola***

***Phytolaccaceae***

*Rivina* ..... ***C. rivinae***

***Pinaceae***

*Pinus*

1 Conidia 0–3-septate, almost smooth to usually verruculose, sometimes verrucose *in vivo*; *in vitro* conidiophores macronematous, (2.5–)3.5–5.5 µm wide, terminal conidial chains long, up to nine conidia ..... ***C. pini-ponderosae***

1* Conidia 0–1-septate, almost smooth to minutely verruculose; *in vitro* conidiophores both macro- and micronematous, (1.5–)2.5–4 µm wide, up to three or four conidia in the terminal unbranched part of the chain ..... ***C. chubutense***

***Piperaceae***

*Piper* ..... ***C. pipericola***

***Plantaginaceae***

*Melosperma* ..... ***C. melospermae***

***Poaceae***

1 Conidiophores solitary, non-fasciculate, arising from internal and external creeping hyphae, 5–90 × 3–5(–6) µm; conidia catenate, in unbranched or branched chains, narrow, 3–41(–60) × 3.5–5.5(–7) µm, 0–4(–7)-septate, septa often distinctly darkened, smooth; conidiogenous loci and hila narrow, 0.5–1.5(–2) µm diam; on *Cenchrus* and *Chaetochloa* ..... ***C. spongiosum***

1* Conidiophores fasciculate, longer and wider; conidia solitary or only in short chains, rather large, about 23–40(–60) × 6–15 µm, verruculose ..... **2**

2 Conidiophores in usually fairly large, dense fascicles, some-times in palisade-like layers, arising from stromata, 40–120 × 5–9 µm; conidia solitary, 0–1-septate; conidiogenous loci and hila 3–5 µm diam; on *Alopecurus* ..... ***C. alopecuri***

2* Conidiophores solitary or in small, loose fascicles, up to 300 µm long, 6–9 µm wide; conidia solitary or in short chains, (0–)1–3(–5)-septate; conidiogenous loci and hila 2–2.5 µm diam; on *Phleum* ..... ***C. phlei***

***Polypodiaceae***

[*Neocheiropteris* ..... ***C. neocheiropteridis***]

***Primulaceae***

1 Stromata lacking; conidiophores solitary or loosely aggregated, 100–400 µm long; on dead leaves of *Primula* ..... ***C. auriculae***

1 Stromata 40–150 µm diam; conidiophores in large, dense fascicles, sometimes even subsynnematous; on *Soldanella* ..... ***C. soldanellae***

***Proteaceae***

1 Sexual part of the life cycle formed; asci, ascospores; on *Grevillea* ..... ***C. grevilleae***

1* Asexual part of the life cycle formed; conidiophores and conidia; on *Alloxylon* ..... ***C. angustisporum***

***Ranunculaceae***

*Ranunculus*

1 Conidia solitary, very large, *ca.* 30–60 × 7.5–9 µm ..... ***C. ferox***

1* Conidia catenate, much smaller, (2.5–)5–23 × (2.5–)3.5–7.5 µm ..... ***C. grech-delicatae***

***Rosaceae***

1 Conidia (2–)3–45 × 2–8 µm, 0–6-septate; conidiogenous loci and hila 1–2.5(–3) µm diam; on *Photinia* ..... ***C. diaphanum***

1* Conidia smaller, up to 22 µm long, 0–3(–4)-septate; conidiogenous loci and hila 0.5–2 µm diam; on *Eriobotrya* ..... **2**

2 Conidiophores dimorphic, 50–300 µm long, sometimes branched, not geniculate; conidia 3.5–14(–20) × 2.5–6 µm, 0–1(–2)-septate, very pale, smooth or almost so ..... ***C. fusicladiiformis***

2* Conidiophores not dimorphic, 20–120 µm long, unbranched, usually distinctly geniculate-sinuous; conidia up to 22 µm long, 0–3(–4)-septate, distinctly verruculose ..... ***C. eriobotryae***

***Rubiaceae***

*Galium* ..... ***C. galii***

***Rutaceae***

1 Conidia solitary or occasionally in short chains, rather broad, (15–)18–30 × 9–13 µm; on *Haplophyllum* ..... ***C. haplophylli***

1* Conidia catenate, narrower, 3–7 µm wide ..... **2**

2 Conidiophores 10–40 µm long, 0–1(–2)-septate; conidiogenous cells terminal or conidiophores often reduced to conidiogenous cells; conidia 0–1-septate; conidiogenous loci and hila 1.5–2.5 µm diam; on *Ruta* ..... ***C. rutae***

2* Conidiophores longer, 15–70 µm long, 0–5-septate; conidiogenous cells terminal or intercalary; conidia 0–2(–3)-septate; conidiogenous loci and hila narrower, 0.5–1.5(–2) µm diam; on *Citrus* ..... ***C. corrugatum***

***Salicaceae***

1 Conidiophores mostly strongly and frequently geniculate-sinuous, 15–100 × 2–5(–7) µm; conidiogenous cells 0.5–1.5 µm diam; on *Salix* ..... ***C. minusculum***

1* Conidiophores longer and wider, 50–175 × (2.5–)3–8(–11) µm, only somewhat geniculate-sinuous or subnodulose; conidiogenous loci and hila 1–2 µm diam ..... **2**

2 Conidiophores (4–)5–8(–11) µm wide; conidia 4–14 × 3–5(–5.5) µm, 0–1-septate; on *Populus* ..... ***C. populicola***

2* Conidiophores (2.5–)3–6(–7) µm wide; conidia 3–20(–25) × 2.5–6(–7) µm, 0–3-septate; on *Oncoba* ..... ***C. oncobae***

***Sapindaceae***

*Aesculus* ..... ***C. asperistipitatum***

***Sapotaceae***

*Chrysophyllum* ..... ***C. chrysophylli***

***Scrophulariaceae***
[*Digitalis* ..... ***C. digitalicola***]

***Smilacaceae***
*Smilax* ..... ***C. smilacicola***

***Styracaceae***
*Styrax* ..... ***C. inconspicuum***

***Thymelaeaceae***
[*Edgeworthia* ..... ***C. edgeworthiae***]

***Typhaceae***
*Typha* ..... ***C. heleophilum***

***Ulmaceae***
*Ulmus*
1 Conidiophores 58–325 × 3.5–9(–11) µm; ramoconidia up to 60 µm long, 0–3(–5)-septate; conidia polymorphous, 2–32 × 2–7 µm, 0–2-septate; conidiogenous loci and hila 0.5–3 µm diam; on *Ulmus laevis* and additional hosts ..... ***C. varians***
1* Conidiophores much shorter and narrower, 10–80(–100) × (2–)2.5–4(–5) µm; ramoconidia absent; conidia shorter and narrower, 4–17(–19) × 2–5 µm, 0–1(–3)-septate; conidiogenous loci and hila narrower, 0.5–1.5 µm; on *Ulmus minor* ..... ***C. hypophyllum***

***Xanthorrhoeaceae***
[*Dianella* ..... ***C. dianellicola***]

***Xyridaceae***
*Xyris* ..... ***C. xyridis***

***Zingiberaceae***
[*Alpinia* ..... ***C. alpiniae***]

## Key to fungicolous and lichenicolous *Cladosporium* species *in vivo* based on morphology and ecology

Beside fungicolous and lichenicolous *Cladosporium* species, this key also contains some common, widespread saprobic species which occasionally occur on other fungi and lichens.

1 With numerous globose to subglobose terminal conidia, almost smooth to verruculose; conidiophores often branched; saprobic species ..... ***C. sphaerospermum***
1* Without globose terminal conidia ..... **2**
2 Conidia verruculose, rarely a few intermixed conidia smooth or almost so ..... **3**
2* Conidia smooth or almost so, rarely a few intermixed conidia faintly rough-walled ..... **8**
3 Conidiophores distinctly nodulose, swellings round about the stalk; conidiogenous loci confined to swellings; saprobic species, occasionally occurring on other fungi and lichens as secondary invader ..... **4**
3* Conidiophores non-nodulose, straight, subcylindrical to geniculate-sinuous ..... **5**
4 Swellings of the conidiophores up to 8 µm diam; conidia in branched chains, secondary ramoconidia usually (3–)5–7(–8) µm wide ..... ***C. herbarum***
4* Swellings of the conidiophores wider, up to 12 µm diam; conidia *in vivo* dimorphic, smaller conidia in branched chains, mixed with at least some very large conidia, formed singly or in short simple chains, (6–)7–12(–15) µm wide ..... ***C. macrocarpum***
5(3) Conidiophores often irregularly to dichotomously branched; on *Exobasidium* ..... ***C. exobasidii*** var. ***verruculosum***
5* Conidiophores unbranched, rarely with a single branching ..... **6**
6 Occasionally with ramoconidia; isolated from *Caloplaca regalis*, Antarctica ..... ***C. antarcticum***
6* Ramoconidia lacking; on aecia of rust fungi or *Epichloë typhina* ..... **7**
7 On *Epichloë typhina* ..... ***C. epichloës***
7* On aecia of rust fungi ..... ***C. aecidiicola***
8(2) Conidiophores nodulose, with conspicuous swellings round about the stalk, swellings with conidiogenous loci ..... **9**
8* Conidiophores non-nodulose ..... **11**
9 Conidiophores often simply branched; on *Exobasidium* ..... ***C. exobasidii*** var. ***exobasidii***
9* Conidiophores unbranched ..... **10**
9 Conidiophores very long, about up to 500 µm or even longer, swellings regular, round about the stalk, and remote; saprobic species ..... ***C. oxysporum***

9* Conidiophores much shorter, up to 80 µm, swellings lacking or present, if present not remote and rather irregular; on *Taphrina tosquinetii* ..... '***C. herbarum*** f. ***parasiticum***'
11(8) Conidiophores very long, up to 550(–800) µm, filiform-etiform, unbranched; conidiogenous cells terminal, often somewhat swollen; conidia 0–1-septate; saprobic species ..... ***C. tenuissimum***
11* Conidiophores usually much shorter or branched; specific, fungicolous or lichenicolous species ..... **12**
12 Conidiophores frequently branched, branched part terminal, often dense and periconiella-like; conidiogenous loci often numerous and crowded at the tips of the branchlets ..... **13**
12* Conidiophores simple or irregularly branched, branching not confined to the apex, not periconiella-like; conidiogenous loci usually not crowded ..... **14**
13 With well-developed stromata, 45–130 × 30–90 µm; conidia up to 29 µm long, 2–3(–4)-septate; on rust fungi (*Cronartium*, *Endocronartium* and *Pucciniastrum*) ..... ***C. gallicola***
13* Stromata lacking; conidia 3.5–13 µm long, 0–1-septate; lichenicolous, on *Parmelia*, *Pertusaria*, *Phaeophyscia*, *Physcia* and *Xanthoria* ..... ***C. licheniphilum***
14(12) Conidiophores thick-walled throughout or at least towards the base, thickened walls conspicuously two-layered (light microscopy); conidia always thick-walled, wall partly two-layered as well ..... **15**
14* Walls of the conidiophores and conidia always one-layered (light microscopy), thin to slightly thickened ..... **16**
15 Walls of the conidiophores two-layered throughout, septa strongly darkened; hila conspicuously protuberant, up to 1.5 µm high; ramoconidia lacking; on *Monilinia laxa* and *Boletales* ..... ***C. episclerotiale***
15* Conidiophores only two-layered towards the base, septa not conspicuously darkened; hila less protuberant; ramoconidia present; on *Gerwasia* (rust fungus) ..... ***C. gerwasiae***
16(14) Colonies on fruit bodies of macromycetes (gilled fungi, gastero-mycetes, poroid fungi) ..... **17**
16* Colonies on pathogenic fungi (rust fungi, powdery mildews, downy mildews or *Taphrina* spp.) ..... **18**
17 Ramoconidia frequently formed, 33–53 × 4.5–7 µm, 0–6-septate ..... ***C. epimyces***
17* Ramoconidia rarely formed, 21–32 × 4.5–5.5 µm, 0–4(–5)-septate ..... ***C. lycoperdinum***
18(16) Conidiophores erect to frequently decumbent, repent, growth characteristically effuse; ramoconidia present; conidia (0–)1–5(–6)-septate; conidiogenous loci and hila (0.5–)1–3 µm diam; on *Taphrina* ..... ***C. phyllophilum***
18* Conidiophores usually erect, neither repent nor effuse; ramoconidia lacking; conidiogenous loci and hila smaller, 0.5–2 µm diam ..... **19**
19 Conidia 4–20 µm long; mycelium in asci of *Taphrina coerulescens* ..... ***C. taphrinae***
19* Conidia up to 40 µm long; mycelium in sori of rust fungi, on powdery mildew or downy mildew ..... ***C. uredinicola***

## Tabular key to fungicolous and lichenicolous *Cladosporium* species based on hosts



### Lichenised *Ascomycota*

1 Conidiophores subcylindrical or only slightly geniculate-sinuous, 5–8 µm wide; conidia smooth, 3.5–13 × 3–7 µm; on *Parmelia*, *Pertusaria*, *Phaeophyscia*, *Physcia* and *Xanthoria* ..... ***C. licheniphilum***
1* Conidiophores usually distinctly geniculate-sinuous, 3–4.5 µm wide; isolated from the thallus of *Caloplaca regalis* .... ***C. antarcticum***

### Non-lichenised *Ascomycota*

***Capnodiales***
*Teratosphaeria* ..... ***C. chalastosporoides***

***Erysiphales*** (powdery mildews)
1 Conidiophores 6–105(–120) µm long; conidia 3–17(–24) × (2–)3–4.5 µm, 0–1(–2)-septate; on *Phyllactinia guttata* ..... ***C. phyllactiniicola***
1* Conidiophores (5–)20–230(–300) µm long; conidia 3–39 × 3–6.5(–8) µm, 0–3(–5)-septate; on *Erysiphe* and *Phyllactinia* spp. ..... ***C. uredinicola***

***Helotiales*** (*Monilinia*)
*Monilinia laxa* (*Sclerotinia cinerea*) ..... ***C. episclerotiale***

***Hypocreales*** (*Epichloë*)
*Epichloë typhina* ..... ***C. epichloës***

***Taphrinales*** (*Taphrina*)

1 Conidiophores erect to decumbent, repent; ramoconidia present ..... ***C. phyllophilum***
1* Conidiophores erect, usually not decumbent; ramoconidia lacking ..... **2**
2 Conidiophores usually arising from hyphae, 23–150(–200) × 3–5(–7) µm, without intercalary swellings; conidiogenous loci usually numerous, crowded, denticle-like; confined to asci of *Taphrina coerulescens* ..... ***C. taphrinae***
2* Conidiophores usually arising from stromata, 52–82 × 3.5–5.5 µm, occasionally with intercalary swellings, up to 6 µm diam, swellings with conidiogenous loci, but loci not confined to these swellings; on *Taphrina tosquinetii* ..... '***C. herbarum*** f. ***parasiticum***'

### *Basidiomycota*

***Exobasidiales*** (*Exobasidium*)

1 Conidia smooth ..... ***C. exobasidii*** var. ***exobasidii***
1* Conidia verruculose ..... ***C. exobasidii*** var. ***verruculosum***

***Pucciniales*** (*Uredinales*)

1 Conidia verruculose, rarely a few conidia only faintly rough-walled; on aecia ..... ***C. aecidiicola***
1* Conidia smooth ..... **2**
2 Conidiophores frequently branched in the upper part, simply branched to several times, dense, periconiella-like; on aecia of *Cronartium*, *Endocronartium* and *Pucciniastrum* ..... ***C. galliicola***
2* Conidiophores usually unbranched, rarely a few conidiophores simply branched ..... **3**
3 Conidiophores solitary, arising from hyphae, (5–)21–230(–300) × 2–5 µm, walls of the conidiophores only slightly thickened, 0.5–0.75 µm; ramoconidia lacking; on various rust fungi ..... ***C. uredinicola***
3* Conidiophores in loose to dense fascicles, arising from stromata, larger, 24–366(–630) × 3–8 µm, tips often elongated and narrowed, walls of the conidiophores mostly strongly thickened towards the base, (0.5–)1–1.5 µm; ramoconidia present; on *Gerwasia* ..... ***C. gerwasiae***

**On fruit bodies of macromycetes (*Agaricales*, *Boletales*, *Polyporales*, *Russulales*)**

1 Walls of the conidiophores conspicuously two-layered; conidia subglobose, ellipsoid to broadly ellipsoid, often constricted at the septa which are conspicuously darkened, walls of the conidia often two-layered; ramoconidia lacking; on *Boletales* ..... ***C. episclerotiale***
1* Walls of the conidiophores not two-layered; conidia polymorphous; ramoconidia present (rarely to frequently formed) ..... **2**
2 Ramoconidia frequently formed, 33–53 × 4.5–8 µm, 0–6-septate; on *Agaricales* and *Russulales* ..... ***C. epimyces***
2* Ramoconidia rarely formed, shorter, 11–32 × (4.5–)5–6 µm, 0–4-septate; on *Agaricales*, *Boletales*, *Polyporales* and *Russulales* ..... ***C. lycoperdinum***

### *Cladosporium* on aphids

On aphids and superficially on leaves attacked by aphids ..... ***C. aphidis***

## RESULTS

### Phylogenetic analysis

Approximately 1 700 bases, spanning the ITS and LSU regions, were obtained for isolates listed in Table 1. These two regions were analysed separately; ITS, together with EF-1α and ACT, to determine species level relationships and LSU for the generic placement. Approximately 350–600 and 230 bases were determined for EF-1α and ACT, respectively, and these were concatenated with the corresponding ITS sequences for a combined analysis of the *Cladosporium* species with ex-type or representative strains.

The manually adjusted LSU alignment contained 98 taxa (including the outgroup sequence) and, of the 837 characters used in the phylogenetic analysis, 408 were parsimony-informative, 50 were variable and parsimony-uninformative and 379 were constant. Neighbour-joining analyses using the three substitution models on the sequence data yielded trees with similar topology and bootstrap values; 528 equally most parsimonious trees were obtained from the heuristic search, the first of which is shown in Fig. 2 (TL = 2 302, CI = 0.375, RI = 0.827, RC = 0.310). The phylogenetic tree derived from this region (Fig. 2) shows that *Cladosporium s.str.* is restricted whereas *Cladosporium*-like genera are distributed across many different orders, including but not restricted to *Corticiales*, *Pleosporales*, *Helotiales*, *Chaetothyriales* etc. These genera are discussed in more detail elsewhere in this manuscript.

The manually adjusted combined ITS, EF-1α and ACT alignment contained 70 taxa (including the outgroup sequence) and, of the 1 112 characters used in the phylogenetic analysis, 385 were parsimony-informative, 212 were variable and parsimony-uninformative and 515 were constant. Neighbour-joining analyses using the three substitution models on the sequence data yielded trees with similar topology and bootstrap values. Twelve equally most parsimonious trees were obtained from the heuristic search, the first of which is shown in Fig. 5 (TL = 3 415, CI = 0.372, RI = 0.636, RC = 0.237). The phylogenetic tree of these combined regions (Fig. 5) shows that the ex-type and representative strains known from sequence can be placed in one of three species complexes, the exceptions being *C. salinae* and *C. aphidis*, and with *C. langeronii* and *C. psychrotolerans* not occurring on the same branch as the rest of the species in the *C. sphaerospermum*-complex but as a more basal sister clade.

## Alphabetical descriptive list of true *Cladosporium* species

The present work provides a comprehensive treatment of all biotrophic, foliicolous, fungicolous and saprobic *Cladosporium* species known to date. *Cladosporium* species formerly referred to the genus *Heterosporium* described in detail by David (1997) are also included. Species of uncertain taxonomic position and excluded species are separately listed. Names are arranged in alphabetical order. All species are comprehensively described and illustrated. Drawings (1: 100) are, if not otherwise stated, based on type material or other authentic collections. The scale bars represent 10 µm. The treatments of the particular species contain the scientific names with bibliographic references, synonyms, type collections, literature references, published illustrations, exsiccatae, comprehensive descriptions, host range and geographic distribution, additional collections examined and notes. Author abbreviations conform to those of Brummit & Powell (1992), while journal abbreviations follow Lawrence *et al.* (1968) and Bridson & Smith (1991). Herbarium names have been abbreviated according to Holmgren *et al.* (1990). Abbreviations of exsiccatae conform to those of Triebel & Scholz (2001−2011). The host and distribution data indicate the known distributions and hosts or substrates obtained from checklists, herbarium specimens, databases and other sources compiled for different countries. Host names have been checked as far as possible and conform to "Tropicos". Under "additional collections examined" all specimens seen are cited, arranged in alphabetical order. The recently published checklist (Dugan *et al.* 2004) served as source for the compilation of the taxa treated in this monograph.

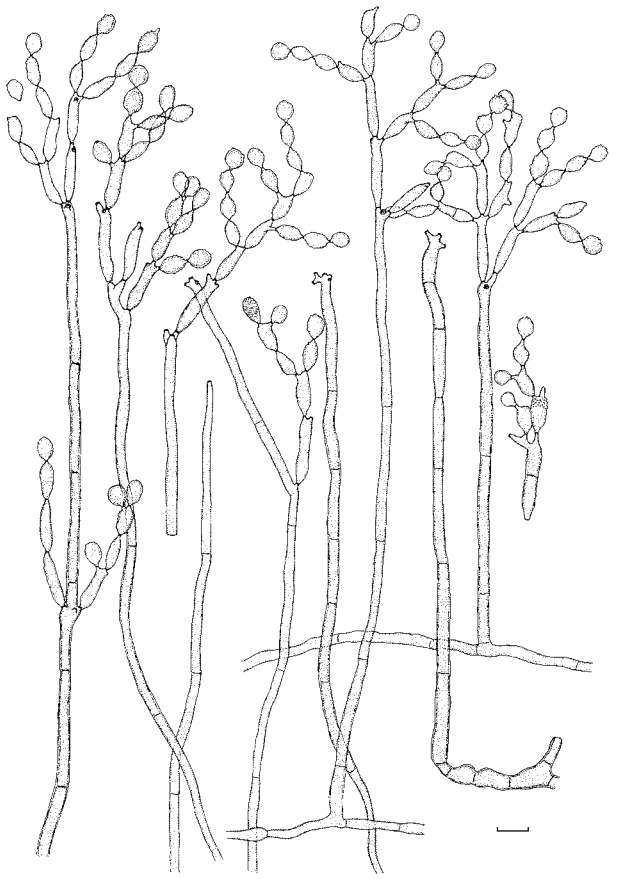


**Fig. 6.** *Cladosporium acalyphae* (CBS 125982). Macronematous conidiophores, mycelium, ramoconidia and conidial chains *in vitro*. Scale bar = 10 µm. K. Bensch *del*.

**1. *Cladosporium acalyphae*** Bensch, H.D. Shin, Crous & U. Braun, Stud. Mycol. 67: 17. 2010. Figs 6–8.

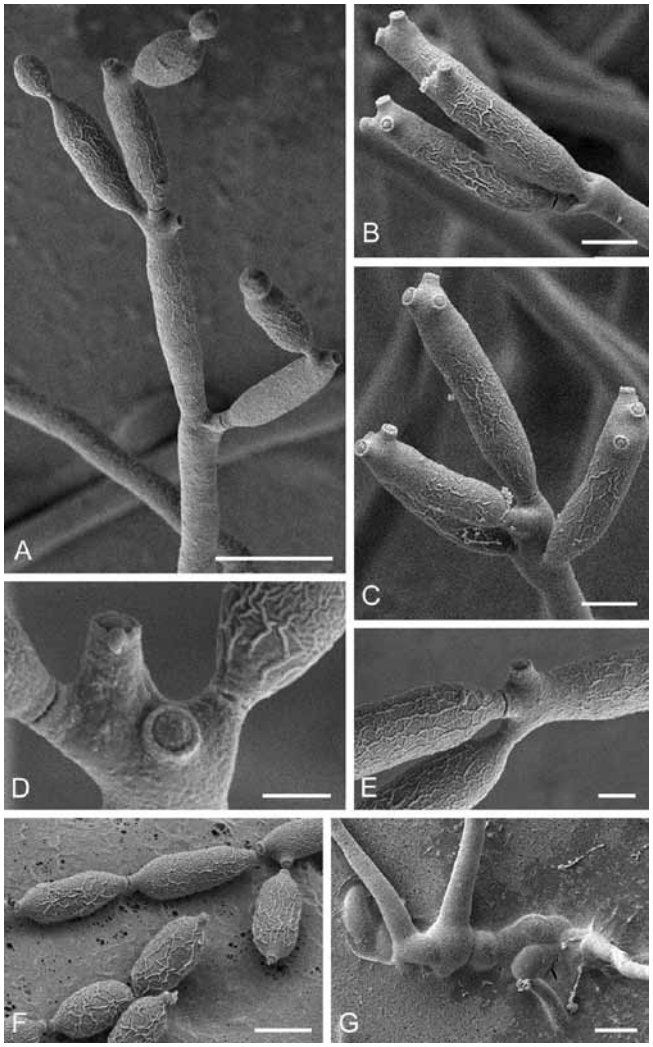
*Holotype*: **South Korea**, Hoengseong, N37º32'09" E128º07'07", isol. from *Acalypha australis* (*Euphorbiaceae*), 11. Oct. 2004, coll. H.-D. Shin, isol. P.W. Crous (CBS H-20422). *Ex-type culture*: CBS 125982 = CPC 11625.

*Ill.*: Bensch *et al.* (2010: 18−20, figs 2−4).

*In vitro: Mycelium* internal and superficial; hyphae unbranched or loosely branched, filiform to cylindrical-oblong, 1−4 µm wide, later up to 7 µm wide, especially towards the base of conidiophores, pluriseptate, not constricted or in wider hyphae slightly constricted at septa, sometimes septa in short succession, smooth or minutely verruculose, walls unthickened or slightly thick-walled. *Conidiophores* solitary, macronematous, arising terminally and laterally from ascending or plagiotropous hyphae, erect, straight to somewhat flexuous, very long, narrowly cylindrical-oblong, 150−430 × (2.5−)3−4(−5) µm, unbranched or once branched, branches often rather long, appearing like a conidiophore on its own, non-nodulose, sometimes once geniculate, often slightly attenuated towards the apex, pluriseptate, cells rather long, not constricted at septa, medium olivaceous-brown, smooth, walls slightly thickwalled. *Conidiogenous cells* integrated, terminal and sometimes intercalary, narrowly cylindrical-oblong, non-nodulose, occasionally once geniculate-sinuous, 23−80 µm long, with 1−4 loci at the apex, occasionally few additional loci at a lower level, but mostly above the septum, loci conspicuous, subdenticulate to denticulate, 1.5−2 µm diam, somewhat thickened and darkened-refractive. *Ramoconidia* cylindrical-oblong, 21−44(−65) × 3.5−4(−4.5) µm, 0(−1)-septate, base truncate, 2−2.5 µm wide, somewhat refractive. *Conidia* catenate, in branched chains, branching in all directions or dichotomously, 1−4 conidia in the terminal unbranched part of the chain, small terminal conidia globose, subglobose to obovoid, broad, 4.5−9 × 4.5−6 µm (av. ± SD: 6.9 ± 1.3 × 5.0 ± 0.5), aseptate, apex broadly rounded, base attenuated, hilum often on a short stalk-like prolongation, intercalary conidia ovoid, ellipsoid to subcylindrical, often with rostrate ends, (6−)8−17(−21) × 3.5−5(−6) µm (av. ± SD: 11.3 ± 3.3 × 4.4 ± 0.7), aseptate, attenuated towards apex and base, small terminal and intercalary conidia smooth to loosely verruculose, irregularly verruculose-rugose or rough-walled (LM), surface with irregularly reticulate structure or embossed stripes under SEM probably caused by diminishing turgor and shriveling of young conidia, thin-walled, with 1−3(−4) hila at the apex, secondary ramoconidia ellipsoid to subcylindrical or cylindrical, 12−25(−29) × 3−5 µm (av. ± SD: 18.4 ± 4.5 × 3.9 ± 0.6), aseptate, rarely 1-septate, pale to medium olivaceousbrown, smooth or finely verruculose, walls slightly thickened, hila conspicuous, often situated on small peg-like prolongations, subdenticulate to denticulate, 0.8−2 µm diam, somewhat thickened and darkened-refractive; microcyclic conidiogenesis occurring.

*Culture characteristics*: Colonies on PDA attaining 60−72 mm diam after 14 d, olivaceous-grey to grey-olivaceous, reverse leaden-grey to iron-grey, powdery to floccose, margins colourless to grey-olivaceous, narrow, feathery, regular, aerial mycelium loose, diffuse to floccose or fluffy, mainly in colony centre,


**Fig. 7.** *Cladosporium acalyphae* (CBS 125982). A–G. Macronematous conidiophores and conidial chains. Scale bars = 10 µm.




olivaceous-grey, growth effuse, without prominent exudates, sporulation profuse. Colonies on MEA reaching 56−64 mm diam after 14 d, grey-olivaceous to pale olivaceous-grey and iron-grey towards margins, somewhat zonate, reverse iron-grey, powdery to floccose, margins colourless to white, feathery, regular, aerial mycelium diffuse to floccose, pale olivaceous-grey, mainly in colony centre, growth effuse, radially furrowed in the centre, without prominent exudates, sporulation profuse. Colonies on OA attaining 59−67 mm diam after 14 d, dark smoke-grey to brownish, iron-grey towards margins, reverse leaden-grey to iron-grey, powdery to floccose, margins grey-olivaceous, glabrous, regular, aerial mycelium diffuse to floccose, white to pale olivaceous-grey, growth effuse with numerous not very prominent exudates, sporulation profuse.

*Substrate and distribution*: On *Acalypha australis*; South Korea.

*Notes*: *Cladosporium acalyphae* is genetically close to *C. delicatulum* and *C. inversicolor* (Bensch *et al.* 2010, fig. 1, part a), but constitutes a distinct lineage in TEF as well as ACT (distance analyses in TreeBASE), but it is morphologically quite distinct from the latter two species and all other taxa of *Cladosporium*.

**Fig. 8.** *Cladosporium acalyphae* (CBS 125982). A. Secondary ramoconidia and conidia on a conidiophore. Note the smooth surface of the conidiophores. B–C. Secondary ramoconidia on smooth conidiophores and patterns of scars. D. Details of scars on a secondary ramoconidium. E. Secondary ramoconidia and scars. F. Conidia as seen with cryoSEM showing a reticulate surface ornamentation. G. SEM micrograph of "meristematic development" on the agar surface and two conidiophores formed. Scale bars = 2 (D–E), 5 (B–C, F), 10 (A, G) µm.

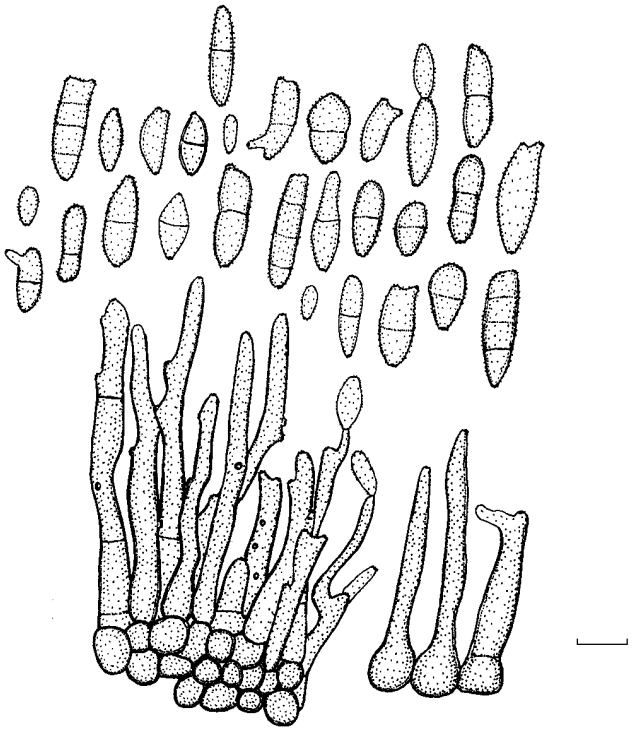


**Fig. 9.** *Cladosporium aecidiicola* (B 700006144). Conidiophores arranged in fascicles and conidia *in vivo*. Scale bar = 10 µm. B. Heuchert *del*.

**2. *Cladosporium aecidiicola*** Thüm., Mycoth. Univ., Cent. IV, No. 373. 1876. Figs 9–11.

*Lectotype* (**designated here**): **Germany**, Bayern, Bayreuth, on aecia on living leaves of *Euphorbia cyparissias* (*Euphorbiaceae*), 1874, Thümen, Mycoth. Univ. 373 (B 700006144). *Isolectotypes*: Thümen, Mycoth. Univ. 373 (*e.g.*, B 700006146, BPI 426074, HAL, HBG, M-0057483) and Germany, Bayern, Bayreuth, May 1874, *ex herb.* Thümen, *in herb*. Körnick (B 700006147).

*Lit.*: Saccardo (1886: 368, 1913a: 1371), Lindau (1907: 806–807, 1910: 796), Ferraris (1912: 350), Gonzáles-Fragoso (1927: 211), Ellis (1976: 330), Ellis & Ellis (1985: 571, 1988), Sagdullaeva *et al.* (1990: 43), Braun & Rogerson (1995: 142), Guo (2001: 464), Zhang *et al.* (2003: 36–37), Heuchert *et al*. (2005: 14–17).
*Ill.*: Ellis (1976: 330, fig. 248), Zhang *et al*. (2003: 36, fig. 11), Heuchert *et al*. (2005: 15, fig. 1).
*Exs.*: Clements & Clements, Crypt. Format. Colorad. 270; Litschauer & Kreissler, Krypt. Exs. 2938; Săvulescu, Herb. Mycol. Roman. 1342; Spegazzini, Dec. Mycol. Ital. 57; Sydow, Mycoth. March. 799, 3285; Thümen, Mycoth. Univ. 373. Vill, Fungi Bav. 898.

*In vivo*: *Colonies* on aecia (usually completely overgrown by the fungus) and surrounding leaf tissue (colonies not vein-limited), occasionally also on spermogonia, olivaceous-brown to dark brown, occasionally almost blackish brown, caespitose, velvety, effuse, confluent. *Mycelium* superficial to immersed, hyphae branched, 2.5–6 µm wide, septate, cells 10–15 µm long, often constricted at septa and with swellings, sometimes forming strands, subhyaline to pale olivaceous or olivaceous-brown, smooth, walls somewhat thickened. *Stromata* lacking to diffuse, composed of subglobose cells, 3–7 µm diam, pale olivaceous-brown to medium brown, smooth, walls somewhat thickened. *Conidiophores* solitary, caespitose or in loose to dense fascicles, arising from diffuse stromatic layers, if arising from the attacked surrounding leaf tissue erumpent through the cuticle, erect, straight to geniculate-sinuous, occasionally subnodulose, simple, occasionally branched, 10–140(–185) × 2.5–7(–8) µm, often swollen at the very base, 6–12 µm wide, 0–5(–7)-septate, sometimes constricted at the septa, pale olivaceous-brown to medium brown, paler towards the apex, smooth, walls thickened, up 1.5 µm wide, at the base sometimes up to 2 µm wide. *Conidiogenous cells* integrated, terminal and

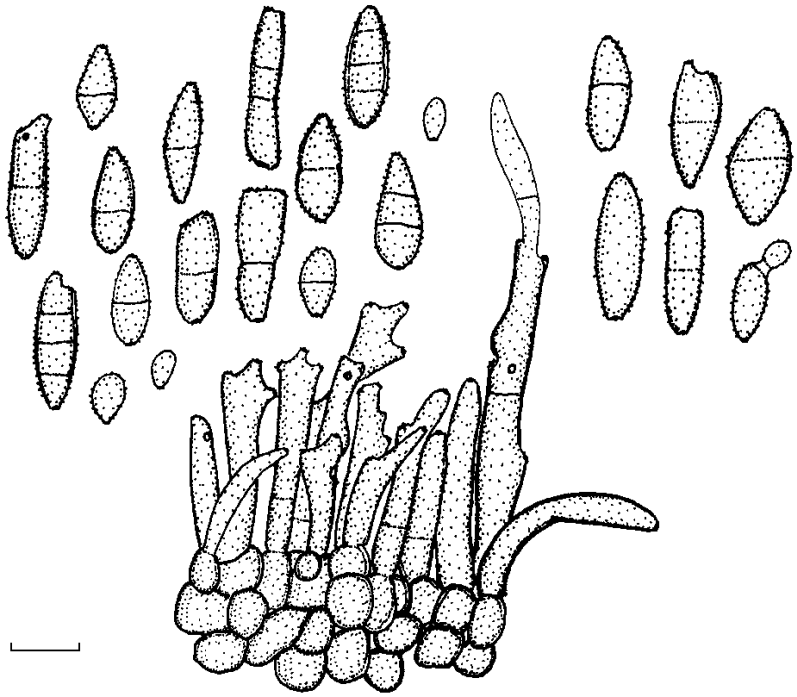


**Fig. 10.** *Cladosporium aecidiicola* (B 700006207). Conidiophores arranged in loose or dense fascicles and conidia. Scale bar = 10 µm. B. Heuchert *del*.

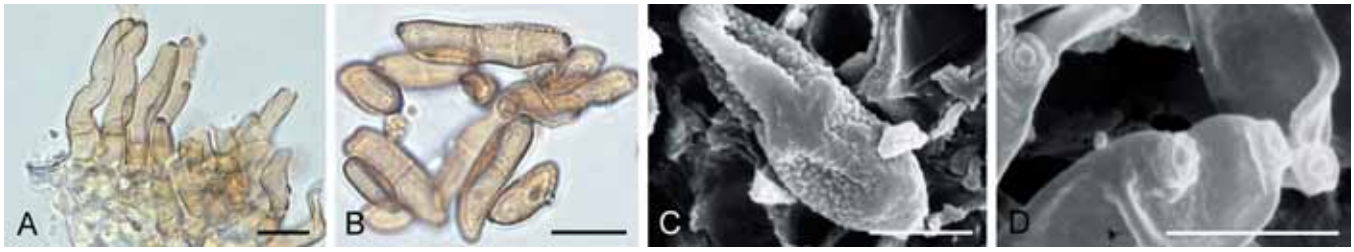



**Fig. 11.** *Cladosporium aecidiicola* (B 700006144). A. Loosely fasciculate conidiophores. B. Conidia. C. Conidium as seen with SEM showing the verruculose surface ornamentation. D. Details of scars on conidiophores and conidia. Scale bars = 5 (C–D), 10 (A–B) µm.

intercalary, 10–67 µm long, polyblastic, sympodially proliferating, 1–4 conidiogenous loci per cell, loci sometimes located at small shoulders formed by sympodial proliferation, protuberant, thickened and darkened, 1–2.5 µm diam. *Conidia* catenate, mostly in branched chains, straight, ovoid, ellipsoid, subglobose, subcylindrical to fusiform, 4–25(–29) × 3–8(–10) µm, 0–3-septate, not or occasionally somewhat constricted at septa, pale olivaceous-brown, smooth or almost so to verruculose, walls unthickened or only slightly thickened, apex rounded to subtruncate, with up to two hila, base truncate to convex, hila protuberant, 1–2(–2.5) µm diam, thickened and darkened; microcyclic conidiogenesis occurring.

*Substrates and distribution*: On aecia of rust fungi; Asia, Caucasus, Europe, North America – on *Aecidium carneum* on *Astragalus* sp. (Sweden), *A. cyparissiae* on *Euphorbia cyparissias* (Germany), *A. euphorbiae* (Italy, Romania, Ukraine), *A. falcariae* on *Falcaria* sp. (Germany), *A. ligustri* on *Ligustrum vulgare* (Germany), *A. lonicerinum* on *Lonicera xylosteum* (Austria), *A. trollii* on *Trollius* sp. (Sweden), *Aecidium* sp. on *Elaeagnus oxycarpa* (Kazakhstan), *Aecidium* sp. on *Euodia* sp. (China), *Coleosporium campanulacearum* on *Campanula* sp. (Austria, Georgia), *C. campanulacearum* on *Campanula rapunculoides* (Austria), on *C. tussilaginis* on *Petasites* sp. (Italy), *Melampsora helioscopiae* (Romania), *Puccinia agropyrina* on *Thalictrum minus* (= *T. collinum*) (Kazakhstan), *P. circaeae* (Romania), *P. coronata* (Romania), *P. graminis* on *Berberis* sp. (Armenia), *P. grindeliae* on *Chrysothamnus viscidiflorus* var. *lanceolatus* (USA, UT), *P. passerinii* (Ukraine), *P. phragmitis* (China, UK), *P. phragmitis* on *Rumex crispus* (Kazakhstan), *P. smilacearum-digraphidis* on *Polygonatum verticillatum* (Germany), *P. tragopogi* (Armenia), *P. violae* (Romania), *Puccinia* sp. on *Hordeum chilense* (USA), *Tranzschelia pruni-spinosae* on *Anemone ranunculoides* (Austria), *Uromyces lapponicus* on *Hedysarum kopetdaghi* (Turkmenistan), *U. limonii* (UK), *U. limonii* on *Limonium* sp. (France), *U. pisi* on *Euphorbia cyparissias* (Germany, Romania), *Uromyces* sp. on *Euphorbia cyparissias* (Switzerland), on *Uromyces* sp. on *Limonium vulgare* (Denmark).

Additional general records (host plants), but without specific host fungi: *Berberis vulgaris* (Austria, Switzerland), *Epilobium hirsutum* (Latvia), *Euphorbia cyparissias* (Austria, Germany, Hungary, Italy, Slovakia), *E. esula* (Romania), *E. hirsuta* (Latvia), *Frangula alnus* (Latvia), *Hymenoxys hoopesii* (≡ *Helenium hoopesii*) (USA, AZ), *Malus* ×*micromalus* (China, Liaoning), *Polygonum aviculare* (Uzbekistan), *Ribes uva-crispa* var. *sativa* (= *R. grossularia*) (Latvia), *R. rubrum* (Latvia), *Salix amygdalina* (Latvia), *Scorzonera hispanica* (Germany), *Silene vulgaris* (Latvia), *Sonchus arvensis* (Latvia), *Tussilago farfara* (Latvia).

*Additional specimens examined*: **Austria**, Graubünden, 1000 m, on aecia on *Euphorbia cyparissias* (*Euphorbiaceae*), 13 Jun. 1901, A. Volkart (HBG); Innsbruck, on *Aecidium lonicerinum* on *Lonicera xylosteum* (*Caprifoliaceae*), 19 Aug. 1894, P. Magnus (HBG); on *Coleosporium campanulacearum* on *Campanula* sp. (*Campanulaceae*), 29 Aug. 1908, P. Magnus (HBG); on *Campanula rapunculoides*, P. Magnus (HBG); near Innsbruck, on aecia on *Berberis vulgaris* (*Berberidaceae*), 29 Jun. 1893, P. Magnus (HBG); on *Uromyces pisi*, Jun., Litschauer & Kreissler, Krypt. Exs. 2938 (B 700006149); Steiermark, Graz, Botanical Garden, Arboretum, on *Tranzschelia pruni-spinosae* on *Anemone ranunculoides* (*Ranunculaceae*), 24 Apr. 2008, C. Scheuer 5438 (GZU 21-2008, HAL 2233 F); Tirol, on aecia on *Euphorbia cyparissias*, 25 Sep. 1893, P. Magnus (HBG); Tirol, Fulpmes, 7 Aug. 1910, P. Magnus (HBG). **Denmark**, Lakolk, on *Uromyces* sp. on *Limonium vulgare* (*Plumbaginaceae*), 21 Jul. 1901, O. Jaap (HBG). **Germany**, Bavaria, Bad Reichenhall, on aecia on *Euphorbia cyparissias*, 14 May 1918, Schoenau (M-0057481); Bavaria, Kr. Schweinfurt, Gerolzhofen, Grettstadt, Höfleinsbach, on aecia on *Scorzonera hispanica* (*Asteraceae*), Jun. 1906, A. Vill, Fungi Bav. 898 (B 700006148); May 1905 (B 700006136); Bavaria, München, on *Aecidium ligustri* on *Ligustrum vulgare* (*Oleaceae*), 24 Jun. 1882, Allescher (M-0057479); München, Petersbrunn, on *Aecidium cyparissiae* on *Euphorbia cyparissias*, 1893, Allescher (M-0057480); Bavaria, Oberfranken, Bayreuth, May 1874, ex herb. Körnicke (B 700006147); Brandenburg, Börnicke, 1872, J. Eichelbaum (HBG); 29 May 1910, ex herb. T. Ohrdruf (B 700006155); Rheinland-Pfalz, Kr. Altkirchen, between Steneroth and Elkenroth, 26 May 1923, A. Ludwig (B 700006207); Saxony, on *Aecidium falcariae* on *Falcaria* sp. (*Apiaceae*), 27 May 1893, P. Magnus (HBG); Westfalen, on *Puccinia smilacearum-digraphidis* on *Polygonatum verticillatum* (*Asparagaceae*), 9 Jul. 1938, A. Ludwig (B 700006152, B 700006153). **Hungary**, Posonii, on aecia on *Euphorbia cyparissias*, Aug. 1890, J.A. Bäumler (M-0057487). **Italy**, Conegliano, on *Aecidium euphorbiae* on *Euphorbia* sp., 1879, Spegazzini, Dec. Mycol. Ital. 57 (B 700006133); Emilia Romagna, Parma, Langhirano, on aecia on *Euphorbia cyparissias*, Apr. 1873, G. Passerini, ex herb. Natter (B 700006132); Meran, on *Coleosporium tussilaginis* on *Petasites* sp. (*Asteraceae*), 2 Nov. 1893, P. Magnus (HBG). **Romania**, Muntenia, distr. Dâmboviţţa-Băaduleşsti, on *Uromyces pisi*, 16 Apr. 1944, T. Săvulescu, Herb. Mycol. Roman. 1342 (M-0057486). **Slovakia**, Banská-Štiavnica, on aecia on *Euphorbia cyparissias*, 2 Jun. 1897, A. Kmet (HBG). **Switzerland**, Engadin, on aecia on *Berberis vulgaris*, 22 Aug. 1888, P. Magnus (B 700006143, HBG); Kt. Wallis, Zermatt, 26 Jul. 1905, O. Jaap, Jaap, Fl. Schweiz 17 (B 700006141); on aecia on *Euphorbia cyparissias*, Jaap, Fl. Schweiz 15 (B 700006140). **USA**, California, Berkeley, on *Puccinia* sp. on *Hordeum chilense* (*Poaceae*), 20 Sep. 1897, P. Magnus (HBG); Colorado, Manitou, on aecia, 22. Jun. 1906, Clements & Clements, Crypt. Format. Colorad. 270 (B 700006137).

*Notes*: *Cladosporium aecidiicola* is somewhat reminiscent of the saprobic *C. herbarum*, but clearly differs in having conidia which are often distinctly narrowed towards the base and more frequently formed in branched chains. Furthermore, the conidiophores are not distinctly nodulose as in the latter species. *Cladosporium epichloës* on *Epichloë typhina*, which is also characterised by having subnodulose conidiophores and verruculose conidia, is morphologically barely distinguishable from *C. aecidiicola*, but tentatively maintained as separate species due to clear ecological differences and the host specialization. Final conclusions about the affinity of the two taxa have to be based on inoculation experiments.

Oudemans (1919–1924) listed *Coleosporium* sp., *Aecidium falcariae* and *A. tussilaginis* (= *Puccinia poarum*) as hosts of *C. aecidiicola*, but without any further details, and Lindau (1907) recorded it on *Euphorbia palustris*, *E. verrucosa*, *Falcaria* sp., *Lonicera xylosteum*, *Teucrium scorodonia*, on the host fungus *Coleosporium* sp. on *Petasites* sp. and on *Campanula rapunculoides*.

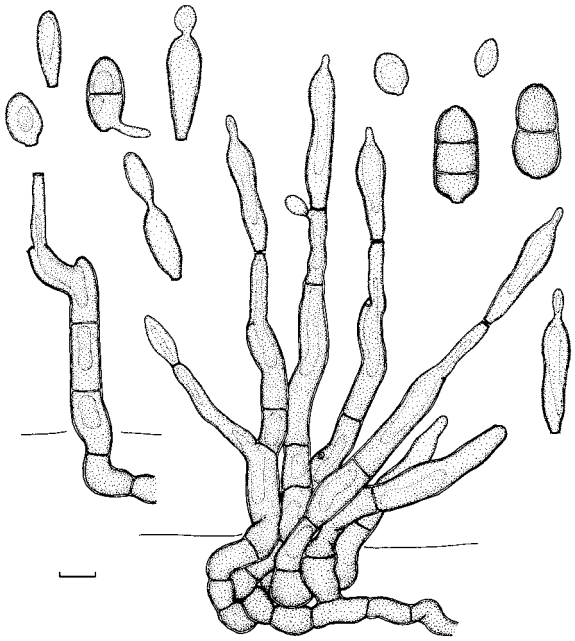


**Fig. 12.** *Cladosporium agoseridis* (HAL 1556 F). Fascicle of conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

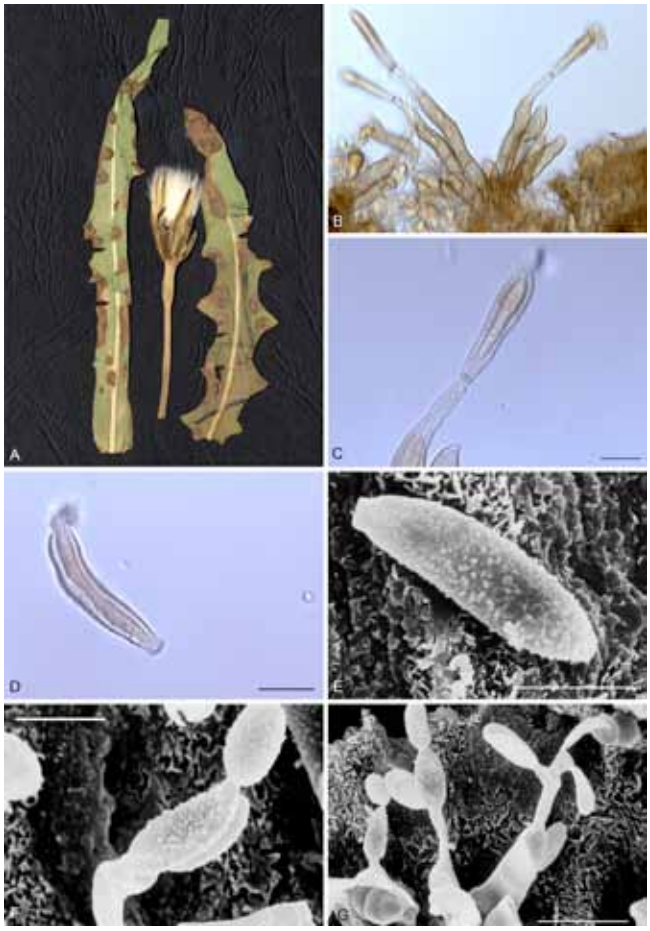


**Fig. 13.** *Cladosporium agoseridis* (HAL 1556 F). A. Symptoms. B. Fascicle of conidiophores. C. Tip of a conidiophore with attached conidium. D. Conidium. E. Conidium showing surface ornamentation. F. Tip of a conidiophore with still attached conidia. G. Small fascicle of conidiophores. Scale bars = 10 (C–F), 20 (B, G) µm.

**3. *Cladosporium agoseridis*** U. Braun & Rogerson, Sydowia 47(2): 142. 1995. Figs 12, 13.

*Holotype*: **USA**, Utah, Washington Co., northwest side of Pine Valley Mountain, northeast of Diamond Valley, vicinity of Mud Spring, on living leaves of *Agoseris glauca* (*Asteraceae*), 7 Jun. 1994, C.T. Rogerson (NY). *Isotype*: HAL 1556 F.

*Lit.*: Schubert (2005b: 34).
*Ill.*: Braun & Rogerson (1995: 143, fig. 1), Schubert (2005b: 35, fig. 3, pl. 1, figs A–G).

*In vivo*: Leaf spots amphigenous, subcircular or somewhat irregular, 1–8 mm diam or confluent and larger, greyish brown, often somewhat zonate, surrounded by a narrow, darker margin or marginal line, necrotic. *Colonies* amphigenous, punctiform to subeffuse, brown, somewhat velvety. *Mycelium* internal, subcuticular to intraepidermal; hyphae branched, 3–13 µm wide, septate, often with swellings and constrictions, pale to medium olivaceous-brown, smooth, walls thickened, forming small to moderately large aggregations of inflated hyphal cells, 25–100 µm wide, flattened, only few layers deep, cells subglobose to cylindrical-oblong, 5–15 µm wide, medium olivaceous-brown, smooth, thick-walled. *Conidiophores* solitary, in small loose groups or often loosely fasciculate, arising from internal hyphae or hyphal aggregations, erumpent through the cuticle, straight and subcylindrical to somewhat flexuous, geniculate-sinuous, unbranched, occasionally once branched, 20–90(–110) × (3–)4–10(–13) µm, 0–4-septate, often somewhat constricted at the basal septum, often wider and somewhat swollen at the base, up to 15 µm wide, and attenuated towards the apex, pale yellowish, pale to medium olivaceous-brown or brown, smooth, walls somewhat thickened, cells sometimes with distinct, clearly delineated lumen. *Conidiogenous cells* integrated, terminal and sometimes intercalary, cylindrical, 14–55 µm long, often somewhat geniculate, usually with a single or up to three, rarely four conidiogenous loci, conspicuous, protuberant, obconically truncate to slightly convex, 2–3.5(–4.5) µm diam, dome and surrounding rim relatively flat, dome not higher than the surrounding rim, somewhat thickened, darkened-refractive. *Conidia* catenate, usually in unbranched chains, occasionally in branched chains, broadly subglobose, obovoid, ellipsoid-ovoid, subcylindrical or somewhat clavate, (10–)12–40(–50) × (5–)6–13(–15) µm, 0–1(–3)-septate, pale yellowish, olivaceous to brown, loosely to densely verruculose or verrucose, sometimes almost smooth, walls somewhat thickened, lumen sometimes distinct, clearly separated from the inner wall, apex rounded or slightly attenuated, hila obconically truncate to slightly convex, conspicuous, (1.5–)2–3.5(–4.5) µm diam, somewhat thickened and darkened-refractive; conidia sometimes germinating but microcyclic conidiogenesis not observed.

*Substrate and distribution*: On *Agoseris glauca*; USA.

*Notes*: *Cladosporium agoseridis* belongs to a group of leaf-spotting species forming fasciculate, relatively broad conidiophores, broad conidiogenous loci and hila and rather large, above all wide conidia. Other plant pathogenic *Cladosporium* species on composites are well distinguished by having quite distinct lesions, narrower conidiophores [3–7 µm in *C. inopinum*; (2.5–)3.5–6(–7) µm in *C. praecox*], narrower conidia [2.5–6 µm in *C. inopinum*; 4–7(–8) µm in *C. praecox*] and narrower conidiogenous loci and hila [(1–)1.5–2.5 µm in *C. praecox*]. A record of *Cladosporium* sp. on *Agoseris glauca* from Washington (Shaw 1973) seems to pertain to *C. agoseridis*.

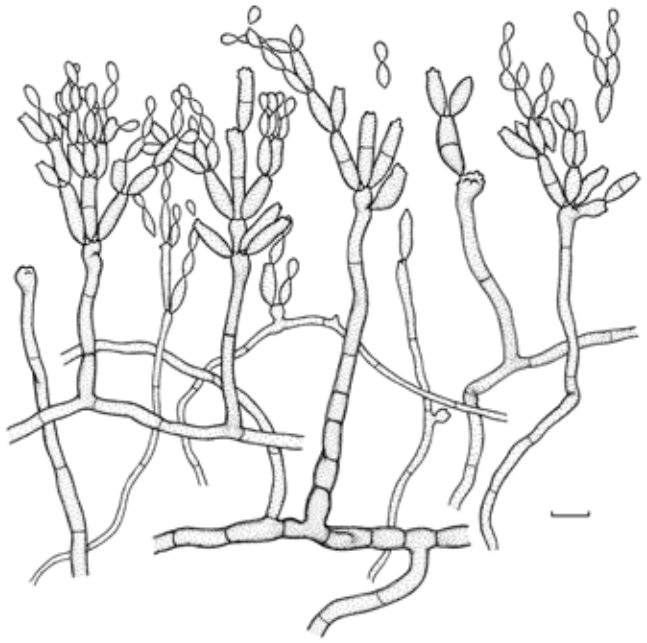


**Fig. 14.** *Cladosporium allicinum* (CPC 12211). Macro- and micronematous conidiophores and conidia *in vitro*. Scale bar = 10 µm. K. Bensch *del*.

**4. *Cladosporium allicinum*** (Fr. : Fr.) Bensch, U. Braun & Crous **comb. nov.** MycoBank MB800304. Figs 14–17.

*Basionym*: *Sphaeria allicina* Fr., Kongl. Vetensk. Acad. Handl. 38: 247. 1817 : Fr., Syst. Mycol. 2: 437. 1823.

≡ *Sphaerella allicina* (Fr. : Fr.) Auersw., in Gonn. & Rabenh., Mycol. Europaea 5–6: 19. 1869.

≡ *Davidiella allicina* (Fr. : Fr.) Crous & Aptroot, in Aptroot, *Mycosphaerella* and its anamorphs: 2. Conspectus of *Mycosphaerella*. Biodiversity Ser. 5: 30. 2006.

= *Hormodendrum hordei* Bruhne, in W. Zopf, Beitr. Physiol. Morph. nied. Org. 4: 1. 1894, non *C. hordei* Pass., 1887.

≡ *Cladosporium herbarum* δ *cerealium* f. *hordei* (Bruhne) Ferraris, Flora Ital. Crypt., Pars I, Fungi, Fasc.13: 882. 1914.

≡ *Cladosporium bruhnei* Linder, Bull. Natl. Mus. Canada 97: 259. 1947.

≡ *Cladosporium hordei* (Bruhne) Pidopl., Gribnaya Flora Grubykh Kormov: 268. 1953, *nom. illeg*., homonym, non *C. hordei* Pass., 1887.

*Holotype:* **Sweden**, Skåne, on tip blight of living leaves of *Allium* sp. (*Amaryllidaceae*) (Fr. no. F-09810, UPS-FRIES). *Neotype* of *Cladosporium bruhnei* (designated in Schubert *et al.* 2007b): **Belgium**, Kampenhout, isol. from *Hordeum vulgare* (*Poaceae*), 26 June 2005, J.Z. Groenewald (CBS H-19856). *Isoneotype*: HAL 2023 F. *Ex-type cultures*: CBS 121624 = CPC 12211, CPC 12212.

= *Cladosporium fasciculatum* f. *gladioli* Roum., Fungi Sel. Gall. Exs., Cent. XII, No. 1158. 1881, *nom. nud*. [syntypes: *e.g.*, HBG], **syn. nov.**

= *Cladosporium juncicola* ["*juncicolum*"] Niessl, *in herb*. [M-0057609], **syn. nov.**

*Lit*.: Saccardo (1899: 1076), Linder (1947: 289), Schubert *et al*. (2007b: 118–120).

*Ill*.: Linder (1947: 289, pl. 14, fig. C), Schubert *et al*. (2007b: 118–120, figs 9–12).

*Exs*.: Ellis & Everhart, Fungi Columb. 163 p.p.; Roumeguère, Fungi Sel. Gall. Exs. 1158.

*In vitro*: *Ascomata* pseudothecial, black, superficial, situated on a small stroma, globose, up to 250 µm diam; ostioles periphysate, with apical periphysoids present; wall consisting of 3–6 layers of reddish brown *textura angularis*. *Asci* fasciculate, bitunicate, subsessile, obovoid to broadly ellipsoid, straight to slightly curved,

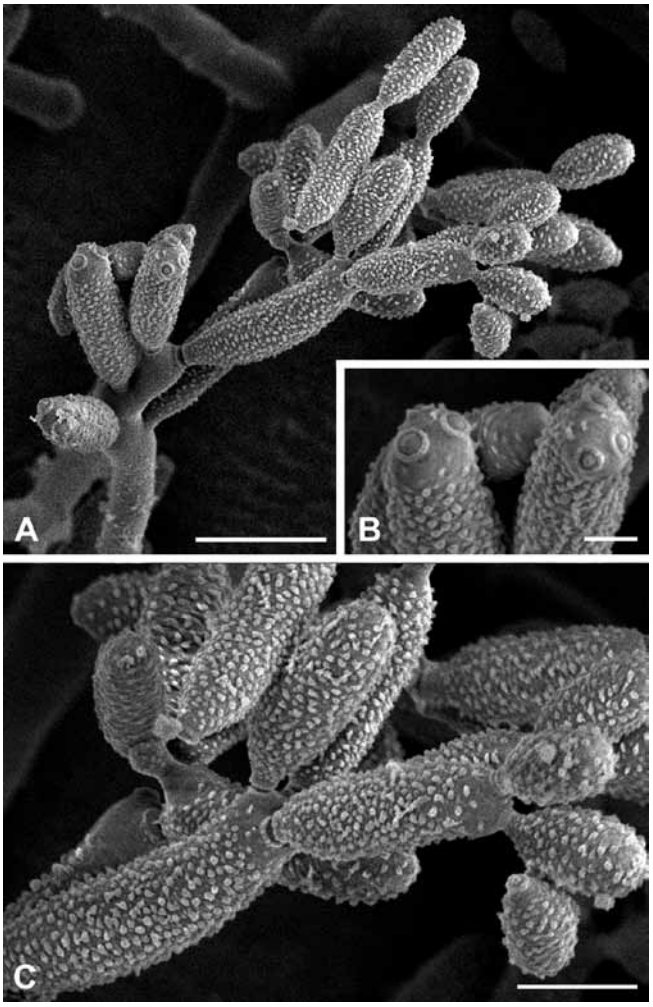



**Fig. 15.** *Cladosporium allicinum* (CPC 12211). A. Conidiophore with characteristic long secondary ramoconidium and complex conidiophore. B. Detail of hila on secondary ramoconidia. C. Details of prominent ornamentation on conidia. Scale bars = 2 (B), 5 (C), 10 (A) µm.

8-spored, 65–90 × 16–25 µm; with pseudoparenchymatal cells of the hamathecium persistent. *Ascospores* tri- to multiseriate, overlapping, hyaline, with irregular lumina, thick-walled, straight to slightly curved, fusoid-ellipsoidal with obtuse basal end, and acutely rounded apical end, widest near the middle of the apical cell, medianly 1-septate, not to slightly constricted at the septum, (20–)25–27(–30) × (5.5–)6–7 µm. *Mycelium* superficial, hyphae branched, 1.5–8 µm wide, pluriseptate, broader hyphae usually slightly constricted at the septa and somewhat swollen, hyaline to subhyaline, almost smooth to somewhat verruculose or irregularly rough-walled, sometimes appearing to have a slime coat, walls unthickened. *Conidiophores* macronematous, sometimes also micronematous, arising as lateral or terminal branches from plagiotropous or ascending hyphae, erect, straight to more or less flexuous, sometimes geniculate, nodulose, usually with small head-like swellings, sometimes also with intercalary nodules, sometimes swellings protruding and elongated to one side, unbranched, occasionally branched, (7–)20–330 µm, sometimes even longer, (2–)3–5 µm wide, swellings (4–)5–8 µm wide, pluriseptate, not constricted at the septa, septa sometimes not very conspicuous, subhyaline to pale brown or pale olivaceous, smooth or somewhat verruculose, walls unthickened or almost so, more thickened with age. *Conidiogenous cells* integrated, usually terminal, cylindrical with a terminal head-like swelling, sometimes with a second swelling, 15–40 µm long, proliferation sympodial, with few conidiogenous loci confined to swellings, up to five per swelling,

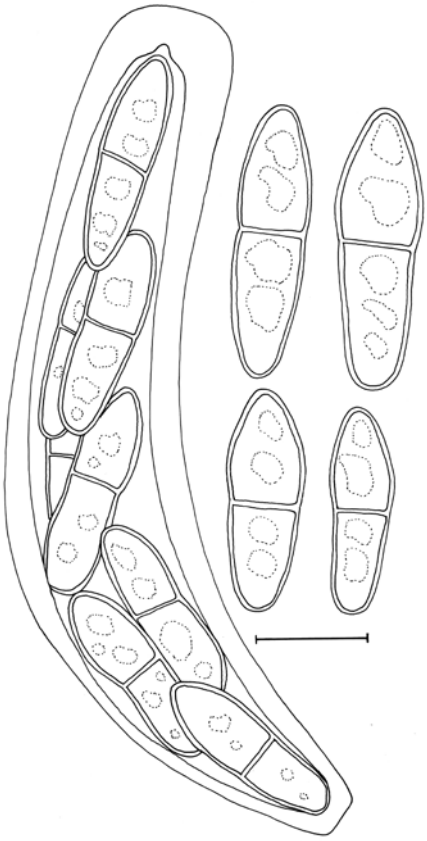


**Fig. 16.** *Cladosporium allicinum* (F-09810, UPS-FRIES, holotype). Ascus and ascospores of the teleomorphic state. Scale bar = 10 µm. P.W. Crous *del*.

loci protuberant, conspicuous, 1–2 µm diam, thickened and darkened-refractive. *Conidia* catenate, formed in branched chains, straight to slightly curved, small terminal conidia subglobose, ovoid to obovoid or somewhat limoniform, 4–9 × 2.5–3.5 µm [av. ± SD, 6.5 (± 1.5) × 3.1 (± 0.5) µm], aseptate; secondary ramoconidia and occasionally formed ramoconidia ellipsoid to subcylindrical or cylindrical, 10–24(–31) × 3–5(–7) µm [av. ± SD, 16.1 (± 4.1) × 4.1 (± 0.8) µm], rarely up to 40 µm long, 0–1(–3)-septate, very rarely 5-septate, subhyaline to pale brown or pale olivaceous, minutely verruculose to verrucose (mostly granulate with some muricate projections under SEM), walls unthickened or almost so, apex rounded or slightly attenuated towards apex and base, hila protuberant, conspicuous, 1–2 µm wide, up to 1 µm high, thickened and darkened-refractive; microcyclic conidiogenesis occurring.

*In vivo*: Agreeing with the features *in vitro*, but mycelium usually immersed and conidiophores solitary to fasciculate, arising from immersed hyphae or swollen hyphal cells, stromata usually absent.

*Culture characteristics*: Colonies on PDA reaching 22–32 mm diam after 14 d at 25 ºC, olivaceous grey to iron grey, sometimes whitish, smoke grey to pale olivaceous due to abundant aerial mycelium

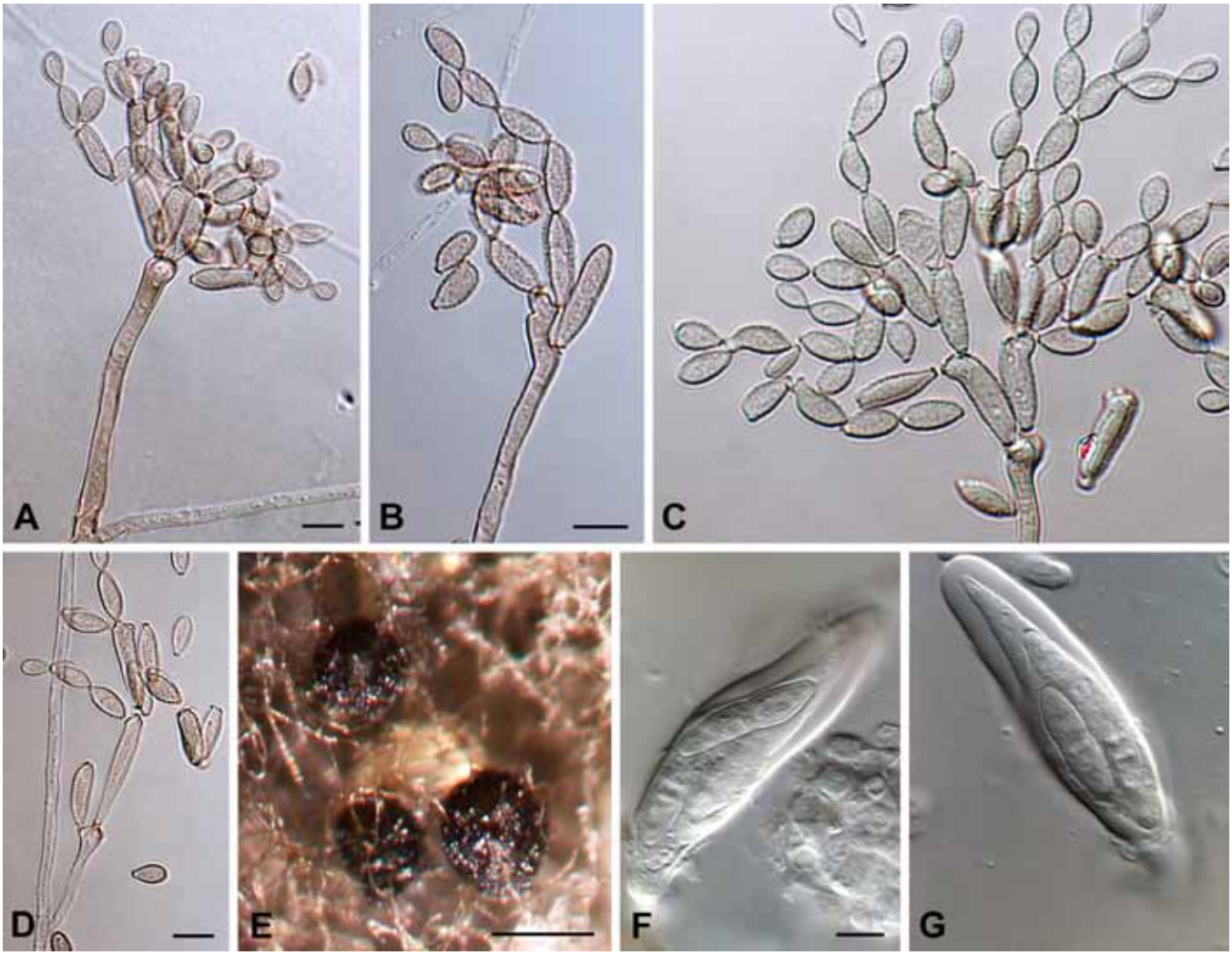



**Fig. 17.** *Cladosporium allicinum* (CPC 12211). A–B. Macronematous conidiophores. C. Conidial chains. D. Micronematous conidiophore. E. Ascomata of the teleomorphic state formed on the host. F–G. Asci. Scale bars = 10 (A–B, D, F), 200 (E) µm.

covering almost the whole colony, with age collapsing becoming olivaceous grey, occasionally zonate, velvety to floccose, margin narrow, entire edge, white, glabrous to somewhat feathery, aerial mycelium sparse to abundant, white, fluffy, growth regular, flat to low convex, sometimes forming few exudates in the colony centre, sporulating. Colonies on MEA reaching 21–32 mm diam after 14 d at 25 ºC, grey olivaceous, olivaceous grey to dull green or iron grey, sometimes whitish to pale smoke grey due to abundant aerial mycelium, olivaceous grey to iron grey reverse, velvety, margin narrow, entire edge to slightly undulate, white, radially furrowed, glabrous to slightly feathery, aerial mycelium sparse to abundant, mainly in the centre, white, fluffy, growth convex to raised, radially furrowed, distinctly wrinkled in the colony centre, without prominent exudates, sporulating. Colonies on OA reaching 20–32 mm diam after 14 d at 25 ºC, smoke grey, grey olivaceous to olivaceous grey, greenish black or iron grey reverse, margin narrow, entire edge, colourless to white, glabrous, aerial mycelium sparse to abundant, dark smoke grey, diffuse, high, later collapsed, felty, growth flat, without prominent exudates, sporulation profuse.

*Substrates and distribution*: On living and decaying plant and fungal material, man, air, hypersaline and industrial water; worldwide.

*Additional specimens examined*: *Sine loco et dato* (CBS 188.54 = ATCC 11290 = IMI 049638). **Australia**, New South Wales, Barrington Tops National Park, isol. from leaves of *Eucalyptus stellulata* (*Myrtaceae*), 3 Jan. 2006, B. Summerell, (CPC 12921). **Austria**, Zillertal, on dead leaves of *Hordeum* sp., 9 Aug. 1906, P. Magnus (HBG), mixed with *C. macrocarpum*. **Belgium**, isol. from *Quercus robur* (*Fagaceae*), (CBS 157.82). **Czech Republic**, Lisen, isol. from *Polygonatum odoratum* (*Asparagaceae*) (CBS 813.71, albino mutant of CBS 812.71). **France**, Perpignan, on old leaves of *Gladiolus* ×*gandavensis* (*Iridaceae*), Dec. 1879, Roumeguère, Fungi Gall. Sel. Exs. 1158 (B). **Germany**, CBS 134.31 = ATCC 11283 = IMI 049632; Berlin, park, on dead leaves of *Hedera helix* (*Araliaceae*), 19 June 1896, P. Magnus (HBG); Nordrhein-Westfalen, Essen, botanical garden, on dead *Nigella damascena* (*Ranunculaceae*), 10 Jul. 2007, N. Ale-Agha (HAL); Mühlheim an der Ruhr, isol. from industrial water, IWW 727 (CBS 110024); Sachsen-Anhalt, Halle (Saale), Robert-Franz-Ring, isol. from leaves of *Tilia cordata* (*Tiliaceae*), 2004, K. Schubert (CPC 11386). **Italy**, South Tirol, Marling near Meran, on dead leaves of *Arrhenatherum elatius* (*Poaceae*), 29 Aug. 1911, P. Magnus (HBG); Seir, on dead leaves of *Sesleria* sp. (*Poaceae*), 19 Aug. 1908, P. Magnus (HBG). **Netherlands**, isol. from air (CBS 521.68); isol. from *Hordeum vulgare* (*Poaceae*), 1 Jan. 2005, P.W. Crous (CPC 12139); isol. from man, skin (CBS 159.54 = ATCC 36948); Amsterdam, isol. from Thuja tincture (CBS 177.71); Geleen, St. Barbara Ziekenhuis, isol. from man, skin (CBS 366.80, CBS 399.80); isol. from man, sputum, Aug. 1955 (CBS 161.55). **New Zealand**, Auckland, Mt. Albert, Harbutt Ave., on dead leaves of *Cortaderia selloana* (*Poaceae*), 23 Sep. 2007, C.F. Hill 2007/2954 (HAL); Otago, Lake Harris, isol. from *Ourisia macrophylla* (*Plantaginaceae*), 30 Jan. 2005, A. Blouin, Hill 1135 (CPC 11840). **Poland**, Białowieża national Park, on dead leaves of *Tilia cordata*, 27 Oct. 1992, W. Mułenko (LBL). **Russia**, Moscow region, isol. from *Polyporus radiatus* (*Polyporaceae*), Oct. 1978 (CBS 572.78 = VKM F-405); St. Petersburg, Botanical Garden of the Komarov Botanical Institute, on necrotic segments of leaves of *Actinidia arguta* (*Actinidiaceae*), 14 Sep. 2009, V.A. Mel'nik (HAL 2329 F). **Slovenia**, Ljubljana, isol. from an air conditioning system, 2004, M. Butala (EXF-680 = CPC 12046); Sečovlje, isol. from hypersaline water from salterns (reserve pond), 2005, P. Zalar (EXF-389 = CPC 12042). **Spain**, Ebro Delta, isol. from hypersaline water from salterns (crystallisation pond), 2004, P. Zalar (EXF-594 = CPC 12045). **Switzerland**, Graubünden, 980 m, on dead leaves of *Dianthus caryophyllus* (*Caryophyllaceae*), 5 Nov. 1900, A. Volkart (HBG); Simplonhospiz, 2010 m, on dead leaves of *Homogyne alpina* (*Asteraceae*), 29 Jul. 1905, O. Jaap (HBG). **USA**, New Jersey, Vineland, on necrotic parts of leaves of *Hedera helix*, Apr. 1893, Ellis & Everhart, Fungi Columb. 163 (HBG); New York, Geneva, isol. from CCA-treated Douglas-fir pole (CBS 115683 = ATCC 66670 = CPC 5101).

*Notes*: Based on the recently decided abolition of Art. 59 of the ICBN, the older teleomorph name *Sphaeria allicina* has priority over the anamorph name *C. bruhnei*, and *Cladosporium* antedates *Davidiella*. Therefore, the combination *Cladosporium allicinum* (= *C. bruhnei*) is introduced. This species belongs to the *C. herbarum* complex, as already stated by Linder (1947), but differs from *C. herbarum s. str.* and *C. macrocarpum* in having consistently narrower conidia, usually 2.5–5 µm wide, and the conidiophores often form only a single apical swelling. Although this species occurs on numerous substrates and is widely distributed, it has not yet been recognised as a distinct species since it has probably been interpreted as a narrow variant of *C. herbarum*. Based on morphology and DNA sequence data, the CBS strain CBS 177.71 chosen by Prasil & de Hoog (1988) as representative living strain of *C. herbarum*, clusters instead with isolates of *C. allicinum*. The CBS strain 813.71 is an albino mutant of the latter species as it does not appear to contain colour pigment. Furthermore, all isolates from humans treated until now as *C. herbarum* proved to be conspecific with the narrow-spored *C. allicinum*.

Aptroot (2006) treated *Davidiella tassiana* (ascospores 17–25 × 6–8.5 µm, RO), the teleomorph name of *Cladosporium herbarum*, as a synonym of *D. allicina* (ascospores 20–27 × 6–7 µm, UPS). However, the teleomorphs of the two species differ in apical ascospore taper (acutely rounded in *D. allicina*, but obtusely rounded in *D. tassiana*).

**5. *Cladosporium allii*** (Ellis & G. Martin) P.M. Kirk & J.G. Crompton, Pl. Pathol. 33: 320. 1984. Figs 18, 19.
*Basionym*: *Heterosporium allii* Ellis & G. Martin, J. Mycol. 1: 100. 1885.

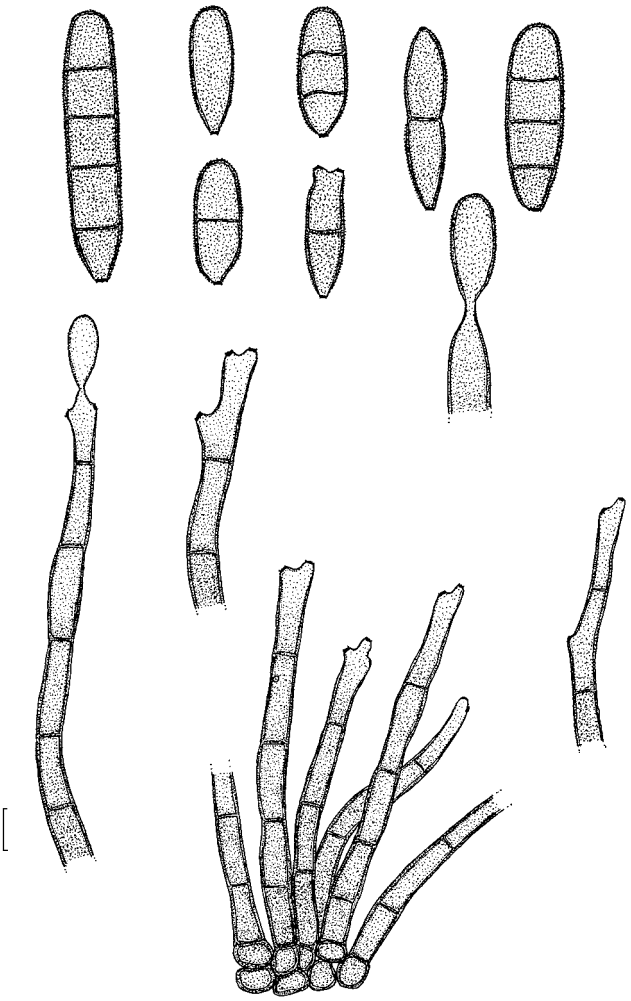


**Fig. 18.** *Cladosporium allii* (NY). Fascicle of conidiophores, conidiogenous cells and conidia *in vivo*. Scale bar = 10 µm. U. Braun *del*.

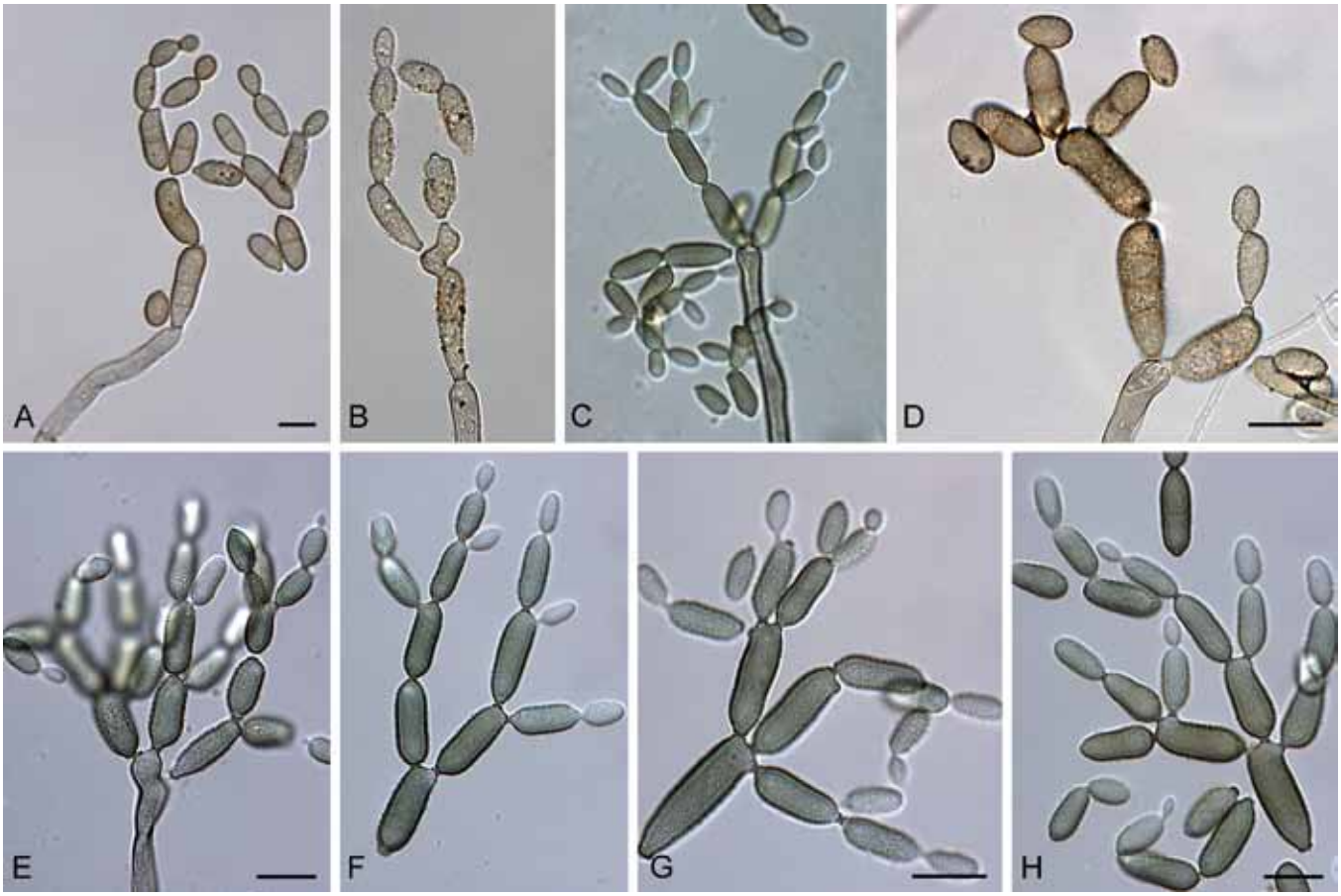



**Fig. 19.** *Cladosporium allii* (CBS 101.81). A–H. Conidiophores and conidial chains *in vitro*. Scale bars = 10 µm.

*Neotype*: **USA**, New Jersey, on *Allium vineale* (*Amaryllidaceae*), June 1882, Ellis 3608a (NY), selected by Kirk & Crompton, 1984 [the neotype is topotype material (the true type material was collected in Aug. 1883)].

= *Heterosporium ornithogali* var. *allii-porri* Sacc. & Briard, Rev. Mycol. 8: 25. 1886 [holotype: PAD].
≡ *Heterosporium allii* var. *allii-porri* (Sacc. & Briard) Sacc., Syll. fung. 4: 488. 1886.
≡ *Heterosporium allii-porri* (Sacc. & Briard) Nicolas & Aggéry, Rev. Pathol. Vég. Entomol. Agric. France 14: 197. 1927.
≡ *Heterosporium allii-porri* (Sacc. & Briard) Arx, Genera Fungi Sporul. Pure Culture, Ed. 3: 305. 1981, *comb. superfl.*
≡ *Cladosporium allii-porri* (Sacc. & Briard) Boerema, Verslagen Meded. Plantenziektenk. Dienst Wageningen 152: 15. 1978 ["1977"].
= (?) *Didymellina intermedia* Cif., Not. Matatt. Piante 2: 6–7. 1949 (unconfirmed).
= *Heterosporium allii* var. *allii-sativi* Bontea & Dumitriaş, Rev. Roumaine Biol., Sér. Bot., 12(6): 389. 1967 [isotypes: Săvulescu, Herb. Mycol. Roman. 1749, *e.g.* IMI 115600, K].

*Lit.*: Saccardo (1902: 1065), Lindau (1910: 77), CMI Descriptions of Pathogenic Fungi and Bacteria No. 841 (1986). Kirk (1986a), Jordan, Burchill & Maude (1990a,b), Jordan, Maude & Burchill (1990a,b), David (1997: 29–33), Ho *et al*. (1999: 116–118), Zhang *et al*. (2003: 38–40).
*Ill.*: CMI Descriptions of Pathogenic Fungi and Bacteria No. 841 (1986: figs A–B), Kirk & Crompton (1984: 321, fig. 3), David (1997: 31, fig. 4, 32, fig. 5 A–C), Zhang *et al*. (2003: 39, fig. 13 and pl. 5, fig. 3, pl. X, fig. 1).
*Exs.*: Reliqu. Farlowianae 177; Săvulescu, Herb. Mycol. Roman. 1749.

*In vivo*: Leaf spots lacking (fruiting on necrotic leaves) or amphigenous, ellipsoid-fusiform, oblong, with the long axis parallel to the leaf veins, 5–25 × 2–15 mm, initially yellowish, ochraceous, later brown, greyish brown or dingy greyish white, margin indefinite or with a diffuse paler to darker halo. *Colonies* amphigenous, punctiform to confluent, dense, medium to dark brown. *Mycelium* immersed. *Stromata* lacking to well-developed, 10–80 µm diam, immersed, brown, composed of swollen hyphal cells, 3–20 µm diam, thick-walled. *Conidiophores* solitary or in small to large, dense fascicles, arising from internal hyphae or stromata, erumpent, erect, straight, subcylindrical to moderately geniculate-sinuous or subnodulose, unbranched, 30–120(–160) × 4–10 µm (up to 600 µm or even longer in culture or moist chamber), continuous to pluriseptate, uniformly pale olivaceous, olivaceous-brown or ochraceous-brown, smooth to distinctly verruculose, wall up to 1 µm wide. Conidiophores reduced to conidiogenous cells or *conidiogenous cells* integrated, terminal or intercalary, 10–60 µm long, conidiogenous loci distinctly coronate, protuberant, peg-like, 1–2 per cell, 2–2.5(–3) µm wide, 1–2 µm high. *Conidia* solitary or in simple, rarely branched, short chains, formed on relatively long, thin, neck-like protuberances that eventually form a septum and turn to peg-like scars after conidial secession, ellipsoid-ovoid, obovoid, subcylindrical, finally often soleiform, (15–)20–60(–80) × (5–)7–15(–17) µm, 0–3-septate (in culture and moist chamber sometimes up to five septa), barely constricted at septa, septa often becoming sinuous with age, pale olivaceous-brown to brown, wall up to 1 µm wide, one-layered, densely verruculose-verrucose, ends rounded, hila conspicuously coronate, either rather flat or distinctly protuberant, peg-like, 1.5–2.5(–3) × 1–1.5 µm.

*In vitro*: *Mycelium* dimorphic; hyphae narrow, sparingly branched, 1–2 µm wide, septate, septa very pale, not very conspicuous, hyaline to subhyaline or very pale olivaceous, smooth or almost

so or somewhat irregularly rough-walled, walls unthickened, giving rise to micronematous conidiophores. Second type of hyphae wider and darker, unbranched or sparingly branched, (3–)4–8 µm wide, with swellings and constrictions especially at septa, swellings up to 10 µm wide, pale to medium olivaceous-brown, smooth or almost so, walls somewhat thickened, about 0.5 µm wide, giving rise to macronematous conidiophores. *Macronematous conidiophores* solitary, arising terminally or laterally from plagiotropous or ascending hyphae, erect, straight to somewhat flexuous, subcylindrical, nodulose, with a single apical swelling or sometimes with additional nodules at a lower level, unbranched, occasionally branched towards the apex, 40–240 × 4–8(–9) µm, pluriseptate, occasionally slightly constricted at septa, pale to medium olivaceous-brown, smooth or almost so, walls unthickened or only slightly thickened. *Micronematous conidiophores* arising terminally and laterally from hyphae, somewhat flexuous, narrowly cylindrical-oblong or filiform, non-nodulose or only subnodulose at or towards the apex, 5–100 × 2–3(–4) µm, 0–4-septate, septa not constricted but somewhat darkened, subhyaline to pale olivaceous, smooth, sometimes verruculose towards the apex, walls unthickened. *Conidiogenous cells* terminal but also intercalary, cylindrical-oblong, sometimes distinctly geniculate, with subnodulose or nodulose apices and one or several additional swellings at a lower level, 19–60 µm long, conidiogenous loci confined to these swellings being situated on shoulders, 1.5–2.5 µm diam, thickened and darkened-refractive. *Ramoconidia* occasionally formed. *Conidia* numerous, catenate, in short unbranched or branched chains, with 2–4(–5) conidia in the unbranched terminal part of the chain, small terminal conidia broadly obovoid to ellipsoid, 5–13 × (3.5–)4–6(–6.5) µm [av. ± SD, 9.3 (± 2.4) × 5.0 (± 0.9) µm], 0(–1)-septate, intercalary conidia ellipsoid, ovoid to subcylindrical, 9–17 × 5–7.5 µm [av. ± SD, 13.1 (± 2.2) × 6.1 (± 0.8) µm], 0–1-septate, secondary ramoconidia broadly ellipsoid to subcylindrical, sometimes obclavate being narrower at the base, sometimes irregular in outline due to loci being situated on short lateral outgrowth or lateral shoulders, 14–28(–35) × (4.5–)6–9(10) µm [av. ± SD, 22.1 (± 5.1) × 7.2 (± 1.3) µm], 0–2(–4)-septate, septa not very conspicuous, with age becoming curved or sinuous, pale to medium or even dark olivaceous-brown, verruculose to distinctly and densely verrucose, thick-walled, due to ornamentation up to 1.5 µm thick, apex rounded or attenuated towards the base, hila prominent, conspicuous, (1–)1.5–2.5 µm diam, dome quite flat but rim protuberant, thickened and darkened-refractive; microcyclic conidiogenesis commonly occurring with conidia giving rise to nodulose secondary conidiophores; conidia sometimes germinating.

*Culture characteristics*: Colonies on PDA olivaceous-grey to iron-grey, reverse olivaceous-black, velvety to floccose, somewhat shiny, margins rhizoid, grey-olivaceous, aerial mycelium floccose, loose to dense, growth flat, without prominent exudates, sporulating. Colonies on MEA iron-grey to olivaceous-grey, reverse olivaceous-black, velvety to floccose, margins feathery to rhizoid, olivaceous-black, aerial mycelium scattered, loose to dense, floccose, growth effuse, without prominent exudates, sporulation profuse. Colonies on OA grey-olivaceous to olivaceous-grey, reverse leaden-grey to iron-grey, velvety to floccose, margin grey-olivaceous, feathery, regular, aerial mycelium loose to more dense, floccose, growth flat, without prominent exudates, sporulation profuse.

*Substrates and distribution*: On *Allium* spp. (*Amaryllidaceae*); Asia, Caucasus, Europe, North and South America, New Zealand – *Allium ampeloprasum* (Canada), *A. canadense* (USA, MD, MS, NY, PA, TX, WI), *A. cernuum* (USA, WY), *A. fistulosum* (China), *A. oleraceum* (Latvia), *A. porrum* (France, Netherlands, New Zealand, UK, USA, PA), *A. sativum* (Brazil, China, Denmark, India, Romania), *A. schoenoprasum* [incl. *A. sibiricum*] (Norway), *A. scorodoprasum* (China), *A. stellatum* (USA), *A. validum* (USA, CA, OR), *A. vineale* (USA, DE, IL, NJ, TX), *Allium* spp. (Armenia, Austria, Belgium, Canada, Czech Republic, Denmark, France, Georgia, Germany, Greece, Japan, Kazakhstan, Latvia, Norway, Romania, Russia, UK, Ukraine).

*Additional specimens examined*: **Netherlands**, Limburg, Horst, experimental garden, isol. from *Allium porrum*, isol. by G.H. Boerema, CBS H-10337 (CBS 101.81 = ATCC 200948 = PD 80/165, reference strain). **Norway**, Finnmark Co., Loppa, Vasbotndalen in Øksfjord, on *Allium schoenoprasum* (*A. sibiricum*), 22 Aug. 1968, H.B. Gjaerum (IMI 159610). **UK**, without locality, on *A. porrum*, 12 Mar. 1980, A.L. Smith (IMI 246076); Oxfordshire, 4 Feb. 1981, J.A. Crompton (IMI 255145).

*Notes*: *Allium cepa* has occasionally been reported as host of *C. allii*. Such records are, however, wrong and undoubtedly pertain to *C. allii-cepae* (David 1997). *Cladosporium allii-cepae* is comparable with *C. allii* but easily distinguishable by its much larger conidia. The record of *Kniphofia uvaria* (*Xanthorrhoeaceae*) as host of *C. allii* by Oudeman (1919) is very doubtful. Chinese records of *C. allii* on *A. ascalonicum* probably refers to *C. allii-cepae*. *Allium escalonicum auct.* non L. is a name previously applied to shallots. Since *in vitro* the conidia of *C. allii* are shorter, narrower and not soleiform the species is reminiscent of *C. macrocarpum* but genetically the two species are quite distinct (see Fig. 5).

**6. *Cladosporium allii-cepae*** (Ranoj.) M.B. Ellis, More Dematiaceous Hyphomycetes: 337. 1976. Fig. 20.
*Basionym*: *Heterosporium allii-cepae* Ranoj., Ann. Mycol. 8: 399. 1910.

*Holotype*: **Serbia**, Sumadija, Rebschule von Veliko Oraschje, on stems of *Allium cepa* (*Amaryllidaceae*), June 1905, N. Ranojevic (BPI 1108762).

= (?) *Heterosporium allii* var. *cepivorum* Nicolas & Aggéry, Rev. Pathol. Vég. Entomol. Agric. France 14: 197. 1927.
= *Mycosphaerella allii-cepae* M.M. Jord., Maude & Burchill, Trans. Brit. Mycol. Soc. 86: 392. 1986.
≡ *Davidiella allii-cepae* (M.M. Jord., Maude & Burchill) Crous & U. Braun, Mycol. Progr. 2(1): 10. 2003.

*Lit.*: Saccardo (1913a: 1388), Ellis (1976: 337), Hall & Kavanagh (1984, 1985), Ellis & Ellis (1985: 305), CMI Descriptions of Pathogenic Fungi and Bacteria No. 842 (1986), Kirk (1986b), Jordan, Burchill & Maude (1990a,b), Jordan, Maude & Burchill (1986, 1990a,b), David (1997: 33–34), Zhang *et al*. (2003: 40–42).
*Ill.*: Ellis (1976: 336, fig. 255), Kirk & Crompton (1984: 322, fig. 4, 323, fig. 5), Ellis & Ellis (1985: pl. 129, fig. 1343), CMI Descriptions of Pathogenic Fungi and Bacteria No. 842 (1986: figs A–B). Shin (1995: 92: fig. 1 a–d), David (1997: 32, fig. 5 D–G, 35, fig. 6), Kiehr *et al.* (1997), Zhang *et al*. (2003: 41, fig. 14 and pl. 5, fig. 4).
*Exs.*: Vestergren, Micromyc. Rar. Sel. Praec. Scand. 1798.

*In vivo*: Leaf spots on living and faded leaves and stems, more or less elliptical, with the long axis parallel to the leaf veins, up to 15 × 5 mm, whitish, yellow, ochraceous, later brownish due to the developing fungal colonies. *Colonies* mainly hypophyllous, punctiform to dense, pale to medium brown. *Mycelium* internal, hyphae forming loose to dense stromatic aggregations of swollen hyphal cells, small to expanded, cells subcircular in outline, up

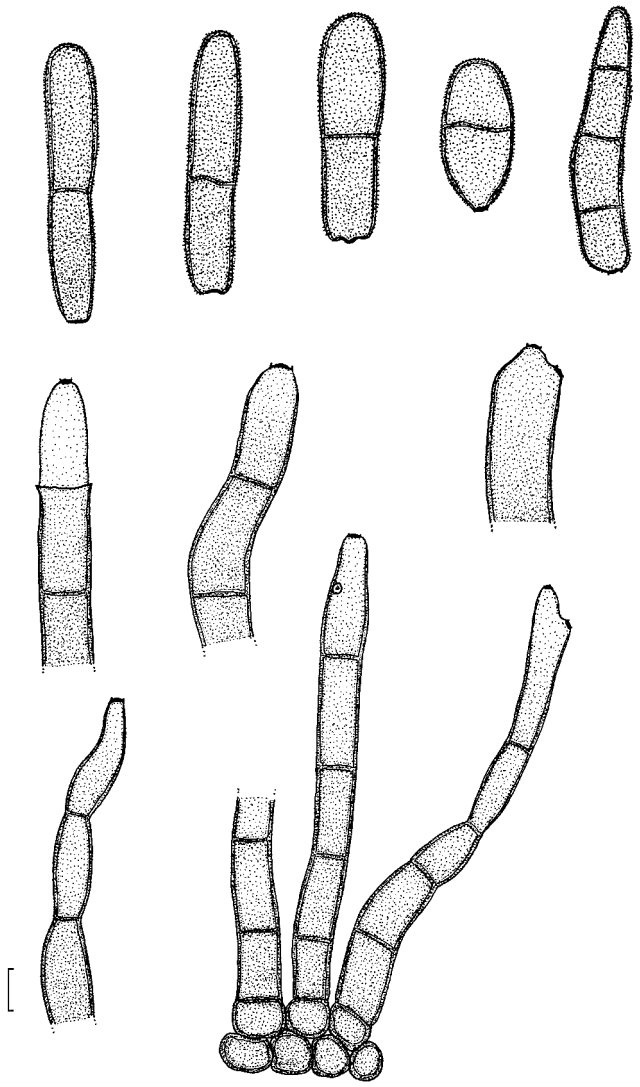


**Fig. 20.** *Cladosporium allii-cepae* (BPI 1108762). Fascicle of conidiophores, conidiophores, conidiogenous cells and conidia *in vivo*. Scale bar = 10 µm. U. Braun *del*.

to 20 µm diam, brown, wall somewhat thickened. *Conidiophores* solitary to caespitose, loose to dense, erect, straight, subcylindrical to geniculate-sinuous, usually not torulose-nodulose, at most cells slightly swollen by constrictions at septa, usually unbranched, rarely branched, 60–150(–250) × 4–19 µm, pluriseptate, rather pale to medium olivaceous or brownish, walls thickened, 0.5–2.5 µm wide, thicker walls in the lower half sometimes distinctly two-layered, smooth or occasionally faintly rough-walled. *Conidiogenous cells* integrated, terminal, 10–60 µm long, straight, curved to sinuous, but barely geniculate, apex mostly rounded, sympodial, occasionally enteroblastically proliferating, usually with 1–3 conidiogenous loci per cell, conspicuous, but barely or only slightly protuberant, 2–5 µm wide, 1–1.5 µm high, periclinal rim not very evident. *Conidia* solitary, occasionally in short chains, broadly ellipsoid-ovoid, soleiform, subcylindrical, 30–90(–120) × 12–20 µm, (0–)1–2(–3)-septate, septa often somewhat curved to sinuous with age, usually not constricted at septa or only slightly so, very pale to pale olivaceous, olivaceous-brown or brown, wall thin to slightly thickened, 0.5–1.5 µm, densely verruculose-verrucose, ends rounded, sometimes becoming truncate to concave at the base with age, hila 2–4 µm wide, 1 µm high, not very protuberant, somewhat darkened-refractive.

*Substrates and distribution*: On *Allium* spp. (*Amaryllidaceae*); Asia, Europe, North and South America – *Allium cepa* (Argentina, Brazil, Canada, Chile, China, Denmark, France, Greece, India, Ireland, Japan, Korea, Norway, Peru, Serbia, UK, USA, CA, CO, WA), *A. fistulosum* (China, Korea, Norway).

*Additional specimens examined*: **India**, Kashmir, Lalmandi, Agric. Res. Station, on *Allium cepa*, 9 Aug. 1957, T.N. Kaul (IMI 69995). **Ireland**, Dublin, on *Allium cepa*, 26 May 1976, E.W. Ryne (IMI 228272).

*Notes*: *Cladosporium allii* differs from *C. allii-cepae* by its much smaller conidia. Zhang *et al.* (2003) listed *Allium ascalonicum* as host of the latter species from China, which is, however, very probably wrong as *A. escalonicum auct.* non L. has previously often been applied to shallots. The record of *Allium sibiricum* from India, Kashmir as host of *C. allii-cepae* (Ellis 1976) is also wrong and undoubtedly refers to the IMI specimen cited above, in which the host proved to be *A. cepa*. Kiehr *et al.* (1997) recorded this species from Argentina and summarised its distribution in South America, including a list of literature references.

**7. *Cladosporium alneum*** Pass. ex K. Schub., Schlechtendalia 14: 56. 2006. Figs 21, 22.

≡ *Cladosporium alneum* Pass., *in herb*.

*Holotype*: **Italy**, Emilia Romagna, Parma, on living leaves of *Alnus glutinosa* (*Betulaceae*), 1879, G. Passerini (B 700006156).

*Lit.*: Schubert (2005b: 35–37).
*Ill.*: Schubert (2005b: 37, fig. 4, pl. 2, figs A–C), Schubert *et al*. (2006: 57, fig. 1, pl. 1, fig. A).

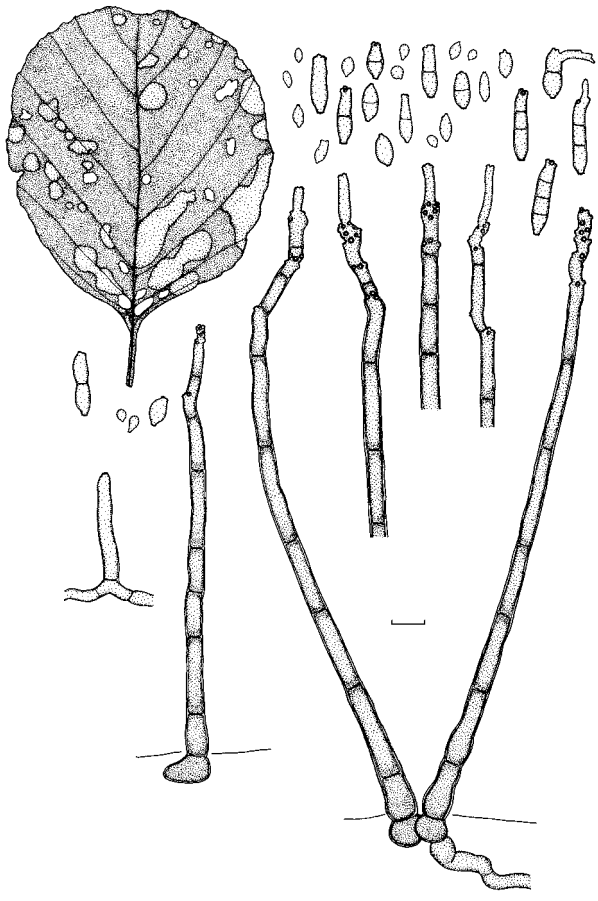


**Fig. 21.** *Cladosporium alneum* (B 700006156). Symptoms, conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

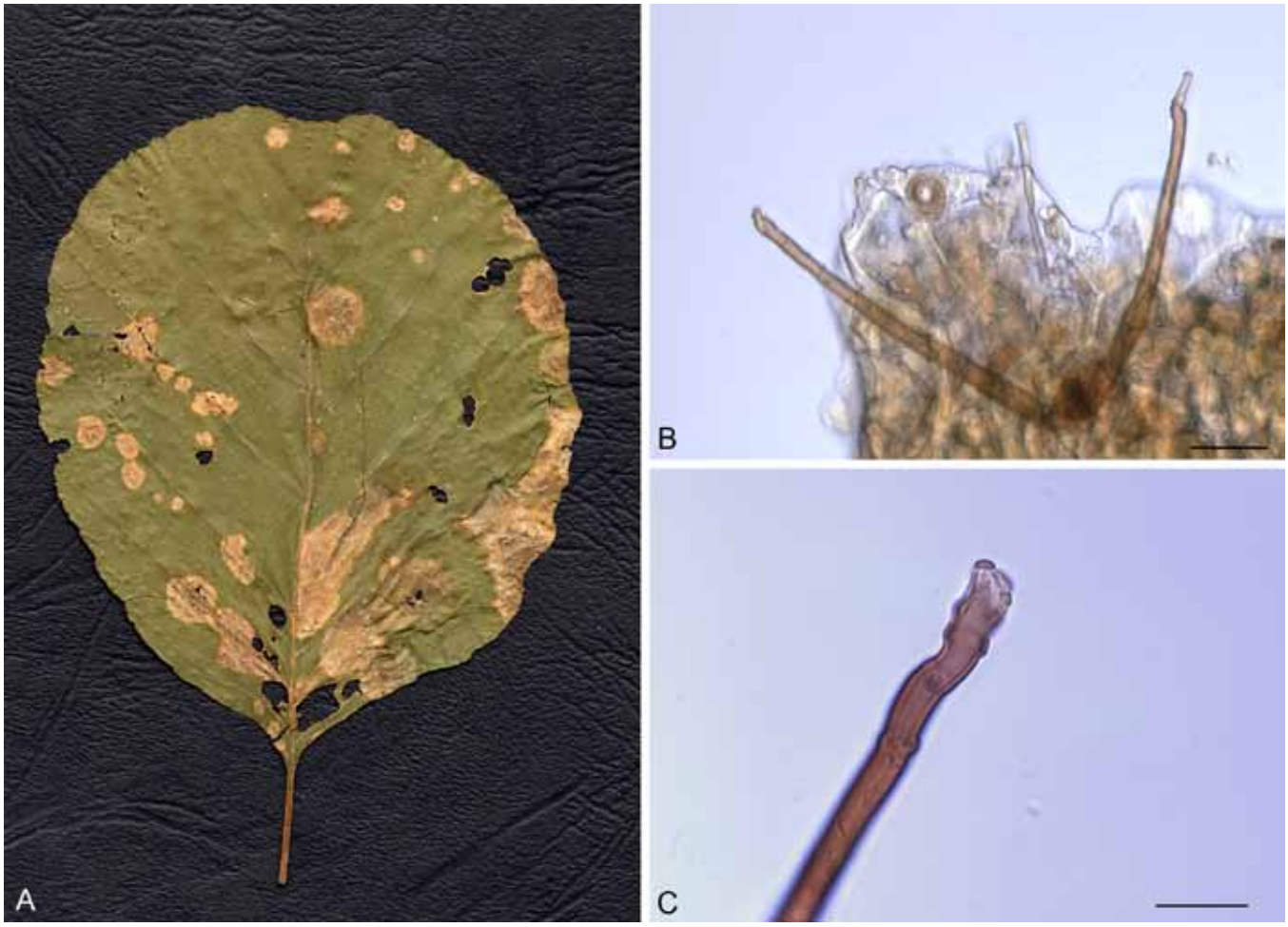



**Fig. 22.** *Cladosporium alneum* (B 700006156). A. Symptoms. B. Overview, small, loose group of conidiophores. C. Tip of a conidiophore with several somewhat darkened conidiogenous loci. Scale bars = 10 (C), 20 (B) µm.

*In vivo*: Leaf spots amphigenous, subcircular, oval to somewhat irregular in outline, scattered over the whole leaf surface, extending and often confluent, becoming oblong-irregular, 1–30 mm long, 1–13 mm wide, pale brownish, ochraceous or clay-coloured, becoming grey-brown or olivaceous-brown by dense fructification, mostly without margin, occasionally with a narrow, irregular, pale to medium reddish brown margin, affected areas turning fragile and finally forming shot hole symptoms. *Colonies* amphigenous, scattered to subeffuse, loosely caespitose, brown, villose. *Mycelium* internal, subcuticular to intra-epidermal, sometimes also external, growing superficially; hyphae unbranched or sparingly branched, 3–9 µm wide, septate, sometimes slightly constricted at the septa, pale to medium olivaceous-brown or medium brown, smooth, walls somewhat thickened, forming swollen hyphal cells, subglobose, 7–13 µm wide, medium brown or medium olivaceous-brown, smooth, thick-walled. *Stromata* usually absent, sometimes developed, small, up to 30 µm diam, composed of swollen hyphal cells. *Conidiophores* solitary, in pairs of two or sometimes in loose groups, arising from swollen hyphal cells, erumpent, sometimes arising from internal and external hyphae, lateral and terminal, erect, straight to somewhat flexuous, sometimes slightly geniculate-sinuous and subnodulose towards the apex, unbranched, 25–260 × (2–)3–7(–8.5) µm, pluriseptate, pale to usually pale medium brown or medium brown, paler towards the apex, sometimes subhyaline, smooth to somewhat asperulate, especially near the base, walls thickened, one-layered or two-layered, inner wall not very conspicuous, 0.5–1 µm wide, usually attenuated towards the apex, sometimes slightly swollen at the base, up to 10 µm wide, protoplasm of the cells somewhat aggregated at the septa, appearing to be thickened, similar to distoseptation. *Conidiogenous cells* integrated, terminal and intercalary, cylindrical-oblong, 9–46 µm long, proliferation sympodial, with several or even numerous conidiogenous loci, sometimes situated on small lateral shoulders or crowded at small multilateral swellings but not confined to them, protuberant, short cylindrical, subdenticulate, (0.5–)1–2(–2.5) µm diam, thickened, refractive to somewhat darkened. *Conidia* catenate, usually in branched chains, subglobose, ovoid, ellipsoid-ovoid, subcylindrical to cylindrical, 3–23 × 2.5–6 µm, 0–3-septate, sometimes slightly constricted at the septa, pale brown or pale olivaceous, sometimes almost subhyaline, smooth, walls somewhat thickened, apex rounded or with a single or several hila, slightly attenuated towards the base, hila protuberant, 0.5–2(–2.5) µm diam, obconically truncate, thickened, refractive to somewhat darkened; microcyclic conidiogenesis occurring.

*Substrate and distribution*: On *Alnus glutinosa*; Italy.

*Notes*: *Cladosporium alneum* is morphologically very close to *C. oncobae*, described from New Zealand on *Oncoba*, but differs in having deviating lesions and conidiophores with somewhat thinner walls. Since the two species are geographically and ecologically clearly distinct, we prefer to maintain two separate species. All other species of *Cladosporium s. lat.* on *Alnus* are quite distinct from *C. alneum* and proved to belong to *C. herbarum* (*viz.*, *C. alnicola* Corda and *C. alnicola* Bubák & Vleugel) or *Passalora* (*C. bacilligerum*).

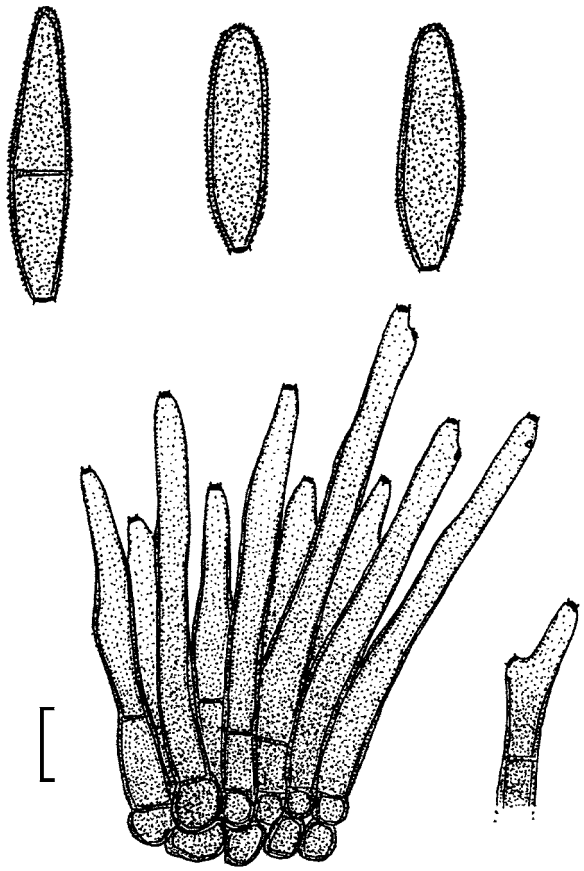


**Fig. 23.** *Cladosporium alopecuri* (NY). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. U. Braun *del*.

**8. *Cladosporium alopecuri*** (Ellis & Everh.) U. Braun, Schlechtendalia 5: 32. 2000. Fig. 23.
*Basionym*: *Fusicladium alopecuri* Ellis & Everh., J. Mycol. 4: 53. 1888.

*Holotype*: **USA**, Montana, Columbia Falls, on *Alopecurus geniculatus* (*Poaceae*), 20 May 1887, B.T. Galloway (NY).

*Lit.*: Schubert (2005b: 38).
*Ill.*: Braun (2000: 33, fig. 2), Schubert (2005b: 38, fig. 5).

*In vivo*: Symptoms on faded host plants, definite leaf spots lacking, but with yellowish ochraceous to brownish, later greyish brown discolorations. *Colonies* amphigenous, punctiform, scattered to dense, brown to blackish brown, later dark greyish brown. *Mycelium* internal, immersed, forming moderately large stromata, olivaceous to olivaceous-brown, occasionally confluent. *Conidiophores* in well-developed, usually fairly large, dense fascicles, sometimes in palisade-like layers, arising from stromata, erumpent, erect, straight, subcylindrical to slightly geniculate-sinuous, unbranched, 40–120 × 5–9 µm, 0–1-septate, subhyaline, pale olivaceous to yellowish or olivaceous-brown, smooth, thin-walled, conidiophores usually reduced to conidiogenous cells, mostly with a single or only two conidiogenous loci, conspicuous, 3.5–5 µm diam, thickened, darkened. *Conidia* solitary, obovoid, ellipsoid-ovoid, short cylindrical, 20–40 × 7–13(–15) µm, 0–1-septate, subhyaline, pale olivaceous-yellowish to pale brown, densely finely asperulate-echinulate, apex obtuse, broadly rounded, base obconically truncate, hila protuberant, 3–5 µm diam, periclinal rim only slightly raised, often not very conspicuous, thickened, darkened.

*Substrate and distribution*: On *Alopecurus geniculatus*; USA.

*Notes*: *Cladosporium alopecuri* belongs to a group of leaf-spotting species with fasciculate conidiophores. It is well characterised by forming usually rather large, dense fascicles, sometimes in palisade-like layers, arising from often large stromata. These characters distinguish this species from all other plant pathogenic species of *Cladosporium*, including the morphologically otherwise close *C. phlei*. Zhang *et al*. (2003) listed this species on *Alopecurus geniculatus*, *A. aequalis* and *Polypogon fugax* (= *P. higegaweri*) from China, and considered *Fusicladium alopecuri* Sawada (*nom. inval.*), introduced without Latin diagnosis, a synonym of *F. alopecuri* Ellis & Everh., which could not be confirmed since type material of *F. alopecuri* Sawada could not be traced and the Chinese collections were not available for a re-examination.

**9. *Cladosporium angustisporum*** Bensch, Summerell, Crous & U. Braun, Stud. Mycol. 67: 17. 2010. Figs 24, 25.

*Holotype*: **Australia**, north Queensland, Daintree N.P., isol. from *Alloxylon wickhamii* (*Proteaceae*), coll. B.A. Summerell, isol. P.W. Crous (CBS H-20423). *Ex-type culture*: CBS 125983 = CPC 12437.

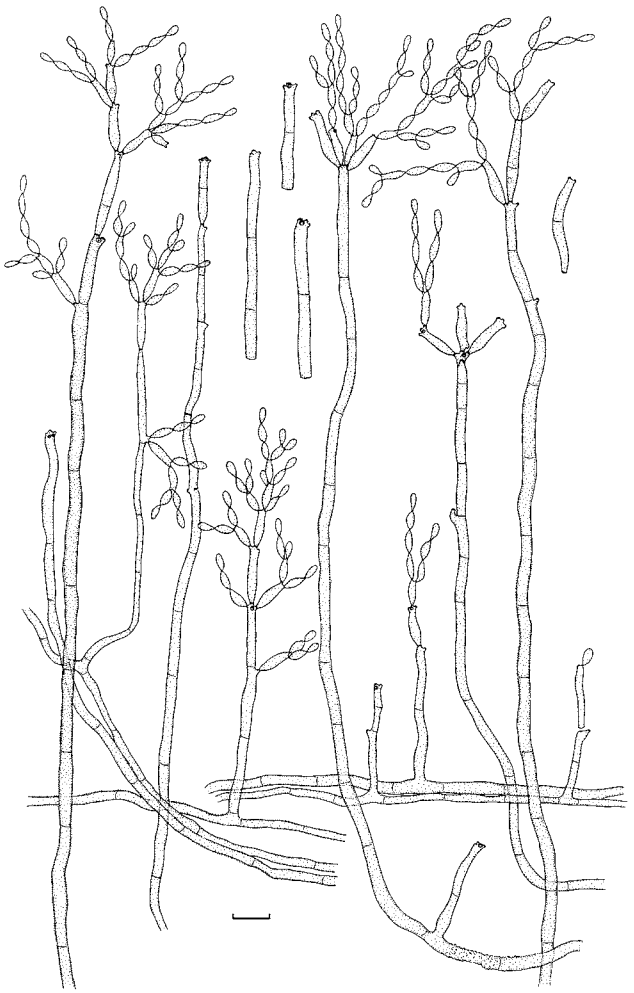


**Fig. 24.** *Cladosporium angustisporum* (CBS 125983). Macro- and micronematous conidiophores, mycelium often forming ropes, ramoconidia and conidial chains *in vitro*. Scale bar = 10 µm. K. Bensch *del*.

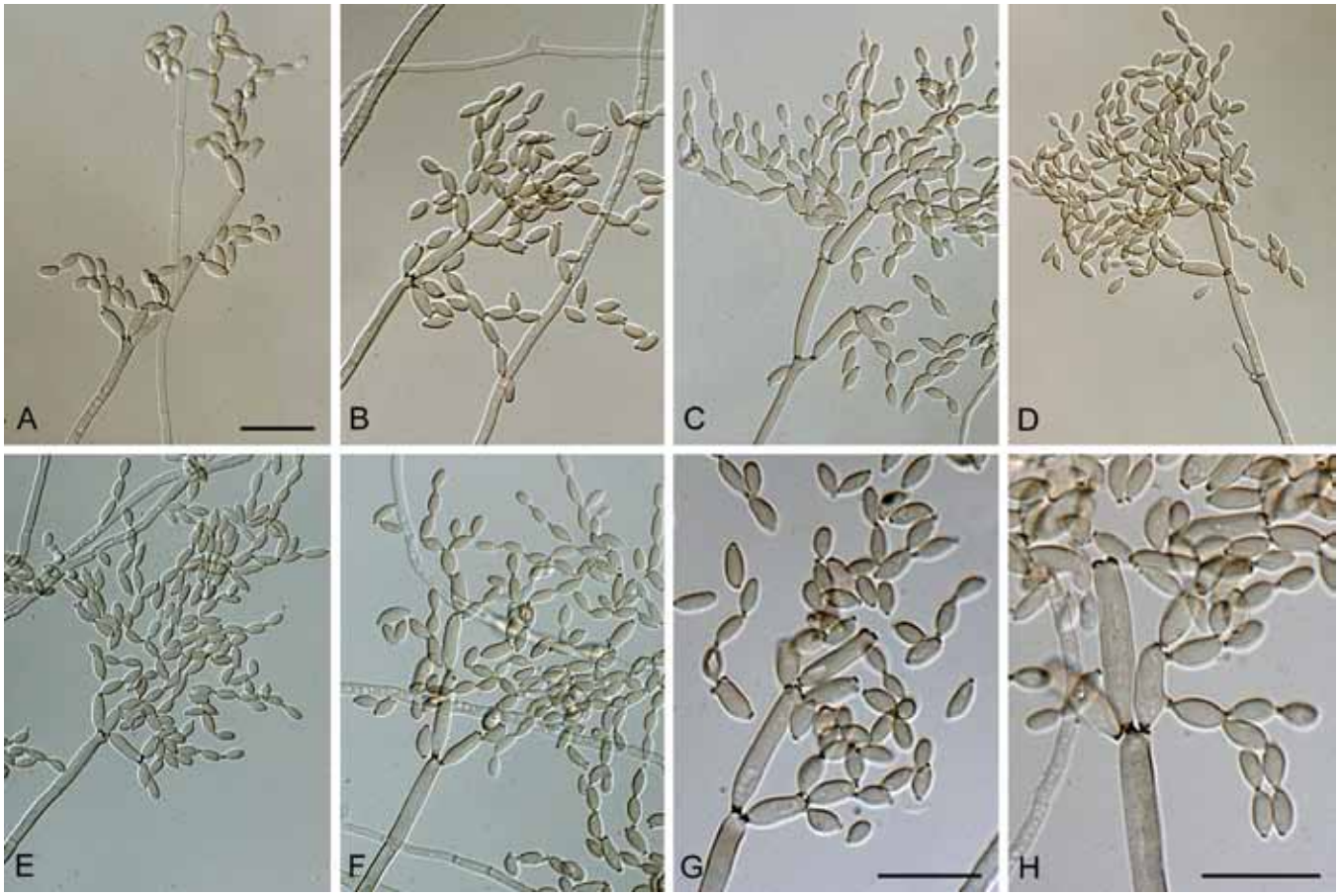



**Fig. 25.** *Cladosporium angustisporum* (CBS 125983). A–H. Macronematous conidiophores and conidial chains. Scale bars = 10 µm.

*Ill.*: Bensch *et al.* (2010: 21, figs 5–6).

*In vitro: Mycelium* immersed and superficial; hyphae branched, 1–3 µm wide, septate, mostly not constricted at septa, subhyaline to olivaceousbrown, smooth to verruculose or irregularly rough-walled, walls unthickened, sometimes irregular in outline due to swellings and constrictions, forming expanded hyphal ropes. *Conidiophores* solitary, macro- and micronematous, erect or ascending, arising terminally from ascending or laterally from plagiotropous hyphae, straight or flexuous, filiform to cylindrical-oblong, non-nodulose, usually not geniculate, two types of conidiophores, short and long ones, 22–280 × (1.5–)2–4 µm, pluriseptate, not constricted at septa, but sometimes irregular in outline due to wider or narrower parts within the stalk, pale to medium olivaceous-brown or pale olivaceous, smooth or verruculose at the base, walls unthickened or slightly thickened. *Conidiogenous cells* integrated, mainly terminal, sometimes also intercalary, neither nodulose nor geniculate, narrowly cylindrical-oblong, 10–27 µm long, with several loci crowded at the apex, in intercalary conidiogenous cells loci mainly situated on small lateral denticles just below a septum, subdenticulate, conspicuous, 1–1.5(–2) µm diam, thickened and darkened-refractive. *Ramoconidia* cylindrical, 18–42(–55) µm long, 0–1-septate, concolouress with tips of conidiophores, base broadly truncate, 2.5–3 µm wide, unthickened but sometimes slightly refractive. *Conidia* catenate, in branched chains, with 1–5 conidia in the terminal unbranched part of the chain, branching in all directions, small terminal conidia obovoid to narrowly ellipsoid, 3–6.5 × 1.5–2 µm (av. ± SD: 4.9 ± 1.0 × 1.8 ± 0.3), aseptate, intercalary conidia narrowly ellipsoid, fusiform, (4–)5.5–11.5(–13) × (1.5–)2–2.5(–3) µm (av. ± SD: 8.1 ± 2.4 × 2.4 ± 0.4), 0(–1)-septate, with 1–3 distal hila, secondary ramoconidia ellipsoid to subcylindrical or cylindrical, (6–)7.5–26 × 2–3 µm (av. ± SD: 14.9 ± 6.1 × 2.7 ± 0.4), 0–1-septate, not constricted at the median septum, pale olivaceous or pale olivaceous-brown, smooth, walls unthickened, somewhat attenuated towards apex and base, with 2–4(–5) distal hila, hila conspicuous, subdenticulate, 0.5–2 µm diam, thickened and darkened-refractive.

*Culture characteristics*: Colonies on PDA attaining 57–76 mm diam after 1 mo, pale olivaceous-grey to smoke-grey, mouse-grey due to abundant sporulation, glaucous-grey towards margins, reverse greenish-black, fluffy, margin whitish, feathery, broad, aerial mycelium abundant, woolly to fluffy, covering almost the whole colony surface, without prominent exudates, sporulating. Colonies on MEA reaching 45–60 mm diam after 1 mo, smoke-grey, whitish to pale olivaceous-grey due to abundant aerial mycelium, reverse iron-grey to pale greenish-grey, velvety to woolly-fluffy, margin colourless to whitish, feathery, regular, aerial mycelium abundant, dense, fluffy, without prominent exudates, sporulation profuse.

*Substrate and distribution*: On *Alloxylon wickhamii*; Australia.

*Notes*: *Cladosporium angustisporum* belongs to the *C. cladosporioides* complex and is morphologically very close to *C. cladosporioides s. str.* but differs in having distinctly narrower conidia, 1.5–3 µm wide. Furthermore, the mycelium is often aggregated in hyphal ropes, and the conidiophores are dimorphic. In phylogenetic analyses, *C. angustisporum* proved to be allied to *C. subuliforme* and *C. vignae* but is distinct and morphologically and ecologically easily distinguishable (Bensch *et al.* 2010).

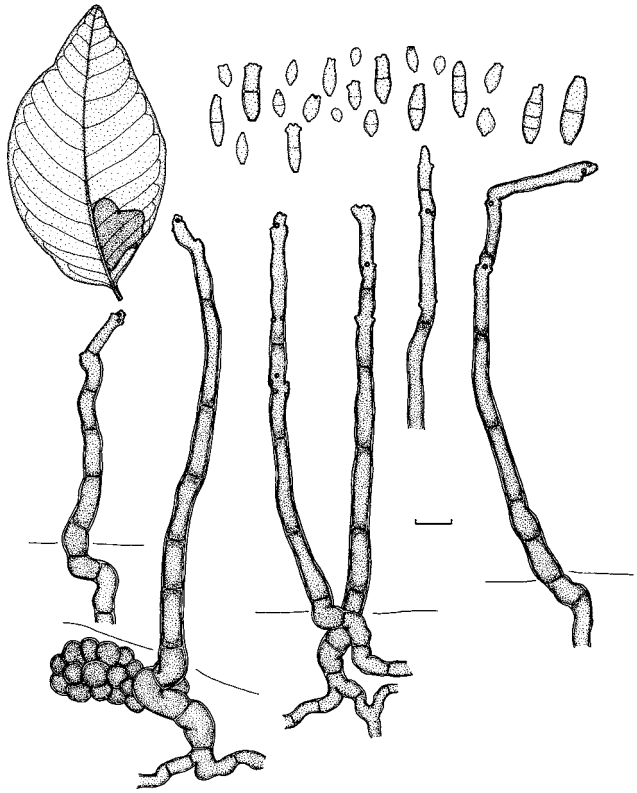


**Fig. 26.** *Cladosporium annonae* (SIENA). Symptoms, conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

**10. *Cladosporium annonae*** Nann., Atti Reale Accad. Fisiocrit. Siena, Ser. 10, 4(1–2): 91. 1929, as "*anonae*". Figs 26, 27.

*Holotype*: **Italy**, Siena, botanical garden, on living leaves of *Annona* sp. (*Annonaceae*), Aug. 1928, mixed infection with *C. herbarum* as secondary invader (SIENA).

*Lit.*: Saccardo (1972: 1336), Schubert (2005b: 39–40).
*Ill.*: Schubert (2005b: 39, fig. 6, pl. 2, figs D–F).

*In vivo*: Leaf spots amphigenous, irregular in shape and size, often near to or limited by the midrib, pale to medium brown, mostly surrounded by a narrow, more or less irregular, medium to dark brown margin, paler below, becoming fragile with age, surrounding leaf tissue often somewhat discoloured, yellowish to olivaceous. *Colonies* epiphyllous, loosely scattered, caespitose, brown. *Mycelium* internal, subcuticular to intraepidermal; hyphae branched, 2.5–7 µm wide, septate, with swellings and constrictions, single hyphal cells up to 12 µm wide, pale to medium olivaceous-brown, smooth, walls thickened, forming a loose to somewhat denser hyphal network, sometimes aggregated. *Stromata* mostly absent, sometimes developed, 10–35 µm diam, composed of swollen hyphal cells, subglobose, 5–8 µm diam, medium dark olivaceous-brown to brown, smooth, thick-walled, walls up to 1 µm wide. *Conidiophores* mostly solitary or in small loose groups, arising from internal hyphae, swollen hyphal cells or stromata, erumpent through the cuticle, erect, straight to somewhat flexuous, cylindrical-oblong, usually without swellings, unbranched, 45–


**Fig. 27.** *Cladosporium annonae* (SIENA). A. Symptoms. B. Tip of a conidiophore with several somewhat darkened conidiogenous loci. C. Conidiophore and conidia. Scale bars = 10 (B–C) µm.

150(–300) × (3.5–)4–7 µm, septate, not constricted at the septa, medium olivaceous-brown or brown, often somewhat paler at the apex, smooth, walls thickened, mostly distinctly two-layered, up to 1 µm wide, often wider or swollen at the base, 7–11 µm, protoplasm of the cells somewhat aggregated at the septa, so that the walls and septa appear to be thickened (as in distoseptation). *Conidiogenous cells* integrated, terminal and intercalary, cylindrical, 7–43 µm long, proliferation sympodial, with several conidiogenous loci, sometimes situated on small shoulders, protuberant, almost flat to short cylindrical, 1–2(–2.5) µm diam, thickened, refractive, sometimes slightly darkened. *Conidia* mostly in branched chains, straight, subglobose, obovoid, ellipsoid, sometimes subcylindrical, 3–15(–19) × (2–)3–4.5(–6) µm, 0–1(–3)-septate, not constricted at the septa, at first subhyaline, later pale olivaceous-brown, smooth, walls somewhat thickened, apex rounded or attenuated towards the apex and base, hila protuberant, (0.5–)1–2(–2.5) µm diam, thickened, refractive to somewhat darkened; sporadically microcyclic conidiogenesis occurring.

*Substrate and distribution*: On *Annona* sp.; Italy.

*Notes*: *Cladosporium annonae* belongs to a group of leaf-spotting *Cladosporium* species. Type material has been examined, but the observed conidiophores are much shorter than those given in Nannizzi's (1929) original description (240–300 µm). *Cladosporium populicola* and *C. alneum* are two somewhat similar leaf-spotting species that are, however, ecologically and morphologically easily distinguishable (see keys and Schubert 2005b). *Cladosporium alneum* differs from *C. annonae* in having longer and usually somewhat wider conidia, 3–23 × 2.5–6 µm, and conidiophores arising from swollen hyphal cells as well as internal and external creeping hyphae. The conidiophores of *C. populicola*, often with a distinct lumen which is clearly separated from the inner wall, are sometimes apically branched, possess thicker walls, (0.5–)1–2 µm wide, and often proliferate enteroblastically. This phenomenon is visible as a discontinuity in pigmentation and in thickness of the wall.

**11. *Cladosporium antarcticum*** K. Schub., Crous & U. Braun, Stud. Mycol. 58: 115. 2007. Figs 28–30.

*Holotype*: **Antarctica**, King Georg, Arctowski, isol. from the lichen *Caloplaca regalis* (*Teloschistaceae*), 1991, C. Möller, No. 32/12 (CBS H-19857). Isotype: HAL 2024 F. *Ex-type culture*: CBS 690.92.

*Ill.*: Schubert *et al.* (2007b: 116–117, figs 6–8).

*In vitro*: *Mycelium* immersed and superficial, dimorphic, branched, often with short lateral outgrowths, narrow hyphae 1–3 µm wide, hyaline to subhyaline, thin-walled, hyphae of the second type wider, 3.5–8(–9) µm, pluriseptate, often somewhat constricted at the septa, sometimes swollen, pale to dark greyish olivaceous or olivaceous-brown, smooth or verruculose, thick-walled, sometimes even two-layered (two distinct wall layers visible), 1(–1.5) µm thick, hyphae appearing consistently enveloped in polysaccharide-like material or covered by a slime coat. *Conidiophores* micronematous and macronematous, solitary or in loose groups, arising from plagiotropous or ascending hyphae, terminally or usually laterally. *Macronematous conidiophores* erect to somewhat decumbent, straight to somewhat flexuous or bent, cylindrical, once or several times slightly to distinctly geniculate towards the apex due to sympodial proliferation, unbranched or once branched, up to 120 µm long, 3–4.5 µm wide, sometimes slightly attenuated towards the apex, pluriseptate, up to eight septa, occasionally slightly constricted at the septa, pale to medium or even dark olivaceous-brown or greyish brown, paler towards apices, smooth to somewhat rough-walled, walls thickened but thinner-walled towards apices, sometimes slightly swollen at the base, up to 6 µm wide. *Conidiogenous cells* integrated, terminal and intercalary, once or several times slightly to distinctly geniculate, 10–33 µm long, proliferation sympodial, with several or numerous conidiogenous loci, at first terminal, later turning to one side of the stalk and situated on small lateral shoulders, up to 14 per cell, protuberant, denticulate, 1–1.5(–2) µm diam, thickened and darkened-refractive. *Micronematous conidiophores* as short lateral, peg-like outgrowths with a single apical scar or somewhat longer, occasionally once geniculate with several conidiogenous loci at the apex, 2–22 × 2–3 µm, pale greyish olivaceous, loci denticulate. *Ramoconidia* occasionally occurring, cylindrical, up to 30 µm long, 4–5 µm wide, 0–1-septate, concolorous with the tips of conidiophores, with a broadly truncate, unthickened and not darkened base, without dome and rim, 2.5 µm wide. *Conidia* catenate, in branched chains, straight, small terminal conidia obovoid, limoniform or narrowly ellipsoid, 4–14 × 2.5–4 µm [av. ± SD, 8.5 (± 3.3) × 3.5 (± 0.6)], 0(–1)-septate, secondary ramoconidia ellipsoid to cylindrical, often with several or numerous conidial hila crowded at the distal end, up to 12, 13–30 × 4–5 µm [av. ± SD, 20.1 (± 5.8) × 4.3 (± 0.5) µm], 0–3-septate, sometimes slightly constricted at the median septum, pale olivaceous-brown or greyish brown, minutely verruculose to verrucose (granulate under SEM), walls more or less thickened, rounded or slightly attenuated towards apex and base, hila protuberant, denticulate, 0.8–1.5(–2) µm diam, thickened and darkened-refractive; microcyclic conidiogenesis occurring.

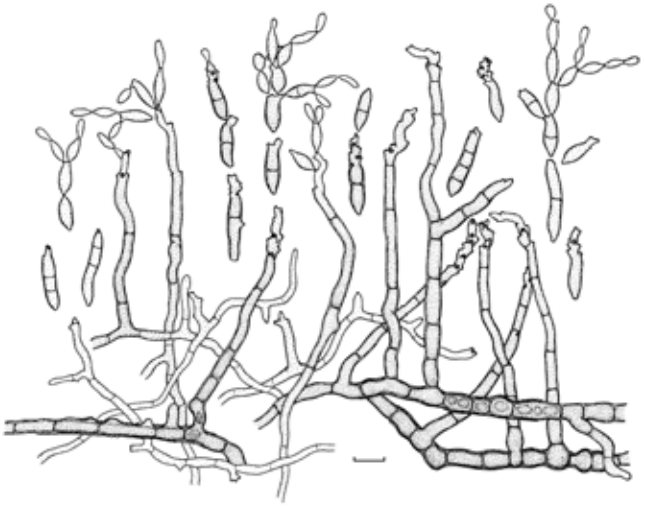


**Fig. 28.** *Cladosporium antarcticum* (CBS 690.92). Macro- and micronematous conidiophores and conidia *in vitro*. Scale bar = 10 µm. K. Bensch *del*.

*Culture characteristics*: *Colonies on PDA* attaining 9 mm diam after 14 d at 25 ºC, greenish olivaceous to grey olivaceous, at the margin becoming dull green, reverse with a pale olivaceous grey centre and a broad olivaceous black margin, margin narrow, regular, entire edge, white, feathery, aerial mycelium sparse but colonies appearing felty, growth flat with somewhat elevated colony centre, prominent exudates not formed, sporulation dense, covering almost the whole colony. *Colonies on MEA* attaining 12 mm diam after 14 d at 25 ºC, olivaceous grey to iron grey, iron grey reverse, velvety

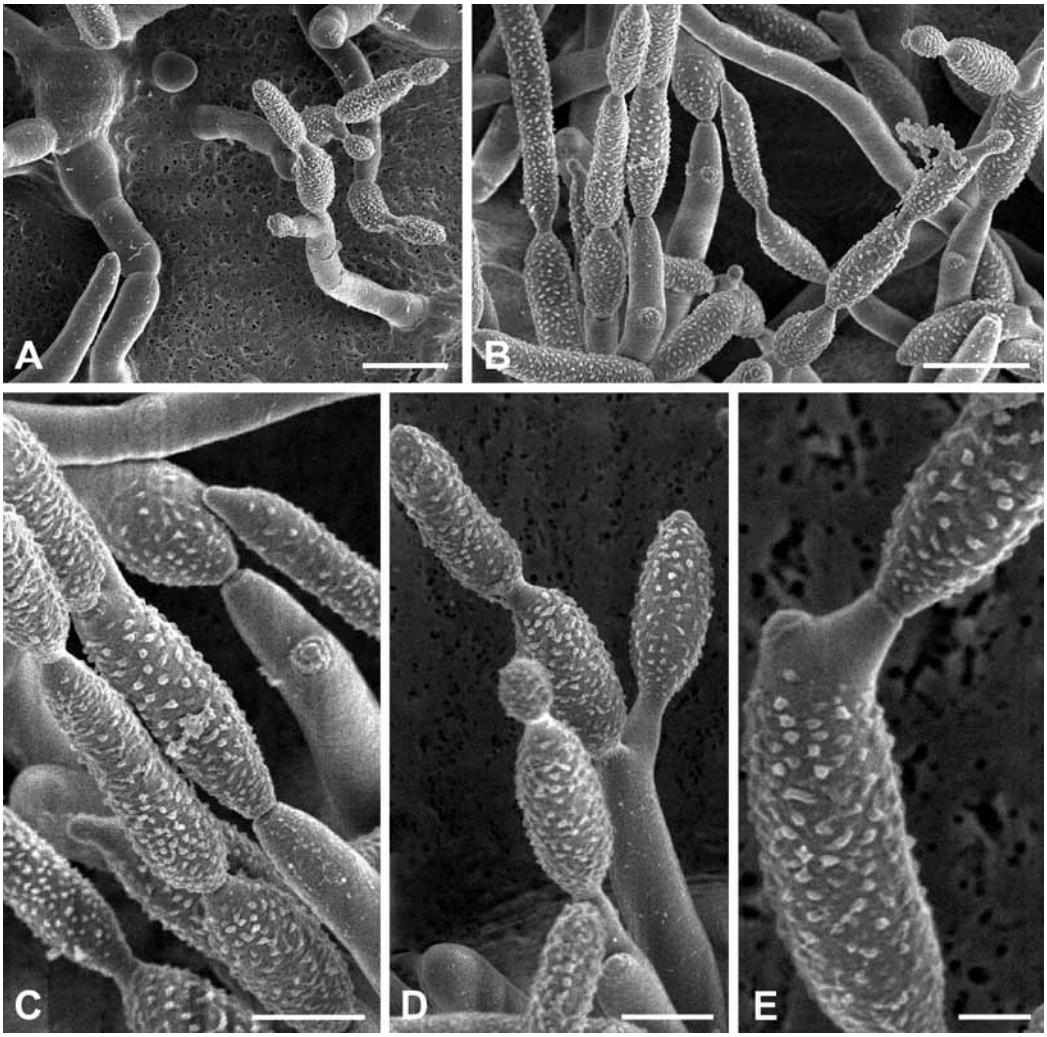



**Fig. 29.** *Cladosporium antarcticum* (CBS 690.92). A. Overview of the growth pattern on SNA. Note the very large bulbous cells formed at the base of different conidiophores. Other conidiophores sprout from the agar surface. B. Overview of conidiophores and conidia. Note the large distance of the scars on the conidiophore and the different stages of conidial formation on the tips of other conidia. The long secondary ramoconidia are also visible, and sparse aerial hyphae. C. Detail of B with details of the ornamentation and scars. The absence of ornamentation at the apical (spore-forming) end of the secondary ramoconidium is clearly visible. D–E. Tubular structures on conidiophore (D) and secondary ramoconidium (E). Scale bars = 2 (E), 5 (C–D), 10 (A–B) µm.

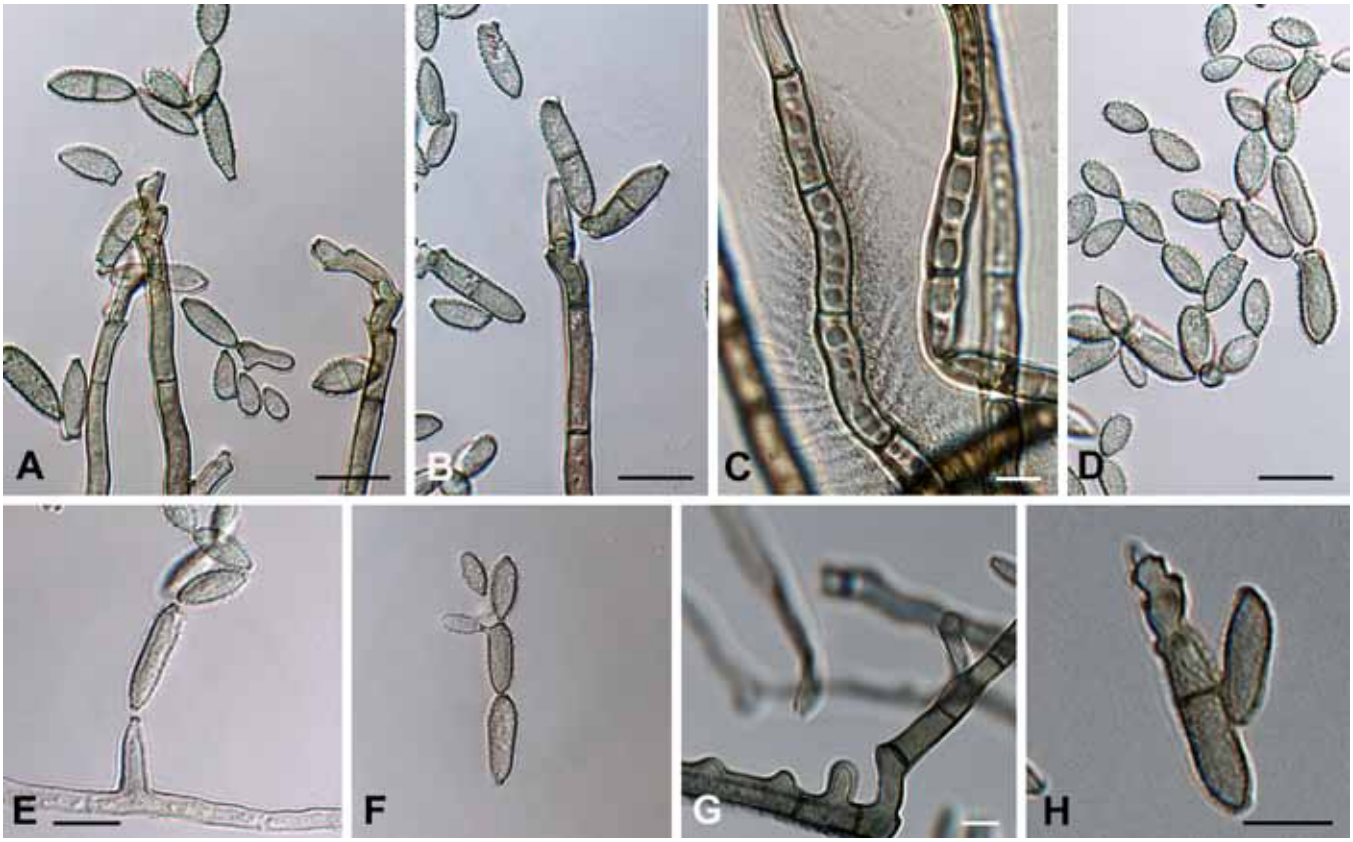



**Fig. 30.** *Cladosporium antarcticum* (CBS 690.92). A–B. Macronematous conidiophores. C, G. Mycelium enveloped by a polysaccharide-like layer. D, F. Conidia. E. Micronematous conidiophore. H. Ramoconidium with numerous distal scars. Scale bars = 10 µm.

to powdery, aerial mycelium sparse, sporulation profuse. *Colonies on OA* attaining 4 mm after 14 d at 25 ºC, olivaceous grey, aerial mycelium sparse, diffuse, growth flat, without prominent exudates, sporulating.

*Substrate and distribution*: On the lichen *Caloplaca regalis*; Antarctica.

*Notes*: Two genuine lichenicolous *Cladosporium* species are known, *viz*., *C. antarcticum* and *C. licheniphilum*, described on apothecia of *Pertusaria alpina* in Russia. The latter species is, however, quite distinct from *C. antarcticum* by its subcylindrical or only slightly geniculate-sinuous, wider conidiophores, 5–8 µm diam, with numerous characteristically terminal branches and much shorter, 0–1-septate, smooth conidia, 3.5–13 × 3–7 µm (Heuchert & Braun 2006). Other *Cladosporium* species described from lichens, *viz*., *C. lichenicola*, *C. arthoniae* and *C. lichenum* are invalid or have been excluded (see list of excluded *Cladosporium* species).

**12. *Cladosporium aphidis*** Thüm., Oesterr. Landwirtsch. Wochenbl. 2(43): 505. 1876. Figs 31–33.

*Lectotype* (**designated here**): **Austria**, Klosterneuburg, on *Symphytum officinale* (*Boraginaceae*), associated with *Aphis symphyti*, Aug. 1875, Thümen, Herb. Mycol. Oecon. 484 (B 700006165). *Isolectotypes*: Thümen, Herb. Mycol. Oecon. 484 (*C. aphidis* mixed with *C. herbarum*).

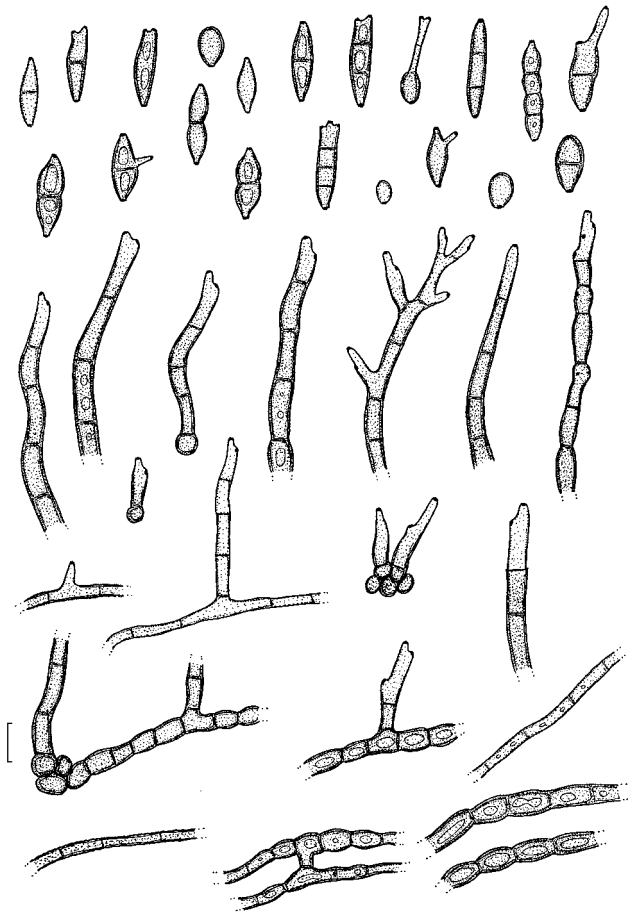


**Fig. 31.** *Cladosporium aphidis* (B 700006165). Mycelium, conidiophores and conidia *in vivo*. Scale bar = 10 µm. U. Braun *del*.

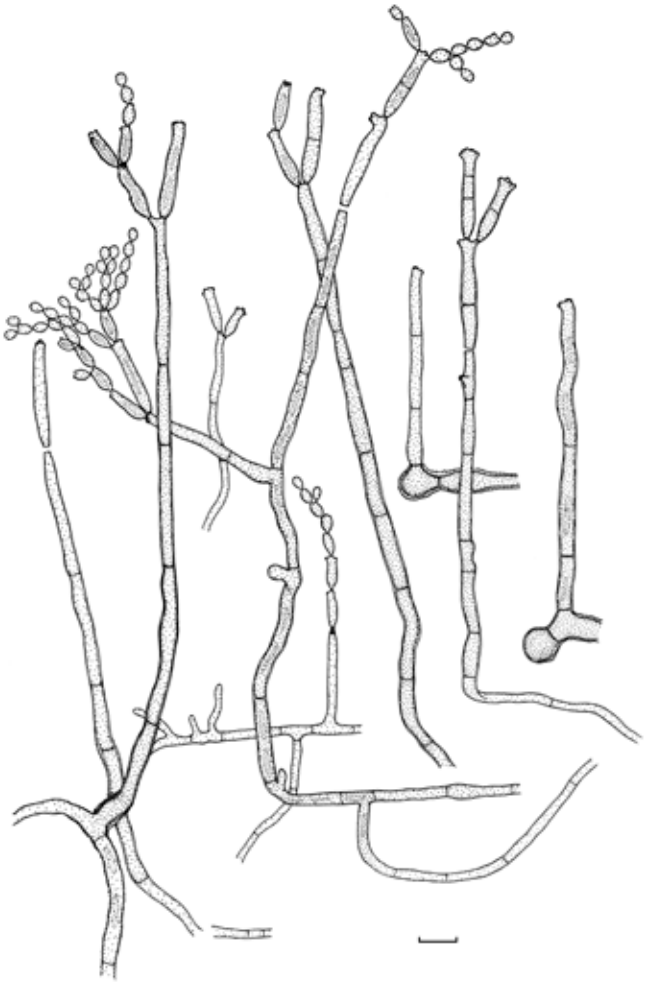


**Fig. 32.** *Cladosporium aphidis* (CBS H-20938). Conidiophores and conidia *in vitro*. Scale bar = 10 µm. K. Bensch *del*.

*Epitype* (**designated here**): **Germany**, Nordrhein-Westfalen, Essen, botanical garden, superficially on dead carcasses of aphids on leaves of *Echium vulgare* (*Boraginaceae*), 27 June 2006, N. Ale-Agha (CBS H-20938, HAL). *Ex-type culture*: CBS 132182 = CPC 13204.

≡ *Cladosporium aphidis* Thüm., Herb. Mycol. Oecon., Fasc. X, No. 484. 1877.
= *Cladosporium aphidis* Thüm., Oesterr. Bot. Z. 27: 12. 1877 [syntypes: Thümen, Mycoth. Univ. 672, *e.g.*, B, HAL, HBG].
≡ *Cladosporium aphidis* Thüm., Mycoth. Univ., Cent. VII, No. 672. 1877.
= *Cladosporium aphidigenum* Pass., *in herb*. (B).

*Lit*.: Saccardo (1886: 369), Lindau (1907: 830), Ferraris (1912: 351), Lind (1913: 522), Zhang *et al*. (2003: 43).
*Ill*.: Zhang *et al*. (2003: 43, fig. 16).
*Exs*.: Roumeguère, Fungi Sel. Gall. Exs. 5192 p.p.; Thümen, Herb. Mycol. Oecon. 484; Thümen, Mycoth. Univ. 672.

*In vivo*: *Colonies* on carcasses of aphids, on leaves and stems punctiform to effuse, floccose, often overgrowing entire carcasses and spreading around the aphids, thin to dense, later often forming colonies on the leaf surface around the carcasses, finally sometimes spread on the whole leaf, forming superficial colonies without nutritive contact to the host plant, *i.e.*, entirely superficial, patches or effuse, loose to dense, springing from germinating conidia, probably nourishing from the honey dew produced by the aphids, colonies olivaceous-brown to dark brown. *Mycelium* in and

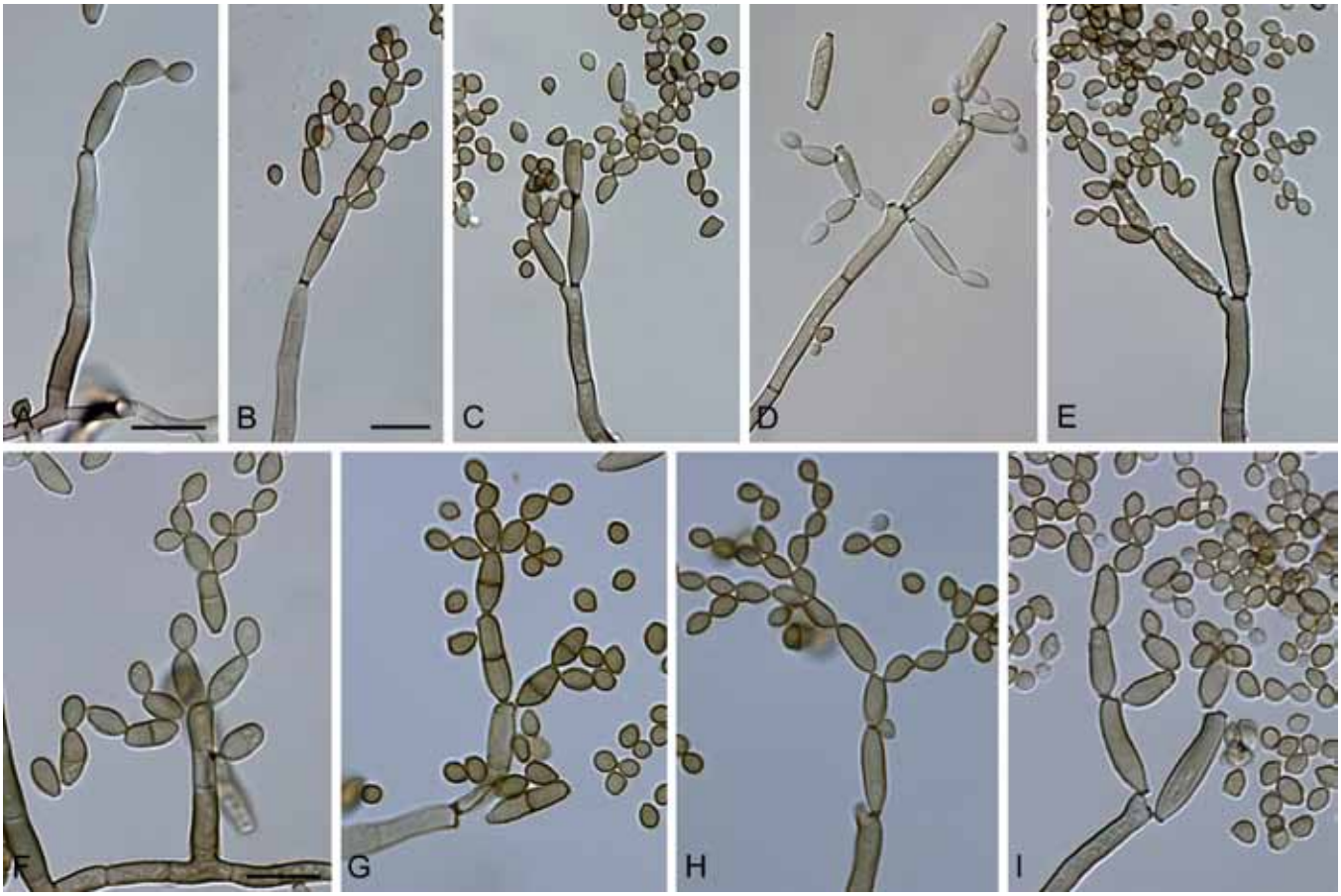



**Fig. 33.** *Cladosporium aphidis* (CBS 132182). A–I. Conidiophores and conidial chains *in vitro*. Scale bars = 10 µm.

on aphids, on leaves consistently superficial, often forming web-like aggregations of hyphae; hyphae straight to strongly flexuous-sinuous, branched, 2–6 µm wide, subhyaline to olivaceous-brown, wall thin, about 0.5–1 µm, smooth to distinctly rough-walled, later with swollen hyphal cells, often monilioid, up to 10 µm diam, walls darker and thicker, up to 1.5 µm, occasionally distinctly two-layered, occasionally hyphal cells with distinct central lumen. *Stromata* lacking, at most with small aggregations of swollen hyphal cells. *Conidiophores* solitary, occasionally in loose groups, arising from superficial hyphae, lateral, occasionally terminal, or emerging from aggregations of swollen hyphal cells, erect to decumbent, shape and size very variable, straight, subcylindrical-conical to strongly geniculate-sinuous, occasionally subnodulose, simple or branched, occasionally strongly branched, 10–120 × 2–7 µm, sometimes up to 300 µm long (but differentiation between very long, branched conidiophores and ordinary hyphae often difficult), aseptate to pluriseptate throughout, pale olivaceous to medium olivaceous-brown or brown, wall thin to somewhat thickened, 0.5–1(–1.5) µm, smooth to distinctly rough-walled. *Conidiogenous cells* integrated, terminal, occasionally intercalary or pleurogenous, 5–30 µm long, with a single to several conidiogenous loci 1–2 µm diam, slightly protuberant. *Conidia* in simple and branched chains, shape and size variable, subglobose, ellipsoid-ovoid, obovoid, fusiform, subcylindrical, secondary ramoconidia 8–25 × 3–8.5 µm, 0–3-septate, conidia 3–20 × 2–5 µm, 0–1-septate, subhyaline to olivaceous-brown, smooth to faintly rough-walled, conidia thin-walled (< 1 µm), walls of secondary ramoconidia somewhat thicker, 0.5–1.5 µm, conidial cells often with distinct lumen that renders the conidia seemingly thick-walled, ends rounded to attenuated, hila often somewhat protuberant, denticle-like, 0.5–1.5 µm diam; germination and microcyclic conidiogenesis occurring.

*In vitro*: *Mycelium* sparingly or loosely branched, 1.5−5 µm wide, septate, often slightly constricted at septa, almost hyaline, subhyaline or very pale olivaceous-brown, smooth or minutely verruculose, walls only slightly thickened, cell lumen granular, guttulate, sometimes aggregated at walls, single hyphal cells sometimes swollen, bulbous, mainly near or at septa or at the base of conidiophores, swellings up to 8 µm wide. *Conidiophores* solitary, sometimes in pairs of two, macro- and micronematous, arising terminally or laterally from plagiotropous or ascending hyphae, erect to ascending, straight or slightly flexuous, filiform or subcylindrical, non-geniculate or rarely slightly so towards or near the apex, non-nodulose, unbranched, occasionally once branched, 20−255 × 3−5(−6) µm, septate, not constricted at septa, slightly attenuated towards the apex, pale to olivaceous-brown, smooth, base often appears to be verruculose, cell lumen often as in hyphae but not all conidiophores with granular lumen. *Micronematous conidiophores* narrower, shorter and paler, unbranched, 15−72 × 2−3 µm subhyaline to pale olivaceous-brown, smooth, mostly with a single or two apical conidiogenous loci. *Conidiogenous cells* integrated, terminal, sometimes also intercalary, usually neither geniculate nor nodulose, 11−40 µm long, with a single or only few (mostly three) apical conidiogenous loci, 1−2 µm diam, somewhat thickened and darkened-refractive. *Ramoconidia* often formed, straight or slightly flexuous, subcylindrical, 19−45(−50) × (3−)3.5−5(−5.5) µm, 0−1(−3)-septate, not constricted at septa, concolouress with apices of conidiophores, not or only very slightly attenuated towards apex and base, base non-cladosporioid. *Conidia* numerous, polymorphous, catenate, formed in branched chains, small terminal conidia subglobose to obovoid, limoniform or somewhat irregular, 3−5(−6) × 2−3 µm (av. ± SD: 3.8 ± 0.6 × 2.7 ± 0.4), aseptate, rounded at the apex, intercalary conidia

broadly ovoid, limoniform or ellipsoid, (4−)5−13 × (2.5−)3−4(−5) µm (av. ± SD: 7.9 ± 2.1 × 3.6 ± 0.6), 0−1-septate, rounded or slightly attenuated at apex and base, secondary ramoconidia ellipsoid to subcylindrical, (8−)10−30(−36) × 3−5(−5.5) µm (av. ± SD: 18.1 ± 6.2 × 3.8 ± 0.6), 0−2(−4)-septate, not constricted, slightly attenuated towards the base, pale olivaceous-brown to olivaceous-brown, almost smooth to minutely verruculose or somewhat irregular, walls thin or only slightly thickened, sometimes cell lumen distinct that renders the conidia seemingly thick-walled, lumen mostly granular, hila 0.5−2 µm diam, somewhat thickened and darkened-refractive.

*Culture characteristics*: Colonies on PDA attaining 47−53 mm after 1 mo, grey-olivaceous to olivaceous or olivaceous-grey due to profuse sporulation, greenish-grey towards margin, leaden-grey to olivaceous-black reverse, velvety, margin white, regular, narrow to somewhat broader, feathery, aerial mycelium at first almost absent, diffuse, later dense, covering large parts of the colony, whitish or pale olivaceous-grey, felty-woolly, growth low convex to sometimes umbonate, with age few small but prominent exudates formed, sporulation profuse. Colonies on MEA attaining 16−30 mm after 1 mo, olivaceous-grey to olivaceous, pale olivaceous-grey due to aerial mycelium, iron-grey reverse, sometimes zonate, velvety or powdery, margin colourless or white, regular, radially furrowed, feathery, colony centre often forming a crater like structure, immersed, aerial mycelium sparse, diffuse or dense, numerous small prominent exudates formed, appear almost blackish, sporulation profuse. Colonies on OA attaining up to 63 mm after 1 mo, grey-olivaceous or olivaceous-grey, reverse iron-grey to grayish-blue, powdery, margin white, glabrous, narrow, aerial mycelium sparse, diffuse, growth flat, without prominent exudates, sporulation profuse.

*Substrates and distribution*: On or associated with aphids; Asia (China), Europe (Austria, Denmark, Germany, Italy, UK), South Africa, North America (USA), Central and South America (Brazil, Peru, Puerto Rico, Virgin Islands), Oceania (Hawaii).

*Additional specimens examined*: **Austria**, Klosterneuburg, on *Symphytum officinale* (*Boraginaceae*) associated with *Aphis symphyti*, Aug. 1876, Thümen, Mycoth. Univ. 672 (B 700006166; BPI 426119, 426367; HAL); Steiermark, Graz, Botanical Garden of the Karl-Franzens-University, on *Onosma* sp. (*Boraginaceae*), June 1990, M. Teppner (HAL 2095 F). **Brazil**, S.P., Piracicaba, on aphids, on leaves of *Manihot utilissima* (*Euphorbiaceae*), 27 Mar. 1933, A.P. Viégas (BPI 425871). **Germany**, Bavaria, Bad Kissingen, superficial on leaves of *Lonicera xylosteum* (*Caprifoliaceae*), 6 Sep. 1891, P. Magnus (HBG); Berlin, on *Aphis* sp., on *Pyrus communis* (*Rosaceae*), 29 July 1923, Noack (B 700006168); Berlin, University Garden, on aphids and superficially on leaves of *Euonymus japonicus* (*Celastraceae*), 4 Mar. 1898, P. Magnus (HBG); Brandenburg, on aphids on leaves of *Brassica oleracea* (*Brassicaceae*), 4 Oct. 1904, O. Jaap (B 700006169); Nordrhein-Westfalen, Duisburg, on leaves of *Buddleja davidii* (*Scrophulariaceae*), 2007, N. Ale-Agha (HAL); Essen, botanical garden, on leaves of *Anthyllis barba-jovis* (*Fabaceae*), associated with aphids, 18 Aug. 2006, N. Ale-Agha (HAL); on *Asplundia moritziana* (= *Carludvicia plicata*) (*Cyclanthaceae*), 30 Oct. 2008, N. Ale-Agha (HAL); on leaves of *Echium pininana* (*Boraginaceae*), 27 June 2006, N. Ale-Agha (HAL); on leaves of *Erythrochiton brasiliensis* (*Rutaceae*), associated with aphids, 2006, N. Ale-Agha (HAL); on leaves of *Pericallis appendiculata* (*Asteraceae*), associated with aphids, 18 Aug. 2006, N. Ale-Agha (HAL); on brown scales and deciduous short shoots at the base of needles of *Pinus* sp. (*Pinaceae*), 3 June 2008 and 18 Jul. 2008, N. Ale-Agha (HAL); on leaves of *Sonchus congestus* (*Asteraceae*), associated with aphids, 8 May 2006, N. Ale-Agha (HAL), CPC 13087. **Italy**, Emilia Romagna, Parma, on leaves of *Populus alba* (*Salicaceae*), associated with aphids, Passerini (B 700006164), as "*C. aphidigenum*"; on aphids on leaves of *Symphytum officinale*, Sep., Passerini (B 700006163 A), as "*C. aphidigenum*"; on aphids on leaves of *Salix* sp., Sep., Passerini (B 700006163 B), as "*C. aphidigenum*". **Portugal**, Coimbra, on leaves of *Asclepias consanguinea* (*Apocynaceae*), superficial, together with other hyphomycetes, F. Moller, Roumeguère, Fungi. Sel. Gall. Exs. 5192 (B 700006637), as *C. mollis*. **Puerto Rico**, Trujillo Alto, on *Aphis gossypii* on *Abelmoschus esculentus* (*Malvaceae*), 10 Apr. 1931, R. Faxon & A.S. Mills (BPI 426118). **USA**, Delaware, Wilmington, on insect carcasses (aphids?), on leaves of *Buddleja* sp. (*Scrophulariaceae*), 8 Nov. 1926, J.F. Adams (BPI 427205), as "*C. heugelianum*"; Hawaii, Honolulu, on *Aphis maidis* on *Zea mays* (*Poaceae*), 20 Oct. 1910, H. Marsh (BPI 426115); Virginia, Clark Co., Blandy Exp. Farm, on carcasses of insects (aphids?), on leaves of *Buddleja asiatica*, 23 May 1949, C.L. Lefebvre (BPI 427206), as "*C. heugelianum*"; Washington, Seattle, University of Washington campus, 47.6263530, -122.3331440, isol. from chasmothecia of *Phyllactinia guttata* (*Erysiphales*) on leaves of *Corylus avellana* (*Betulaceae*), 2 Dec. 2004, D. Glawe, CPC 11829.

*Notes*: Conidia of *C. aphidis* often germinate on the surface of leaves and form entirely superficial colonies, sometimes quite independent of infected aphids. Such superficial colonies are often mixed with *C. herbarum* which may also germinate and grow superficially. The conidia in vitro are narrower and somewhat longer.

A single collection on *Musca* from Hungary proved to belong to *C. fusiforme* which was quite surprising. *Cladosporium aphidis* differs from the latter species in having mycelium with distinct bulboid swellings, longer and somewhat wider macronematous conidiophores, slightly wider conidiogenous loci, wider ramoconidia and somewhat longer and wider intercalary and secondary ramoconidia.

**13. *Cladosporium apicale*** Berk. & Broome, J. Linn. Soc., Bot. 14: 99. 1873, 1875. Figs 34, 35.

*Holotype*: **Sri Lanka** (Ceylon), Peradeniya, on leaves of *Cycas circinalis* (*Cycadaceae*), Jan. 1868, G.H.K. Thwaites (K 121544).

= *Cladosporium cycadacearum* Shambu Kumar *et al.*, Indian Phytopathol. 60(3): 352. 2007 [holotype: GPU Herb. No. KSR 109; isotype: HCIO 47979].

*Lit.*: Saccardo (1886: 367), Ellis (1976: 332), Pasqualetti *et al.* (2005: 108), Schubert (2005b: 40–41).
*Ill.*: Ellis (1976: 334, fig. 252 A), Schubert (2005b: 42, fig. 7, pl. 3, figs A–H), Kumar *et al.* (2007: 353, fig. 2).

*In vivo*: On leaves, hypophyllous as greyish to blackish patches or discolorations, irregular in shape, usually extended, covering large areas of the leaf surface, stretching halfway or right across the leaves. *Colonies* hypophyllous, scattered, in small tufts or very loosely caespitose, erect to decumbent, dark brown or almost blackish, villose. *Mycelium* internal, later also external, growing superficially, creeping; hyphae sparingly branched, 1.5–5 µm wide, septate, often slightly constricted at the septa, subhyaline to pale brown, smooth, walls slightly thickened. *Stromata* mostly substomatal, composed of more or less angular, polygonal cells, medium to dark brown, smooth, thick-walled. *Conidiophores* mostly loosely fasciculate, occasionally solitary, arising from stromata, emerging through stomata, more or less erect, straight or almost so, but somewhat flexuous towards the apex, cylindrical-oblong, subulate, somewhat geniculate-sinuous to subnodulose near the apex, unbranched or branched, at the base and, above all, at the apex, 30–360 µm long or even longer, 6–11(–16) µm wide at the base, (2–)3–5.5 µm wide at the apex, pluriseptate, medium to usually dark brown or dark reddish brown, paler towards the apex, smooth or almost so to often obviously faintly asperulate, thick-walled, often distinctly two-layered, 0.75–3 µm wide, sometimes swollen at the base, protoplasm of the cells somewhat aggregated at the septa, so that the walls and, above all, septa appear to be thickened (as in distoseptation), occasionally enteroblastically proliferating.

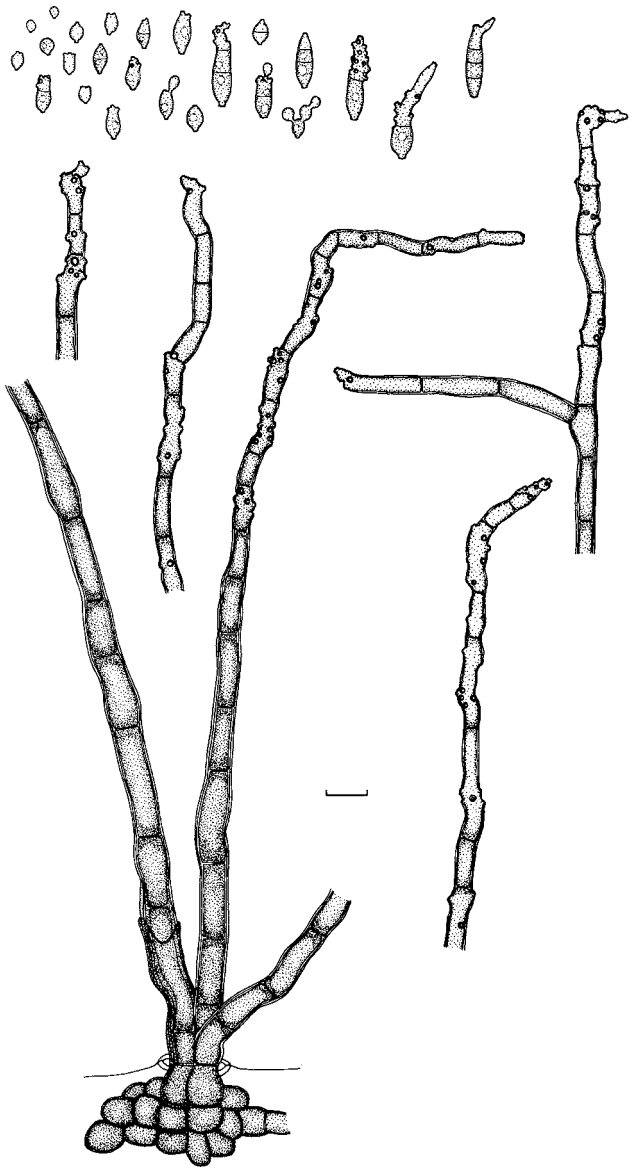


**Fig. 34.** *Cladosporium apicale* (K 121544). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

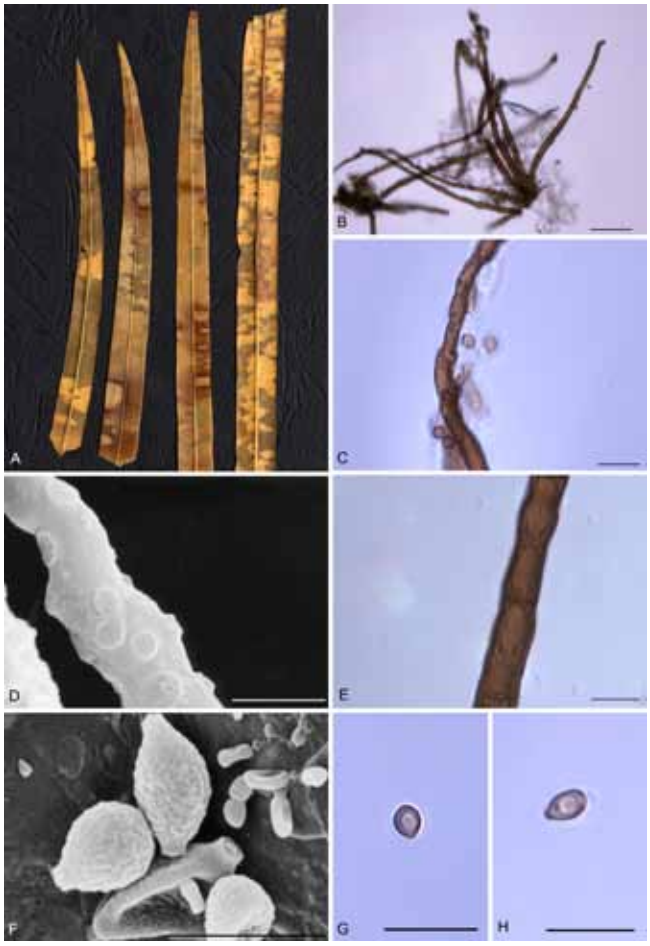


**Fig. 35.** *Cladosporium apicale* (K 121544). A. Symptoms. B. Overview, fascicle of conidiophores. C. Conidiophore with numerous conidiogenous loci and small subglobose conidia. D. Conidiophore with numerous protuberant conidiogenous loci. E. Conidiophore showing cell structure, with thickened, two-layered walls and protoplasm aggregated at the septa. F. Conidia showing coronate scar structure. G, H. Conidia showing cell structure, with paler cavity in the centre. Scale bars = 5 (D, F), 10 (C, E, G–H), 50 (B) µm.

*Conidiogenous cells* integrated, terminal and intercalary, somewhat geniculate-sinuous and subnodulose, 6–23 µm long, proliferation sympodial, cicatrised, with numerous, small conidiogenous loci, conspicuously protuberant, subdenticulate, short cylindrical, often situated on small lateral shoulders or somewhat crowded, obconically truncate, 1–2 µm diam, dome often not higher than the surrounding rim, thickened, refractive to somewhat darkened. *Conidia* catenate, in branched chains, most of them very small, subglobose, obovoid, limoniform or ellipsoid, 2–11 × 2–4 µm, 0–1-septate, few conidia larger, ellipsoid, fusiform or subcylindrical, up to 22 µm long, 3–5(–6) µm wide, 1–3-septate, not constricted at the septa, pale olivaceous to pale or sometimes medium olivaceous-brown, smooth or almost so, walls somewhat thickened, in the centre often with a distinct plae lumen, surrounded by the somewhat darker protoplasm, apex rounded or with a single to numerous, small hila, slightly attenuated towards the base, base truncate or obconically truncate, hila protuberant, short cylindrical, 0.5–2 µm diam, dome and periclinal rim often not very conspicuous, thickened, refractive to somewhat darkened; occasionally microcyclic conidiogenesis occurring.

*Substrates and distribution*: On *Cycas* spp. (*Cycadaceae*); Asia – *Cycas circinalis* (Sri Lanka), *C. revoluta* (India, U.P.).

*Notes*: The coronate (cladosporioid) structure of the conidiogenous loci and hila in *Cladosporium apicale* is not very evident when examined by light microscopy, but has been proven by means of SEM (see Schubert 2005b, pl. 3, fig. F). *Cladosporium cycadis*, known from Asia, Europe and Central America on leaves of *Cycas* spp., is well distinguished from *C. apicale* by its narrower conidiophores, 4–5 µm wide, and aseptate, rarely 1-septate, smaller conidia. Type material of *C. cycadacearum* was not available, but based on the description, drawing and host given in Kumar *et al.* (2007) it is very probable that this species has to be considered a synonym of *C. apicale*.

Unconfirmed reports of occurrence of *C. apicale* have been published by De & Chattopadhyay (1994) from West Bengal, India, on *Swietenia mahogoni* (*Meliaceae*), Zhang *et al*. (2003: 45–46, fig. 18) on *Allium fistulosum* and *Magnolia grandiflora* from China (Sichuan and Yunnan) and Pasqualetti *et al.* (2005) on dead leaves of *Arbutus unedo*.

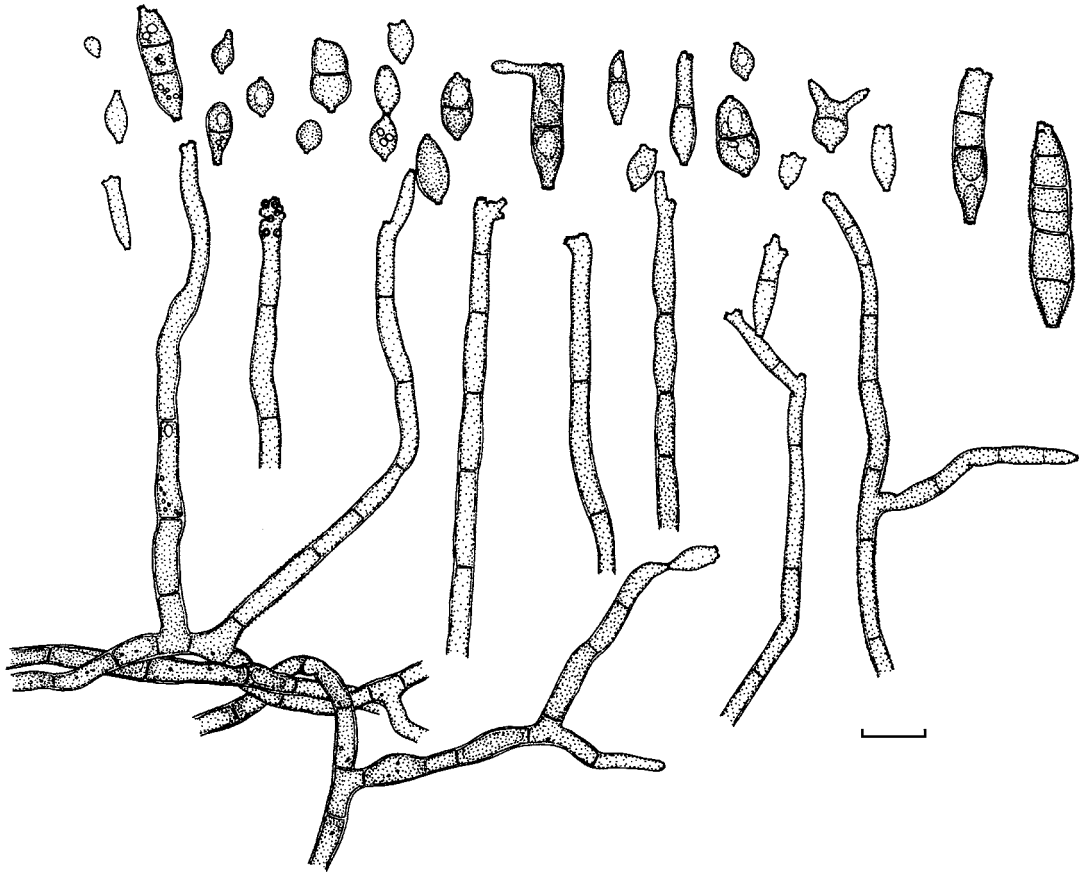


**Fig. 36.** *Cladosporium arthrinioides* (M-0057465). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

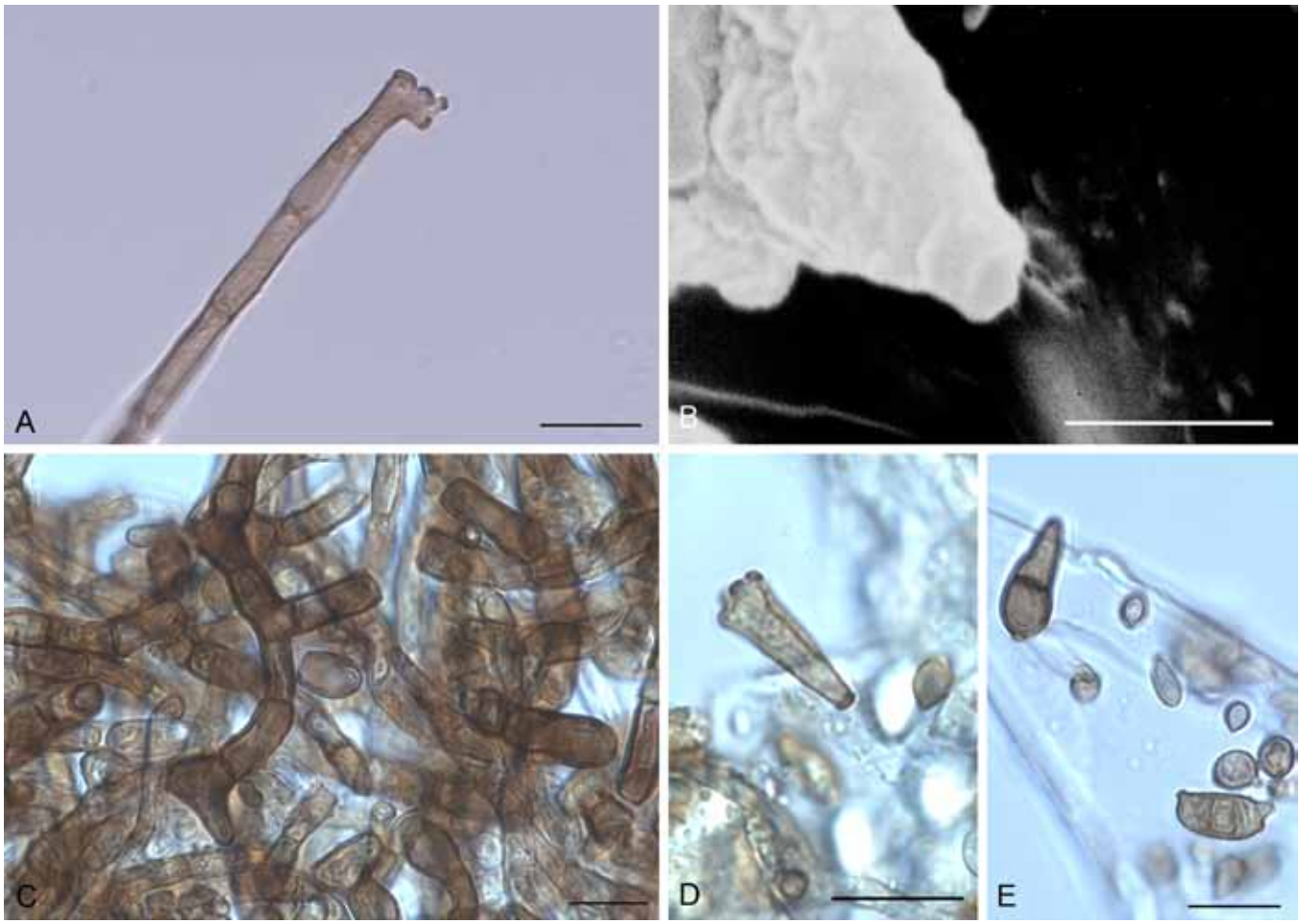



**Fig. 37.** *Cladosporium arthrinioides* (M-0057465). A. Apex of a conidiophore. B. Conidium showing the coronate scar structure. C. Superficial mycelium. D, E. Conidia. Scale bars = 2 (B), 10 (A, C–E) µm.

**14. *Cladosporium arthrinioides*** Thüm. & Beltr., Nuovo Giorn. Bot. Ital. 8: 252. 1876. Figs 36, 37.

*Lectotype* (**designated here**): **Italy**, Sicily, Palermo, botanical garden, on living and wilted leaves of *Bougainvillea spectabilis* (*Nyctaginaceae*), Mar. 1875, V. Beltrani-Pisani (M-0057465). *Isolectotypes*: Thümen, Mycoth. Univ. 873 (BPI 426137, HAL, HBG, M-0057466, MICH).

*Lit.*: Saccardo (1886: 359), Ferraris (1912), Schubert (2005b: 43–44).
*Ill.*: Schubert (2005b: 43, fig. 8, pl. 4, figs A–E).
*Exs.*: Thümen, Mycoth. Univ. 873.

*In vivo*: Leaf spots amphigenous, minute, at first punctiform, later subcircular, up to 3 mm diam, dark brown to almost blackish, often near or at the leaf margin, without distinct margin, velvety, occasionally somewhat raised. *Colonies* amphigenous, scattered to subeffuse, loose to often dense, brown, villose or somewhat downy. *Mycelium* external, superficial; hyphae branched, 2–6 µm wide, septate, sometimes slightly constricted at the septa and somewhat swollen, up to 9 µm wide, subhyaline to pale or medium dirty olivaceous-brown, smooth or almost so to somewhat asperulate or irregularly rough-walled, walls thickened, protoplasm of the cells granular, sometimes distinct and clearly separated from the wall, with small oil droplets, sometimes aggregated at the septa, so that the walls and, above all, septa appear to be thickened (as in distoseptation), forming a more or less dense hyphal network. *Stromata* lacking. *Conidiophores* solitary, arising from superficially growing hyphae, terminal and lateral, often growing like and confusable with hyphae, erect, straight to flexuous, filiform, unbranched or once branched, non-nodulose, 25–200 × 2–4 µm, pluriseptate, sometimes slightly attenuated at the septa, pale to medium dirty olivaceous-brown, smooth to somewhat asperulate or irregularly rough-walled, walls slightly thickened, sporadically with oil droplets. *Conidiogenous cells* integrated, mostly terminal, sometimes also intercalary, narrowly cylindrical, 5–43 µm long, proliferation sympodial, with a single to several conidiogenous loci, protuberant, subdenticulate to denticulate, obconically truncate, 0.5–2 µm diam, dome and periclinal rim often not very conspicuous, thickened and darkened-refractive. *Ramoconidia* occasionally formed, subcylindrical, up to 24 µm long, 4–5 µm wide, 1–2-septate, broadly truncate at the base, up to 2.5 µm wide. *Conidia* catenate, in unbranched or branched chains, small terminal conidia globose, subglobose, ovoid, limoniform, ovoid-ellipsoid or somewhat irregular, 2–11 × 2–5 µm, 0–1-septate, secondary ramoconidia and intercalary conidia ellipsoid, narrowly obclavate to subcylindrical, 13–18 × 3–6.5 µm, 0–1(–2)-septate, occasionally distoseptate, with age larger and more frequently septate, up to 32 µm long, with up to four septa, subhyaline, pale to medium dirty olivaceous-brown, smooth or sometimes minutely verruculose, walls more or less thickened, in the centre of the cells often with distinct lumen, surrounded by the protoplasm, sometimes also with somewhat refractive oil droplets, ends rounded or attenuated, hila protuberant, small, obconically truncate, 0.5–1.5(–2) µm diam, dome and rim often inconspicuous, thickened, refractive, sometimes darkened; microcyclic conidiogenesis occurring.

*Substrates and distribution*: On *Bougainvillea spectabilis*; Italy.

*Notes*: *Cladosporium arthrinioides* superficially resembles *Stenella* species, above all due to verruculose superficial hyphae. However, the coronate (cladosporioid) structure of the conidiogenous loci and hila has been shown by means of SEM examinations (see Schubert 2005b, pl. 4, fig. B). *Cladosporium heterophragmatis* is the only morphologically comparable species, which is, however easily distinguishable by having erect to decumbent, creeping conidiophores with only few non-constricted septa. Ramoconidia are lacking and the conidia are never distoseptate. Farr *et al*. (1989) listed *C. arthrinioides* on *Bougainvillea* sp. from Texas, USA.

**15. *Cladosporium arthropodii*** K. Schub. & C.F. Hill, Fungal Diversity 22: 15. 2006. Figs 38–40.

*Holotype*: **New Zealand**, Auckland, Glen Funes, University of Auckland, Tamaki Campus, on *Arthropodium cirratum* (*Asparagaceae*), 1 Jul. 2004, C.F. Hill, No. 1054, mixed infection with *Alternaria* sp. (HAL 1828 F). *Paratypes*: **New Zealand**, East Tamaki, Auckland University Campus, on *Arthropodium cirratum*, 4 Sep. 2003, E.H.C. McKenzie (PDD 78376) and Little Huia, 3 Dec. 1963, J.M. Dingley (PDD 23039). *Epitype* (**selected here**): **New Zealand**, Auckland, Glen Funes, University of Auckland, Tamaki Campus, on *Arthropodium cirratum*, 8 Oct. 2008, C.F. Hill, CBS H-20939. *Ex-epitype culture*: CBS 124043 = CPC 16160.

*Lit.*: Schubert (2005b: 44–46).
*Ill.*: Schubert (2005b: 45, fig. 9, pl. 5, figs A–G), Braun *et al*. (2006: 16, fig. 1, 17, pl. 1).

*In vivo*: Leaf spots amphigenous, oval to oblong-irregular, at first visible as small, whitish, shiny discolorations, later forming larger spots, up to 30 mm long, finally confluent, covering large areas of the

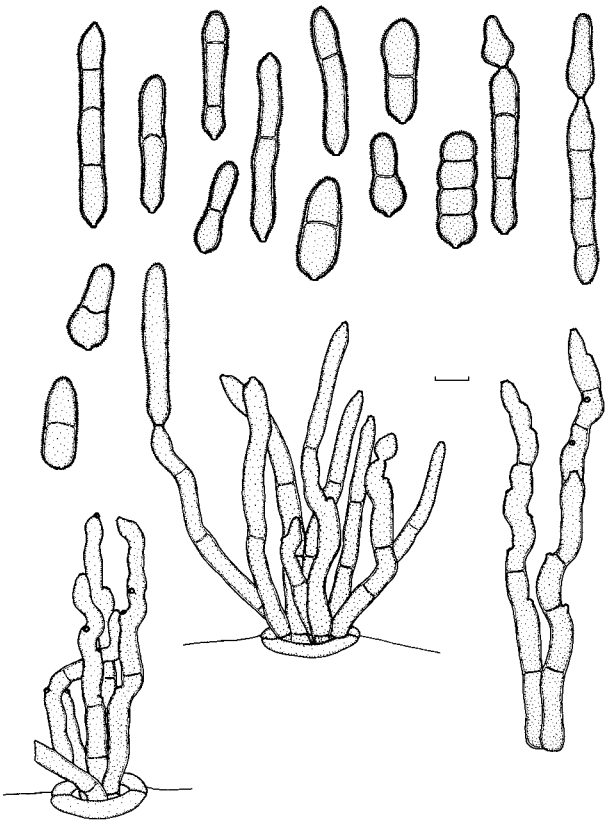


**Fig. 38.** *Cladosporium arthropodii* (HAL 1828 F). Fascicles of conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

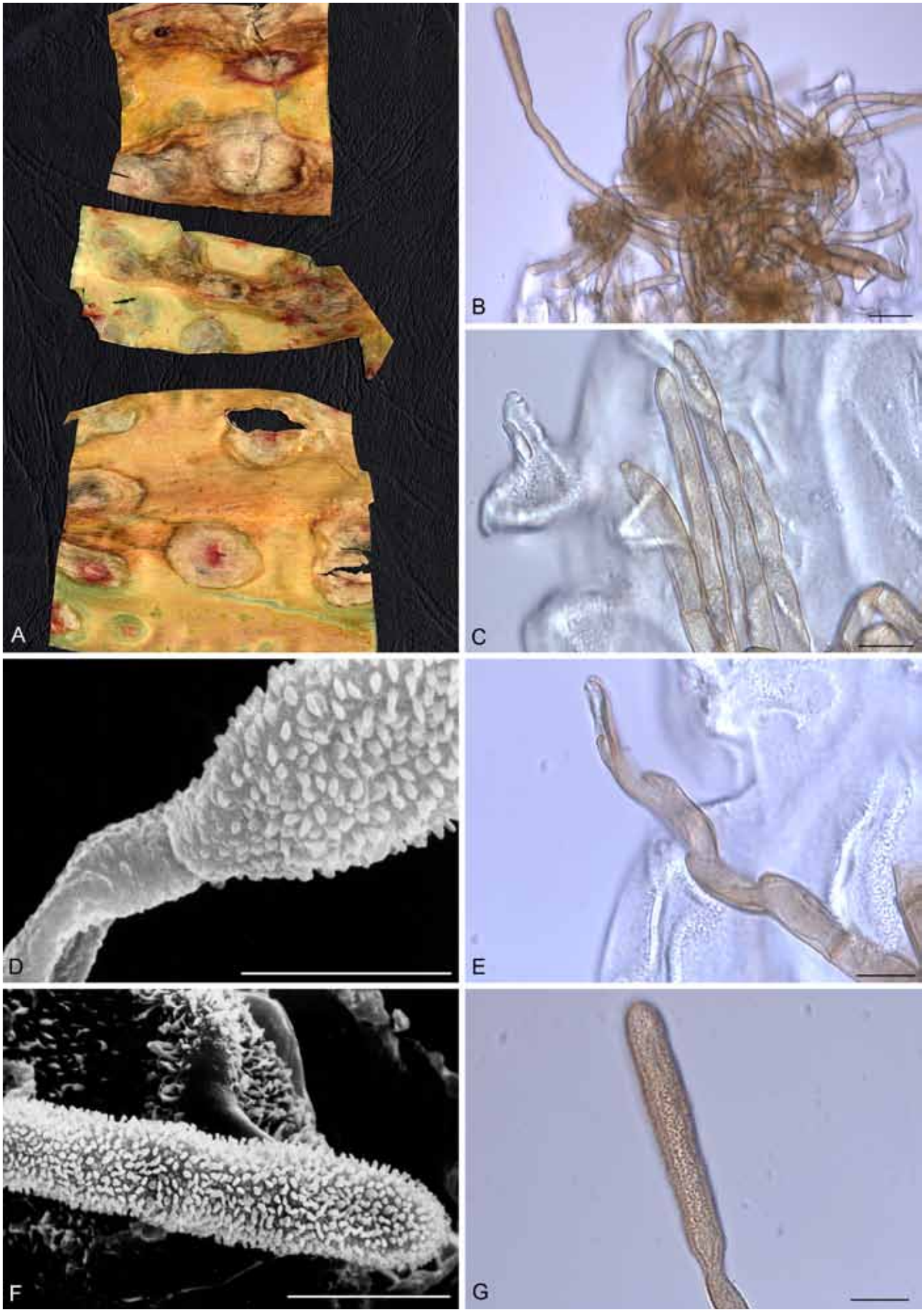



**Fig. 39.** *Cladosporium arthropodii* (HAL 1828 F). A. Symptoms. B. Fascicle of conidiophores. C. Conidiophores. D. Tip of a conidiophore with still attached conidium. E. Geniculate conidiophore. F. Conidium showing surface ornamentation. G. Tip of a conidiophore with still attached conidium. Scale bars = 5 (D), 10 (C, E–G), 20 (B) µm.

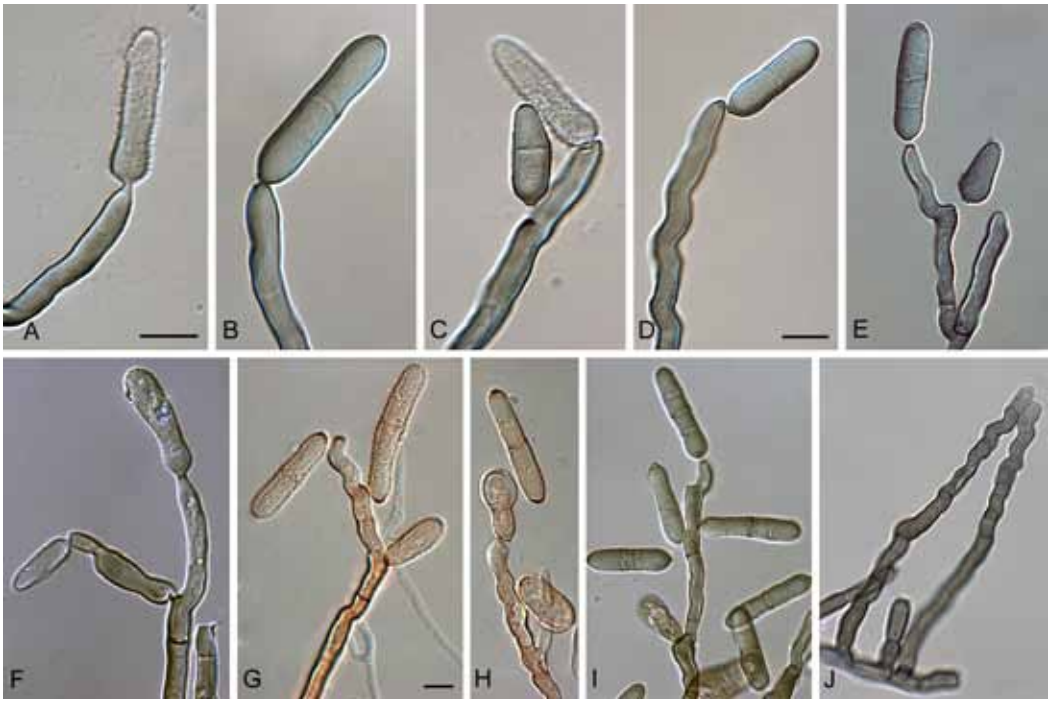



**Fig. 40.** *Cladosporium arthropodii* (CPC 16160). A–J. Conidiophores and still attached conidia *in vitro*. Scale bars = 10 µm.

leaves, on the upper leaf surface whitish, whitish grey to somewhat rose-coloured, shiny, often with slightly rose- to purple-coloured, irregular discolorations in the centre of pale spots, somewhat zonate, surrounded by a narrow or broader, irregular margin or halo, yellowish brown to dark reddish brown, rarely purple or greenish, on the lower leaf surface darker, greyish to grey-green. *Colonies* hypophyllous, scattered, effuse, loose to dense, short caespitose, olivaceous-brown to brown or even blackish. *Mycelium* internal, subcuticular; hyphae branched, 3–5(–7.5) µm wide, septate, pale olivaceous to pale olivaceous-brown, smooth, walls unthickened or slightly thickened, sometimes with small swellings and constrictions, often aggregated. *Stromata* mostly substomatal, 20–50 µm diam, dense, compact, pale to medium olivaceous or olivaceous-brown. *Conidiophores* loosely to densely fasciculate, arising from stromata, usually emerging through stomata, occasionally erumpent through the cuticle, erect, straight to flexuous, cylindrical-oblong, not to somewhat geniculate-sinuous, unbranched or rarely branched, non-nodulose to subnodulose, 30–130 × (3–)4.5–8(–10) µm, 0–5-septate, not constricted at the septa, very pale olivaceous to pale brown, smooth, sometimes somewhat verruculose near the apex, walls only slightly thickened, not or only slightly attenuated towards the apex. *Conidiogenous cells* integrated, terminal and intercalary, cylindrical, 10–47 µm long, proliferation sympodial, with a single to few conidiogenous loci, often on small lateral shoulders, more or less protuberant, 1.5–2.5(–3.5) µm wide, 0.5–1 µm high, periclinal rim not distinctly raised, thickened, somewhat darkened. *Conidia* solitary or in short unbranched chains, straight to slightly curved, cylindrical-oblong, (10–)20–60 × (5–)7–12 µm, (0–)1–3(–5)-septate, sometimes slightly constricted at the septa, septa not very conspicuous, pale to pale medium olivaceous-brown, echinulate (digitate under SEM), walls more or less thickened, apex usually rounded, base rounded or often somewhat attenuated, hila more or less protuberant, 1.5–2.5(–3.5) µm diam, somewhat darkened.

*In vitro* (description based on OA): *Mycelium* immersed and superficial; hyphae branched, 1–7 µm wide, due to swellings and constriction somewhat irregular in outline, swellings up to 10 µm wide, sometimes somewhat geniculate-sinuous or zig-zag-like and therefore hardly distinguishable from conidiophores, septate, subhyaline to pale olivaceous-brown, often somewhat darker at the base of conidiophores, smooth, walls unthickened or almost so. *Conidiophores* solitary or sometimes in loose groups of 2–3, arising terminally or laterally from hyphae, erect, straight to somewhat flexuous, cylindrical-oblong, often slightly to distinctly geniculate or subnodulose with unilateral shoulders due to sympodial proliferation or irregular in outline due to swellings and constrictions, unbranched, occasionally branched, up to 170 µm long, 4–6 µm wide, pluriseptate, pale to medium olivaceous-brown, smooth, walls unthickened or only slightly so. *Conidiogenous cells* integrated, terminal or intercalary, geniculate-sinuous or subnodulose with unilaterally swollen shoulders, 10–31 µm long, mostly with a single conidiogenous locus per cell, loci often not very prominent, convex but dome and rim not distinctly raised, 1–3 µm diam, somewhat darkened-refractive. *Conidia* solitary or in very short unbranched chains, more or less straight, small conidia ovoid, pyriform or ellipsoid, aseptate, larger conidia ellipsoid to cylindrical-oblong, (9–)15–45 (5.5–)6–10 µm (av. ± SD: 29.3 ± 10.2 × 7.9 ± 1.8), sometimes basal cell bulboid or single cells distinctly swollen, up to 17 µm diam, 0–3-septate, sometimes slightly constricted at septa, septa usually not very conspicuous, becoming sinuous with age, pale to medium olivaceous-brown, densely echinulate, sometimes loosely verrucose, walls thickened, up to 1 µm wide, slightly attenuated towards the base, hila conspicuous, 1.5–3 µm diam, thickened and darkened-refractive; sometimes germinating.

*Culture characteristics*: Colonies on PDA attaining 1–8 mm diam after 14 d, olivaceous-grey to white due to aerial mycelium, reverse iron-grey, fluffy, margins white, narrow, aerial mycelium loose to dense, fluffy, abundant, without prominent exudates, sparsely sporulating on the agar blocks. Colonies on MEA 1–4 mm diam, white to pale greenish-grey, reverse iron-grey, fluffy, margins white, narrow, feathery, aerial mycelium abundant, white, fluffy, covering the whole colony, dense, growth low convex to convex, without prominent exudates, sparsely sporulating. Colonies on OA 1–4

mm, iron-grey to olivaceous-grey, whitish due to aerial mycelium, reverse olivaceous-grey, velvety, aerial mycelium white, loose, fluffy, growth low convex, without prominent exudates, sporulating.

*Substrate and distribution*: On *Arthropodium cirratum*; New Zealand.

*Notes*: *Cladosporium arthropodii* is endemic in New Zealand on *Arthropodium cirratum*. *Cladosporium allii* is morphologically comparable but well distinguished by its consistently fasciculate conidiophores and much wider conidia. Furthermore, the periclinal rim of the conidiogenous loci of *C. allii* is distinctly elongated (ca. 2 µm high) giving a peg-like appearance. *Cladosporium allii-cepae* differs in having much longer conidia, (40–)60–120(–90) µm, and *C. victorialis* (Braun & Mel'nik 1997) is quite distinct by its smooth conidia.

**16. *Cladosporium asperistipitatum*** U. Braun & K. Schub., Schlechtendalia 16: 62. 2007. Fig. 41.

*Holotype*: **USA**, California, Contra Costa Co., Orinda, on living leaves of *Aesculus californica* (*Sapindaceae*), 30 Oct. 1932, L. Bonar (F 1167622).

*Ill*.: Braun & Schubert (2007: 63, fig. 1).

*In vivo*: Leaf spots large, usually marginal, 5–30 mm wide, brown, with somewhat raised margin, occasionally with diffuse purplish to brown halo. *Colonies* amphigenous, faintly punctiform to effuse, dark brown to blackish. *Mycelium* internal. *Stromata* lacking or small, 10–30 µm diam, substomatal to intraepidermal, brown, composed of swollen hyphal cells, 3–13 µm diam, walls thickened. *Conidiophores* solitary or in small fascicles, arising from internal hyphae or stromatic hyphal cells, erumpent or emerging through stomata, erect, straight to slightly geniculate-sinuous, unbranched or occasionally branched, 10–60 × 2.5–9 µm, continuous to septate, pale olivaceous to medium olivaceous-brown, wall thickened, up to 2 µm wide, above all in the lower half, and distinctly two-layered. *Conidiogenous cells* integrated, terminal, 10–30 µm long; conidiogenous loci (1–)1.5–2(–2.5) µm diam, somewhat thickened, darkened and protuberant. *Conidia* catenate, in simple or branched chains, subglobose, ellipsoid-ovoid, fusiform, limoniform to subcylindrical, 4–30 × 3–7 µm, 0–2(–4)-septate, pale olivaceous to olivaceous-brown, walls thin to slightly thickened, < 1 µm wide, faintly to distinctly verruculose, ends obtuse, rounded to attenuated, apex with 1–3 hila, base with a single hilum, 1–2 µm diam, slightly protuberant.

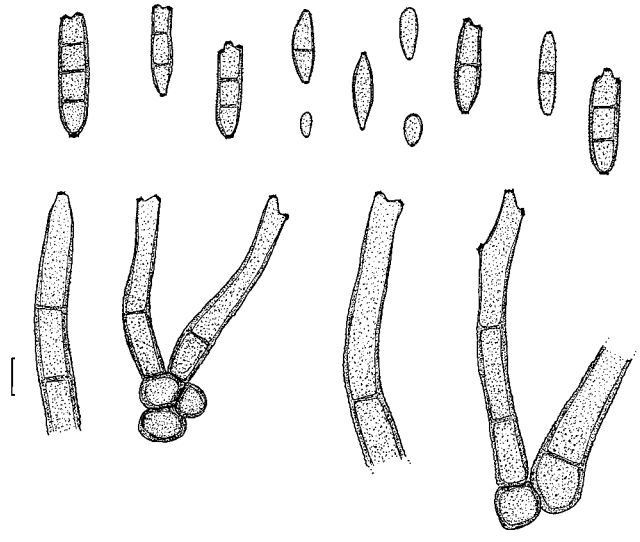


**Fig. 41.** *Cladosporium asperistipitatum* (F 1167622). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. U. Braun *del*.

*Substrate and distribution*: On *Aesculus californica*; USA.

*Notes*: *Cladosporium asperistipitatum* is a biotrophic, leaf-spotting species morphologically resembling *C. gentianae* which differs, however, in having quite distinct lesions and somewhat shorter, mostly 0–1-septate conidia, frequently with distinct lumina, so that the conidia become seemingly very thick-walled.

**17. *Cladosporium asperulatum*** Bensch, Crous & U. Braun, Stud. Mycol. 67: 21. 2010. Figs 42–44.

*Holotype*: **Portugal**, isol. from *Protea susannae* (*Proteaceae*), 1 May 2007, P.W. Crous (CBS H-20424). *Ex-type culture*: CBS 126340 = CPC 14040.

*Ill*.: Bensch *et al.* (2010: 22−24, figs 7−9).

*In vitro*: *Mycelium* immersed, sparingly superficial; hyphae unbranched or very sparingly branched, 2−4.5 µm wide, septate, not constricted at septa, subhyaline to pale or medium olivaceous-

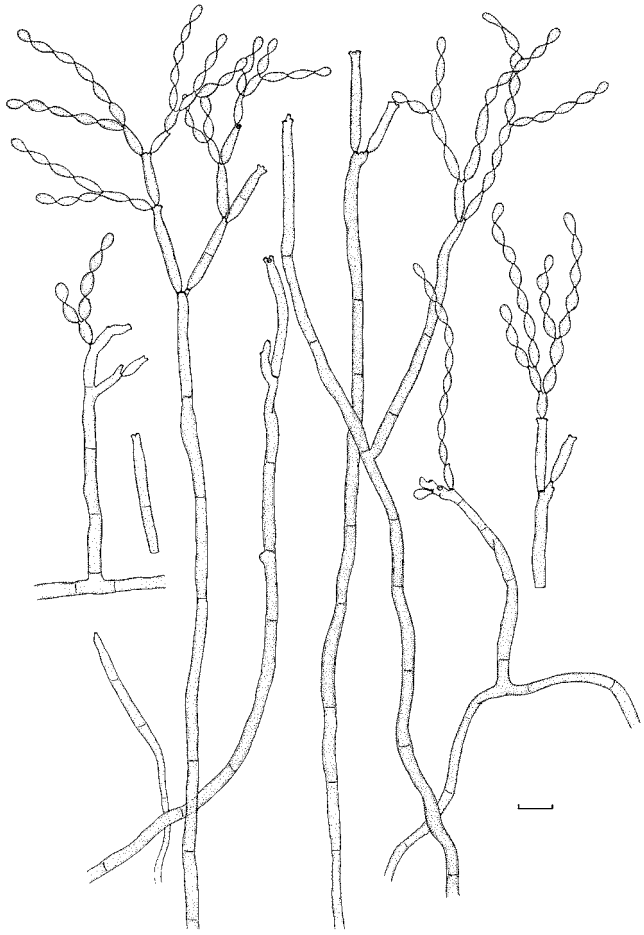


**Fig. 42.** *Cladosporium asperulatum* (CBS 126340). Macronematous conidiophores, ramoconidia and conidial chains *in vitro*. Scale bar = 10 µm. K. Bensch *del*.

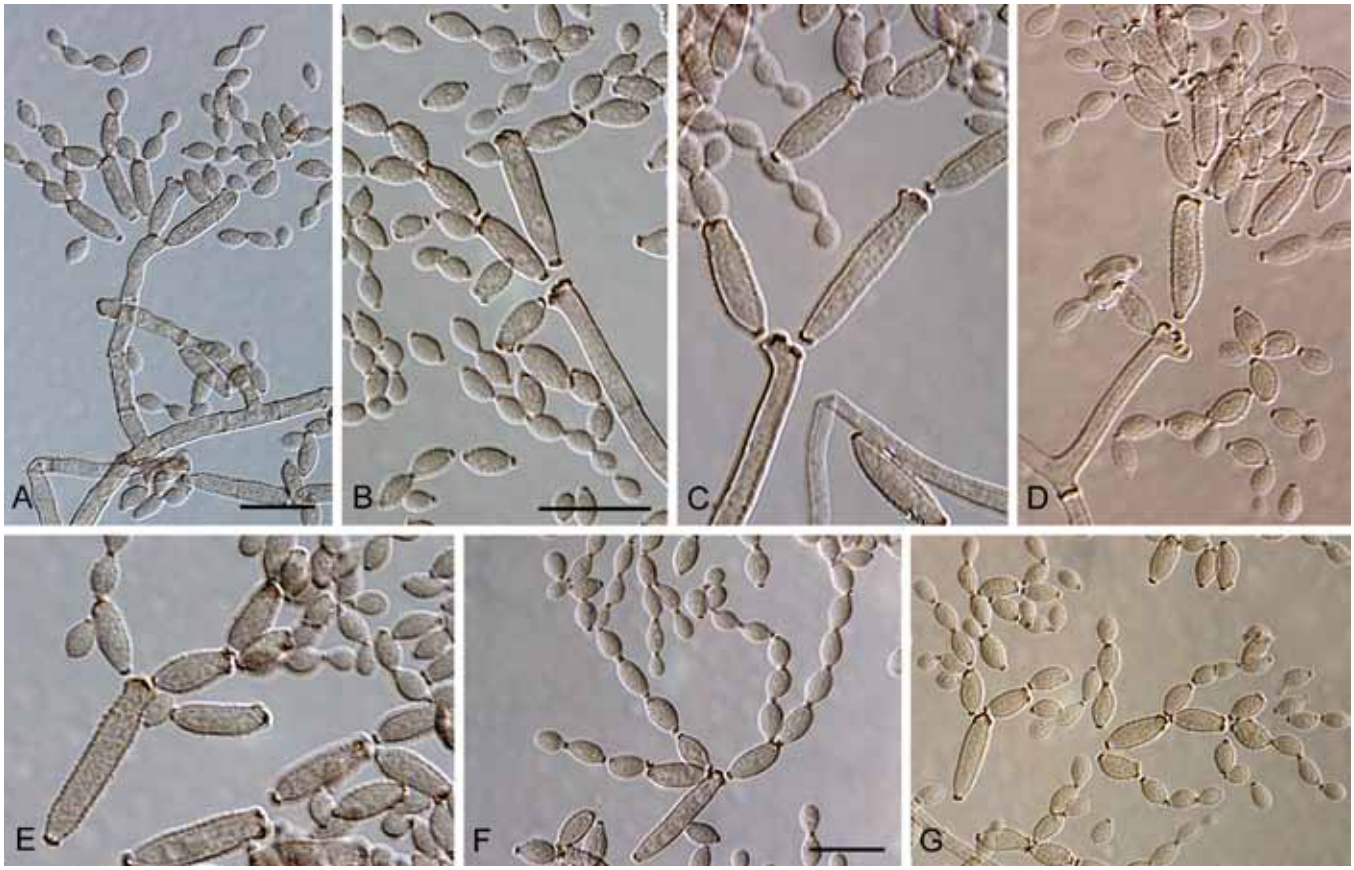



**Fig. 43.** *Cladosporium asperulatum* (CBS 126340). A–D. Conidiophores and conidia. E–G. Secondary ramoconidia and conidia formed in branched chains. Scale bars = 10 µm.

brown, smooth to minutely verruculose or irregularly verrucose, walls unthickened or almost so, sometimes forming ropes. *Conidiophores* macro- and micronematous, solitary, arising terminally or laterally from plagiotropous or ascending and erect hyphae, erect, straight to slightly flexuous, cylindrical-oblong, sometimes slightly geniculate towards the apex, non-nodulose, (15−)45−210(−360) × (2−)3−4(−5) µm, sometimes up to 5 µm wide at the base, unbranched, occasionally branched, branches below the apex or at a lower level, usually below a septum, sometimes up to 105 µm long, pluriseptate with 0−12 septa, not constricted, pale to medium olivaceous-brown, paler towards the apex and sometimes attenuated, smooth to asperulate or minutely verruculose, walls slightly thickened; micronematous conidiophores filiform or narrowly cylindrical-oblong, about 2 µm wide, paler and narrower, subhyaline or pale olivaceous-brown, mostly with a single apical scar. *Conidiogenous cells* integrated, mainly terminal, cylindrical-oblong, sometimes slightly geniculate-sinuous towards the apex, 22−38 µm long, smooth or almost so, with 2−4 apical loci, protuberant, subdenticulate, sometimes situated on peg-like prolongations, 1−2 µm diam, thickened and darkened-refractive. *Ramoconidia* cylindrical-oblong, 15−50 × 3−4 µm, 0(−1)-septate, concolouress with tips of conidiophores, smooth or almost so, base broadly truncate, (2.2−)2.5−3(−3.2) µm wide, unthickened. *Conidia* catenate, in branched chains, up to 8(−10) conidia in the terminal unbranched part of the chain, small terminal conidia obovoid, 4.5−7(−8) × 2−3(−3.5) µm (av. ± SD: 5.6 ± 1.0 × 2.6 ± 0.5), intercalary conidia ovoid, fusiform to ellipsoid, 5−11(−13) × 2.5−3(−4) µm (av. ± SD: 8.0 ± 2.1 × 2.8 ± 0.4), aseptate, secondary ramoconidia ellipsoid, fusiform, subcylindrical, (7.5−)9−26(−37) × (2.5−)3−4(−5) µm (av. ± SD: 18.3 ± 6.6 × 3.4 ± 0.6), 0(−1)-septate, very rarely with a second septum, not constricted at septa, subhyaline to pale olivaceous-brown, smooth to minutely verruculose or irregularly rough-walled (LM), under SEM loosely verruculose or surface with irregularly reticulate structure or embossed stripes probably caused by diminishing turgor and shriveling of tender conidia, walls slightly thickened, attenuated towards apex and base, hila protuberant, subdenticulate, 0.8−2 µm diam, thickened and darkened-refractive; microcyclic conidiogenesis not observed.

*Culture characteristics*: Colonies on PDA attaining 48−53 mm diam after 14 d, olivaceous-grey, iron-grey or grey-olivaceous at margins, sometimes zonate, reverse leaden-grey, greyish blue to iron-grey, powdery to fluffy or hairy, margin white, narrow, glabrous, aerial mycelium abundantly formed, dense, fluffy and high in colony centre, growth flat to low convex with somewhat elevated colony centre, without prominent exudates, sporulation profuse. Colonies on MEA reaching 45−64 mm diam after 14 d, olivaceous-grey to pale greenish grey, reverse olivaceous-grey to iron-grey, powdery to fluffy, margin white to smoke-grey, narrow, regular, glabrous to feathery, sometimes radially furrowed, aerial mycelium abundant, several prominent exudates formed appearing blackish, sporulation profuse.

*Substrates and distribution*: On plant material; Asia (India), Europe (Portugal), North America (USA).

*Additional specimens examined*: **India**, isol. from *Eucalyptus* leaf litter (*Myrtaceae*), 1 Mar. 2004, coll. W. Gams, isol. P.W. Crous (CBS 126339 = CPC 11158). *Cf. asperulatum*: **USA**, isol. from grape bud, F. Dugan (208 db sci 1 = CBS 113744).

*Notes*: *Cladosporium asperulatum* is phylogenetically close to *C. myrtacearum* forming a distinct sister clade (see Bensch *et al.* 2010, fig. 1, part a). Morphologically this species is comparable with *C. subtilissimum*, but differs in having 0−12-septate, somewhat longer conidiophores and narrower conidia (Schubert *et al.* 2007b). An isolate from North America (CBS 113744) is morphologically and phylogenetically slightly distinct from the other two isolates

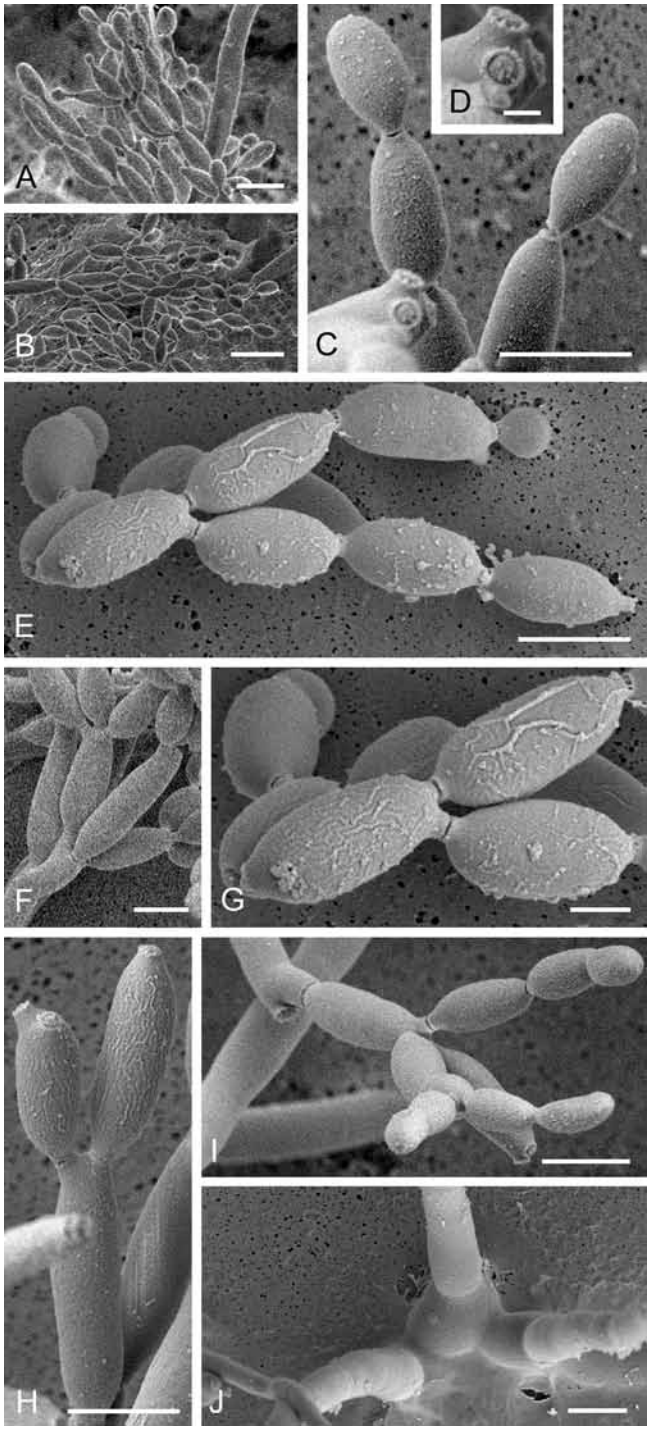



**Fig. 44.** *Cladosporium asperulatum* (CBS 126340). A–B. Conidiophores and very young conidia (A). C–D. Conidia and details of scars on a secondary ramoconidium. E. Conidia with sparse ornamentation. Note the round conidium-initial. F. Whorl of secondary ramoconidia formed at the tip of a conidiophore. G. Details of ornamentation showing loosely irregularly reticulate structures. H. Secondary ramoconidia. I. Overview of a conidiophore with scars on the tip of the conidiophore. J. Swollen cells at agar surface giving rise to conidiophores. Note the scar on the root structure. Scale bars = 1 (D), 2 (G), 5 (A, C, E–F, H–J), 10 (B) µm.

and only tentatively assigned to the present species (Bensch *et al.* 2010, fig. 1, part a).

**18. *Cladosporium astroideum*** Ces., Flora 36: 204. 1853 **var. *astroideum***. Fig. 45.

*Lectotype* (**designated here**): **Italy**, on dead stems of *Alisma* sp. (*Alismataceae*) and leaves and stems of *Typha* sp. (*Typhaceae*), 1852, Cesati, Klotzsch, Herb. Viv. Mycol. 1787 (HAL). *Isolectotypes*: Klotzsch, Herb. Viv. Mycol. 1787 (*e.g.*, HBG, M).

= *Cladosporium acaciae* Reichert, Bot. Jahrb. Syst. 56: 720. 1921 [holotype: B 700006135].
= *Cladosporium herbarum* var. *indutum* Thüm., Mycoth. Univ., Cent. XVI, No. 1571. 1880 [syntypes: *e.g.* HBG].
= *Cladosporium juglandis* Pass., *in herb.* [B 700006561]

*Lit.*: Saccardo (1886: 366), Lindau (1907: 813), Ferraris (1912: 337), Zhang *et al*. (1999b: 37–38; 2003: 50–51).
*Ill.*: Zhang *et al*. (1999b: 37, fig. 2; 2003: 50, fig. 24).
*Exs.*: Ellis & Everhart, Fungi Columb. 789; Ellis & Everhart, N. Amer. Fungi 650; Klotzsch, Herb. Viv. Mycol. 1787; Marcucci, Unio Itin. Crypt. VI; Saccardo, Mycoth. Ven. 586; Thümen, Mycoth. Univ. 1571.

*In vivo*: Saprobic. *Colonies* small, punctiform to pustulate, subcircular in outline to dendritic, sometimes subeffuse, scattered to confluent, forming diffuse layers, dark brown to black. *Mycelium* internal and external; immersed hyphae forming strands or small to large stromatic hyphal aggregations, immersed to erumpent, composed of swollen hyphal cells, 2.5–17 µm diam, superficial hyphae simple or branched, 3–10 µm wide, septate, thick-walled, 0.5–1.5 µm wide, at first subhyaline to pale olivaceous or olivaceous-brown, later pale to medium dark brown, smooth to verruculose, septate, often with constrictions at septa, sometimes effecting a monilioid appearance, cells sometimes with distinct lumen. *Conidiophores* solitary or loosely aggregated, caespitose, arising from immersed hyphae, swollen hyphal cells or stromata, or solitary, arising from superficial hyphae, lateral, erect to decumbent, straight to curved, subcylindrical to geniculate-sinuous, rarely subnodulose, simple or occasionally branched, 10–120 × 2–8 µm, continuous to pluriseptate, pale to medium dark brown or olivaceous-brown, sometimes paler towards the tip, smooth- to rough-walled, walls 0.5–1.5 µm wide, sometimes distinctly two-layered, cells often with distinct, clearly delineated lumen, so that the conidiophores appear to be very thick-walled. *Conidiogenous cells* integrated, terminal, occasionally intercalary, 10–30 µm long, conidiogenous loci distinctly coronate, 1–2.5 µm diam, protuberant, denticle-like. *Conidia* solitary or usually in simple or branched chains, secondary ramoconidia common, broadly ellipsoid-ovoid, obovoid, fusiform, subcylindrical, (5–)8–35(–40) × (4–)5–10(–12) µm, (0–)1–4(–6)-septate, often somewhat constricted at septa, rarely with 1(–2) oblique or longitudinal septa or septa mixed with a few distosepta, small aseptate terminal conidia subhyaline to pale olivaceous, septate secondary ramoconidia or intercalary conidia pale to medium dark brown or olivaceous-brown, smooth- to somewhat rough-walled, walls thin to usually thickened, 0.5–2.5 µm, thick walls sometimes distinctly two-layered, cells often with distinct lumen, ends rounded or somewhat attenuated, hila coronate, somewhat protuberant, 1–2 µm diam or (1–)1.5–2.5 µm wide and 1 µm high; germination and microcyclic conidiogenesis occurring.

*Substrates and distribution*: On dead fruits, leaves and stems; Europe (Germany, Greece, Italy, Slovenia), North Africa (Egypt), North America (USA, CA, IL, NJ).

*Additional specimens examined*: **Egypt**, Alexandria, Gabbarey, on dead stems of *Typha angustifolia* (*Typhaceae*), 1920, G. Maire, Plantes d'Egypte (HBG); El-Tor, on dead leaves of *Dichanthium foveolatum* (≡ *Andropogon foveolatus*) (*Poaceae*), Feb. 1903, R. Muschler, Iter sinaicum (HBG). **Germany**, Berlin, zoo, on dead leaves of *Acer saccharinum* (*Sapindaceae*), 5 Nov. 1871, P. Magnus (HBG); Brandenburg, Potsdam, Caputh, on dead leaves of *Phragmites australis* (*Poaceae*), 20 Dec. 1877, P. Magnus (B 700006477). **Greece**, Rhodos, Kahiram, on dry pods of *Vachellia*

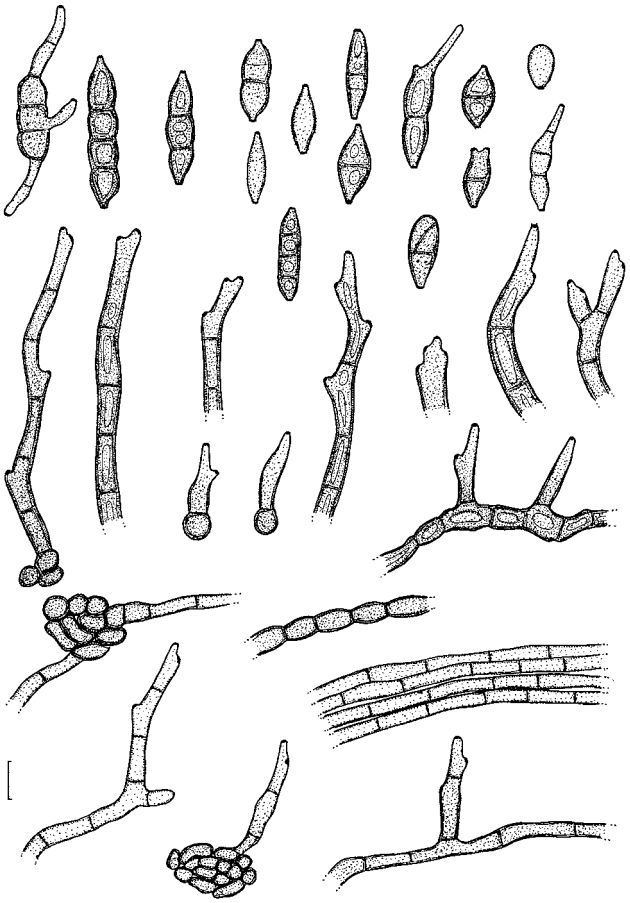


**Fig. 45.** *Cladosporium astroideum* var. *astroideum* (HAL). Mycelium, conidiophores and conidia *in vivo*. Scale bar = 10 µm. U. Braun *del*.

*farnesiana* (≡ *Acacia farnesiana*) (*Fabaceae*), Feb. 1822, Ehrenberg (B 700006135), holotype of *C. acaciae*. **Italy**, Cagliari, botanical garden, on dead stems of *Glebionis coronaria* (*Asteraceae*), 1866, Marcucci, Unio Itin. Crypt. VI (HBG); Emilia Romagna, Parma, on dead leaves of *Juglans regia* (*Juglandaceae*), G. Passerini (B 700006561); South Tirol, near Bozen, on dead leaves of *Quercus pubescens* (*Fagaceae*), 13 Nov. 1910, W. Pfaff (HBG); Veneto, Treviso, Bosco Montello, on dead leaves of *Castanea sativa* (*Fagaceae*), Sep. 1875, Saccardo, Mycoth. Ven. 585 (B 700006297). **Slovenia**, Krain (Carniolia), Laibach, on old leaves of *Castanea sativa*, 20 Jan. 1877, W. Voss (B 700006289, HBG). **USA**, Carolina, Aiken, on dead stems of *Zea mays* (*Poaceae*), 1877, H.W. Ravenel, Thümen, Mycoth. Univ. 1571 (HBG); Illinois, on dead leaves of *Typha latifolia*, 15 Sep. 1993, R.A. Harper (HBG); New Jersey, Newfield, on old fruits of *Yucca filamentosa* (*Agavaceae*), Sep. 1894, Ellis & Everhart, Fungi Columb. 789 and N. Amer. Fungi 650 (HBG).

*Notes*: Zhang *et al*. (1999b) reported this species from China as causal agent of leaf spots on *Sagittaria sagittifolia*, which is very doubtful since *C. astroideum* is a saprobic fungus.

***Cladosporium astroideum* var. *catalinense*** U. Braun, **var. nov.** MycoBank MB800303. Fig. 46.
*Etymology*: Variety named after the island from which it was collected.

Distinguished from var. *astroideum* by its conidiophores that are verruculose below, somewhat narrower conidia, 3–8 µm, mostly verruculose, sometimes with oblique or longitudinal septa.

*Holotype*: **USA**, California, Santa Catalina Island, Johnson's Landing, on dead stems of *Foeniculum vulgare* (*Apiaceae*), 24 Sep. 1920, L.W. Nuttall (F 1320003).

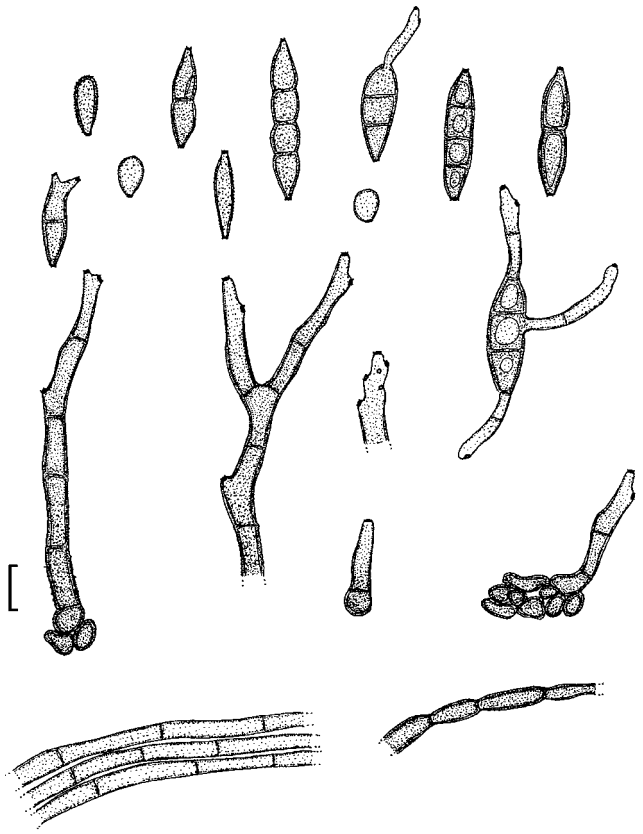


**Fig. 46.** *Cladosporium astroideum* var. *catalinense* (F 1320003). Mycelium, conidiophores, conidia and microcyclic conidiogenesis *in vivo*. Scale bar = 10 µm. U. Braun *del*.

*Additional specimen examined*: **USA**, Santa Catalina Island, Isthmus, on necrotic capsules of *Isomeris* sp. (*Cleomaceae*), 25 Sep. 1920, L.W. Nuttall (F 1320000).

*Notes*: The North American collections are close to *C. astroideum*, but differ in various details. We tentatively consider this fungus as variety of the latter species. A reassessment of the whole complex of *C. astroideum*, including cultures and sequence analyses, is necessary to adequately define the status of this variety.

**19. *Cladosporium auriculae*** (Cooke) J.C. David, Mycol. Pap. 172: 98. 1997. Fig. 47.
*Basionym*: *Heterosporium auriculae* Cooke, J. Roy. Hort. Soc. 27: 380. 1902.
≡ *Heterosporium auriculae* Cooke, Grevillea 16: 109. 1888, *nom. inval*. (ICBN Art. 32.1).

*Holotype*: **UK**, without locality, on dead leaves of *Primula auricula* (*Primulaceae*), without collector and date, ex herb. M.C. Cooke [K(M) 146492)].

*Lit*.: Massee (1910), Saccardo (1913a: 1384).
*Ill*.: David (1997: 84, fig. 19 A–D).

*In vivo*: On necrotic leaves, probably saprobic, leaf spots not evident. *Colonies* amphigenous, finely punctiform to subeffuse, medium brown. *Mycelium* internal and external. *Stromata* lacking. *Conidiophores* solitary to loosely aggregated, arising from immersed swollen hyphal cells or superficial hyphae, erect, straight to flexuous, cylindrical-filiform, neither distinctly geniculate-sinuous nor nodulose, unbranched or occasionally branched, about 100–350 × 3–8 µm, pluriseptate throughout, pale to medium

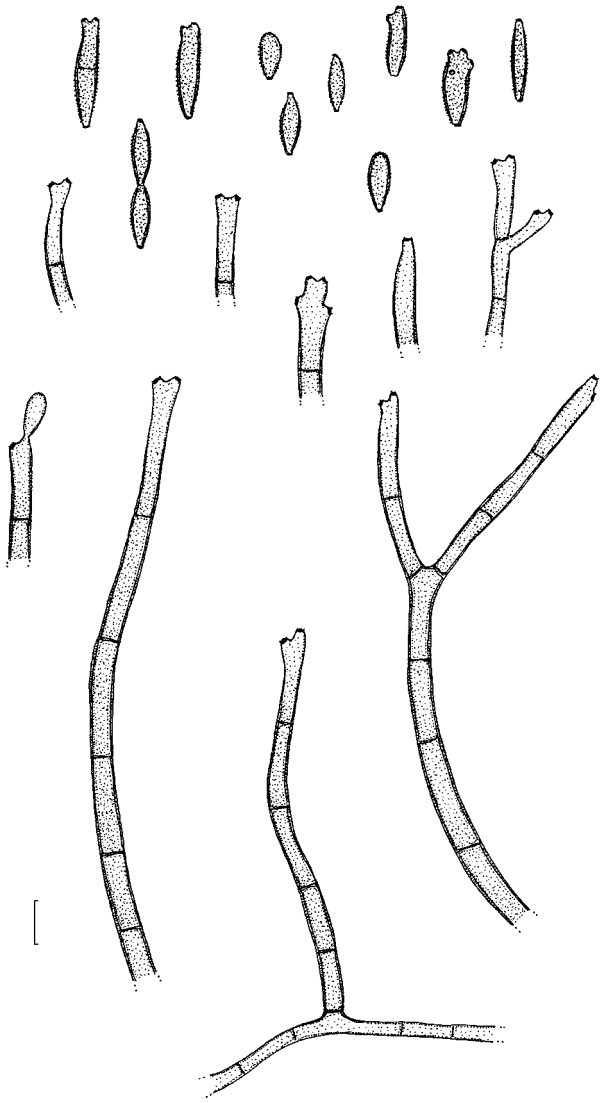


**Fig. 47.** *Cladosporium auriculae* [K(M) 146492]. Conidiophores, conidiogenous cells and conidia *in vivo*. Scale bar = 10 µm. U. Braun *del*.

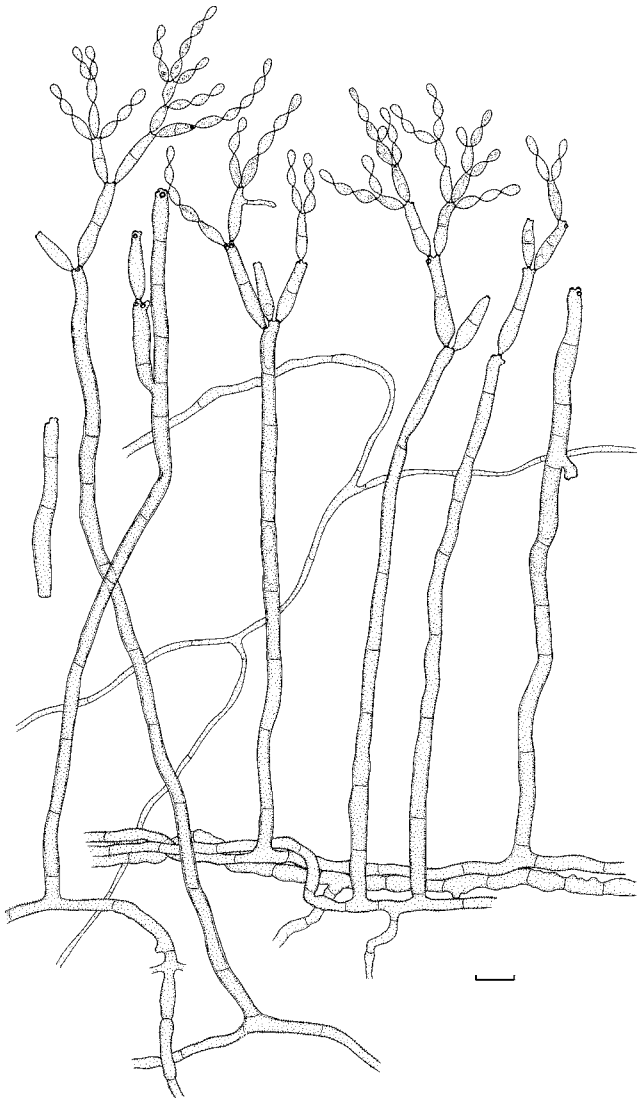


**Fig. 48.** *Cladosporium australiense* (CBS 125984). Conidiophores, ramoconidia and conidial chains, mycelium sometimes forming ropes *in vitro*. Scale bar = 10 µm. K. Bensch *del*.

brown, often paler towards the apex, thin-walled, up to 1 µm wide, smooth or almost so to distinctly verruculose. *Conidiogenous cells* integrated, terminal, occasionally intercalary, 10–40 µm long, usually not or barely geniculate, unswollen, but often subdenticulate by protuberant conidiogenous loci, occasionally slightly swollen or somewhat geniculate-sinuous, with 1–5 conidiogenous loci, often crowded at the apex, 1.5–3 µm diam, distinctly coronate. *Conidia* catenate, in simple or branched chains, subglobose, ellipsoid-ovoid, obovoid, fusiform, (5–)9–16 × 3–6 µm, secondary ramoconidia up to 25 × 8.5 µm, 0(–1)-septate, pale to medium olivaceous or olivaceous-brown, thin-walled, < 1 µm wide, faintly to usually distinctly verruculose, sometimes even verrucose, ends rounded to attenuated, with a single basal and 1–4 terminal hila, often somewhat protuberant, 1–2.5 µm diam, distinctly coronate. Ramoconidia and microcyclic conidiogenesis not observed.

*Substrate and distribution*: On *Primula auricula*; UK.

*Notes*: David (1997) compared this species with *C. cladosporioides*, which is, however, distinct by having smaller, above all narrower, and smooth conidia. The verruculose conidia resemble those of *C. allicinum* (= *C. bruhnei*) and *C. herbarum*, but the two species are easily distinguishable by having distinctly nodulose conidiophores.

**20. *Cladosporium australiense*** Bensch, Summerell, Crous & U. Braun, Stud. Mycol. 67: 24. 2010. Figs 48, 49.

*Holotype*: **Australia**, New South Wales, Douglas Park, S 34°10'50'' E 150°42'18'', isol. from *Eucalyptus moluccana* (*Myrtaceae*), 2006, coll. B.A. Summerell, isol. P.W. Crous (CBS H-20425). *Ex-type culture*: CBS 125984 = CPC 13226.

*Ill.*: Bensch *et al.* (2010: 24−25, figs 10−11).

*In vitro*: *Mycelium* immersed and superficial, abundant, hyphae loosely to densely branched, sometimes anastomosing, filiform to cylindrical-oblong or thicker hyphae irregular in outline due to intercalary swellings and constrictions, 1−5 µm wide, septate, often slightly constricted, subhyaline to pale or medium olivaceous-brown, smooth to verruculose or loosely rough-walled, rugose, walls unthickened or slightly thickened in wider hyphae, rhizoid-like, sometimes cells swollen, up to 7 µm wide, often forming dense ropes with hyphae entwined. *Conidiophores* macronematous, solitary, arising terminally and laterally from hyphae, erect, slightly flexuous, cylindrical-oblong, often very long, 48−285 × 3−4(−5) µm, seta-like, mostly neither geniculate nor nodulose, occasionally subnodulose and slightly geniculate, unbranched or branched,

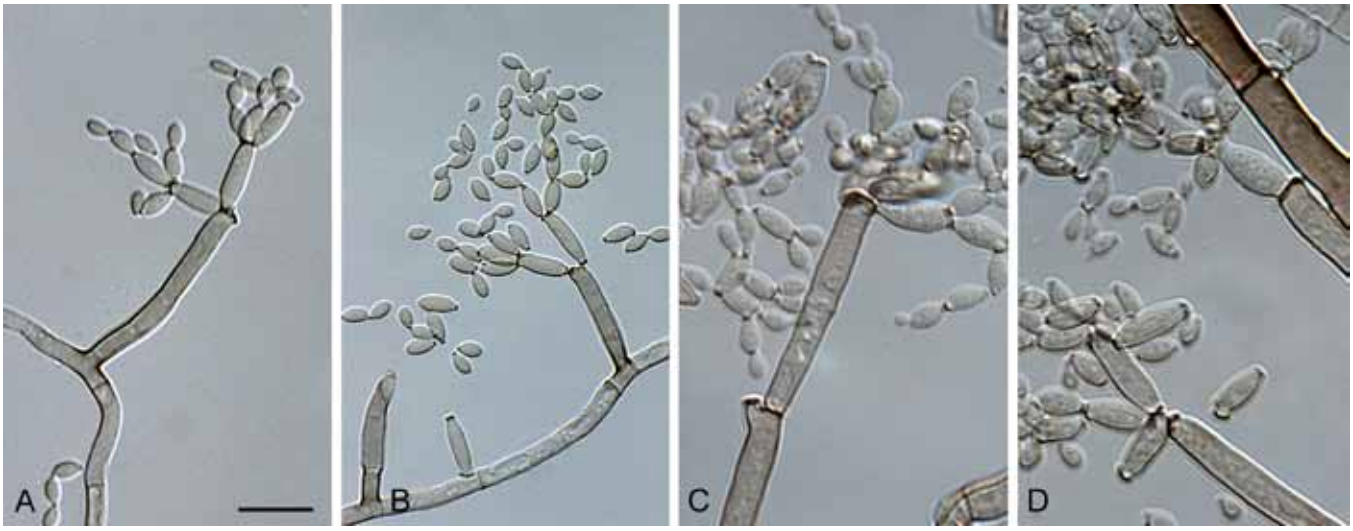



**Fig. 49.** *Cladosporium australiense* (CBS 125984). A–B. Conidiophores and conidial chains. C. Conidiophore with a septate secondary ramoconidium still attached. D. Conidia. Scale bars = 10 µm.

branches 3−55 µm long, pluriseptate, not constricted at septa, pale to medium olivaceous-brown, smooth, walls somewhat thickened, about 0.5 µm wide, several cells with unusual cell structure having one or few bigger cavities and protoplasm attached at cell walls or forming distosepta. *Conidiogenous cells* integrated, terminal, occasionally intercalary, cylindrical-oblong, neither geniculate nor nodulose, 6−15(−40) µm long, with 1−4 loci at the apex or 1−3 loci in intercalary cells with loci situated mostly all at more or less the same level, like a garland, conspicuous, subdenticulate, 1−2 µm diam, somewhat thickened and darkened-refractive. *Ramoconidia* occasionally formed, cylindrical-oblong, often hardly distinguishable from secondary ramoconidia. *Conidia* catenate, in branched chains, branching in all directions, up to 2−4(−5) conidia in the terminal unbranched part of the chain, small terminal conidia globose, subglobose to obovoid, 3−6 × 2−3 µm (av. ± SD: 4.2 ± 0.9 × 2.5 ± 0.4), aseptate, rounded at the apex, intercalary conidia ovoid, ellipsoid to subcylindrical, 5−14(−16) × 2.5−3(−4) µm (av. ± SD: 9.1 ± 3.2 × 3.0 ± 0.4), 0−1-septate, not constricted at septa, with 1−3 distal hila, secondary ramoconidia ellipsoid, subcylindrical to cylindrical, (7−)11−25(−27) × 3−4 µm (av. ± SD: 18.5 ± 5.1 × 3.4 ± 0.3), 0−1(−2)-septate, septum median or often somewhat in the upper half, not constricted at septa, often with additional distosepta, cells with one or few small to large cavities giving the cells a somewhat thick-walled appearance, pale olivaceous to pale olivaceous-brown, smooth, walls unthickened to slightly thickened, slightly attenuated towards apex and base, hila conspicuous, subdenticulate to denticulate, (0.5−)0.8−2 µm diam, thickened and darkened-refractive; microcyclic conidiogenesis not observed.

*Culture characteristics*: Colonies on PDA attaining 70−75 mm diam after 14 d, pale olivaceous-grey, grey-olivaceous towards margins, reverse greyish-blue to iron-grey, floccose to fluffy, margins colourless to white, regular, somewhat feathery, aerial mycelium abundant, forming loosely to densely floccose or fluffy mats covering the whole colony, smoke-grey to pale olivaceous-grey, growth low convex, without prominent exudates, sporulation sparse. Colonies on MEA reaching up to 80 mm diam after 14 d, olivaceous-grey to pale olivaceous-grey, glaucous-grey due to sporulation, reverse iron-grey, velvety to floccose, margins colourless to white, regular, feathery, aerial mycelium abundant, densely floccose, growth effuse, radially furrowed, without prominent exudates, sporulating. Colonies on OA attaining 65−69 mm diam after 14 d, pale olivaceous-grey to pale greenish-grey, towards margins and few areas grey-olivaceous, with smaller dots of smoke-grey, reverse pale mouse-grey with smaller dots or patches of leaden-grey or iron-grey, velvety to floccose, margins colourless, regular, glabrous, aerial mycelium abundant, dense, forming expanded mats, floccose to fluffy, growth low convex, without prominent exudates, sporulating.

*Substrate and distribution*: On *Eucalyptus*; Australia.

*Notes*: *Cladosporium australiense* pertains to the *C. cladosporioides* complex and is morphologically close to the latter species *s. str.*, but genetically clearly distinct, forming a separate clade in sister position to *C. xylophilum* and *C. verrucocladosporioides*, and differs in having conidiophores and secondary ramoconidia with one or several bigger cavities and protoplasm attached at cell walls or forming distosepta. Furthermore, the mycelium usually forms dense ropes and secondary ramoconidia are 0−1-septate or may have one or more distosepta.

**21. *Cladosporium basiinflatum*** Bensch, Crous & U. Braun, Stud. Mycol. 67: 25. 2010. Figs 50, 51.

*Holotype*: **Germany**, on *Hordeum vulgare* (*Poaceae*) (CBS H-20426). *Ex-type culture*: CBS 822.84.

*Ill.*: Bensch *et al.* (2010: 26−27, figs 12−13).

*In vitro*: *Mycelium* immersed, rhizoid, aerial mycelium sparsely formed; hyphae sparingly branched, 4−7 µm wide, septate, not constricted or often distinctly constricted at septa, medium to dark brown, paler at the tips, at the base of the conidiophores distinctly swollen and constricted at septa, 5−11 µm wide, medium to dark brown, smooth to asperulate, thick-walled, sometimes forming stromatic hyphal aggregations. *Conidiophores* macronematous, solitary or in groups of two or three, rarely four, arising from swollen hyphal cells or stromatic hyphal aggregations, erect, straight to slightly flexuous, often quite rigid, seta-like, usually non-nodulose, sometimes slightly head-like, unilaterally swollen at the apex, not geniculate, cylindrical-oblong, distinctly attenuated towards the apex, unbranched, 35−140 µm long, at the base 4−7(−8) µm wide, at the apex 3−4 µm wide, 1−6-septate, not constricted at septa,

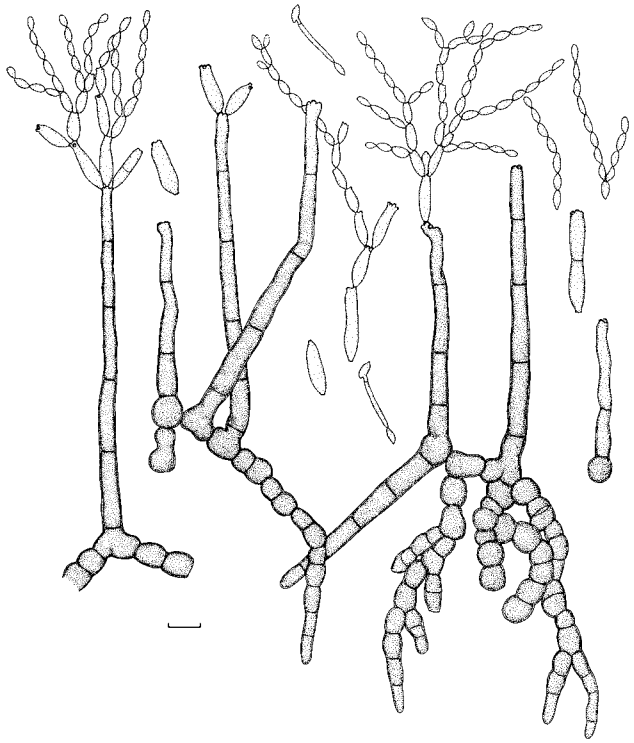


**Fig. 50.** *Cladosporium basiinflatum* (CBS 822.84). Mycelium, stromatic hyphal aggregations, conidiophores often with foot-like swollen base and conidial chains *in vitro*. Scale bar = 10 µm. K. Bensch *del*.

medium to dark brown, paler towards the tip, smooth to minutely verruculose, walls thickened, sometimes two-layered, especially towards the base, about 1 µm wide, often swollen at the base, foot-like. *Conidiogenous cells* integrated, terminal, cylindrical-oblong, 11−25 µm long, neither nodulose nor geniculate, with 2−3(−4) loci at the apex, subdenticulate, protuberant, 1.2−2 µm diam, thickened and darkened-refractive. *Ramoconidia* absent or only very rarely formed. *Conidia* numerous, catenate, in long unbranched or basely branched chains, up to 9(−11) conidia in the unbranched part, straight, small terminal conidia and intercalary conidia obovoid, ovoid to narrowly ellipsoid, 4−6(−7) × (2−)2.5−3 µm, intercalary conidia (6.5−)7−10(−11) × 2.5−3.5(−4) µm (av. ± SD: 8.4 ± 1.3 × 3.0 ± 1.3), aseptate, rounded at the apex or attenuated towards apex and base, secondary ramoconidia ellipsoid to subcylindrical or cylindrical, 10−23(−32) × 3−4.5(−5) µm (av. ± SD: 15.0 ± 4.7 × 4.0 ± 0.4), mainly 4 µm wide, 0(−1)-septate, not constricted at the median septum, pale brown to pale olivaceous-brown, distinctly paler than conidiophores, smooth or almost so, walls unthickened or almost so, slightly attenuated towards apex and base, hila protuberant, often broadly truncate at the base, 1−2(−2.2) µm diam, somewhat thickened and darkenedrefractive; microcyclic conidiogenesis occasionally occurring.

*Culture characteristics*: Colonies on PDA olivaceous-black to grey-olivaceous due to profuse sporulation and mycelium, reverse iron-grey to dark leaden-grey, felty-woolly, margin narrow, white, feathery, aerial mycelium diffuse, loose, fluffy, without prominent exudates, sporulation profuse, mainly in colony centre. Colonies on MEA greenish olivaceous to grey-olivaceous, reverse olivaceous-grey to iron-grey, powdery to fluffy or felty, margin white, feathery, narrow, without prominent exudates, sporulation profuse. Colonies on OA olivaceous-grey to dull green, with age olivaceous, reverse iron-grey to sky-grey, woolly-felty, margin dull green, outermost

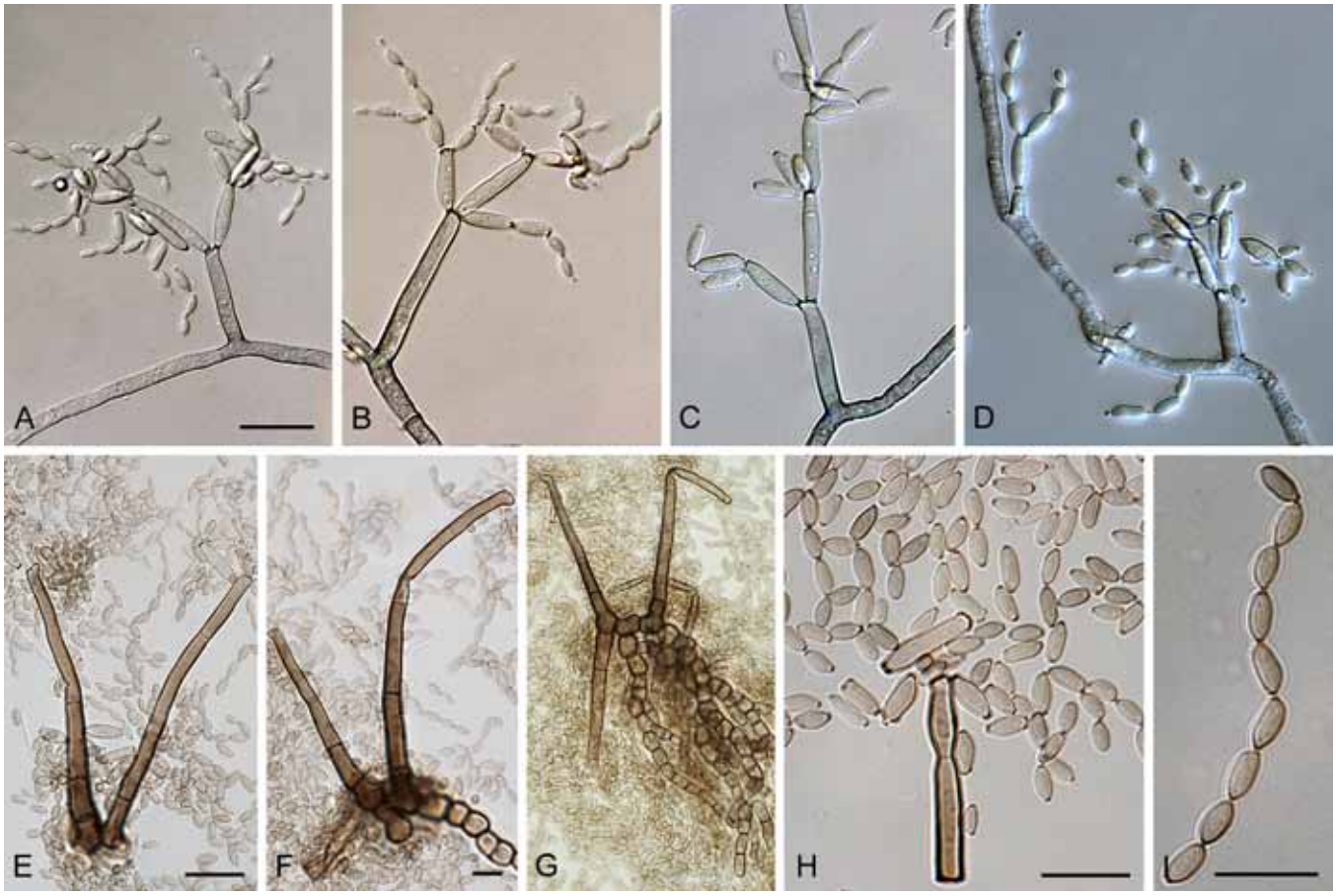



**Fig. 51.** *Cladosporium basiinflatum* (CBS 822.84). A–D. Young conidiophores arising laterally from hyphae with conidial chains still attached. E–G. Older conidiophores formed in pairs arising from distinctly swollen hyphal cells or stromatic hyphal aggregations and numerous conidia. H. A single ramoconidium and numerous conidia. I. A conidial chain composed of intercalary and small terminal conidia. Scale bars = 10 µm.

margin colourless to white, feathery, aerial mycelium abundant, felty-woolly, loose to dense, without prominent exudates, sporulation profuse.

*Substrate and distribution*: On *Hordeum*; Germany.

*Notes*: *Cladosporium basiinflatum*, which clusters as a sister to *C. lycoperdinum* and *C. cladosporioides s. lat*. (Bensch *et al.* 2010, fig. 1, part a), is part of the *C. cladosporioides* complex, but differs from most species of this group by having mainly aseptate conidia that are distinctly paler than conidiophores and dark brown, thick-walled conidiophores with usually foot-like swollen basal cells. *Cladosporium gentianae* is the only species which is morphologically comparable with *C. basiinflatum*, but its conidia are somewhat darker, verruculose or irregularly rough-walled, and 0−1(−3)-septate (Lobik 1928, Schubert 2005b).

**22. *Cladosporium borassi*** Hasija, Indian Phytopathol. 19: 373. "1966", 1967, as "*borassii*". Figs 52, 53.

*Holotype*: **India**, Madhya Pradesh, Jabalpur, Howbagh, Coll. Garden, on living leaves of *Borassus flabellifer* (*Arecaceae*), 7 Sep. 1964, S.K. Hasija (IMI 109416c).

*Lit.*: Schubert (2005b: 46–47).
*Ill.*: Hasija (1967: 375, fig. 2), Schubert (2005b: 47, fig. 10, pl. 4, figs F–H).

*In vivo*: Leaf spots amphigenous, at first as brown pinhead spots on the upper region of the leaves, later extending, irregular in size, effuse, fading, turning yellowish to pale brown or pale reddish brown, surrounded by a narrow, reddish brown to medium brown margin. *Colonies* amphigenous, scattered, caespitose, loose to dense, dark brown to blackish. *Mycelium* internal, immersed, subcuticular to intraepidermal; hyphae branched, 2–4 µm wide, septate, often with small swellings, nodulose, subhyaline to pale olivaceous, walls slightly thickened. *Stromata* composed of subglobose, angular or somewhat irregular cells, 5–10 µm wide, pale to medium brown or yellowish brown, walls slightly thickened, sometimes forming extended stromatic layers. *Conidiophores* in loose to dense fascicles, arising from stromata, erumpent through the cuticle, erect, straight to flexuous, sometimes slightly geniculate-sinuous, subnodulose or nodulose, small swellings up to 6 µm wide, often connected with conidiogenesis, unbranched, 40–105(–150) × 4–5.5 µm, pluriseptate, olivaceous-brown to medium brown, somewhat paler towards the apex, smooth, walls thickened, sometimes distinctly two-layered, up to 1 µm wide, often swollen at the base, up to 8 µm wide. *Conidiogenous cells* integrated, terminal or intercalary, proliferation sympodial, with numerous conidiogenous loci, often situated on small multilateral swellings, small, often not very conspicuous, truncate to slightly convex, 0.5–1(–1.5) µm diam or smaller, slightly thickened, somewhat darkened-refractive. *Conidia* catenate, in unbranched or branched chains, straight, subglobose, ellipsoid, subcylindrical, 3–10(–14) × 2.5–6 µm, 0–1-septate, septum more or less median, sometimes slightly constricted at the septum, pale brown, smooth, walls slightly thickened, truncate at the base, hila very small, up to 1 µm diam, slightly thickened, somewhat darkened-refractive.

*Substrate and distribution*: On *Borassus flabellifer*; India.

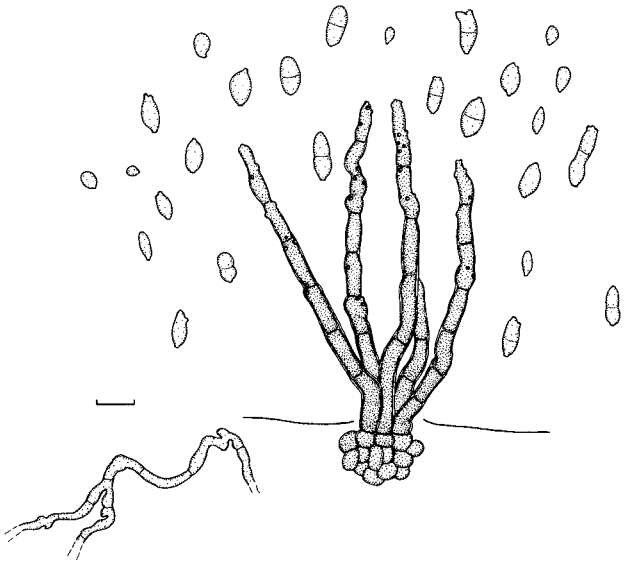


**Fig. 52.** *Cladosporium borassi* (IMI 109416c). Internal mycelium, fascicle of conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

**Fig. 53.** *Cladosporium borassi* (IMI 109416c). A. Symptoms. B. Fascicle of conidiophores. C. Nodulose conidiophores. Scale bars = 10 (C), 20 (B) µm.

*Notes*: *Cladosporium borassi* has subnodulose or nodulose conidiophores as do species of the *C. herbarum* complex, but is quite distinct by its smooth conidia and narrower conidiogenous loci and hila.

**23. *Cladosporium bosciae*** (Sacc.) K. Schub., Schlechtendalia 14: 58. 2006. Figs 54, 55.
*Basionym*: *Cladosporium compactum* f. *bosciae* Sacc., Ann. Mycol. 8: 340. 1910.
≡ *Cladosporium compactum* var. *bosciae* (Sacc.) Sacc., Syll. Fung. 22: 1367. 1913.

*Holotype*: Eritrea, Barca, Agordat, alt. 640 m, on *Boscia senegalensis* (*Capparaceae*), 23 Feb. 1909, A. Fiori (PAD).

*Lit.*: Schubert (2005b: 47–48).
*Ill.*: Schubert (2005b: 49, fig. 11, pl. 6, figs A–E), Schubert *et al*. (2006: 59, fig. 2).

*In vivo*: Leaf spots amphigenous, numerous, punctiform, up to 2 mm wide, often somewhat irregular and limited by larger leaf veins,

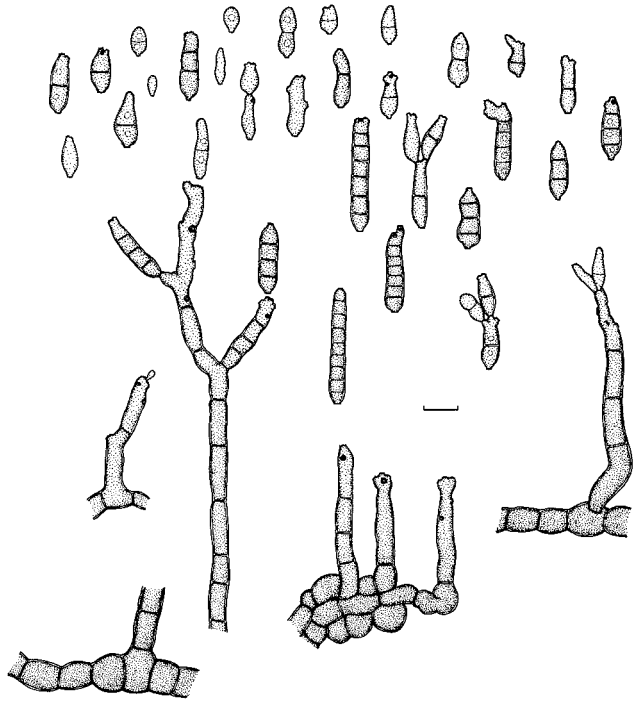


**Fig. 54.** *Cladosporium bosciae* (PAD). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

grey brown to dark brown or almost blackish, later confluent, then leaves with a somewhat spotted appearance, spots surrounded by a narrow, reddish or pale reddish brown, irregular margin, cuticle of the diseased leaves seemingly destroyed or dislodged, looking like the damage caused by insects, yellowish ochraceous. *Colonies* usually hypophyllous, on the upper leaf surface sparingly developed, scattered, dense, caespitose, red-brown to dark brown, velvety. *Mycelium* internal, immersed; hyphae branched, 3.5–4.5 µm wide, septate, sometimes slightly constricted at the septa, pale olivaceous to olivaceous-brown, smooth, walls somewhat thickened, often somewhat wider and darker at the base of conidiophores. *Stromata* intraepidermal composed of subglobose to somewhat angular, thick-walled cells, 5–12 µm wide, olivaceous-brown, smooth. *Conidiophores* solitary or in loose groups, arising from stromata or from swollen hyphal ropes, erect, more or less straight, cylindrical-oblong, unbranched, rarely branched, 35–130 × 4.5–7(–9) µm, septate, sometimes slightly constricted at the septa, olivaceous-brown, smooth or sometimes faintly asperulate, walls thickened, sometimes even distinctly two-layered, mostly somewhat paler and attenuated towards the apex. *Conidiogenous cells* integrated, at first terminal, later intercalary, cylindrical, 10–35 µm long, proliferation sympodial, with one or only few conidiogenous loci, subdenticulate, truncate to slightly convex, 1.5–2.5 µm diam, thickened, more or less darkened-refractive. *Conidia* in branched chains, polymorphous, small terminal conidia subglobose, ovoid, obovoid, ellipsoid, subcylindrical, 4–11 × 2.5–5(–6) µm, 0–1-septate, larger intercalary conidia ellipsoid, fusiform, cylindrical 10–20 × 3.5–6(–7) µm, (0–)1–3-septate, ramoconidia and secondary ramoconidia oblong, ellipsoid-cylindrical, 18–40 × 4.5–8 µm, 1–6(–8)-septate, not to slightly constricted at the septa, pale olivaceous, olivaceous-brown to brown, smooth or almost so, sometimes faintly rough-walled,


**Fig. 55.** *Cladosporium bosciae* (PAD). A. Conidiophores. B. Chain of conidia. C. Conidia. D, E. Conidia showing cell structure, with paler cavity in the centre of the cells. Scale bars = 10 (B–E) µm.

walls slightly to distinctly thickened, in the centre often with distinct lumen, surrounded by the somewhat darker protoplasm, similar to distoseptation, apex rounded to attenuated, hila truncate to slightly convex, 1–2.5 µm diam, thickened, somewhat darkened-refractive; microcyclic conidiogenesis not observed.

*Substrate and distribution*: On *Boscia senegalensis*; Eritrea.

*Notes*: The biology of *Cladosporium bosciae* is still unknown, *i.e.*, it is unclear if this species is biotrophic or saprobic. It is morphologically well distinguished from all other species of *Cladosporium* including the common saprobic species *C. herbarum*, *C. oxysporum* and *C. cladosporioides*.

**24. *Cladosporium brassicae*** (Ellis & Barthol.) M.B. Ellis, More Dematiaceous Hyphomycetes: 340. 1976. Fig. 56.
*Basionym*: *Cladotrichum brassicae* Ellis & Barthol., Trans. Kansas Acad. Sci. 16: 167. 1899.
≡ *Heterosporium brassicae* (Ellis & Barthol.) Arx, Genera Fungi Sporul. Pure Cult., Ed. 3: 305. 1981.

*Lectotype* (**designated here**): **USA**, Kansas, Rooks Co., on old leaves of *Brassica oleracea* (*Brassicaceae*), 22 Apr. 1897, E. Bartholomew 2399 (NY). *Isolectotypes*: NY; Ellis & Everhart, N. Amer. Fung. 3589 (*e.g.*, K, IMI 99694, NY) and Ellis & Everhart, Fungi Columb. 1274 (*e.g.* NY).

*Lit.*: David (1997: 82), Zhang *et al*. (2003: 55–56).
*Ill.*: Ellis (1976: 341, fig. 259 A), David (1997: 83, fig. 18; 84, fig. 19 E–G), Zhang *et al*. (2003: 55, fig. 28).
*Exs.*: Ellis & Everhart, Fungi Columb. 1274; Ellis & Everhart, N. Amer. Fung. 3589.

*In vivo*: Leaf spots amphigenous, but usually more densely fruiting on the upper leaf surface, patches at first more or less discrete, 1–2.5 mm diam, circular to ellipsoid, later extending and often confluent, 1–2 cm diam, covering large areas of the leaf surface, dark olivaceous to brown, without margin. *Colonies* amphigenous, short caespitose, dense, velvety. *Mycelium* immersed, subcuticular to intraepidermal; hyphae sparingly branched, 4–8 µm wide, septate, subhyaline to pale olivaceous, sometimes slightly constricted at septa, walls smooth and only slightly thickened, forming hyphal aggregations and stromata. *Stromata* at first small, consisting of only few swollen hyphal cells, later extended but only few layers deep, swollen hyphal cells 7–13 µm wide, subglobose to somewhat angular, pale to medium olivaceous or olivaceous-brown, smooth, thick-walled. *Conidiophores* in small to large, loose to somewhat dense fascicles, often effuse, forming extended layers, arising from swollen hyphal cells or stromata, emerging through stomata or erumpent through the cuticle, erect, straight to more or less flexuous, geniculate, once or usually several times, often closely so, nodulose, but not distinctly nodose, unbranched, occasionally branched, usually only once at the apex of conidiophores, such branches often being more like short lateral protuberances, 30–150 × 5–10 µm, 10–12 µm wide at swellings, 1–4-septate, usually one in the lower third, pale olivaceous to pale medium olivaceous-brown or sometimes reddish brown, darker towards the base and paler towards the apex, smooth, occasionally somewhat rough-walled towards apex or near scars, walls somewhat thickened, up to 1 µm wide, less thickened towards the apex. *Conidiogenous cells* integrated, terminal or intercalary, geniculate, nodulose, with conidiogenous loci confined to swellings,

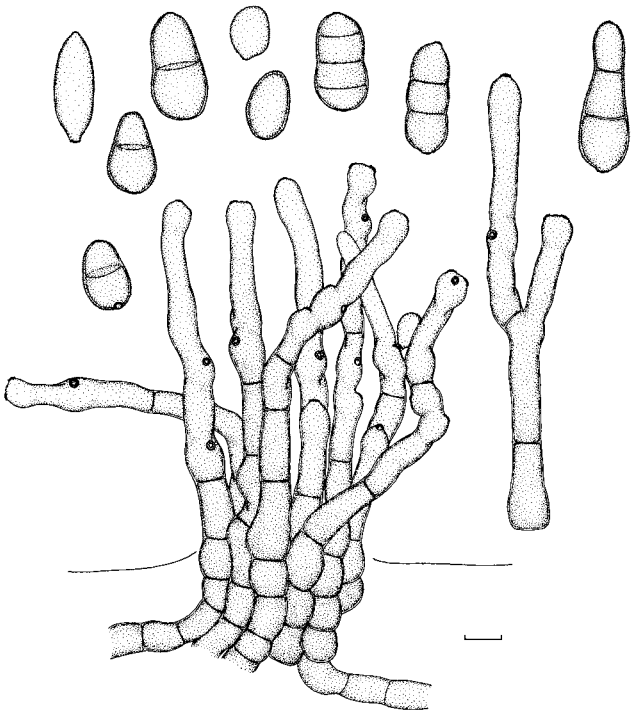


**Fig. 56.** *Cladosporium brassicae* (NY). Fascicle of conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

often very long, up to 70 µm, proliferation sympodial, with a single or up to four conidiogenous loci, loci sessile to protuberant, 2–3.5 µm diam, thickened and somewhat darkened-refractive. *Conidia* solitary or catenate, in short, unbranched chains, broadly ovoid, ellipsoid to cylindrical, straight, (7–)10–32(–40) × (7–)9–16 µm, mainly 0–1-septate, often with a second subsidiary septum, occasionally 3-septate, not to sometimes slightly constricted, concolorous with conidiophores, coarsely verrucose to echinulate, walls somewhat thickened, up to 1.5 µm wide including ornamentation, both ends rounded, hila sessile, apparently somewhat immersed, to slightly protuberant, 2–3.5 µm diam, thickened and darkened-refractive; microcyclic conidiogenesis not observed.

*Substrates and distribution*: On *Brassica* and *Thelypodium* spp. (*Brassicaceae*), Asia, North America – *Brassica oleracea* (USA, KS), *Brassica oleracea* subsp. *gongylodes* (= *B. caulorapa*) (China), *B. rapa* (*B. campestris*) (China), *Thelypodium sagittatum* (USA, UT).

*Additional specimens examined*: **USA**, Utah, Sevier Co., T 238, R2W, Sec 23, *ca.* 1 mile north of Glenwood, 5400 f., on *Thelypodium sagittatum* (*Brassicaceae*), 25 Apr. 1979, Welsh, Welsh & Moore, det. C.T. Rogerson (NY).

*Notes*: *Cladosporium brassicae* was until now only known from type collections. An additional collection on *Thelypodium sagittatum* from North America could be examined and proved to be conspecific. Conidia were 1–3-septate and the conidiophores were somewhat darker, reddish brown but agreed well with the concept of the species concerned. Therefore, *Thelypodium sagittatum* is a new host. *Brassica oleracea* subsp. *gongylodes* (= *B. caulorapa*), *B. rapa* (= *B. campestris*) and *Crepidiastrum denticulatum* (≡ *Ixeris denticulata*) (*Asteraceae*) have been recorded as hosts from China (Zhang *et al*. 2003).

Type material of *C. brassicicola* Sawada, an invalid name published without Latin diagnosis (Sawada 1959), could not be traced. Therefore, the taxonomic status of this species, described from Taiwan on leaves of *Brassica juncea*, is uncertain.

*Cladosporium brassicae* is distinguished from the latter taxon by its coarsely verrucose or echinulate, much wider conidia, 10–14 µm wide.

David (1997) classified the lectotype material as holotype, which was, however, not correct. Several duplicates (syntypes) of the original collection had been distributed in exsiccata, and no holotype was designated in the original publication.

**25. *Cladosporium buteicola*** ("*buteacola*") Cooke, Grevillea 5(33): 15. 1876. Fig. 57.

*Holotype*: **India**, on pods of *Butea monosperma* (= *B. frondosa*) (*Fabaceae*), 1876, Hobson 113 [K(M) 121548].

*Lit*.: Saccardo (1886: 353), Ellis (1976: 343).
*Ill*.: Cooke (1876: pl. 74, fig. 10), Ellis (1976: 343, fig. 260 B).

*In vivo*: *Colonies* on pods, effuse or thin patches, olivaceous-brown. *Mycelium* internal and external; superficial hyphae branched, 2–10 µm wide, septate, without or sometimes with constrictions at septa, olivaceous-brown, smooth or almost so, walls thin to slightly thickened, forming swollen hyphal cells, 3–12 µm diam, sometimes aggregations of such cells, but true well-developed stromata lacking. *Conidiophores* solitary or in small, loose groups, arising from immersed or superficial hyphae or aggregations of swollen hyphal cells, erect, straight, flexuous, filiform, barely or only slightly geniculate-sinuous, unbranched, 20–300 µm long, 4–10 µm wide below and 2.5–5 µm wide in the upper half, pluriseptate throughout, pale to medium olivaceous-brown, at first smooth, later becoming verruculose, above all in the lower half, walls 0.5–1 µm wide. *Conidiogenous cells* integrated, terminal, 10–30 µm long, not or only slightly geniculate or subdenticulate, with a single or several conidiogenous loci, distinctly coronate, 1–2 µm diam, somewhat protuberant. *Conidia* catenate, in simple or branched chains, ellipsoid-ovoid, subcylindrical, pyriform, fusiform, small terminal and intercalary conidia 4–18 × 2–6 µm, 0–1-septate, secondary ramoconidia 8–30(–55) × 4–8(–10) µm, 0–3(–4)-septate, pale olivaceous to olivaceous-brown, smooth to faintly rough-walled, walls thin to slightly thickened, up to 1 µm wide, ends rounded to attenuated, hila 1–2 µm diam; germination and microcyclic conidiogenesis occurring.

*Substrate and distribution*: On *Butea monosperma*; India.

*Notes*: This species is only known from the type collection. It is morphologically close to *C. delicatulum*, also described by Cooke from India, but differs in forming abundant superficial hyphae with solitary conidiophores. Furthermore, distinct lumina in cells of the conidiophores and conidia are lacking.

**26. *Cladosporium caraganae*** K. Schub., U. Braun & H.D. Shin, Schlechtendalia 16: 63. 2007. Figs 58, 59.

*Holotype*: **South Korea**, Jinju, Gazwa Arboretum, Forestry Research Institute, on dead but not fallen leaves of *Caragana sinica* (*Fabaceae*), 15 Oct. 2003, H.D. Shin (HAL 2008 F).

*Ill*.: Braun & Schubert (2007: 64, fig. 2).

*In vivo*: Leaf spots amphigenous, on the upper leaf surface subcircular to irregular, about 2 mm diam, grey to blackish, on the lower leaf surface forming blackish patches, not distinctly limited, somewhat dendritic towards the margin. *Colonies* hypophyllous, effuse, dense, grey to dark olivaceous-brown, velvety. *Mycelium* internal, subcuticular to intraepidermal, later also external; hyphae unbranched or branched, 2–7 µm wide, septate, often slightly to distinctly constricted at septa, sometimes with swellings, up to 9(–13) µm wide, subhyaline to pale olivaceous or olivaceous-brown, smooth, walls mostly thickened, cells often with small oil droplets or appearing granulated, forming loose to dense hyphal aggregations. *Stromata* lacking. *Conidiophores* solitary, arising from superficial

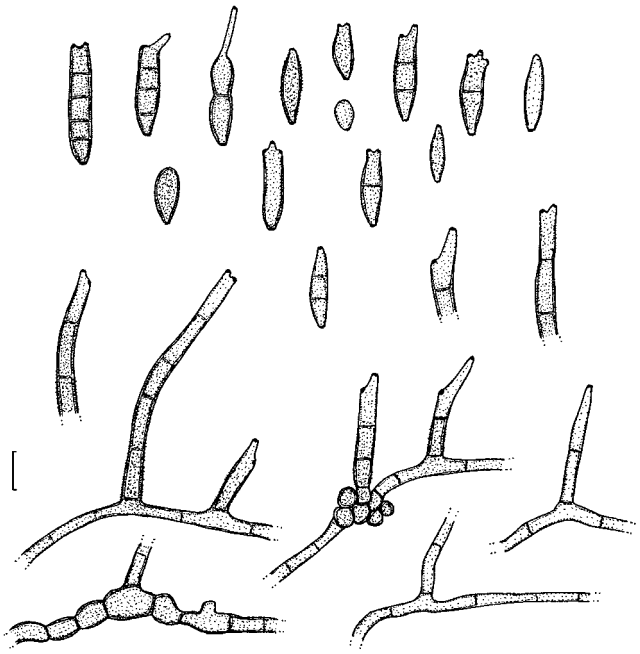


**Fig. 57.** *Cladosporium buteicola* [K(M) 121548]. Mycelium, conidiophores and conidia *in vivo*. Scale bar = 10 µm. U. Braun *del*.

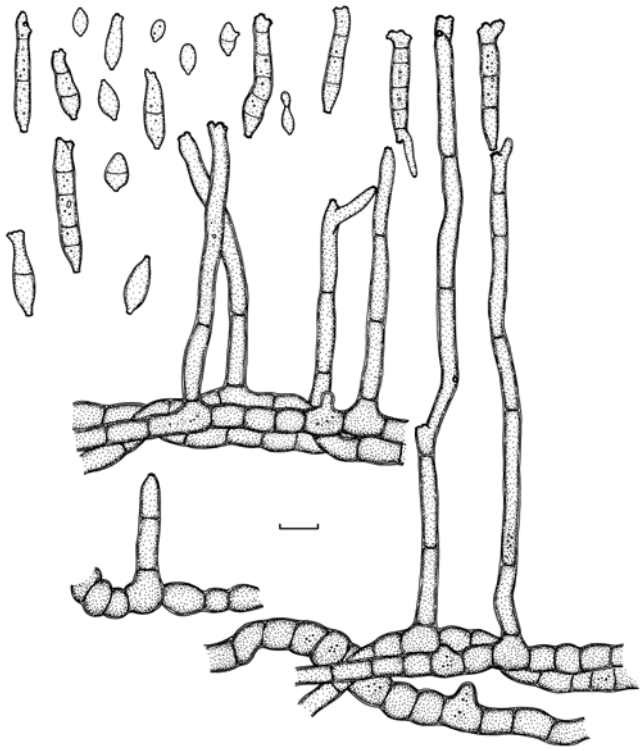


**Fig. 58.** *Cladosporium caraganae* (HAL 2008 F). Conidiophores arising from superficial hyphae and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.


**Fig. 59.** *Cladosporium caraganae* (HAL 2008 F). A. Superficial hyphal ropes giving rise to conidiophores. B. Details of scar structure on a secondary ramoconidium and conidia. C. Tip of a conidiophore with smooth, catenate conidia. Scale bars = 10 (B–C), 20 (A) µm.

hyphae, laterally from creeping hyphae or terminally from ascending hyphae, erect, straight to slightly flexuous, non-nodulose, sometimes distinctly geniculate towards the apex, unbranched, occasionally apically branched, 30–200(–250) × 3–6(–7) µm, septate, occasionally slightly constricted at septa, pale olivaceous or olivaceous-brown, paler towards the apex, sometimes almost hyaline, smooth, sometimes slightly rough-walled, walls thickened, up to 1 µm wide, thinner-walled towards the apex. *Conidiogenous cells* integrated, terminal but also intercalar, cylindrical-oblong, 10–55 µm long, sometimes geniculate, proliferation sympodial, with a single or usually several denticulate conidiogenous loci, often crowded, protuberant, 1.5–2.5(–3) µm diam, thickened and somewhat darkened-refractive. *Conidia* catenate, in unbranched or branched chains, straight, ellipsoid, fusiform or cylindrical, 5–35(–55) × (2.5–)3.5–6.5(–7.5) µm, 0–4(–5)-septate, occasionally slightly constricted at septa, subhyaline, pale olivaceous or olivaceous-brown, smooth, walls unthickened or somewhat thickened, slightly attenuated towards the base, cells with oil droplets appearing granular, hila 1–2 µm diam, thickened and darkened-refractive; microcyclic conidiogenesis occurring.

*Substrate and distribution*: On *Caragana sinica*; South Korea.

*Notes*: *Cladosporium caraganae* belongs to a group of leaf-spotting *Cladosporium* species morphologically close to *C. cladosporioides*, *C. psoraleae* and *C. vignae* but easily distinguishable from those species by its 0–4-septate conidia and loose to dense hyphal aggregations.

**27. *Cladosporium carpesii*** Sawada, Bull. Gov. Forest Exp. Sta. 105: 93. 1958.

*Holotype*: **Japan**, Iwate Prefecture, Morioka, on leaves of *Carpesium abrotanoides* var. *thunbergianum* (*Asteraceae*), 12 Sep. 1947, K. Sawada (herb. Univ. Iwate, Japan).

*In vivo*: Leaf spots circular to variable in shape, 3–10 cm diam, greenish yellow, margin indefinite, finally with brownish centre. *Mycelium* internal or epidermal. *Stromata* lacking or only composed of a few swollen hyphal cells, brown. *Conidiophores* solitary, arising from swollen hyphal cells, erumpent through the cuticle, erect, assurgent to the leaf hairs or creeping on the leaf surface, flexuous, cylindrical, unbranched, rarely 1–2 times branched, 48–250 × 3.4–5.8 µm, pluriseptate, not constricted at septa, brown, smooth to minutely verruculose, thick-walled. *Conidiogenous cells* integrated, terminal and intercalary, with a few conidiogenous loci per conidiogenous cell, conspicuously protuberant, at intercalary conidiogenous cells somewhat on shoulders, 1.5–2.2 µm wide, 1–2 µm high, darkened, refractive. *Conidia* catenate, in unbranched chain, ramoconidia not observed, straight, fusiform, ovoid to ellipsoid, 8–14 × 4–8 µm, usually aseptate, not constricted at septa, pale brown to brown, slightly verruculose, apex slightly attenuated, protuberant, hila 1–1.5 µm diam.

*Substrate and distribution*: On *Carpesium*; Japan.

*Notes*: Type material of *C. carpesii* has been traced in the herbarium of the Iwate University, Japan (without acronym). C. Nakashima re-examined the type material and prepared the current description.

**28. *Cladosporium cassiae-surathensis*** J.M. Yen, Bull. Soc. Mycol. France 97(3): 130–131. 1981. Figs 60–62.

*Holotype*: **Singapore**, Bukit Timah, on living leaves of *Senna surattensis* (≡ *Cassia surattensis*) (*Fabaceae*), 29 Mar. 1970, G. Lim, No. 45 (LAM: Yen Herb., No. 10541).

*Lit.*: Braun & Freire (2004: 222), Schubert (2005b: 49–51).
*Ill.*: Yen (1981: 130, fig. 1), Schubert (2005b: 50–51, figs 12–13, pl. 7, figs A–F).

*In vivo*: Leaf spots amphigenous, subcircular, oval-oblong to irregular, 1–8 mm wide, sometimes covering large areas of the leaf surface, small spots brown, larger ones with a pale brown centre, surrounded by a narrow, somewhat raised, dark brown, reddish brown to blackish margin, spots somewhat paler on the lower leaf surface. *Colonies* amphigenous, punctiform, scattered, loosely caespitose, brown, not velvety. *Mycelium* internal, subcuticular to intraepidermal, later also external, growing superficially; hyphae sparsely branched, 3–4 µm wide, septate, not constricted at the septa, pale brown or somewhat darker at the base of conidiophores, smooth, walls slightly thickened, often single cells swollen, up to 8 µm. *Stromata* subcuticular to intraepidermal, small, up to 25 µm wide, flat, only few layers deep, composed of swollen, subcircular to somewhat angular, thick-walled cells, 5–9 µm diam, pale brown to medium brown, sometimes even dark brown, smooth. *Conidiophores* solitary arising from internal and external hyphae or swollen hyphal cells, or in small, loose fascicles (up to 10) arising from stromata, erumpent through the cuticle, erect, straight to somewhat flexuous, cylindrical, unbranched, rarely branched, 20–100 × 3–5 µm, septate, not constricted at the septa, pale brown to mostly medium or even dark brown, somewhat paler towards the apex, smooth, sometimes slightly rough-walled, walls thickened, usually distinctly two-layered, up to 1 µm wide, often swollen at

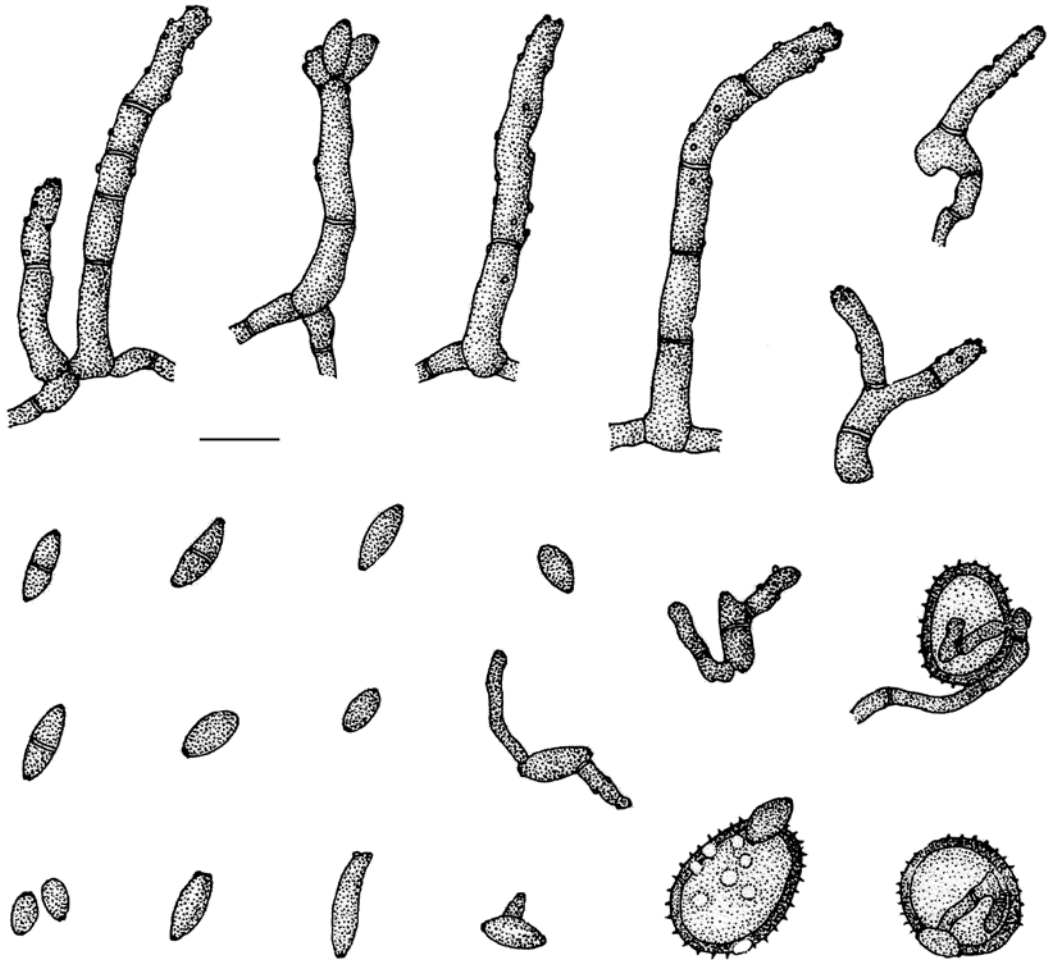


**Fig. 60.** *Cladosporium cassiae-surathensis*. Original drawing from Yen (1981). A–D. Conidiophores. E–H. Conidia. I–J. Germinating conidia. K. Uredospores parasitised by germ tubes of conidia.

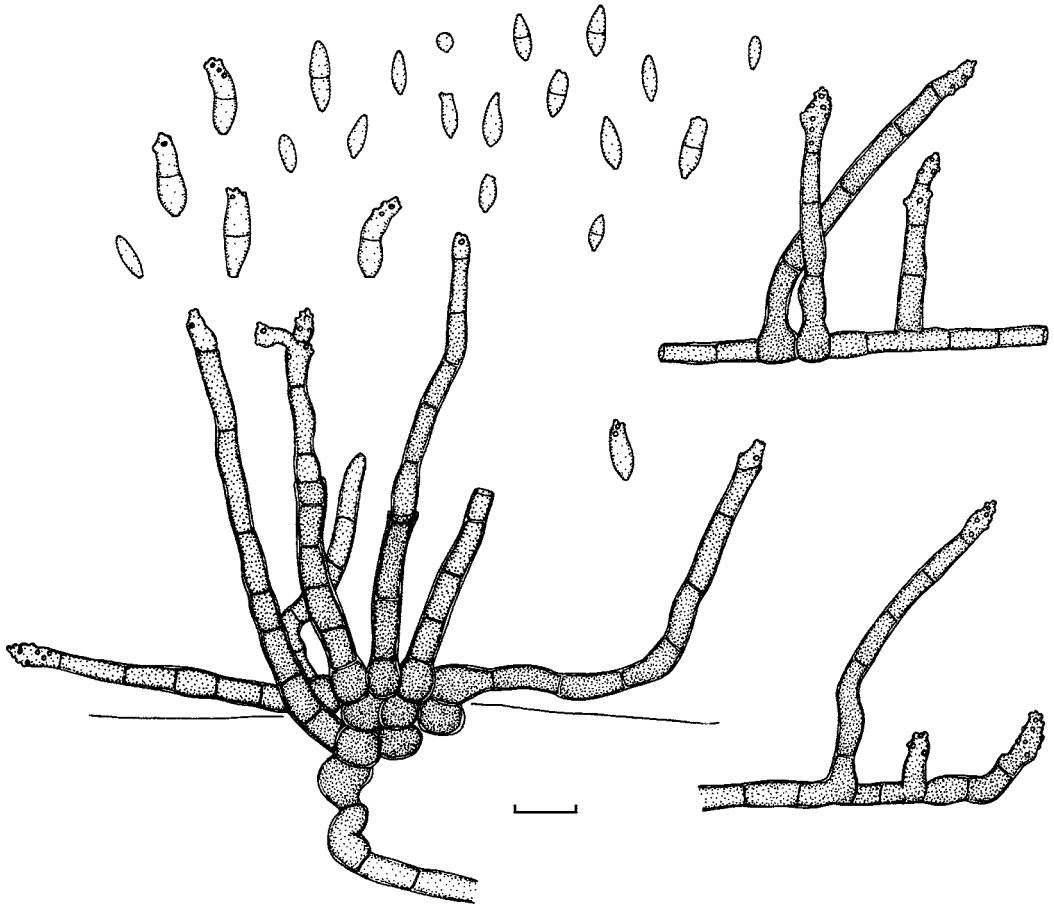


**Fig. 61.** *Cladosporium cassiae-surathensis* (HAL). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

**Fig. 62.** *Cladosporium cassiae-surathensis* (HAL). A. Symptoms on leaves of *Chamaecrista* sp. B. Fascicle of conidiophores. C. Tip of a conidiophore with still attached conidia. D. Fascicle of conidiophores, conidiophores with percurrent, enteroblastic proliferations. E. Conidiophore with terminal conidiogenous cell with numerous, small conidiogenous loci crowded near the apex. F. Conidia. Scale bars = 5 (C), 10 (D–F), 50 (B) µm.

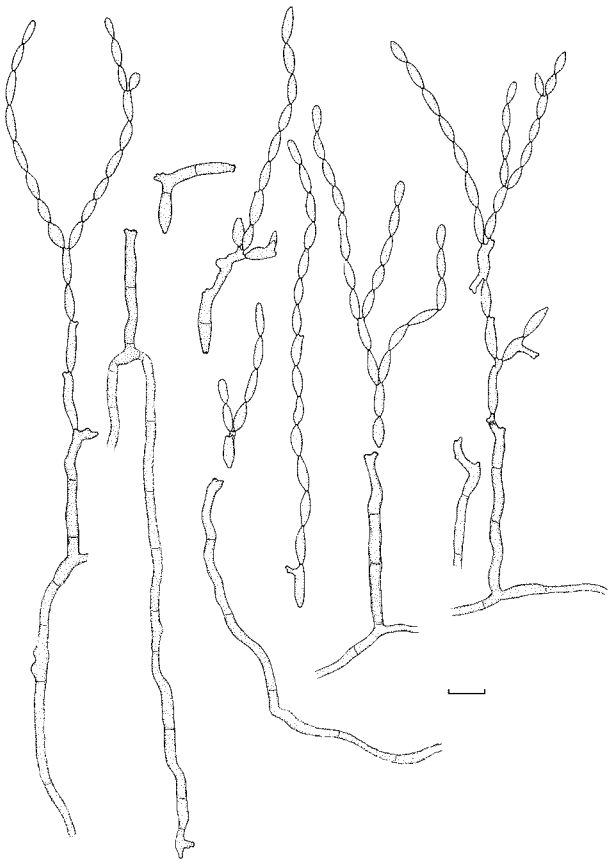


**Fig. 63.** *Cladosporium chalastosporoides* (CBS 125985). Conidiophores, conidia in long unbranched or dichotomously branched chains and microcyclic conidiogenesis *in vitro*. Scale bar = 10 µm. K. Bensch *del*.

the base, up to 8 µm wide, often enteroblastically proliferating. *Conidiogenous cells* integrated, terminal or intercalary, cylindrical, 5–16 µm long, proliferation sympodial, cicatrised, with numerous small conidiogenous loci, often crowded near the apex, slightly convex, up to 1 µm diam, more or less thickened, not to slightly darkened-refractive. *Ramoconidia* ellipsoid to subcylindrical, 9–14 × 3–4.5 µm, mostly 1-septate, darker, concolorous with the tips of conidiophores, walls somewhat thicker as in conidia, with mostly several conidiogenous loci, base broadly truncate, 2 µm wide, unthickened. *Conidia* catenate, in unbranched or branched chains, straight to slightly curved, subglobose, ovoid, ellipsoid-ovoid, 3–11 × 2–4 µm, 0–1-septate, not constricted at the septa, very pale to pale brown, smooth, walls slightly thickened, ends more or less rounded, hila truncate to slightly convex, up to 1 µm diam, thickened, not to slightly darkened.

*Substrates and distribution*: On *Senna* and *Chamaecrista* spp. (*Fabaceae*), Asia, South America – *Chamaecrista* sp. (Brazil), *Senna surattensis* (Singapore).

*Additional specimen examined*: **Brazil**, State of Ceará, Cascavel County, Preaoca district, on *Chamaecrista* sp., 30 Aug. 2003, F. Freire (HAL).

*Notes*: The present description is mainly based on a single collection from Brazil on leaves of *Chamaecrista* sp. (*Cassia s. lat*.) that agreed well with the original description of *C. cassiae-surathensis* except for somewhat longer conidiophores, formed singly as well as in small loose fascicles arising not only from external hyphae but also from internal hyphae, swollen hyphal cells and from small stromata as well as microcyclic conidiogenesis observed by Yen (1981). Yen (1981) also noted that the germinating conidia may occasionally penetrate germ pores of uredospores of *Uredo cassiae-surathensis* occurring on the same leaves.

### 29. *Cladosporium chalastosporoides* Bensch, Crous & U. Braun, Stud. Mycol. 67: 27. 2010. Figs 63–65.

*Holotype*: **South Africa**, Western Cape Province, Jonkershoek Nature Reserve, isol. from fruiting bodies of *Teratosphaeria proteae-arboreae* (*Teratosphaeriaceae*) on leaves of *Protea nitida* [= *P. arborea*] (*Proteaceae*), 4 Jan. 2007, P.W. Crous (CBS H-20427). *Ex-type culture*: CBS 125985 = CPC 13864.

*Ill.*: Bensch *et al.* (2010: 28−29, figs 14−16).

*In vitro*: *Mycelium* immersed and superficial; hyphae unbranched or loosely branched, 1−3 µm wide, septate, not constricted at septa, pale to pale medium olivaceous-brown, almost smooth to usually minutely verruculose, walls unthickened or almost so. *Conidiophores* solitary, macronematous, arising terminally and laterally from hyphae, erect, straight to somewhat flexuous, cylindrical-oblong, sometimes with constrictions, attenuations and swellings which give the conidiophores an irregular appearance, often slightly to distinctly geniculatesinuous, usually once,

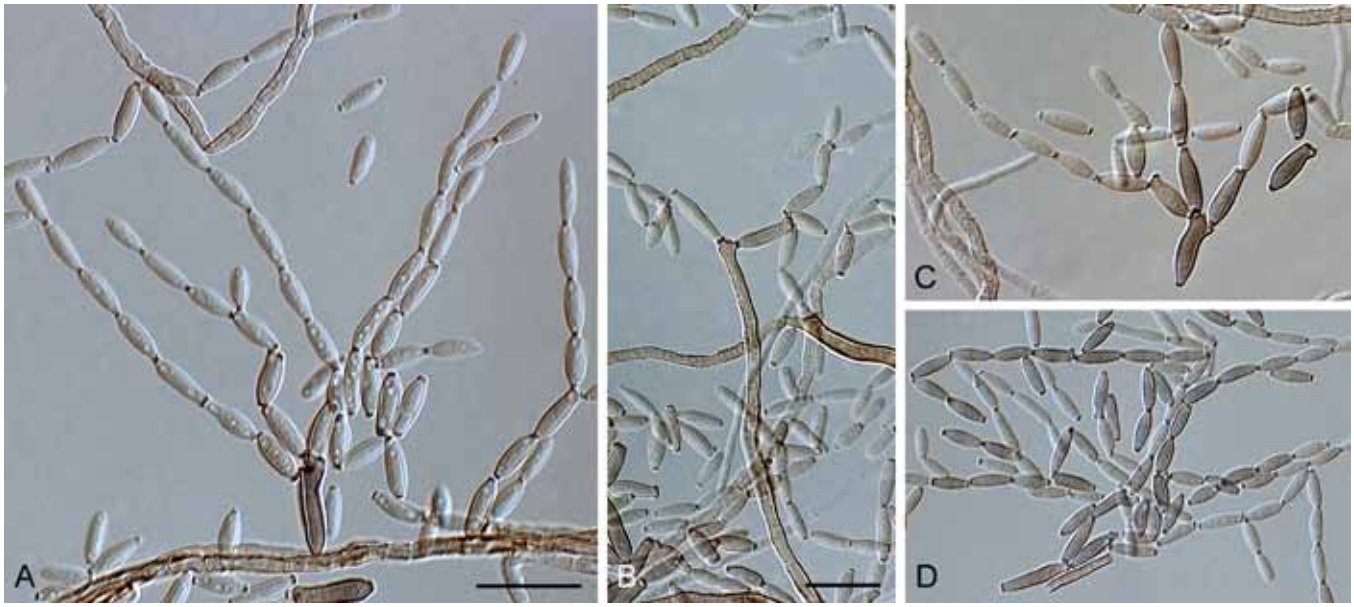
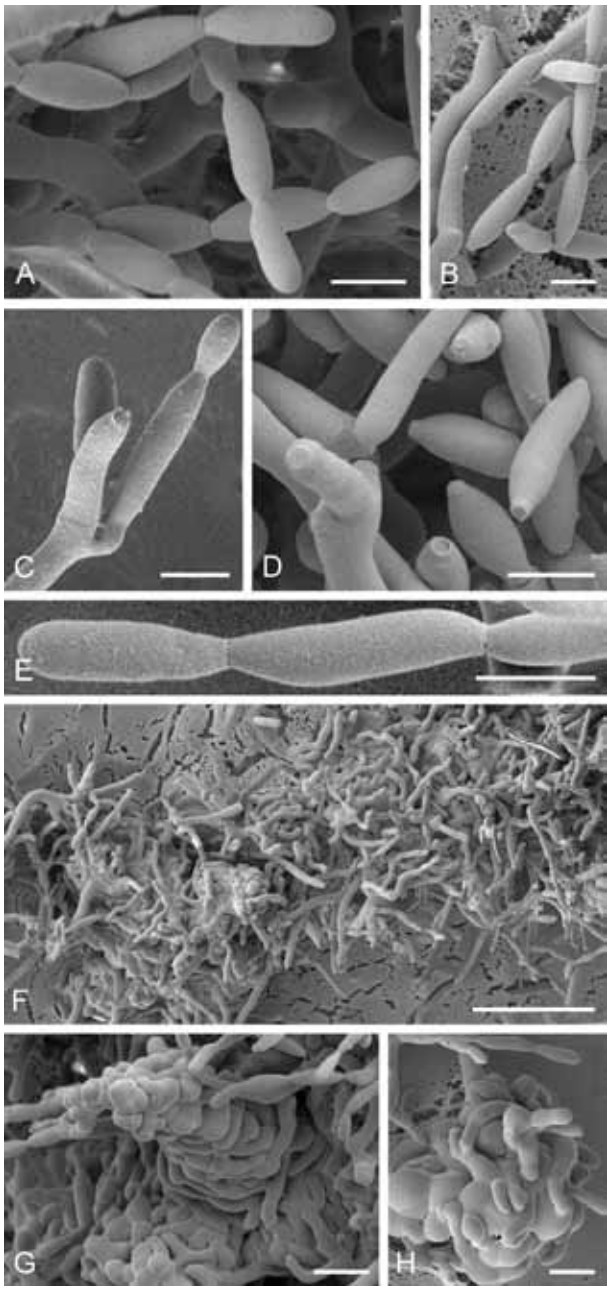



**Fig. 64.** *Cladosporium chalastosporoides* (CBS 125985). A–B. Conidiophores and conidia. C–D. Conidial chains. Scale bars = 10 µm.




unbranched or once branched, below the apex or at a lower level, 30−80 × (2−)2.5−3.5(−4) µm, 1−4-septate, not constricted at septa, medium olivaceous-brown, smooth, walls unthickened or only very slightly thickened, occasionally slightly attenuated towards the apex. *Conidiogenous cells* integrated, mainly terminal but also intercalary, cylindrical, often geniculatesinuous, 6−20 µm long, 1−2(−4) loci at or towards the apex, sometimes situated on small lateral prolongations, subdenticulate to denticulate, 1−1.5 µm diam, central dome and periclinal rim not very conspicuous, loci flat, somewhat thickened and darkened-refractive. *Ramoconidia* formed, hardly distinguishable from secondary ramoconidia, up to 24 µm long, base 2−3 µm wide, broadly truncate. *Conidia* catenate, at the base of the chain or intercalary once or twice mostly dichotomously branched, formed in long, unbranched chains of up to 18 conidia, small terminal conidia narrowly obovoid to subcylindrical, 5−9 × 2−2.5 µm (av. ± SD: 7.3 ± 1.1 × 2.1 ± 0.2), aseptate, intercalary conidia fusiform to subcylindrical, 7−14 × 2−3 µm (av. ± SD: 9.4 ± 1.5 × 2.5 ± 0.3), 0(−1)-septate, with 1−2 distal hila, small terminal and intercalary conidia subhyaline, often distinctly paler compared with secondary ramoconidia, secondary ramoconidia fusiform to subcylindrical, 10−19 × (2−)2.5−4 µm (av. ± SD: 15.3 ± 2.4 × 3.1 ± 0.5), 0−1(−)2-septate, not constricted at septa, pale to pale medium olivaceous-brown, smooth or almost so, walls more or less unthickened, slightly attenuated towards apex and base and occasionally constricted in the middle, hila conspicuous, truncate, 0.8−1.8 µm diam, central dome and periclinal rim not very prominent, neither with LM nor SEM, thickened and darkened-refractive; microcyclic conidiogenesis very often occurring with conidia forming secondary conidiophores.

*Culture characteristics*: Colonies on PDA attaining 42−49 mm diam after 14 d, olivaceous-grey to iron-grey, olivaceous-black towards margins, reverse iron-grey to olivaceous-black, floccose to fluffy-

**Fig. 65.** *Cladosporium chalastosporoides* (CBS 125985). A–B. Examples of elongated conidia and chains. C. Branch formation on conidiophores. D. Branched conidiophore, ramoconidia and conidia. E. Elongated conidia. Note the broad areas of connection between the spores. F. Overview of a large cell mass that gives rise to conidiophores and spores. G. Detail of a cell mass showing meristematic growth. H. Differentiation of fungal cells into a cell mass. Scale bars = 5 (A–E), 10 (G–H), 50 (F) µm.

felty, margins crenate, very narrow, white, feathery, aerial mycelium abundant, dense, covering most of colony surface, floccose to fluffy-felty, growth effuse with elevated colony centre, without exudates, sporulation sparse. Colonies on MEA attaining 38−56 mm diam after 14 d, pale olivaceous-grey to olivaceous-grey, reverse olivaceous-grey, velvety to floccose, margins regular, white, glabrous, aerial mycelium abundant, covering the whole surface, dense, floccose, growth effuse, radially furrowed, without exudates, sporulation sparse. Colonies on OA reaching 38−45 mm diam after 14 d, olivaceous-grey to pale olivaceous-grey, zonate, grey-olivaceous towards margins, colony centre with dots of pale greenish grey aerial mycelium, reverse iron-grey to leaden-grey, velvety to floccose, margin regular to undulate, narrow, glabrous, white, aerial mycelium abundant, covering the whole surface, floccose, flat, without exudates, not sporulating.

*Substrate and distribution*: On fruiting bodies of *Teratosphaeria proteae-arboreae*; South Africa.

*Notes*: The narrow, fusiform conidia of *C. chalastosporoides* formed in long, mostly unbranched chains remind one of *Chalastospora* (*Pleosporales*), above all its type species *C. gossypii* (Simmons 2007, Crous *et al.* 2009a). However, based on SEM examinations of the conidiogenous loci and hila, which proved to be coronate (cladosporioid), as well as its phylogenetic position as sister of *C. hillianum* it became evident that this species is part of *Cladosporium s. str.* (Bensch *et al.* 2010).

**30. *Cladosporium chamaeropis*** (Unamuno) K. Schub., Schlechtendalia 14: 63. 2006. Figs 66, 67.
*Basionym*: *Cladosporium fasciculare* f. *chamaeropis* Unamuno, Trab. Secc. Cienc. Nat. Congr. Assoc. Progr. Cienc. Oporto 1921: 60. 1922.

*Holotype*: **Spain**, near Oriedo, on leaves of *Chamaerops humilis* (*Arecaceae*), May 1921, P. Unamuno (MA 06416).

*Lit.*: Schubert (2005b: 51–53).
*Ill.*: Schubert (2005b: 53, fig. 14, pl. 6, figs F–I), Schubert *et al.* (2006: 64, fig. 3, pl. 1, figs D–E).

*In vivo*: Leaf spots amphigenous, at first small, subcircular-oval to somewhat oblong, later extending and confluent, oblong-irregular, covering large areas of the leaf surface, mainly at the tips of leaves, pale brown or fading, turning pale clay-coloured in the centre, surrounded by a narrow to wide irregular margin, dark brown or almost blackish, surrounding leaf tissue discoloured, brownish. *Colonies* amphigenous, scattered to sub-effuse in the pale centre, loosely caespitose, in tufts, brown. *Mycelium* internal, intraepidermal; hyphae sparingly branched, 2–4 µm wide, septate, subhyaline to pale brown, smooth, walls not or only slightly thickened. *Stromata* usually well-developed, compact, substomatal to intraepidermal, 10–30 µm diam, several layers deep, composed of somewhat angular swollen hyphal cells, 4–10 µm wide, brown to olivaceous-brown, smooth, thick-walled. *Conidiophores* mostly in loose to somewhat denser fascicles, few to numerous, arising from stromata, rarely solitary arising from swollen hyphal cells, mostly emerging through stomata or erumpent through the cuticle, erect, straight to somewhat flexuous, cylindrical-oblong, sometimes slightly geniculate-sinuous towards the apex, usually without swellings, unbranched or rarely once branched, 20–125 × 4–6.5 µm, septate, not constricted at the septa, pale to medium olivaceous-brown or brown, sometimes paler towards

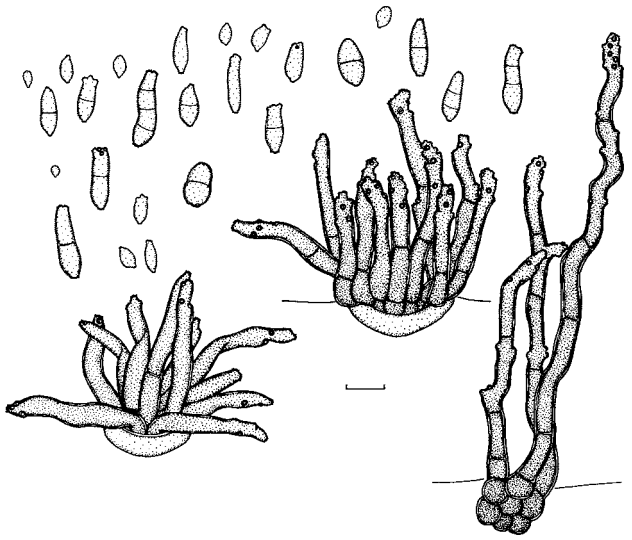


**Fig. 66.** *Cladosporium chamaeropis* (MA 06416). Fascicles of conidiophores emerging through stomata or erumpent through the cuticle and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

the apex, smooth or almost so, walls thickened, often distinctly two-layered, up to 1 µm wide. *Conidiogenous cells* integrated, terminal and intercalary, cylindrical, (6–)11–35 µm long, proliferation sympodial, with few to numerous conidiogenous loci, often on small lateral shoulders, protuberant, more or less subdenticulate, short cylindrical, 1–2(–2.5) µm diam, thickened, refractive to somewhat darkened. *Ramoconidia* not observed. *Conidia* catenate, mostly in branched chains, ovoid, obovoid, limoniform, ellipsoid to cylindrical, 3–20 × 2–5(–6.5) µm, 0–1(–3)-septate, septa sometimes not very conspicuous, sometimes slightly constricted at the septa, pale brown or olivaceous-brown, smooth or almost so to mostly minutely verruculose, walls only slightly thickened, apex rounded, somewhat attenuated or with a single or several conidiogenous hila, hila protuberant, short cylindrical, truncate to slightly convex, (0.5–) 1–2(–2.5) µm diam, thickened, refractive to somewhat darkened; microcyclic conidiogenesis not observed.

*Substrate and distribution*: On *Chamaerops humilis*; Spain.

*Notes*: *Cladosporium chamaeropis* is a biotrophic, leaf-spotting species which is morphologically quite distinct from other taxa described on hosts of the *Arecaceae*, *viz.*, *C. borassi*, *C. coryphae* and *C. phoenicis* (= *C. herbarum*). *Cladosporium praecox*, *C. maracuja* and *C. myrtacearum*, three superficially similar species, are easily distinguishable by deviating conidial surface ornamentation, some additional differences in conidial size, and conidiophore ramification.

**31. *Cladosporium cheonis*** (Chupp & Linder) U. Braun, Biblioth. Lichenol. 86: 85. 2003. Fig. 68.
*Basionym*: *Cercospora cheonis* Chupp & Linder, Mycologia 29: 27. 1937.

*Holotype*: **China**, Jiangsi Prov., Huang Yen Ssu, Hsing Tzu Hsien, on leaves of *Ilex* sp. (*Aquifoliaceae*), 13 Sep. 1932, S.Y. Cheo, No. 922 (CUP 39400).

*Lit.*: Chupp (1954: 52), Crous & Braun (2003: 119), Schubert (2005b: 53–54).

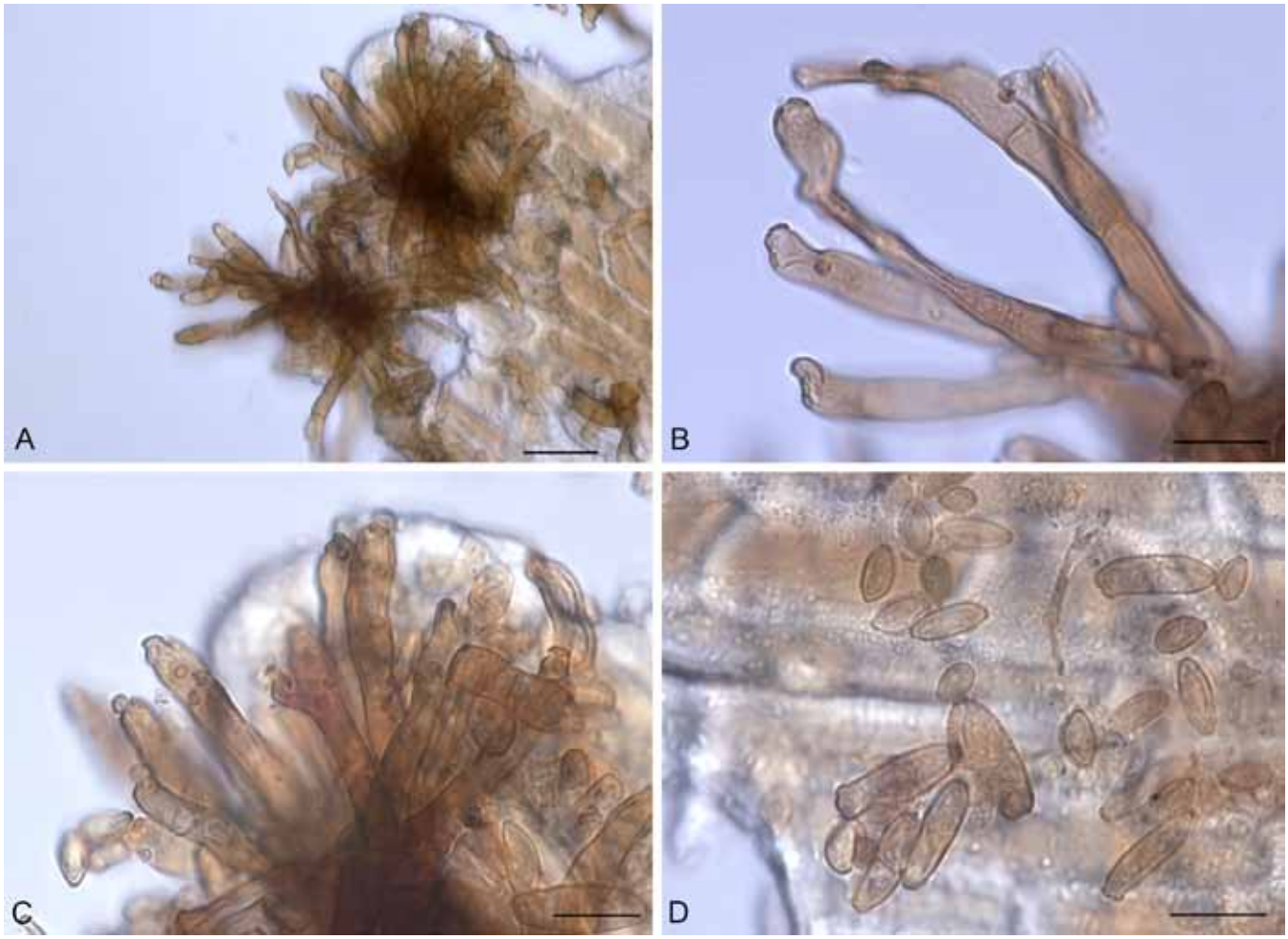



**Fig. 67.** *Cladosporium chamaeropis* (MA 06416). A. Overview. B. Conidiophores. C. Fascicle of conidiophores, conidiophores with numerous, conspicuous, somewhat darkened conidiogenous loci. D. Conidia. Scale bars = 10 (B–D), 20 (A) µm.

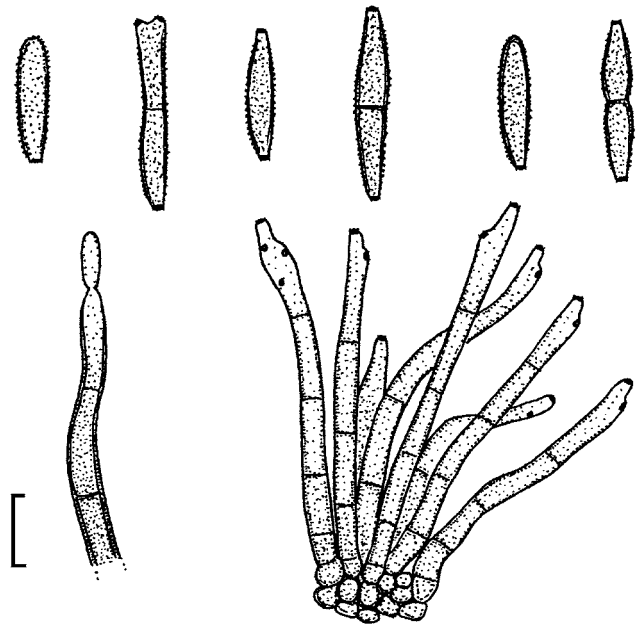


**Fig. 68.** *Cladosporium cheonis* (CUP 39400). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. U. Braun *del*.

*Ill.*: Braun (2003: 94, fig. 8), Schubert (2005b: 54, fig. 15).

*In vivo*: Leaf spots amphigenous, subcircular, 1–5 mm wide, brown, blackish, later pale, greyish, surrounded by a narrow, raised margin, pale to dark. *Colonies* punctiform to subeffuse, dark brown to blackish. *Mycelium* immersed. *Stromata* lacking or developed, 10–50 µm diam, substomatal, brown. *Conidiophores* in small to moderately large fascicles, loose to moderately dense, arising from internal hyphae or stromata, emerging through stomata, erect, straight, subcylindrical to somewhat geniculate-sinuous, non-nodulose, unbranched, 40–100 × 3–5 µm, pluriseptate throughout, pale olivaceous-brown to medium dark brown or somewhat reddish brown, wall thin to somewhat thickened, smooth. *Conidiogenous cells* integrated, terminal or intercalary, 10–30 µm long, proliferation sympodial, with often numerous and crowded conidiogenous loci, conspicuous, 1–1.5 µm diam, thickened and darkened. *Conidia* catenate, occasionally in branched chains, ellipsoid-ovoid, subcylindrical-fusiform, 5–23(–30) × 2–5 µm, 0–1-septate (most conidia septate), olivaceous-brown, thin-walled, almost smooth to verruculose, ends rounded to obconically truncate, hila 1–1.5 µm diam, somewhat thickened and darkened.

*Substrate and distribution*: On *Ilex* sp.; China.

*Notes*: This species was originally assigned to *Cercospora*, but based on the coronate, *Cladosporium*-like structure of its conidiogenous loci and hila Braun (2003) reallocated it to *Cladosporium*. *Cladosporium cheonis* belongs to a group of similar biotrophic, leaf-spotting species, *e.g.*, *C. jacarandicola*, *C. maracuja*, *C. alopecuri*, *C. agoseridis*, *C. praecox* and *C. orchidearum*, which are, however, morphologically well differentiated by characters of the conidiophores, conidiogenous loci and conidia (see Schubert 2005b).

**32. *Cladosporium chrysophylli*** Thaung, Trans. Brit. Mycol. Soc. 63(3): 620. 1974. Figs 69, 70.

*Holotype*: **Myanmar**, Sintoung, east of Thazi, on living leaves of *Chrysophyllum cainito* (*Sapotaceae*), 24 May 1973, Mya Thaung (IMI 17741).

*Lit.*: Schubert (2005b: 54–56).
*Ill.*: Thaung (1974: 620, fig. 1), Schubert (2005b: 55, fig. 16, pl. 8, figs A–F).

*In vivo*: Leaf spots amphigenous, irregular, varying in shape and size, on the upper leaf surface pale olivaceous, greyish green, surrounded by a narrow, dark brown margin, on the lower leaf surface pale greenish brown, margin pale olivaceous-brown and somewhat raised. *Colonies* hypophyllous, effuse, densely caespitose, dark olivaceous-brown or somewhat greyish, short villose or velvety. *Mycelium* both internal, mostly subcuticular or substomatal, and external, superficial; hyphae branched, 2.5–6 µm wide, septate, sometimes slightly constricted at the septa, subhyaline to pale olivaceous, smooth or sometimes distinctly roughened, walls slightly thickened, forming swollen hyphal cells, subglobose, 6–11 µm wide, sometimes aggregated, forming hyphal ropes or stromatic hyphal aggregations. *Conidiophores* solitary or in small loose groups or fascicles, arising from swollen hyphal cells, internal and external hyphae or stromatic hyphal aggregations, emerging through stomata, erumpent through the cuticle or growing superficially, erect to sometimes subdecumbent, straight to slightly flexuous, variable in shape and size, somewhat dimorphic, at first short cylindrical, 18–70 µm long, later filiform, up to 225 µm long, often slightly geniculate-sinuous, unbranched, sometimes branched, once or several times, 3–7(–8) µm wide, septate, pale yellowish brown or pale to medium olivaceous-brown, paler towards the apex, walls often irregularly and distinctly roughened, rugose, outer wall seemingly irregularly detaching, often refractive and somewhat shiny, thickened, often distinctly two-layered, up to 2 µm wide, mostly wider or somewhat swollen at the base, 8–12 µm wide. *Conidiogenous cells* integrated, terminal and intercalary, 7–35 µm long, sub-cylindrical-oblong, sometimes slightly geniculate or subnodulose; conidiogenous loci often situated on small lateral shoulders, protuberant, subdenticulate, obconically truncate, 0.5–2 µm diam, convex dome often not very distinct, somewhat thickened and darkened-refractive. *Conidia* catenate, mostly in branched chains, obovoid, ellipsoid, fusiform to subcylindrical, 3–19(–28) × 2–5(–6) µm, 0–2(–5)-septate, septa not very conspicuous, pale olivaceous-yellow to very pale brown, smooth or almost so, with age turning irregularly rough-walled, outer wall seemingly detached, only slightly thickened, hila more or less protuberant, obconically truncate, 0.5–2 µm diam, convex dome and periclinal rim often not very distinct, thickened, somewhat darkened-refractive; microcyclic conidiogenesis occurring.

*Substrate and distribution*: On *Chrysophyllum cainito*; Myanmar.

*Notes*: Thaung (1974) described longer conidia, up to 28 µm, which is given in brackets in the description above. *Cladosporium chrysophylli* is a leaf-spotting species with unique characters, barely comparable with other *Cladosporium* species.

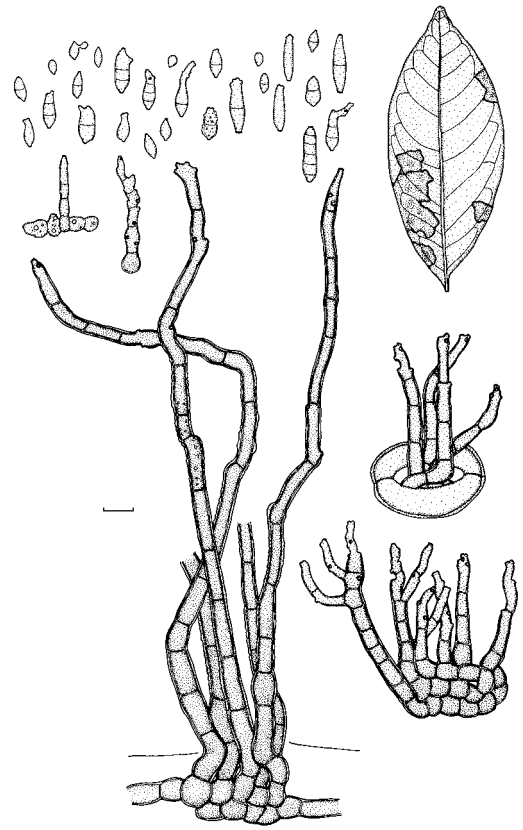


**Fig. 69.** *Cladosporium chrysophylli* (IMI 17741). Symptoms, dimorphic conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del.*

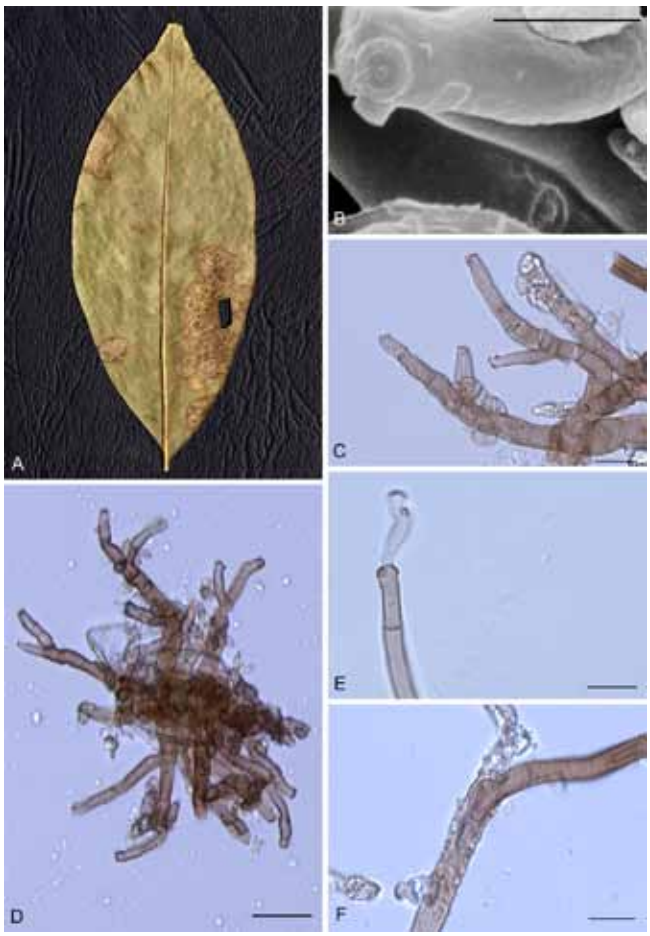



**Fig. 70.** *Cladosporium chrysophylli* (IMI 17741). A. Symptoms. B. Conidiophore and conidium showing coronate scar structure. C. Branched conidiophores. D. Fascicle of conidiophores emerging through stomata. E. Tip of a conidiophore with several somewhat darkened conidiogenous loci. F. Conidiophore, outer wall seemingly irregularly detaching. Scale bars = 5 (B), 10 (C, E–F), 20 (D) µm.

**33. *Cladosporium chubutense*** K. Schub., Gresl. & Crous, Persoonia 22: 116. 2009. Figs 71–73.

*Holotype*: **Argentina**, Chubut, dpto. Languineo, Rio Pico, Carnelia property, 44° 8' 30"S, 71° 26' 40"W, on needles of *Pinus ponderosa* (*Pinaceae*), Apr. 2007, A. Greslebin (CBS H-20209, dried culture). *Isotype*: BAFC 51695. *Ex-type cultures*: CBS 124457 = CIEFAP 321 = CPC 13979.

*Lit*.: Bensch *et al.* (2010).
*Ill*.: Schubert *et al.* (2009: 116–117, figs 4–6).

*In vivo*: Isolated from needles becoming necrotic from the top to the base, no discrete leaf lesions formed. Caespituli first punctiform, dark brown, distributed along the stomatal lines in upper and under sides, then coalescing and forming elongated, erumpent, black stromata. Mycelium internal, subcuticular to intraepidermal, occasionally external, superficial, hyphae unbranched to occasionally branched, 2–6(–8) µm wide, pluri-septate, often in short succession, slightly constricted, often appearing to be darkened, pale olivaceous to pale olivaceous-brown, smooth to minutely verruculose, walls unthickened or almost so, becoming regularly or irregularly swollen, up to 14 µm diam, walls more thickened at swellings, sometimes forming ropes. Stromata small to large, 20–75 µm diam or confluent, compact, dense, several layers deep, substomatal to intra-epidermal, pseudoparenchymatous, composed of swollen hyphal cells, subglobose to somewhat angular, 5–10 µm diam, medium to dark brown, walls thickened. Conidiophores macronematous, fasciculate, in small to large, loose to dense fascicles, spider-like, emerging through stomata or erumpent through the cuticle, arising from stromata, erect, straight to flexuous, subcylindrical, not geniculate or only slightly so, sometimes subnodulose due to small lateral swellings, unbranched or rarely once branched towards the apex, 28–120 × (4–)5–8(–9) µm, often slightly to distinctly attenuated towards the apex, base often wider or swollen, up to 10 µm wide, pluriseptate, septa often in short succession, sometimes slightly constricted, medium to dark olivaceous-brown or brown, paler at apices, smooth to minutely verruculose or irregularly and distinctly roughened, rugose, outer walls seeming to detach irregularly, especially towards the apex, walls thickened, often distinctly 2-layered, up to 1.5 µm wide, sometimes enteroblastically proliferating. Conidiogenous cells integrated, terminal and intercalary, subcylindrical, not geniculate, sometimes subnodulose with loci situated on small lateral shoulders, 6–32 µm long, with a single or several conspicuous loci, somewhat crowded towards the apex, 1–2(–2.5) µm diam, somewhat thickened and darkened-refractive. Conidia solitary or catenate, in unbranched or branched chains, straight, subglobose, obovoid, ellipsoid to subcylindrical, 4.5–19 × 4.5–7(–8) µm (av. ± SD: 11.1 ± 3.5 × 5.8 ± 1.0), 0–1(–2)-septate, rarely with three septa, septum more or less median, sometimes slightly constricted, with age becoming sinuous, pale to medium olivaceous-brown, almost smooth to minutely verruculose, walls somewhat thickened, attenuated towards apex and base, often broadly rounded at the distal end, sometimes slightly pointed, with a single, two, or rarely three hila at the distal end, conspicuous, 1–2(–2.5) µm diam, somewhat thickened and darkened-refractive; microcyclic conidiogenesis not observed.

*In vitro*: Mycelium mainly immersed, sometimes superficial; hyphae mainly unbranched, 1–4 µm wide, septate, septa occasionally darkened, without any swellings and constrictions, subhyaline to pale dingy brown or greyish brown, almost smooth to somewhat irregularly rough-walled, walls unthickened. Conidiophores macronematous and micronematous, arising terminally from ascending hyphae, or sometimes laterally from plagiotropous hyphae, solitary, erect, straight or slightly flexuous, subcylindrical to cylindrical, slightly to distinctly geniculate-sinuous towards the apex, sometimes subnodulose with loci situated on small lateral shoulders, often several times, unbranched or once branched, 10–200 × (1.5–)2.5–4 µm, septate, not constricted at septa, greyish brown to olivaceous-brown, smooth to minutely verruculose or verruculose, especially towards the apex, walls only slightly thickened, about 0.5 µm wide. Conidiogenous cells integrated, terminal and intercalary, subcylindrical to cylindrical, slightly to distinctly geniculate, once or several times, non-nodulose but the whole apical cell occasionally inflated, ellipsoid, 10–57 µm long, conidiogenous loci conspicuous, often crowded towards the apex, up to six or more loci per cell, 1–2(–2.2) µm diam, somewhat

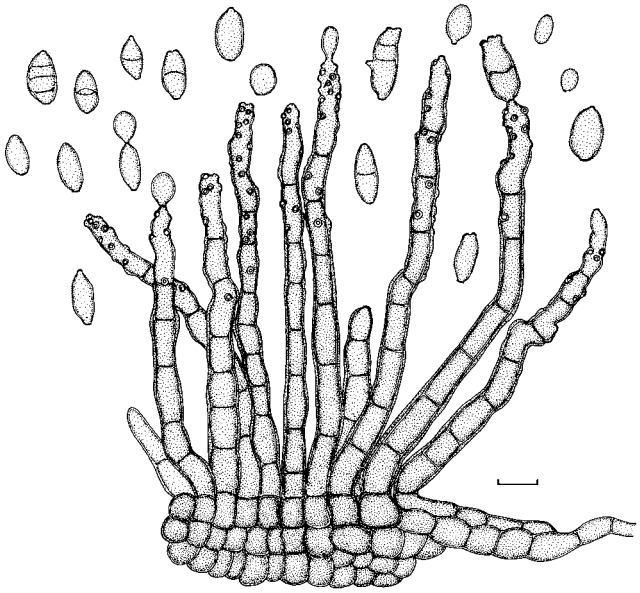


**Fig. 71.** *Cladosporium chubutense* (HAL 2323 F). Fascicle of conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

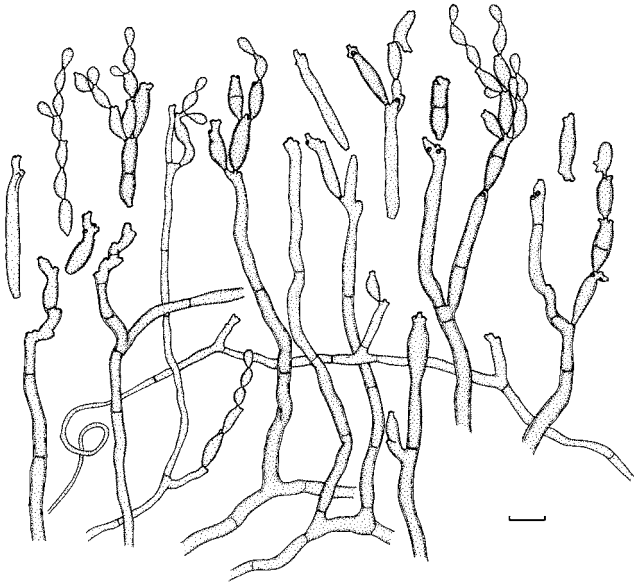


**Fig. 72.** *Cladosporium chubutense* (CBS 124457 = CPC 13979). Conidiophores and conidia *in vitro*. Scale bar = 10 µm. K. Bensch *del*.


**Fig. 73.** *Cladosporium chubutense* (CBS 124457 = CPC 13979). A–E. Macro- and microne-matous conidiophores with conidia. F–G. Conidial chains. Scale bars = 10 µm.

thickened and darkened-refractive. Ramoconidia subcylindrical, 19–34(–38) × (3.5–)4–5 µm, aseptate, concolorous with the tips of conidiophores. Conidia catenate, in branched chains, branching in all directions, up to three or four conidia in the unbranched parts, small terminal conidia obovoid to ellipsoid, 4–8 × 2.5–4 µm (av. ± SD: 5.9 ± 1.2 × 3.0 ± 0.5), aseptate, broadly rounded at the apex, hila 0.5–1 µm diam, intercalary conidia ellipsoid-ovoid, 7–14 × 3–4.5 µm (av. ± SD: 9.9 ± 2.0 × 3.9 ± 0.5), aseptate, with a single sometimes up to three distal hila, hila 0.8–1.5 µm diam, secondary ramoconidia ellipsoid-ovoid to subcylindrical, 13–27(–34) × 4–5 µm (av. ± SD: 19.8 ± 5.4 × 4.4 ± 0.4), 0–1-septate, not constricted at septa, septa median or somewhat in the upper half, with up to four distal hila, pale to medium greyish brown or olivaceous-brown, minutely verruculose to usually verruculose, occasionally distinctly verrucose, walls unthickened or only slightly so, hila conspicuous, (0.5–)0.8–2(–2.2) µm diam, somewhat thickened and darkened-refractive; microcyclic conidiogenesis sometimes generating conidia irregular in outline.

*Culture characteristics*: Colonies on PDA attaining 50–61 mm diam after 1 mo, dull green to dark grey-olivaceous, reverse iron-grey, velvety to powdery, margin white, broad, glabrous, aerial mycelium pale olivaceous-grey, diffuse, loose, only few areas covered, growth regular, flat, without conspicuous exudates, sporulation profuse. Colonies on MEA reaching 26–37 mm diam after 1 mo, olivaceous to greenish olivaceous forming concentric zones, reverse iron-grey to greenish black, velvety, margin white, narrow, regular, feathery, aerial mycelium pale olivaceous-grey, sparse, growth flat, sometimes with a crater-like structure in the centre or wrinkled, without conspicuous exudates, sporulation profuse.

*Substrate and distribution*: On *Pinus ponderosa*; Argentina.

*Additional specimens examined*: **Argentina**, Chubut, dpto. Languineo, Rio Pico, Carnelia property, 44° 8' 30''S, 71° 26' 40''W, on needles of *Pinus ponderosa* (*Pinaceae*), 12 Jan. 2005, A. Greslebin, mixed infection with *C. macrocarpum* and an alternarioid hyphomycete (HAL 2323 F).

*Notes*: On its host, *Pinus ponderosa*, *Cladosporium chubutense*, a species with unclear biology and ecology, is dissimilar to other species, except for *C. oreodaphnes*, which has, however, longer and somewhat narrower nodulose conidiophores (Schubert 2005b), as well as *C. antarcticum* distinguished by its dimorphic mycelium, 0–3-septate conidia and its narrower conidiogenous loci and hila, 0.8–1.5(–2) µm (Schubert *et al.* 2007b).

**34. *Cladosporium cladosporioides*** (Fresen.) G.A. de Vries, Contr. Knowl. Genus *Cladosporium*: 57. 1952. Figs 74–76.
*Basionym*: *Penicillium cladosporioides* Fresen., Beitr. Mykol. 1: 22. 1850.

≡ *Hormodendrum cladosporioides* (Fresen.) Sacc., Michelia 2(6): 148. 1880.
≡ *Cladosporium herbarum* f. *hormodendroides* Ferraris, Flora Ital. Crypt., Pars I, Fungi, Fasc. 8: 332. 1912

*Type*: **Germany**, on overwintered leaves of *Hydrangea* sp. (*Hydrangeaceae*) (not preserved). *Neotype* (designated in Bensch *et al.* 2010): **Germany**, isol. from indoor air, Ch. Trautmann (CBS H-20428). *Ex-type culture*: CBS 112388.

= ? *Ramularia meliloti* Ellis & Everh., Erythea 2: 26. 1894 [holotype: NY].
= *Cladosporium myriosporum* Ellis & Dearn., Proc. Canad. Inst., N.S., 3, 1: 90. 1897, *p.p.* (*nom. confus.*, type material composed of *C. macrocarpum* and *C. cladosporioides*) [syntypes: DAOM, NYS].
= *Monilia humicola* Oudem., Arch. Néerl. Sci. Exact. Nat. 7: 286. 1902.
= *Cladosporium herbarum* f. *camelliae-japonicae* Bubák, in Rabenhorst-Patzschke, Fungi Eur. Exs., Cent. 43, No. 4289. 1901, *nom. nud.* [syntypes: *e.g.* B, HAL, HBG].

*Lit*.: Yamamoto (1959: 3), Ellis (1971: 319), Subramanian (1971: 285), Shvartsman *et al*. (1975: 93–94), Domsch *et al*. (1980: 202), Ellis & Ellis (1985: 290, 468), Wang & Zabel (1990), Braun (1998: 301), Ho *et al*. (1999: 121), Samson *et al*. (2000: 108), de Hoog *et al*. (2000: 583), Samson *et al*. (2001: 340), Zhang *et al*. (2003: 69–74), Park *et al.* (2004), Schubert & Braun (2004: 304), Heuchert *et al*. (2005: 46–47), Pasqualetti *et al.* (2005), Schubert (2005b: 155–156), Bensch *et al.* (2010: 29–34).
*Ill*.: Fresenius (1850: Taf. 3, figs 23–28), de Vries (1952: 58–59, figs 10–11), Yamamoto (1959: 4, figs 9–12), Ellis (1971: 318, fig. 219 C), Domsch *et al*. (1980: 203, fig. 82), Ho *et al*. (1999: 122, figs 8–9), de Hoog *et al*. (2000: 583–584, figs), Samson *et al*. (2000: 108, fig. 48; 109, pl. 46), Schell (2003: 582, fig. 16), Zhang *et al*. (2003: 70, fig. 30), Bensch *et al.* (2010: 30–32, figs 17–19).
*Exs*.: Rabenhorst, Fungi Eur. Exs. 4289.

*In vivo*: *Colonies* usually effuse, sometimes rather inconspicuous, greyish green, olivaceous-brown or brownish. *Mycelium* usually immersed in the substratum. *Stromata* lacking. *Conidiophores* solitary to loosely caespitose, erect, long, filiform or subcylindrical, neither distinctly geniculate-sinuous nor nodulose, usually unbranched, occasionally once branched, 10–250 × (2.5–)3–5(–6) µm, mostly less than 100 µm long, aseptate to pluriseptate throughout, smooth, rarely faintly rough-walled, thin-walled, ≤ 1(–1.5) µm. *Conidiogenous cells* integrated, terminal, rarely also intercalary, occasionally conidiophores aseptate, *i.e.*, reduced to conidiogenous cells, 10–30(–40) µm long, usually not or barely geniculate, *i.e.*, usually without any proliferation, neither sympodial nor percurrent, but often subdenticulate, with 1–3, rarely more, denticle-like, somewhat protuberant conidiogenous loci at the apex, (0.5)1–2(–2.5) µm diam, distinctly coronate, somewhat darkened-refractive. *Conidia* in branched chains, broadly subglobose, ellipsoid-ovoid, limoniform, (3–)4–8(–11) × 2–4(–5) µm, 0(–1)-septate, ramoconidia and secondary ramoconidia ellipsoid-subcylindrical to cylindrical, 8–30 × (2.5–)3–5(–5.5) µm, 0–2-septate, subhyaline, pale olivaceous to olivaceous-brown, smooth, rarely with faintly rough-walled conidia mixed with smooth conidia, thin-walled, ≤ 1 µm, ends attenuated to rounded, hila (0.5)1–2(–2.5) diam, somewhat protuberant and somewhat darkened-refractive.

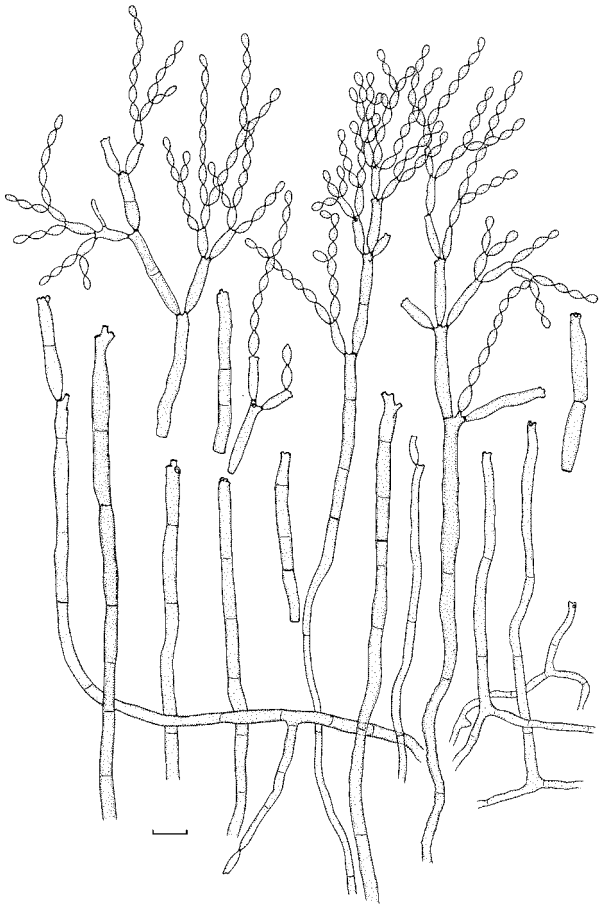


**Fig. 74.** *Cladosporium cladosporioides* (CBS 112388). Macro- and micronematous conidiophores, ramoconidia and conidial chains *in vitro*. Scale bar = 10 µm. K. Bensch *del*.

*In vitro*: *Mycelium* immersed, rarely superficial; hyphae sparse, unbranched or sparingly branched, (1−)2−4(−5) µm wide, septate, septa occasionally darkened, without any swellings and constrictions, subhyaline, pale olivaceous-brown or pale brown, smooth to minutely verruculose or rough-walled, walls unthickened. *Conidiophores* solitary, macronematous or semimacronematous, sometimes micronematous, arising terminally from ascending hyphae or laterally from plagiotropous hyphae, straight to somewhat flexuous, narrowly cylindrical to cylindrical-oblong, sometimes filiform, non-nodulose, usually not geniculate-sinuous, occasionally once geniculate, 40−300(−350) × (2.5−)3−4(−5.5) µm, unbranched or occasionally branched, branches usually short, only as peg-like lateral outgrowth just below a septum, occasionally up to 60 µm, mostly in the upper third, pluriseptate, usually not constricted at septa, sometimes slightly constricted and one of the upper septa slightly darkened where ramoconidia are formed, pale to medium olivaceous-brown or brown, smooth to minutely verruculose or verruculose especially towards the base, walls unthickened or slightly thickened, occasionally slightly attenuated towards the apex, base sometimes swollen, up to 7 µm wide; micronematous conidiophores shorter, narrower, paler, unbranched, 9−150 × (1−)1.5−2.5(−3) µm wide. *Conidiogenous cells* integrated, usually terminal, sometimes intercalary with conidiogenous loci situated on small peg-like or denticle-like lateral outgrowths just below a septum, cylindrical-oblong, not geniculate, non-nodulose, (7−)16−38 µm long, with up to four loci crowded at the apex, subdenticulate to denticulate, protuberant, 1−2(−2.5) µm diam, central dome often not very conspicuous, flat, somewhat thickened and darkened-refractive. *Ramoconidia* seceding at one of the upper, somewhat darkened septa, straight to slightly curved, cylindrical-oblong,


**Fig. 75.** *Cladosporium cladosporioides* (CBS 112388). A–F. Macronematous conidiophores and conidial chains. Scale bar = 10 µm.

15−50 × (2.5−)3−5 µm, with up to three septa, pale olivaceous-brown, concolorous with tips of conidiophores, smooth, base not cladosporioid, 2.5−4 µm wide, unthickened or slightly thickened, sometimes slightly refractive. *Conidia* numerous, catenate, in long branched chains, up to 10 conidia in the upper unbranched part, branching in all directions, small terminal conidia subglobose, obovoid, ovoid to limoniform, 3−6(−7) × (1.5−)2−2.5(−3) µm (av. ± SD: 4.7 ± 0.9 × 2.4 ± 0.3), aseptate, intercalary conidia limoniform, ellipsoid-ovoid, sometimes fusiform or subcylindrical, 5−12(−14.5) × (2−)2.5−3(−4) µm (av. ± SD: 8.1 ± 2.2 × 2.9 ±0.3), aseptate, with up to 3(−4) distal hila, secondary ramoconidia ellipsoid, subcylindrical to cylindrical-oblong, (7−)10−33(−38) × (2−)2.5−4(−6) µm (av. ± SD: 19.4 ± 6.6 × 3.2 ± 0.5), 0(−1)-septate, occasionally with two septa, not constricted at septa, with up to four distal hila, subhyaline, pale brown or pale olivaceous-brown, smooth, under SEM smooth or surface with somewhat irregularly reticulate structure or embossed stripes probably caused by diminishing turgor and shriveling of tender young conidia, thin-walled, sometimes cell structure unusual, with a small cavity in the cells, hila conspicuous, subdenticulate to denticulate, 0.5−2(−2.5) µm diam, somewhat thickened and darkened-refractive; microcyclic conidiogenesis occasionally occurring.

*Culture characteristics*: Colonies on PDA grey-olivaceous to dull green or olivaceous-grey, reverse iron-grey, leaden-grey or olivaceous-black, velvety to floccose, margins grey-olivaceous to white, feathery, regular, aerial mycelium sparse, diffuse, or sometimes abundantly formed, dense, floccose-felty, low, forming mats, growth flat to low convex, usually without prominent exudates, occasionally with several small prominent exudates. Colonies on MEA grey-olivaceous to olivaceous or olivaceous-grey, pale olivaceous-grey or whitish due to aerial mycelium, olivaceous-black or olivaceous-buff at margins, reverse olivaceous-black or iron-grey, velvety to floccose, margins white to grey-olivaceous, glabrous to feathery, aerial mycelium sparse, scattered, diffuse to floccose, sometimes abundantly formed, covering almost the whole colony, floccose-felty, whitish, growth flat to effuse, somewhat radially furrowed, without prominent exudates. Colonies on OA grey-olivaceous, towards margins at first greenish olivaceous, then dull-green and again grey-olivaceous, sometimes white, reverse olivaceous-grey to leaden-grey, sometimes pale mouse-grey, velvety to floccose, margins narrow, glabrous, regular, aerial mycelium scattered to sometimes abundant, floccose or felty, loose to somewhat dense, growth flat, no prominent exudates; sporulation usually profuse on all media.

*Substrates and distribution*: On fading and decaying plant material, on living leaves as secondary invader, isolated from air, soil, foodstuffs, water-damaged building materials and numerous other materials; cosmopolitan.

*Additional specimens examined*: *Sine loco*, deposited by C.L. Shear, stored as "*C. herbarum*" (CBS 132.29). **Australia**, New South Wales, Mullion Creek, S 33º06'48" E149º08'45", isol. from *Eucalyptus robertsonii* ssp. *hemisphaerica* (*Myrtaceae*),

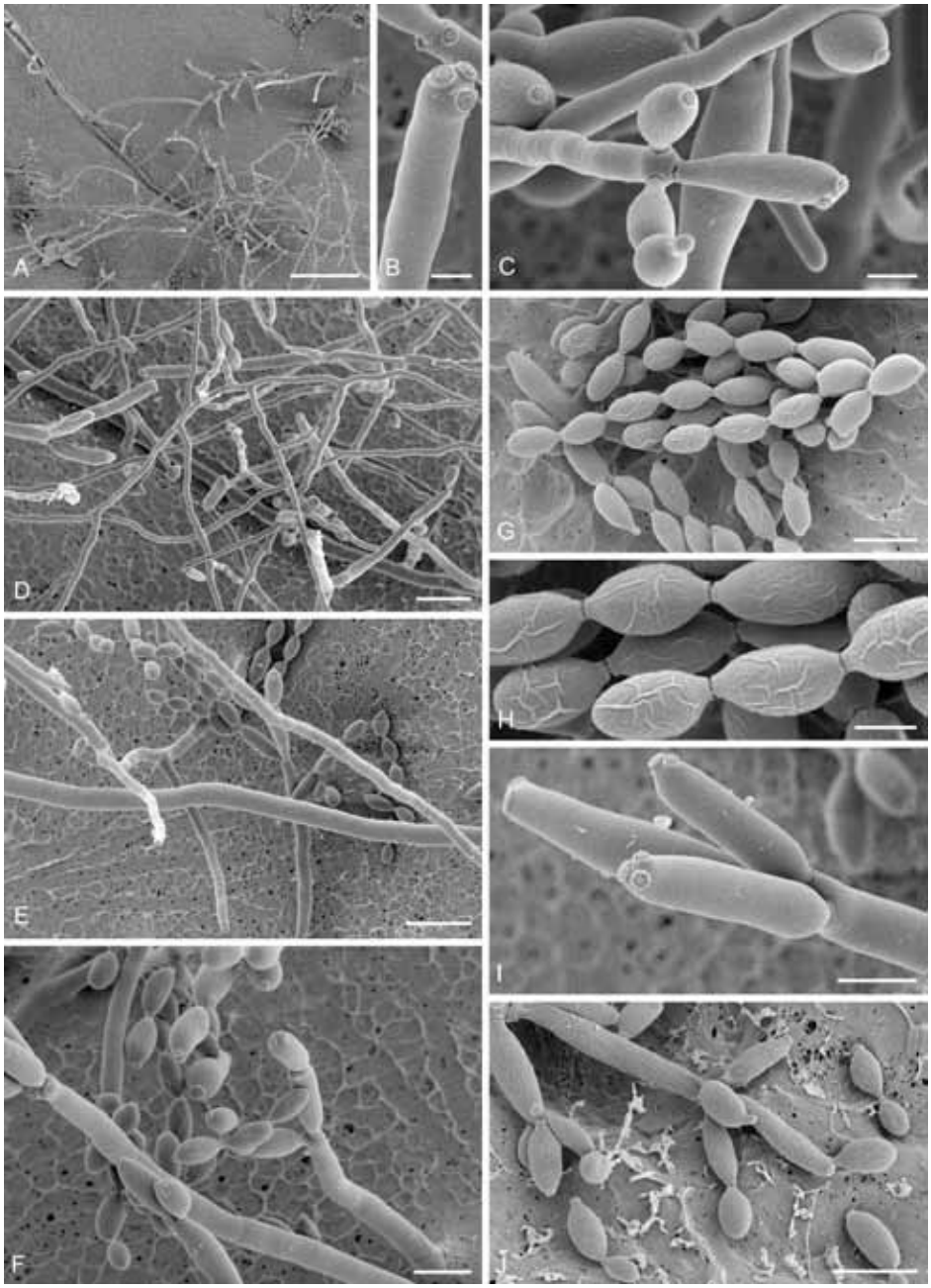



**Fig. 76.** *Cladosporium cladosporioides* (CBS 112388, neotype). A. Overview of a colony containing running differentiated conidiophore-forming hyphae and many aerial hyphae. B. Scars on a conidiophore. C. Top view of a conidiophore with scars and an aerial structure. D. Branching patterns of aerial hyphae intermingled with spore-forming structures. E. Aerial hyphae, conidiophores and spores. F. Conidiophores sprouting from agar with all types of dispersion structures. G. Conidial chains. H. Detail of conidial chains and ornamentation showing irregularly reticulate structures or embossed stripes probably caused by diminishing turgor and shriveling of tender young conidia. I. Three secondary ramoconidia. J. Secondary ramoconidia and conidia on agar with some irregularly reticulate ornamentation. Scale bars = 2 (B–C, H), 5 (F–G, I–J), 10 (D–E), 50 (A) µm.

15 Jan. 2007, coll. B.A. Summerell, isol. P.W. Crous (NSW 134279, CPC 13667, 13669); Queensland, near Cairns, isol. from *Eucalyptus* sp. (*Myrtaceae*), 27 Aug. 2006, P.W. Crous (CPC 13235). **Brazil**, isol. from soil, CBS 101367. **Denmark**, isol. from cellulose powder, paint manufacturer, 2007, B. Andersen (BA 1692 = CPC 14293); isol. from soil, pea field, 2007, B. Andersen (BA 1691 = CPC 14292). **France**, Vallon, Pont d'Arc, isol. from twigs of an unidentified tree, 21 Aug. 2007, P.W. Crous (CPC 14271). **Germany**, isol. from *Pisum sativum* (*Fabaceae*), stored as *C. cladosporioides* f. *pisicola* (CBS 145.35 = MUCL 926); Essen, botanical garden, 51.45, 7.0167, isol. from leaves of *Morus rubra* (*Moraceae*), 2005, N. Ale-Agha (CPC 12214). **India**, isol. from *Dalbergia* sp. (*Fabaceae*), 3 Jan. 2004, coll. W. Gams, isol. P.W. Crous (CPC 11131); isol. from *Eucalyptus* sp., 3 Jan. 2004, coll. W. Gams, isol. P.W. Crous (CPC 11161). **Indonesia**, Tele, isol. from *Eucalyptus* sp., endophyte spots, spots after herbicide, 3 Jan. 2008, coll. M.J. Wingfield, isol. P.W. Crous, as "*Neofusicoccum* sp." (CPC 15038). **Israel**, Jaffa, isol. from *Gossypium* seeds (*Malvaceae*), 1967, isol. by M. Gonen (CBS 674.82 = CBS 320.87 = ATCC 38026 = ATCC 200936 = IMI 126640, stored as "*C. tenuissimum*"). **Japan**, isol. from bamboo slats, probably authentic strain of *C. multigeniculatum* (CBS 122130 = ATCC 38012 = IFO 6539 = JCM 10684 = NBRC 6539). **Slovenia**, Češnjica near Ljubljana, isol. from a living mite inhabiting a strawberry leaf, 4 Apr. 2008, Vojko Škerlavaj, isol. by H.-J. Schroers (HJS 1069 = CPC 15167). **South Africa**, isol. from *Pisum sativum*, B.J. Dippenaar, stored as *C. cladosporioides* f. *pisicola* (CBS 143.35 = MUCL 10090); Barberton, Laeveld Coop, isol. from wheat, 1988 (CPC 14009 = MRC 10150); Eastern Cape, Aiwal North, isol. from wheat, 1989 (CPC 14019 = MRC 10813); Free State, Brandfort, isol. from wheat, 1989 (CPC 14017 = MRC 10809, CPC 14018 = MRC 10810); Perdespan, isol. from wheat, 1988 (CPC 14015 = MRC 10260); Winburg, isol. from wheat, 1989 (CPC 14021 = MRC 10827); Gauteng, Pretoria, isol. from pawpaw, 1990 (CPC 14024 = MRC 11280). **South Korea**, Chuncheon, N37°50'10'' E127°32'01'', isol. from *Celosia cristata* (*Amaranthaceae*), 7 Oct. 2003, coll. H.-D. Shin, isol. P.W. Crous (CPC 11121); Suwon, N37°16'03'' E126°59'16'', isol. from chasmothecia of *Phyllactinia* sp. (*Erysiphales*) on *Fraxinus chinensis* subsp. *rhynchophylla* (*Oleaceae*), 7 Nov. 2007, coll. H.-D. Shin, isol. P.W. Crous (CPC 14705); Chuncheon, N37°50'10'' E127°32'01'', isol. from *Phragmidium griseum* on *Rubus crataegifolius* (*Rosaceae*), 20 Jul. 2004, coll. H.-D. Shin, isol. P.W. Crous (CPC 11398); Jinju, N35°11'24'' E128°10'56'', isol. from *Phytolacca americana* (*Phytolaccaceae*), 15 Oct. 2003, coll. H.-D. Shin, isol. P.W. Crous (CPC 11122); Jinju, N35°11'24'' E128°10'56'', isol. from *Plectranthus* sp. (*Lamiaceae*), 1 Jul. 2004, coll. H.-D. Shin, isol. P.W. Crous (CPC 11406); Chuncheon, N37°50'10'' E127°32'01'', isol. from *Ricinus communis* (*Euphorbiaceae*), 7 Oct. 2003, coll. H.-D. Shin, isol. P.W. Crous (CPC 11119); Yangpyeong, N37°30'12'' E127°41'55'', isol. from *Rubus coreanus*, 23 Jul. 2004, coll. H.-D. Shin, isol. P.W. Crous (CPC 11404); Hongcheon, N37°48'17'' E127°51'13'', isol. from leaves of *Stellaria aquatica* (*Caryophyllaceae*), 6 Jun. 2005, coll. H.-D. Shin, isol. P.W. Crous (CPC 12187); Hoengseong, N37°32'09'' E128°07'07'', isol. from *Valeriana officinalis* (incl. *V. fauriei*) (*Valerianaceae*), 23 Jun. 2004, coll. H.-D. Shin, isol. P.W. Crous (CPC 11393); Jeongeup, N35°36'05'' E126°51'25'', isol. from *Vigna unguiculata* [= *V. sinensis*] (*Fabaceae*), 29 Oct. 2003, coll. H.-D. Shin, isol. P.W. Crous (CPC 11123); Suwon, N37°16'03'' E126°59'16'', isol. from *Viola mandshurica* (*Violaceae*), 14 Oct. 2003, coll. H.-D. Shin, isol. P.W. Crous (CPC 11120); Hongcheon, N37°48'17'' E127°51'13'', isol. from *Chenopodium ficifolium* (*Chenopodiaceae*), 10 Mar. 2002, coll. H.-D. Shin, isol. P.W. Crous (CPC

10142). **Thailand**, Chiang Mai, Mushroom Research Centre, isol. from *Areca* sp. (*Arecaceae*), 20 Dec. 2006, coll. I. Hidayat, isol. P.W. Crous (CPC 13734). **Uganda**, Mubende, isol. from food, coffee leaf, 2000, coll. J.L. Sørensen, isol. B. Andersen (BA 1677 = CPC 14356). **USA**, 2004, M. Blackwell (CPC 11684 = CBS 117483, as "*C. gossypiicola*"); California, isol. from *Pisum sativum*, as *C. cladosporioides* f. *pisicola* (CBS 144.35 = ATCC 11284 = IFO 6371 = IMI 049627); Laramie, isol. from food, mouldy pea, 2000, coll. J.L. Sørensen, isol. B. Andersen (BA 1676 = CPC 14355); Louisiana, Baton Rouge, isol. from *Magnolia* sp. (*Magnoliaceae*), 8 Sep. 2007, P.W. Crous (CPC 14244); isol. from pruned wood, 2006, K. Seifert (CPC 12852); Washington, isol. from spinach seed, *Spinacia oleracea* (*Chenopodiaceae*), 2003, L. du Toit (CBS 126341 = CPC 12763, CPC 12760, 12762, 12764); isol. from grape berry, F.M. Dugan (w99-175a sci 1 = CBS 113740); isol. from grape bud, F.M. Dugan (113db sci 1 = CBS 113738); isol. from culm node of crested wheat grass, F.M. Dugan (wa2-00 sci 1 = CBS 113739).

*Excluded strains within the C. cladosporioides complex* [morphologically indistinguishable but phylogenetically distinct, indicated in Bensch *et al.* (2010), Fig. 1 as *C. cladosporioides s. lat.* Lineages 1–4]: **Argentina**, Chubut, Rio Pico, carnelian property, isol. from needles of *Pinus ponderosa* (*Pinaceae*), 2007, A. Greslebin (CPC 13978). **Denmark**, isol. from indoor building material, school, 2007, B. Andersen (BA 1695 = CPC 14296). **Germany**, isol. from leaves of *Acer pseudoplatanus* (*Aceraceae*), L. Pehl, ident. as *C. tenuissimum* by G.S. de Hoog (CBS 116744); isol. from wheat grain, *Triticum* sp. (*Poaceae*), 2007, B. Andersen (BA 1674 = CPC 14284); Bayern, isol. from lichens on leaves of *Acer platanoides* (*Aceraceae*), 2006, B. Heuchert (CPC 13220); Tübingen, botanical garden, isol. from *Paeonia obovata* (*Paeoniaceae*), Sep. 2006, P.W. Crous (CPC 13362). **Netherlands**, isol. from seed coat of *Cirsium vulgare* (*Asteraceae*), depos. by B.H. van Leeuwen, Jan. 1980 (CBS 125.80); Millingerwaard, isol. from fruits of *Sambucus nigra* (*Adoxaceae*), 29 Aug. 2007, P.W. Crous (CPC 14238). **New Zealand**, Auckland, Auckland University campus, *Oncoba spinosa* (*Salicaceae*), 9 Jan. 2004, C.F. Hill (Hill 1076-2 = CPC 11664); Waikato, Karapiro, Gorton Road, isol. from imported buds of *Prunus avium* (*Rosaceae*), 6 Jan. 2008, J. Rennie (CPC 15457). **South Africa**, Western Cape Province, Jonkershoek Nature Reserve, isol. from *Brunneosphaerella protearum* (*Mycosphaerellaceae*) fruiting bodies, 30 Mar. 2007, P.W. Crous (CPC 13867). **South Korea**, Pocheon, National Arboretum, N37º45'04'' E127º09'55'', isol. from *Fatoua villosa* (*Moraceae*), 18 Oct. 2002, coll. H.-D. Shin, isol. P.W. Crous (CPC 10150). **UK**, Manchester, isol. from uredospores of *Puccinia allii* (*Pucciniaceae*), G.S. Taylor (CBS 306.84). **USA**, Washington State, isol. from bing cherry fruits, R.G. Roberts (CBS 113746).

*Notes*: *Cladosporium cladosporioides* as previously circumscribed on the base of morphology represents a heterogeneous complex of numerous phylogenetically and more or less also morphologically distinct species (Bensch *et al.* 2010). *Cladosporium cladosporioides s. str.* is one of the most common, saprobic *Cladosporium* species with worldwide distribution, frequently occurring as secondary invader on necrotic parts of many different host plants, isolated from air, soil, textiles and numerous other substrates (Ellis 1971) and found as common endophytic fungus (Riesen & Sieber 1985, El-Morsy 2000, Kumaresan & Suryanarayanan 2002). Furthermore, the conidia of this species are among the most ubiquitous bioaerosols found in indoor and outdoor samples (Domsch *et al.* 1980, Mullins 2001, Park *et al.* 2004). Some leaf-spotting races have been reported, but such host-specific pathogenicity is largely untested (Anilkumar & Seshadri 1975, Arya & Arya 2003). Bensch *et al.* (2010) proposed a neotype for *C. cladosporioides* since type material of this species is not preserved. De Vries (1952) invalidly and erroneously lectotypified the species based on Bisby's dried "standard culture" [isol. fr. *Arundo* leaves, Bamboo Garden, Kew, 1943 (IMI 25324, 60507, 60509) = CBS 170.54] which, however, proved to belong to the saprobic *C. ramotenellum*, which is undoubtedly more common than originally presumed by Schubert *et al.* (2007b).

In phylogenetic sequence analyses, this species forms a distinct, well-supported clade (see Bensch *et al.* 2010, fig 1, part c). Nevertheless, *C. cladosporioides* is still paraphyletic representing a species complex since there are still numerous isolates listed under excluded strains that are morphologically indistinguishable from *C. cladosporioides s. str.*, but phylogenetically different, clustering apart in various subclades.

Yamamoto (1959), Ellis (1971), de Hoog *et al.* (2000) and Samson *et al.* (2000) discussed strains of "*C. cladosporioides*" with asperulate or finely verruculose conidia, which proved to represent different, phylogenetically clearly distinct species, as for instance *C. asperulatum* and *C. perangustum*.

*Cladosporium cladosporioides*, which occurs rather commonly on *Pisum sativum*, has often been confused with *C. cladosporioides* f. *pisicola* (≡ *C. pisicola*). The latter species is, however, a biologically and morphologically distinct species (see notes under *C. pisicola*).

**35. *Cladosporium colocasiae*** Sawada, Trans. Nat. Hist. Soc. Taiwan 25: 125. 1916. Figs 77, 78.

*Holotype*: **Taiwan**, on *Colocasia esculenta* (= *C. antiquorum*) (*Araceae*), 2 Jun. 1910, K. Sawada (PPMH). *Ex-type culture*: CBS 386.64 = ATCC 200944 = MUCL 10084.

= *Cladosporium colocasiicola* Sawada, Special Publ. Coll. Agric. Natl. Taiwan Univ. 8: 195. 1959, *nom. inval.*

*Lit.*: Bugnicourt (1958), Ellis (1971: 312), Matsushima (1975: 34), David (1988a), IMI Distribution Maps of Plant Diseases 592 (1988), Holcomb (1989), Ho *et al.* (1999: 123), Zhang *et al.* (2003: 74–76), Schubert (2005b: 56–58), Bensch *et al.* (2010: 34–35).
*Ill.*: Bugnicourt (1958: 235, fig. 1), Ellis (1971: 313, fig. 216 B), Matsushima (1975: pl. 77), David (1988a: fig.), De & Chattopadhyay (1994: 228, fig. 4), Ho *et al.* (1999: 124, figs 10–11), Zhang *et al.* (2003: 76, fig. 40), Schubert (2005b: 57, fig. 17, pl. 9, figs A–E), Bensch *et al.* (2010: 35, fig. 20).

*In vivo*: Leaf spots amphigenous, subglobose, oval to somewhat irregular, at first punctiform, later extending, forming large patches, very variable in size, 1–10(–15) mm wide, sometimes confluent, covering large areas of the leaf surface, medium to dark brown,

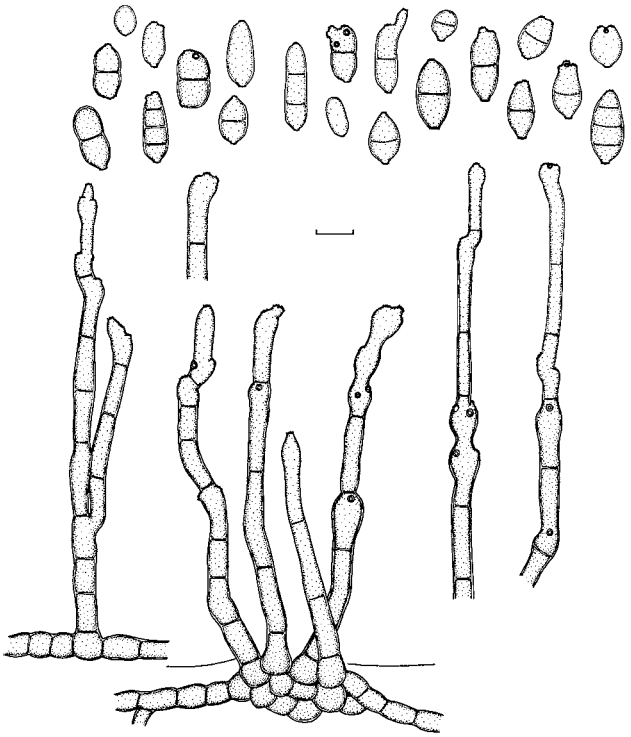


**Fig. 77.** *Cladosporium colocasiae* (BPI 426382). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del.*

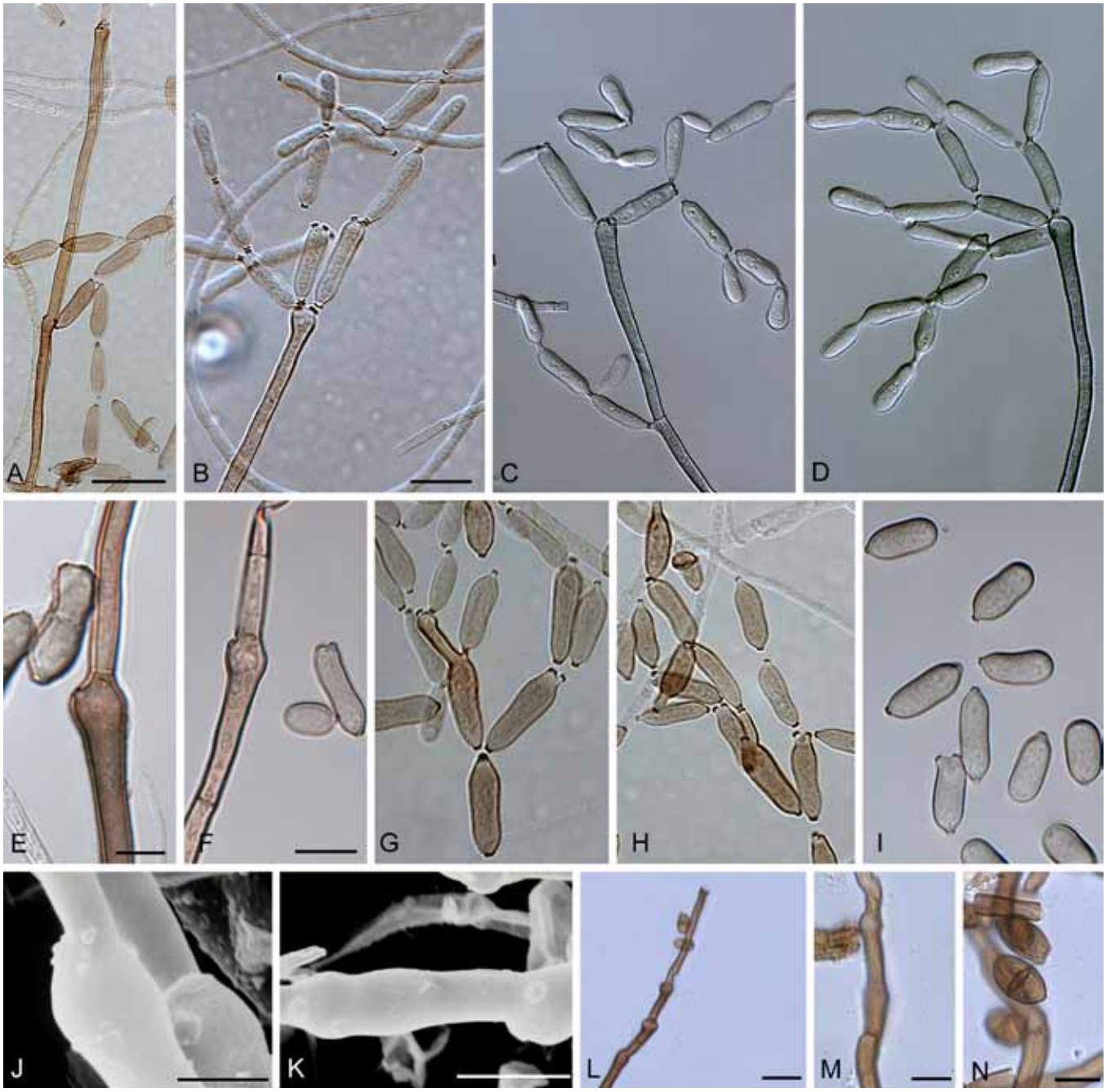



**Fig. 78.** *Cladosporium colocasiae in vivo* (BPI 426382; J–N) and *in vitro* (CBS 386.64 and 119542; A–I). A–D. Conidiophores and conidial chains. E–F. Intercalary conidiogenous cells with typical nodes and conidiogenous loci restricted to these swellings. G–H. Microcyclic conidiogenesis with conidia forming secondary conidiophores. I. Conidia. J. Nodose conidiophore showing coronate scar structure. K. Conidiophore with distinct swellings, clearly separated and distant from each other. L. Conidiophore with coronate scars confined to swellings. M. Conidiophore. N. Conidia. Scale bars = 5 (J), 10 (A–I, L–N), 20 (K) µm.

later yellow, most frequently on old leaves, giving them a spotted appearance, occasionally somewhat paler in the centre, on the lower leaf surface somewhat paler, grey-brown. *Colonies* amphigenous, effuse, mostly densely caespitose, brown, velvety to villose. *Mycelium* internal, subcuticular to intraepidermal, later also external, growing superficially; hyphae branched, 2.5–7.5 µm wide, septate, often with swellings and constrictions, at swellings up to 10 µm wide, pale brown to somewhat yellowish brown, smooth, thick-walled, forming hyphal aggregations, composed of swollen hyphal cells, subglobose to somewhat angular, 4–10 µm wide, pale to pale medium brown or somewhat yellowish brown, smooth, thick-walled. *Conidiophores* solitary or in small loose groups, arising from internal and external hyphae or from hyphal aggregations, conidiophores arising from internal hyphae, erumpent through the cuticle, erect, straight or slightly flexuous, somewhat geniculate-sinuous, subnodulose to distinctly nodulose or even nodose, usually with multilateral, intercalar and terminal swellings, 5–8.5(–10) µm diam, unbranched, sometimes once branched, (25–)50–250(–450) µm long or even longer, 3.5–6(–7) µm wide, pluriseptate, not constricted at the septa, pale to pale medium brown, smooth, with age somewhat asperulate, walls thickened, usually one-layered, sometimes also two-layered, especially near the base, somewhat swollen at the base and attenuated towards the apex. *Conidiogenous cells* integrated, terminal and intercalary, 6–30 µm long, with characteristic nodulose swellings, conidiogenous loci confined to them, situated on small shoulders or multilateral swellings, mostly 1–3 per node, protuberant, almost flat to short cylindrical, well differentiated in dome and raised rim, 1–2(–2.5) µm diam, thickened, somewhat refractive or slightly darkened. *Conidia* catenate, in unbranched or branched chains,

broadly ellipsoid-subcylindrical to cylindrical, (8–)12–23(–32) × (5–)6–9(–10) µm, 0–3(–5)-septate, sometimes slightly constricted at the median septum, pale to pale medium brown, smooth, surface of older conidia sometimes appearing to be net-like, granular or punctate, walls more or less thickened, ends broadly rounded, hila protuberant, 1–2(–2.5) diam, thickened, refractive to somewhat darkened; sporadically microcyclic conidiogenesis occurring.

*In vitro*: *Mycelium* immersed and superficial; hyphae loosely branched, 1–4 µm wide, sometimes distinctly swollen, bulboid, about 10 µm wide, septate, not constricted at septa, subhyaline to pale olivaceous-brown, smooth to loosely verruculose, walls unthickened. *Conidiophores* macronematous, solitary, arising terminally and laterally from hyphae, erect, flexuous, cylindrical-oblong, nodose, with several nodes being quite apart from each other, occasionally branched, very long, up to 1 350 µm or even longer, 3–4(–5) µm wide, nodes multilateral, 5–8 µm diam, pluriseptate, not constricted at septa, pale to medium olivaceous-brown, smooth or sometimes appearing to be reticulate, walls somewhat thickened, about 0.5 µm wide. *Conidiogenous cells* integrated, terminal and intercalary, cylindrical-oblong, nodose with a single node per cell, 15–70 µm long, loci restricted to swellings, usually 2–4 per node, 1–1.8(–2) µm diam *Ramoconidia* occasionally formed. *Conidia* solitary or in short, unbranched or branched chains, more or less straight, broadly ellipsoid-subcylindrical to cylindrical, unbranched terminal conidia 9–16 × 5–7(–8) µm (av. ± SD: 12.5 ± 1.8 × 6.1 ± 0.7), 0–1-septate, catenate conidia 10.5–23(–30) × 5–8(–9) µm (av. ± SD: 17.5 ± 5.2 × 6.0 ± 1.0), 0–1(–2)-septate, septum median or somewhat in the upper or lower half or third, becoming sinuous with age, pale to medium brown, smooth to loosely verruculose or reticulate, walls unthickened or almost so, hila conspicuous, 1–1.8(–2) µm diam, somewhat thickened and darkened-refractive; microcyclic conidiogenesis sometimes occurring with conidia forming secondary conidiophores.

*Culture characteristics*: Colonies on PDA attaining 56–76 mm diam after 14 d, grey-olivaceous to olivaceous or dull green, reverse olivaceous-black, velvety, pulvinate to floccose, with a narrow white or grey-olivaceous margin, regular to slightly undulate, somewhat feathery, aerial mycelium sparse, locally constricted to few areas, floccose, growth regular, flat to low convex, numerous small but not very conspicuous exudates formed, sporulation profuse. Colonies on MEA reaching 50–68 mm diam after 14 d, pale olivaceous-grey, grey-olivaceous to greenish olivaceous due to abundant sporulation, whitish to smoke-grey due to aerial mycelium, reverse olivaceous-grey to iron-grey, velvety, powdery to floccose or fluffy, with a white regular, glabrous or feathery, narrow margin, aerial mycelium abundantly formed, floccose to fluffy, covering large part of the colony surface, growth effuse, conical, radially furrowed and wrinkled with elevated colony centre, few small conspicuous exudates start to be formed, sporulating. Colonies on OA, 60–65 mm diam after 14 d, grey-olivaceous, whitish or pale olivaceous-grey due to floccose aerial mycelium arranged in tufts, spotted, reverse leaden-grey to iron-grey, pulvinate to floccose, margins grey-olivaceous, glabrous, regular, growth flat, without prominent exudates, sporulation profuse.

*Substrate and distribution*: On *Colocasia esculenta* (*Araceae*); Africa (Ethiopia, Ghana, Guinea, Mauritius, Nigeria), Asia (Brunei, China, Hong Kong, India, Indonesia, Japan, Malaysia, Nepal, Pakistan, Sabah, Sarawak, South Korea, Taiwan), Australasia (American Samoa, Australia, Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, Kiribati, Marshall Islands, New Caledonia, New Zealand, Niue, Palau, Papua New Guinea, Solomon Islands, Tahiti, Tonga, Vanuatu, Western Samoa), Europe (Portugal, Azores), North America (USA), West Indies (Barbados), Central & South America (Brazil, Cuba, Dominican Republic, Puerto Rico).

*Additional specimens examined*: **Dominican Republic**, intercepted at San Juan, on *Colocasia esculenta* (*Araceae*), 9 Jul. 1985, R. Barbosa (BPI 525147, as *C. colocasiicola*). **Ethiopia**, Kaffa Prov., Jimma, on *Colocasia esculenta*, 10 Nov. 1955, R.B. Stewart (BPI 426383, BPI 426385, NY). **Fiji**, isol. from *Colocasia esculenta*, June 2001, C.F. Hill (CBS 115191 = CPC 4323 = STE-U 4323). **Japan**, Kyoto, on *Colocasia esculenta*, 2 Oct. 1924, K. Togashi (BPI 426382); Riken, BioResource Centre, isol. from *Colocasia esculenta* (CBS 119542 = CPC 12726 = ICM 13264); Sendai, 25 Oct. 1918, A. Yasuda (BPI 426381). **Puerto Rico**, intercepted at San Juan, on *Colocasia esculenta*, 11 Mar. 1961, H.L. Rubin (BPI 426384).

*Notes*: *Cladosporium colocasiae* is a leaf-spotting species, confined to *Colocasia esculenta*, with nodulose conidiophores that are reminiscent of those of *C. herbarum*, *C. oxysporum* and *C. variabile*, but its conidia are quite distinct (Schubert 2005b, Schubert *et al.* 2007b). In phylogenetic trees (TEF and ACT), sequences of this species are nested within *C. tenuissimum*, but form a distinct, well-supported clade, suggesting that additional markers are necessary for a sufficient resolution. Type material of *C. colocasiicola* could not be traced, but based on the original description and illustration this name has to be reduced to synonymy with *C. colocasiae*.

Ho *et al.* (1999) examined *C. colocasiae* in culture and published a first detailed description of its features *in vitro*, recording the conidiophores as being much longer than on the natural substratum. Matsushima (1980) mentioned *Eucalyptus* sp. and *Psidium guajava* as additional hosts, but these records probably refer to one of the superficially similar, saprobic species mentioned above. Zhang *et al.* (2003) treat *C. colocasiicola* as a separate species and cite a record on *Nelumbo nucifera*, which is, however, very doubtful.

### 36. *Cladosporium colombiae* K. Schub. & Crous, Persoonia 22: 120. 2009. Figs 79, 80.

*Holotype*: **Colombia**, Páramo de San Cayetano, isol. from a dead leaf of *Cortaderia* (*Poaceae*), depos. May 1980, isol. W. Gams (CBS H-10374), formerly stored as *C. tenuissimum. Ex-type culture*: CBS 274.80 B.

*Lit.*: Bensch *et al.* (2010).
*Ill.*: Schubert *et al.* (2009: 120–121, figs 10–11).

*In vitro*: *Mycelium* immersed and superficial; hyphae branched, 1–5 µm wide, septate, sometimes constricted at septa and with swellings, up to 8 µm diam, subhyaline to olivaceous or olivaceous-brown, smooth to minutely verruculose or irregularly rough-walled, sometimes covered by polysaccharide-like material, wart-like, rugose, therefore irregular in outline, often forming ropes or loose aggregations. *Conidiophores* macro- and micronematous, arising terminally or laterally from ascending or plagiotropous hyphae, erect, straight to flexuous, solitary or in pairs of two; macronematous conidiophores cylindrical-oblong, non-nodulose, unbranched or occasionally branched, 25–105 × 3–4(–4.5) µm, often slightly attenuated towards the apex, 0–4(–5)-septate, not constricted at septa, sometimes in short succession, pale to medium olivaceous-brown, sometimes even dark olivaceous-

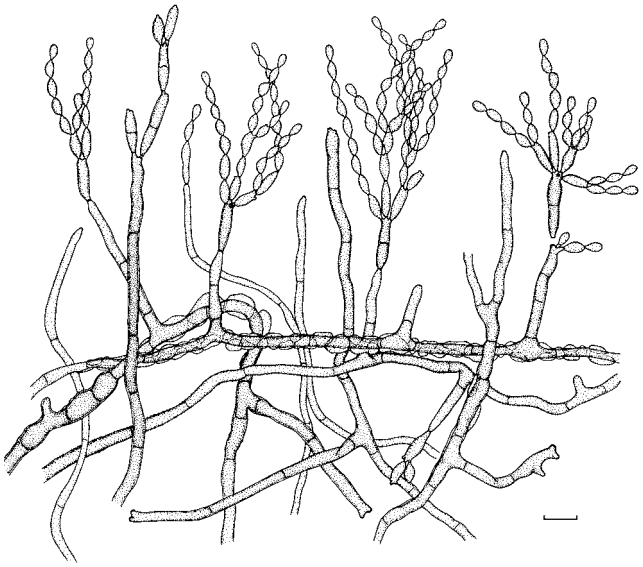


**Fig. 79.** *Cladosporium colombiae* (CBS 274.80 B). Conidiophores and conidia *in vitro*. Scale bar = 10 µm. K. Bensch *del*.

brown, smooth to often minutely verruculose, especially towards the apex, walls slightly thickened; micronematous conidiophores filiform, narrower, paler, often only as peg-like lateral outgrowth of hyphae, unbranched, 10–135 × 2–2.5 µm, septate, subhyaline to pale olivaceous-brown, smooth to minutely verruculose, walls unthickened. *Conidiogenous cells* integrated, terminal, rarely intercalary, cylindrical-oblong or filiform, 10 – 37 µm long, usually with only a single apical locus, sometimes with 2–3 loci, then subdenticulate, 1–2 µm diam, thickened and darkened-refractive. *Conidia* catenate, in long branched chains, up to 10 conidia in the unbranched part, small terminal conidia obovoid, 4–6.5 × 2.5–3(–4) µm (av. ± SD: 4.7 ± 0.8 × 3.2 ± 0.5), intercalary conidia ovoid, limoniform to ellipsoid-ovoid, 6–9 × (2.5–)3–3.5 µm (av. ± SD: 7.0 ± 0.8 × 3.2 ± 0.3), aseptate, attenuated towards apex and base, secondary ramoconidia ellipsoid to subcylindrical, sometimes clavate, 8–17(–23) × (2.5–)3–4 µm (av. ± SD: 13.8 ± 3.4 × 3.5 ± 0.4), 0–1(–2)-septate, not constricted at the median septum, pale to medium olivaceous-brown, smooth to minutely verruculose or often irregularly rough-walled, walls somewhat thickened, about 0.5 µm thick, attenuated towards apex and base, with 2–4(–5) distal hila, subdenticulate, 0.8–2 µm diam, thickened and darkened-refractive; microcyclic conidiogenesis sometimes occurring.


**Fig. 80.** *Cladosporium colombiae* (CBS 274.80 B). A–D. Conidiophores and conidia. E. Conidial chain. Scale bar = 10 µm.

*Culture characteristics*: Colonies on PDA grey-olivaceous, reverse iron-grey to greenish blue, fluffy to felty, margin feathery, aerial mycelium high, fluffy, growth low convex to convex, without prominent exudates, sporulation profuse. Colonies on MEA smoke-grey to grey-olivaceous and pale olivaceous-grey with small dots of olivaceous-grey towards margins, whitish or glaucous-grey towards margins, reverse iron-grey, velvety to woolly-felty, margins colourless to white, somewhat feathery, growth flat, exudates few and small but conspicuous, sporulation profuse.

*Substrate and distribution*: On leaves of *Cortaderia*; Colombia.

*Notes*: *Cladosporium colombiae* is phylogenetically closely allied to *C. chubutense*, but the latter species is morphologically quite distinct by having usually distinctly geniculate, longer conidiophores and minutely verruculose to verruculose, larger conidia formed in short chains. *Cladosporium ramotenellum*, *C. subtilissimum* and *C. tenuissimum* are additional comparable species but can be easily distinguished by the size and shape of their conidia (Schubert *et al.* 2007b). The ecology of *C. colombiae* remains unclear with respect to its possible role as a saprobe or pathogen.

**37. *Cladosporium corrugatum*** McAlpine, Fungus Dis. Citrus Trees Austral.: 88. 1899. Fig. 81.

*Holotype*: **Australia**, Armadale near Melbourne, on both surfaces of green orange leaves (*Citrus* ×*aurantium*, *Rutaceae*), Jan. 1899 (VPRI 5924).

*Lit.*: Saccardo (1913a: 1367), Schubert (2005b: 58–60).
*Ill.*: McAlpine (1899: fig. 57), Schubert (2005b: 59, fig. 18).

*In vivo*: Leaf spots amphigenous, oval to irregular, 3–18 mm wide, pale to dark grey-brown, on the upper leaf surface with an irregular, narrow, dark reddish brown, somewhat raised margin, on the lower leaf surface margin wider, at first yellowish brown, later somewhat reddish, irregularly lobed in outline, surface of the spots more or less corrugated. *Colonies* amphigenous, punctiform to effuse, caespitose, forming dense tufts, dark brown to even blackish, confluent, velvety. *Mycelium* immersed, subcuticular to intraepidermal; hyphae sparingly branched, 3–4 µm wide, sometimes slightly swollen and up to 6 µm wide, septate, not constricted or slightly constricted at the septa, subhyaline to pale olivaceous, smooth, walls not or barely thickened. *Stromata* mostly substomatal, composed of subglobose to somewhat angular, loosely to densely arranged, thick-walled cells, 5–9 µm wide, pale to dark olivaceous-brown, smooth. *Conidiophores* solitary or fasciculate, loose to dense, arising from stromata, emerging through stomata or erumpent through the cuticle, straight to often somewhat flexuous, somewhat geniculate-sinuous, unbranched, rarely branched, 15–70 × 3–6 µm, septate, medium to dark olivaceous, occasionally somewhat paler towards the apex, smooth, walls not or only slightly thickened, often somewhat swollen at the base. *Conidiogenous cells* integrated, terminal or intercalary, cylindrical, 5–25 µm long, proliferation sympodial, with a single to several conidiogenous loci, protuberant, subdenticulate, mostly truncate, 0.5–1.5(–2) µm diam, periclinal rim often not very conspicuous, slightly thickened, only somewhat darkened-refractive. *Conidia* catenate, in branched chains, more or less straight, obovoid, ellipsoid to sometimes

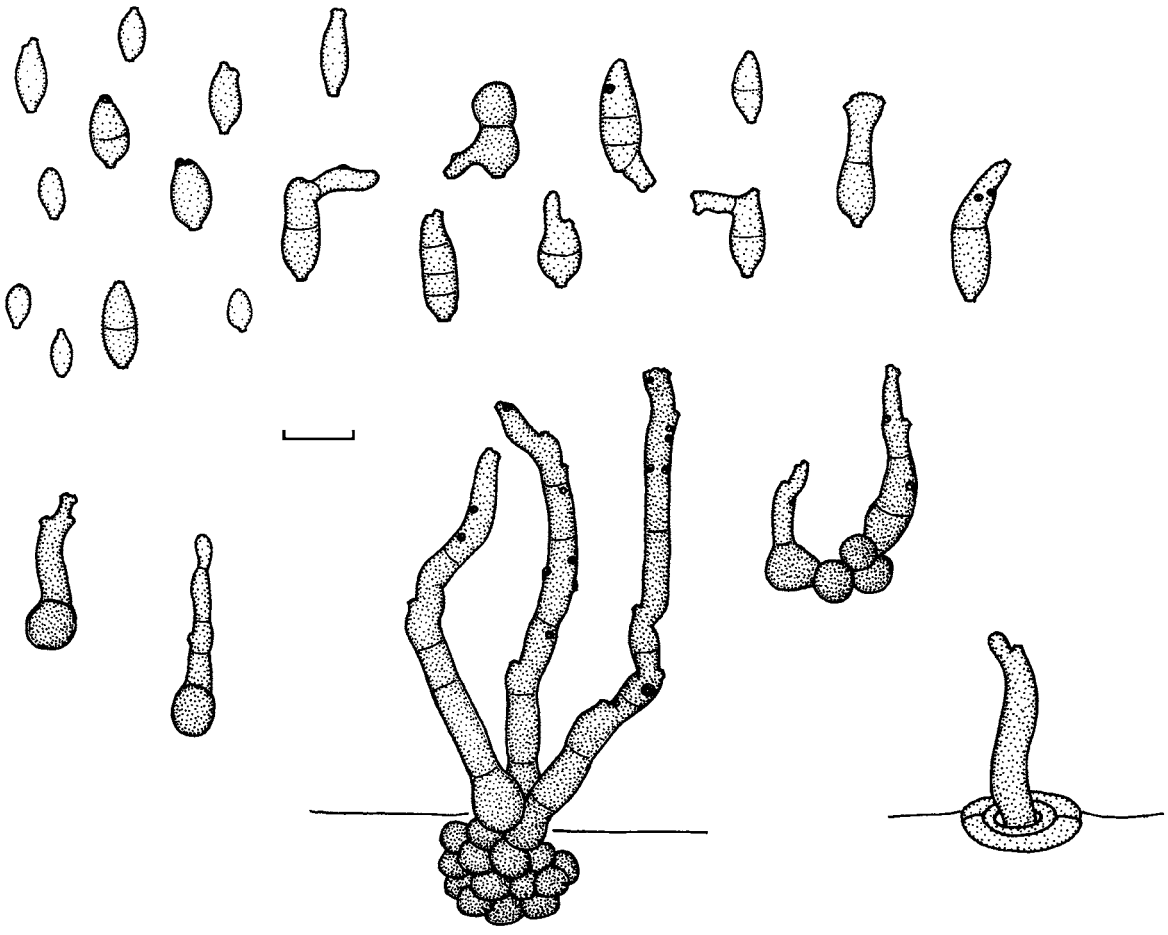


**Fig. 81.** *Cladosporium corrugatum* (VPRI 5924). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

subcylindrical, 3–20 × 2.5–7 µm, 0–2(–3)-septate, not constricted at the septa, pale olivaceous to olivaceous-brown, smooth, rarely minutely verruculose, walls not to slightly thickened, apex rounded or somewhat attenuated, with a single or few apical hila, hila truncate to slightly convex, 0.5–1.5(–2) µm diam, slightly thickened, somewhat darkened-refractive; microcyclic conidiogenesis occurring.

*Substrate and distribution*: On *Citrus* ×*aurantium*; Australia.

*Notes*: *Cladosporium corrugatum* is a leaf-spotting species well-distinguished from other *Cladosporium* spp. occurring on *Citrus* and other hosts. Type material of *C. citri* Massee, *C. farnetianum* (≡ *C. citri* Briosi & Farneti, *nom. illeg.*), *C. furfuraceum*, and *C. subfusoideum*, additional species described from *Citrus*, is not preserved. *Cladosporium brunneoatrum*, causing "False Melanose" on leaves and fruits of *Citrus* ×*aurantium*, is excluded from *Cladosporium s. str*., but its taxonomic status remains unknown since the type material is very sparse. Type details of *C. subfusoideum* recorded on fruits of *Citrus medica* agree with *Diplodia citricola*. *Cladosporium elegans* var. *singaporense* is conspecific with *Spiropes guareicola* (Schubert & Braun 2005a). *Cladosporium sclerotiophilum*, introduced by Sawada (1931) and only described in Japanese, has to be excluded from *Cladosporium s. str*., but its taxonomic affinity is not yet clear.

**38. *Cladosporium coryphae*** (Syd. & P. Syd.) J.C. David, Mycol. Pap. 172: 99. 1997. Fig. 82.
*Basionym*: *Heterosporium coryphae* Syd. & P. Syd., Philipp. J. Sci. 8: 196. 1913.

*Lectotype* (selected by David, 1997): **Philippines**, Mindoro, San José, on leaves of *Corypha elata* (*Arecaceae*), Jan. 1912, P.W. Graff, Sydow, Fungi Exot. Exs. 48 (S). *Isolectotypes*: IMI 10041, K, M-0057517.

*Ill*.: David (1997: 89, fig. 22 I–K; 101, fig. 27).
*Exs*.: Sydow, Fungi Exot. Exs. 48.

*In vivo*: On leaves without conspicuous spots or discolorations. *Colonies* amphigenous, caespitose, loose to dense, effuse, medium olivaceous-brown to brown, velvety, covering more or less the whole leaf surface. *Mycelium* external, superficial, radiating around caespitulae, hyphae branched, 3–7 µm wide, pluriseptate, translucent, pale to medium yellowish brown to olivaceous-brown, smooth, walls slightly thickened, cells becoming often somewhat swollen, subglobose, up to 15 µm wide, forming stromatic hyphal aggregations. *Conidiophores* solitary or loosely fasciculate, arsising from stromatic hyphal aggregations or from hyphae, spreading out irregularly to give a somewhat floccose appearance, erect, flexuous and somewhat sinuous, slightly geniculate near the apex, unbranched, occasionally branched, (35–)70–300(–400) × 4–7(–8) µm, slightly attenuated towards the apex, septate, septa often not very conspicuous, pale to medium chestnut-brown, paler brown or somewhat greyish brown near the apex, smooth, walls somewhat thickened, sometimes two distinct wall layers visible. *Conidiogenous cells* integrated, terminal to more rarely intercalary, cylindrical-oblong to somewhat geniculate, 17–85 µm long, proliferation sympodial, with a single or few, more or less protuberant conidiogenous loci, 1.5–3 µm diam, thickened, darkened-refractive. *Conidia* catenate, in unbranched or branched chains, usually straight, occasionally slightly curved, obovate, obpyriform, broadly ellipsoid to subcylindrical, 9–32(–44) × (5–)7–14(–17) µm, 0–4(–5)-septate, occasionally distoseptate, not constricted at septa, straw-coloured, becoming more densely pigmented, ochre brown to red-brown, smooth, walls thickened, usually 2–3-layered, appearing zonate, different zones with different pigmentation, cells appearing to have a distinct lumen, hila not very conspicuous, 1–3 µm diam, thickened, darkened-refractive; microcyclic conidiogenesis occuring.

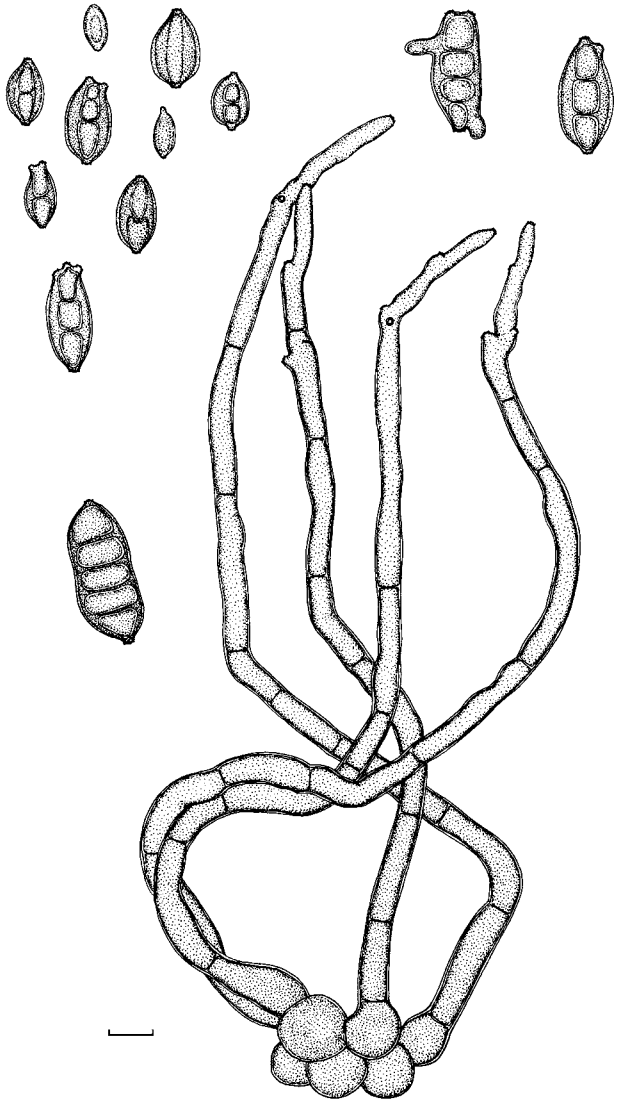


**Fig. 82.** *Cladosporium coryphae* (S). Loosely fasciculate conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

*Substrate and distribution*: On *Corypha elata*; Philippines.

*Notes*: This species was placed in the separate subgenus *Bistratosporium* (David 1997), which is, however not tenable.

**39. *Cladosporium cucumerinum*** Ellis & Arthur, Bull. Agric. Exp. Sta., Indiana 19: 9–10. 1889. Figs 83, 84.

*Holotype*: **USA**, New York, Geneva, on fruits of *Cucumis sativus* (*Cucurbitaceae*), J.C. Arthur (NY).

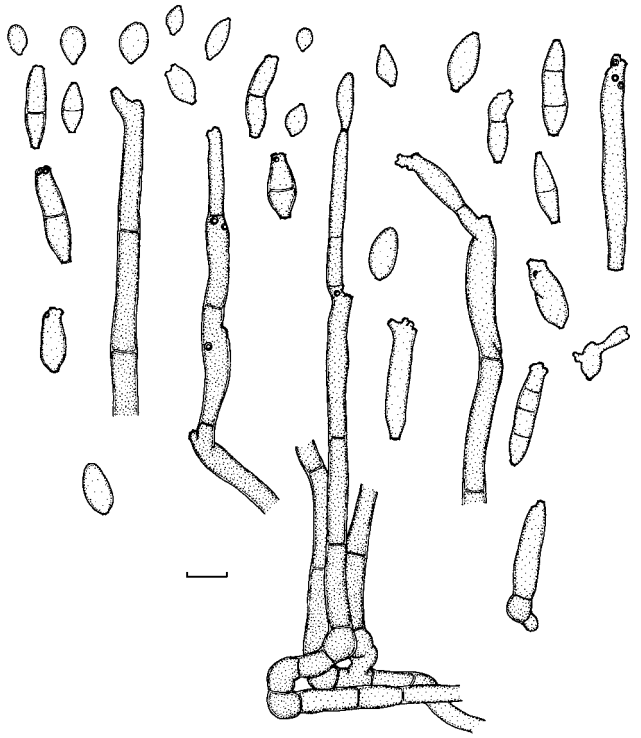


**Fig. 83.** *Cladosporium cucumerinum* (BPI 426422). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

*Epitype* (designated in Bensch *et al.* 2010): isol. from fruits of *C. sativus* (CBS H-20429). *Ex-type culture*: CBS 171.52 = MUCL 10092.

= *Scolecotrichum melophthorum* Prill. & Delacr., Bull. Soc. Mycol. France 7(1): 219. 1891.
≡ *Macrosporium melophthorum* (Prill. & Delacr.) Rostr., Gartn.-Tidende 24: 18. 1893.
= *Cladosporium cucumeris* A.B. Frank, Z. Pflanzenkrankh. 3: 31. 1893 [holotype: B 700006228].
= *Cladosporium scabies* Cooke, Gard. Chron., Ser. 3, 34: 100. 1903 [type: K].
= *Cladosporium cucumerinum* var. *europaeum* Bubák, *in herb*. [BPI 426422].

*Lit*.: Saccardo (1892: 601), Lindau (1907: 830, 1910: 797), Ferraris (1912: 349), Gonzáles-Fragoso (1927: 206), Cash (1952: 68), de Vries (1952: 62), Ellis (1971: 318), Ellis & Holliday (1972), Brandenburger (1985: 403), Ellis & Ellis (1985: 339), von Arx (1987: 193), McKemy & Morgan-Jones (1992), Ho *et al*. (1999: 125), Zhang *et al*. (2003: 80–82), Schubert (2005b: 60–63), Bensch *et al.* (2010: 35–37).
*Ill*.: de Vries (1952: 63, fig. 12), Ellis (1971: 318, fig. 219 B), Ellis & Holliday (1972: fig.), von Arx (1987: 194, fig. 83b), McKemy & Morgan-Jones (1992: 165, fig. 1; 167, pl. 1), Ho *et al*. (1999: 124, fig. 14), Zhang *et al*. (2003: 81, fig. 45), Schubert (2005b: 62, fig. 19), Bensch *et al.* (2010: 36, fig. 21).
*Exs*.: Petrak, Fl. Bohem. Morav. Exs. Pilze 2108; Poelt & Scheuer, Reliqu. Petrak. 2342; Săvulescu, Herb. Mycol. Roman. 643.

*In vivo*: On living leaves, petioles, stems, fruits and young shoots, causing cucumber gummosis or scab and crown blight, on leaves forming necrotic, water-soaked spots, sometimes with a gummy exudate, sporulation mostly only sparse; on fruits forming pronounced, deeply sunken brownish lesions, up to 10 mm diam or confluent, with a gummy exudate, older fruits with brown, cork-like scabs; young seedlings sometimes seriously damaged, dieback of apical shoots may occur. *Colonies* effuse, loosely to densely caespitose, pale to medium or almost dark greyish olive, velvety or somewhat felt-like with age. *Mycelium* partly immersed in the substratum, partly superficial; hyphae branched, 2–6 µm wide, septate, subhyaline to pale olivaceous or pale brown, smooth, walls somewhat thickened, sometimes forming loose hyphal aggregations, composed of swollen, subglobose hyphal cells, pale medium brown, thick-walled, immersed hyphae often with a slime coat, sometimes becoming spirally twisted. *Conidiophores* solitary or in small groups, loose to somewhat dense, arising from internal and external hyphae, lateral or terminal, or from swollen hyphal cells or hyphal aggregations, erect, straight to somewhat flexuous, cylindrical to filiform, often somewhat geniculate-sinuous towards the apex, without multilateral swellings, unbranched, often with short, subapical, lateral projections, sometimes branched, once to several times, 10–300(–400) × 3–7(–8) µm, septate, sometimes constricted at the septa, pale to medium olivaceous-brown or pale to pale medium brown, somewhat paler towards the apex, smooth, walls somewhat thickened, often swollen and somewhat bulbous at the base, up to 8 µm wide. *Conidiogenous cells* integrated, terminal and intercalary, cylindrical or somewhat geniculate, 18–65 µm long, proliferation sympodial, with a single to several conidiogenous loci, subdenticulate, often situated on small shoulders or short lateral projections, protuberant, often truncate and almost flat, 1–2.5 µm diam, central dome usually not higher than the surrounding rim, thickened, refractive to darkened-refractive. *Ramoconidia* occasionally occurring, cylindrical-oblong, up to 52 µm long, mostly aseptate, base 3–4 µm wide, unthickened, not darkened, sometimes slightly refractive. *Conidia* catenate, usually in branched chains, straight to slightly curved, terminal and intercalary conidia subglobose, obovoid, ellipsoid, fusiform or limoniform, 3–25 × 2–7(–9) µm, 0(–1)-septate, occasionally slightly constricted at the septum, secondary ramoconidia cylindrical to somewhat clavate or occasionally ampulliform to doliiform, up to 35 µm long, 3–7(–8) µm wide, 0–2(–3)-septate, with age slightly constricted at the septa, subhyaline, pale brown or pale olivaceous-brown, smooth, sometimes minutely verruculose, walls somewhat thickened, apex broadly rounded or with a single to several (up to 5) somewhat denticle-like hila, more or less truncate at the base, hila protuberant, 1–2.5 µm diam, thickened, refractive to somewhat darkened; microcyclic conidiogenesis sometimes observed.

*In vitro*: *Mycelium* immersed and superficial; hyphae sparingly branched, 0.5–4 µm wide, later up to 8 µm wide, septate, with age constricted at septa, subhyaline to very pale brown or pale olivaceous-brown, later olivaceous-brown, smooth or almost so, walls unthickened, broader hyphae with slightly thickened walls. *Conidiophores* solitary, macro- and micronematous, arising terminally from ascending and laterally from plagiotropous hyphae, erect, straight to slightly flexuous, macronematous conidiophores cylindrical-oblong, sometimes once geniculate-sinuous with conidiogenous loci situated laterally on shoulders, non-nodulose, usually unbranched on SNA, sometimes once branched towards the apex (often branched on PDA according to McKemy & Morgan-Jones, 1992), up to 350 µm long, 3–5(–5.5) µm wide, pluriseptate, not constricted at septa, often more densely septate towards the base, pale brown, later medium brown, smooth, walls unthickened or slightly thickened, up to 0.5 µm wide; micronematous conidiophores straight to slightly flexuous, filiform, narrower, 1–2 µm wide, septate, smooth. *Conidiogenous cells* integrated, usually terminal, filiform to cylindrical-oblong, sometimes once geniculate, up to 47 µm long, 1–2(–3) loci, protuberant, subdenticulate, 1.5–2 µm diam, somewhat thickened and darkened-refractive.

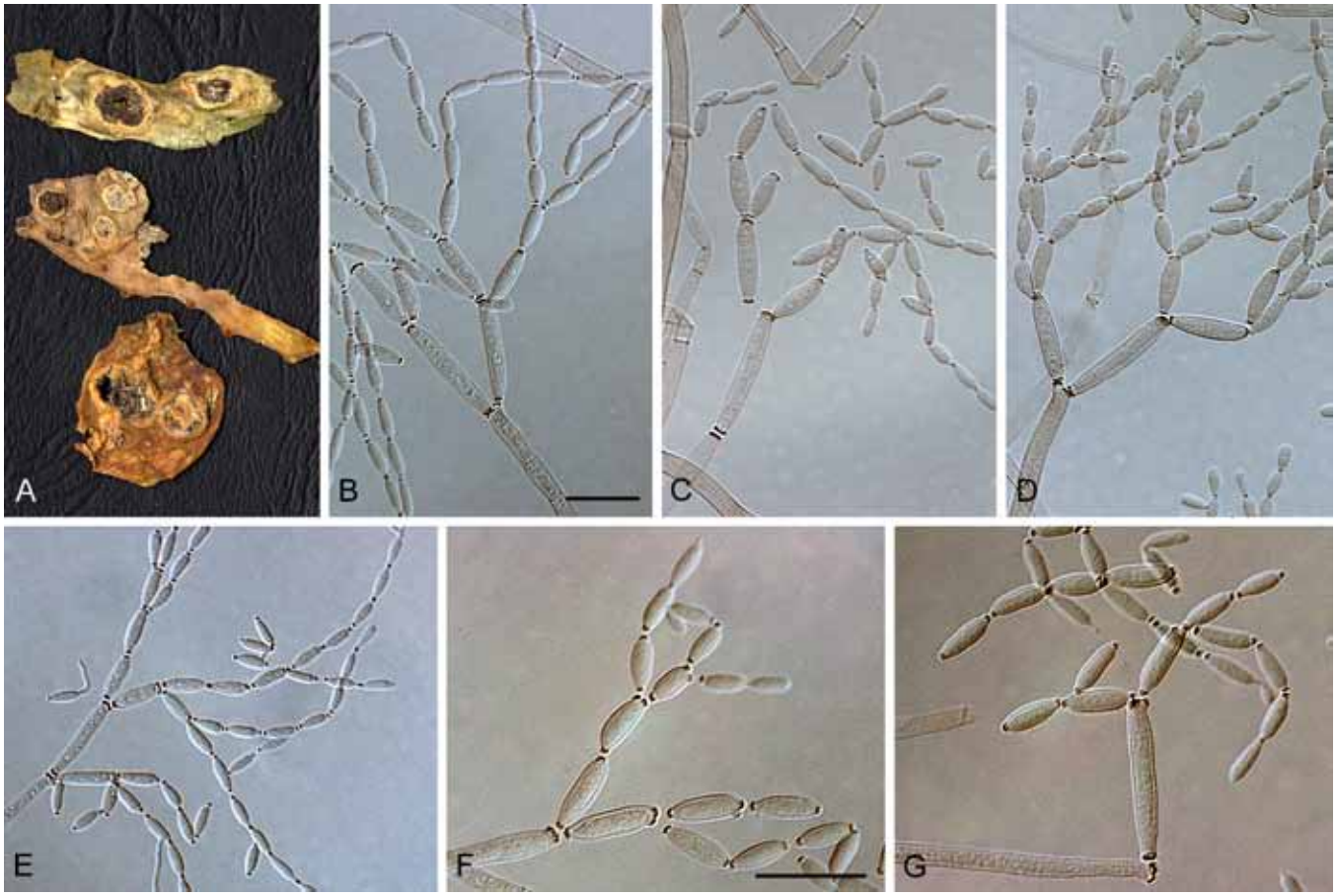



**Fig. 84.** *Cladosporium cucumerinum* (CSB 171.52, epitype). A. Symptoms on fruits of *Cucumis sativus* (holotype NY). B–G. Conidiophores and conidial chains *in vitro*. Scale bars = 10 µm.

*Ramoconidia* occasionally formed, cylindrical-oblong, 24–43 × 3–3.5 µm, 0–2-septate, smooth, base truncate, 2.5–3 µm wide, unthickened or only slightly so. *Conidia* catenate, in long loosely branched chains, often dichotomously branched, up to 10(–14) conidia in the terminal unbranched part of the chain, straight, small terminal conidia obovoid to ellipsoid-ovoid, subglobose, 4–8(–10) × (1–)1.5–3(–3.5) µm (av. ± SD: 6.4 ± 1.2 × 2.2 ± 0.5), aseptate, hila 0.5–0.8(–1) µm diam, intercalary conidia ellipsoid-ovoid to fusiform or subcylindrical, sometimes limoniform, 7–15(–17) × (2–)2.5–4(–5) µm (av. ± SD: 10.9 ± 2.7 × 3.2 ± 0.6), 0(–1)-septate, hila 0.8–1.2(–1.5) µm, secondary ramoconidia ellipsoid, fusiform to cylindrical-oblong, (9.5–)14–30(–40) × (2.5–)3–5(–5.5) µm (av. ± SD: 21.8 ± 5.8 × 3.8 ± 0.7), 0–2(–3)-septate, with age sometimes slightly constricted at septa, septum median or in the upper or lower third, pale brown or very pale brown, later becoming medium brown, smooth, walls unthickened, slightly attenuated towards apex and base, cells sometimes with small cavities, hila 1.5–2.2(–2.5) µm diam, conspicuous, subdenticulate, somewhat thickened and darkened-refractive; conidia often germinating, forming micronematous conidiophores and conidia.

*Culture characteristics*: Colonies on PDA attaining 50–78 mm diam after 14 d, grey-olivaceous to olivaceous-grey or olivaceous, sometimes dull green towards margins and somewhat zonate, reverse olivaceous-black, velvety to floccose or felty, margin narrow to broad, colourless to white, regular, somewhat feathery, aerial mycelium absent, sparse or sometimes abundantly formed at few parts of the colony or covering almost the whole colony surface, white, loose to dense, woolly, floccose, growth flat, regular, without prominent exudates, sporulation profuse. Colonies on MEA reaching 36–73 mm diam after 14 d, grey-olivaceous to smoke-grey, whitish due to aerial mycelium, reverse iron-grey, velvety to fluffy, margin white, glabrous, regular, aerial mycelium dense, forming mats, covering large parts of the colony surface, growth flat, somewhat wrinkled and folded in colony centre, sometimes with several prominent exudates, sporulation profuse. Colonies on OA attaining 54–79 mm diam after 14 d, pale olivaceous-grey, grey-olivaceous to smoke-grey or whitish, grey-olivaceous or iron-grey at margins, reverse leaden-grey to iron-grey, velvety to floccose, margin regular, colourless to white, glabrous, aerial mycelium absent to abundantly formed, covering most of the colony surface, growth flat, regular, without prominent exudates, sporulation profuse.

*Substrates and distribution*: on leaves, stems and fruits of *Cucurbitaceae*, especially *Cucumis sativus*, *C. melo* and *Cucurbita pepo*, other host genera *Citrullus*, *Lagenaria*, *Luffa*, *Momordica*, *Sechium*; cosmopolitan – *Citrullus lanatus* (Greece, Korea, Puerto Rico, Romania, USA), *C. vulgaris* (Canada, Puerto Rico, USA, Virgin Islands, Turkmenistan,), *Coccinia grandis* (Kenya), *Cucumis melo* (Canada, France, Czech Republic, Great Britain, Greece, India, Mexico, Netherlands, Panama, Romania, South Africa, South Korea, Turkmenistan, USA, Zimbabwe), *C. sativus* (Armenia, Austria, Brazil, Canada, China, Czech Republic, Denmark, Estonia, Germany, Great Britain, Greece, Iran, Italy, Japan, Jordan, Kenya, Latvia, Mauritius, Mexico, Netherlands, Panama, Poland, Romania, South Africa, South Korea, Suriname, Switzerland, USA, Zimbabwe), *Cucumis* spp. (Germany, Mexico, South Korea), *Cucurbita maxima* (Canada, Chile, China, USA), *C. pepo* (Barbados, Mauritius, New Zealand, Pakistan, South Africa, USA,

Zimbabwe), *Cucurbita* spp. (Canada, USA), *Lagenaria siceraria* (China, Greece, India), *Luffa acutangula* (India), *L. cylindrica* (= *L. aegyptiaca*) (China), *Momordica charantia* (China), *Sechium edule* (Panama), without host (Georgia, Hungary, Norway).

*Additional specimens examined*: *Sine loco*, isol. from fruits of *Cucumis sativus* (*Cucurbitaceae*), W.W. Gilbert (CBS 108.23); isol. and ident. by J. Westerdijk, 1908 (CBS 109.08). **Austria**, Kärnten, Poertschack at the Wörther See, on *C. sativus*, Aug. 1902, E. Cerny (BPI 426422, original material of *Cladosporium cucumerinum* var. *europaeum*). **Czech Republic**, Mähren-Weisskirchen, on *C. sativus*, Aug. 1925, F. Petrak, Petrak, Fl. Bohem. Morav. Exs. Pilze 2108 (M-0057514). **Denmark**, Kopenhagen, on *C. sativus*, 20 Sep. 1907, J. Lind, Flora Danica (B 700006220); 25 Sep. 1907, J. Lind, Lind, Flora Danica (B 700006219, HBG). **Germany**, Bayern, Mögeldorf near Nürnberg, on *C. sativus*, 16 Sep. 1906, P. Magnus (HBG); Brandenburg, Berlin, Aug. 1924, Noack (B 700006224); Versuchsfeld near Dahlem, 20 Sep. 1902, P. Magnus (HBG); Kreis Oder-Spree, Erkner near Berlin, 18 Jun. 1892 (B 700006228, holotype of *Cladosporium cucumeris*); Mecklenburg-Vorpommern, Bramow near Rostock, 18 Aug. 1924, Fr. Malchow (B 700006225); Sachsen, Dresden-Stetzsch, on *Cucumis* sp., Jul. 1920, Laubert (B 700006222); Sachsen-Anhalt, Harz, Quedlinburg, on *C. sativus*, 30 Jul. 1934 (B 700006221). **Netherlands**, isol. by G.A. de Vries (CBS 158.51 = ATCC 11279 = IFO 6370 = IMI 049628 = VKM F-817); Amsterdam, G.W. van der Helm, isol. by G.A. de Vries, Jan. 1951 (CBS 173.54); Berkel, G.W. van der Helm, isol. by G.A. de Vries (CBS 174.54, CBS 175.54); Naaldwijk, isol. by S. Dudok de Wit, CBS 123.44; Jan. 1951, G.W. van der Helm, isol. by G.A. de Vries (CBS 176.54); Sloten, coll. by G.W. van der Helm, isol. by G.A. de Vries (CBS 172.54). **Pakistan**, Lahore, on *Cucurbita pepo*, Dec. 1951, S. Ahmad, Reliqu. Petrak. 2342 (B 700006227, M-0057513). **Poland**, Oberschlesien, Proskau, on *C. sativus*, 1 Sep. 1895 (B 700006226). **Romania**, Muntenia, District Ilfov-Bucureşti, on *C. sativus*, 13 Jul. 1933, T. Săvulescu & C. Sandu, Săvulescu, Herb. Mycol. Roman. 643 (M-0057515, M-0057516). **Switzerland**, Graubünden, Plantahof, Landquart, on *C. sativus*, 23 Sep. 1901, A. Volkart (HBG). **USA**, Massachusetts, Clinton, on *C. sativus*, Oct. 1892, C.A. Chase, Massachusetts Fungi 828 (NY); Dwight, on *Cucumis melo*, 16 Aug. 1916, Massachusetts Fungi 2040 (NY); Pennsylvania, isol. from painted floor by M.H. Downing, 1951 (CBS 174.62 = ATCC 16022 = ATHUM 2861 = CECT 2110 = IFO 31006 = IMI 045534 = MUCL 19019 = QM 489 = VTT D-92188).

*Notes*: *Cladosporium cucumerinum* is a biotrophic species confined to hosts of the *Cucurbitaceae*. In phylogenetic analyses, this species clustered as a sister to *C. subuliforme* (Bensch *et al.* 2010, fig. 1, part c), but formed a distinct lineage. Morphologically it resembles *C. cladosporioides*, but differs in having geniculate conidiophores and somewhat wider conidia. The characters of the two species *in vitro* are also distinct. In de Vries (1952) and McKemy & Morgan-Jones (1992) "*Macrosporium cucumerinum* Ellis & Everh., Hedwigia 7: 49. 1896." is cited as a synonym of *C. cucumerinum*, but in Hedwigia, vol. 7 (published in 1868, not in 1896) there is no reference to this name. In Index Fungorum the original citation of *Macrosporium cucumerinum* is given as "Proc. Acad. Nat. Sci. Philadelphia 1895: 440. 1895." and "*Alternaria cucumerina* (Ellis & Everh.) A. Elliott, Amer. J. Bot. 4: 472. 1917." is given as current name. De Vries (1952) listed *Chloridium polysporum* (≡ *Acladium polysporum*) as an additional synonym and stressed that this name antedated *C. cucumerinum*. McKemy & Morgan-Jones (1992) discussed this "synonymy" and stated that the two species are not identical and do not even belong in the same genus. Hughes (1958), who examined type material of Wallroth's species, reduced *A. polysporum* to synonymy with *Botrytis cinerea*.

*Cladosporium cucumerinum*, the causal organism of crown blight and scab or gummosis disease is widespread and common especially on *Citrullus lanatus*, *Cucumis melo*, *C. sativus* and *Cucurbita pepo*, but various records from other members of the *Cucurbitaceae* belong very probably to this species and are, therefore, listed under "substrates and distribution". However, there are also records on hosts belonging to other families. These records are partly doubtful, but may indicate that this species is not confined to cucurbits. Molecular analyses based on material from hosts of other plant families are necessary to solve this problem. Roberts *et al.* (1986) examined the internal mycoflora of achenes of *Helianthus annuus* (*Asteraceae*) and reported *C. cucumerinum* as isolated from developing sunflower seeds. Morphological data and illustrations have not been provided, and cultures could not be traced, so that a verification of the identity of the fungus concerned was not possible. Hasija (1967) described this species from India on *Solanum tuberosum* (*Solanaceae*). In Korea, a *Cladosporium* species was isolated from leaves of *Solanum melongena* cultivated in a greenhouse, and identified as *C. cucumerinum* by Kwon *et al.* (1999). They carried out inoculation experiments and reported it to cause symptoms in seedlings of watermelon, cucumber, oriental melon and pumpkins. Kwon *et al.* (2000) reported it to cause a black scab disease on sword bean (*Canavalia ensiformis* = *C. gladiata*, *Fabaceae*) in greenhouses in Korea. Mendes *et al.* (1998) listed *Capsicum annuum* as a further host species. An isolate from a painted floor in the USA very probably resulted due to contamination with *C. cucumerinum* (Bensch *et al.* 2010). The species was originally described from North America but an epitypification with European material is justified due to its pathogenicity to several hosts of cucurbits and its cosmopolitan distribution.

**40. *Cladosporium cycadis*** Marcolongo, Riv. Patol. Veg., Ser. 2, 7(1): 8. 1914. Fig. 85.

*Neotype* (**designated here**): **Italy**, Orto Botanico di Napoli, on *Cycas revoluta* (*Cycadaceae*), I. Marcolongo, Cavara & Pollacci, Fung. Paras. Piante Colt. Utili Exs. 439 (BPI 426433). *Isoneotype*: M-0057511.

*Lit.*: Saccardo (1931: 790), Rao & Baheker (1964), Zhang *et al.* (1998a: 6, 2003: 82–83).
*Ill.*: Zhang *et al.* (1998a: 5, fig. 2; 2003: 82, fig. 46).
*Exs.*: Cavara & Pollacci, Fung. Paras. Piante Colt. Utili Exs. 439; Ciferri, Mycofl. Doming. Exs. 392.

*In vivo*: On living and faded leaves, causing dingy olivaceous-green to brown lesions, small to large leaf segments becoming necrotic, size and shape variable, margin indefinite, later sometimes entire leaves turning brown. *Colonies* faintly punctiform to effuse, often

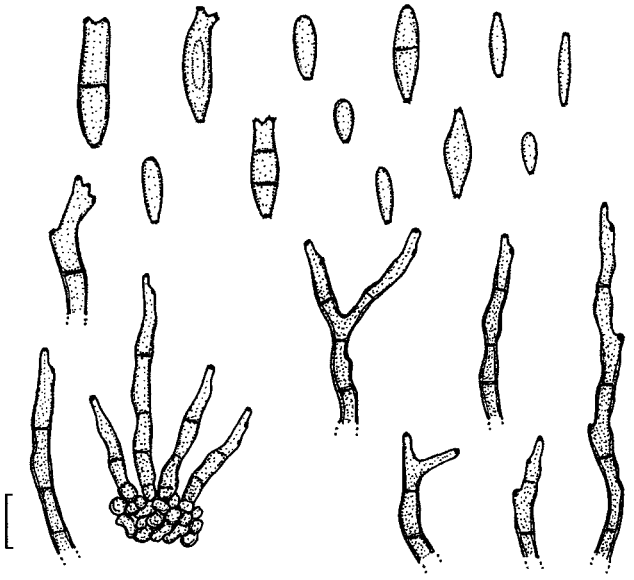


**Fig. 85.** *Cladosporium cycadis* (BPI 426433). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. U. Braun *del.*

rather inconspicuous, dark brown. *Mycelium* internal. *Stromata* lacking or small, up to 50 µm diam, brown, immersed to slightly erumpent. *Conidiophores* solitary or in small, usually loose fascicles, arising from internal hyphae, swollen hyphal cells or stromata, erect, erumpent, straight, subcylindrical to usually geniculate-sinuous, often strongly so, sometimes subnodulose, unbranched or branched, 20–60 × 2–6 µm, pluriseptate throughout, olivaceous-brown, smooth, wall thin, *ca.* 0.5 µm wide. *Conidiogenous cells* integrated, terminal and intercalary, 10–25 µm long, conidiogenous loci 1–1.5 µm diam, slightly protuberant. *Conidia* catenate, in simple or branched chains, subglobose, ellipsoid-ovoid, fusiform, subcylindrical, 4–10 × 2–5 µm, secondary ramoconidia 6–24 × 3–7 µm, 0–2(–3)-septate, subhyaline to pale olivaceous or olivaceous-brown, smooth, thin-walled, up to 0.5 µm, ends obtuse to attenuated, hila often somewhat protuberant, subdenticulate, 1–1.5 µm diam, distinctly coronate; microcyclic conidiogenesis not occurring.

*Substrates and distribution*: On *Cycas* spp. (*Cycadaceae*); Asia, Europe, Central America – *C. intermedia* (Czech Republic), *C. revoluta* (China, Dominican Republic, Italy), *C. rumphii* (China).

*Additional specimens examined*: **Czech Republic**, Moravia, "Eisgrub", on *Cycas intermedia*, H. Zimmermann, ex herb. Bubák, 20 Feb. 1909 (BPI 426121). **Dominican Republic**, Prov. Santo Domingo, Llano Costero, Ciudad Trujillo, on *Cycas revoluta*, Jul. 1928, R. Ciferri, Ciferri, Mycofl. Doming. Exs. 392 (BPI 426432).

*Notes*: *Cladosporium apicale* differs in having much longer conidiophores.

**41. *Cladosporium delectum*** Cooke & Ellis, Grevillea 6(37): 6. 1877. Fig. 86.

*Lectotype* (**selected here**): **USA**, New Jersey, Newfield, on dead leaves of *Magnolia virginiana* (= *M. glauca*) (*Magnoliaceae*), J.B. Ellis 3038 [ex herb. Cooke 1885] [K (F) 121550].

*Lit*.: Saccardo (1886: 358), Lindau (1907: 822), Ferraris (1912: 341), Cash (1952: 68).
*Ill*.: Cooke & Ellis (1877: pl. 96, fig. 36).
*Exs*.: Ellis, N. Amer. Fungi 371; Ellis & Everhart, Fungi Columb. 164.

*In vivo*: Saprobic on dead leaves (leaf litter). *Colonies* punctiform to effuse, blackish brown. *Mycelium* immersed. *Stromata* lacking. *Conidiophores* solitary or in small to moderately large, loose fascicles, arising from immersed hyphae or small aggregations of swollen hyphal cells, erect, straight to usually strongly geniculate-sinuous, but not nodulose, unbranched or occasionally branched, 50–300 × 3–8 µm, at the very base up to 12 µm wide, pluriseptate throughout, medium to medium dark brown, smooth or almost so, wall thickened, 0.5–1.5(–2) µm wide, often distinctly two-layered, above all below. *Conidiogenous cells* integrated, terminal and intercalary, 10–25 µm long, with a single or several conidiogenous loci, only slightly protuberant, 1–2 µm diam, raised periclinal rim not very evident when viewed by light microscopy. *Conidia* catenate, in simple or branched chains, ramoconidia and secondary ramoconidia present, 8–18 × 3–7 µm, 0–3-septate, ramoconidia with truncate base, 2–4 µm wide, without coronate hilum, conidia ellipsoid-ovoid, fusiform, subcylindrical, 3–15 × 2.5–5.5 µm, 0–1-septate, subhyaline to pale olivaceous or olivaceous-brown, smooth or almost so, thin-walled (< 1 µm), ends rounded to attenuated, hila 1–2 µm diam.

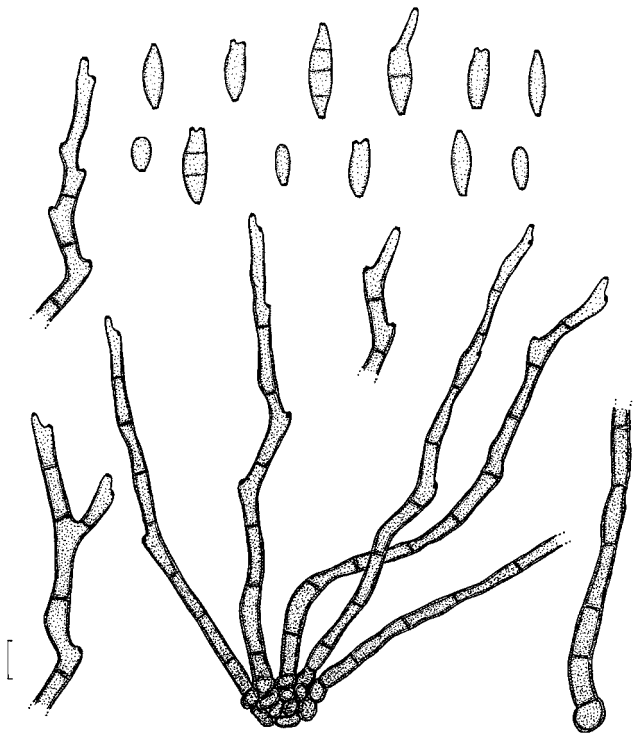


**Fig. 86.** *Cladosporium delectum* [K (F) 121550]. Conidiophores and conidia *in vivo*. Scale bar = 10 µm. U. Braun *del*.

*Substrate and distribution*: On dead leaves of *Magnolia virginiana*; USA.

*Additional specimens examined*: **USA**, New Jersey, Newfield, on dead leaves of *Magnolia virginiana*, June 1878, Ellis, N. Amer. Fungi 371(NY) and June 1893, Ellis & Everhart, Fungi Columb. 164 (NY), topotype material.

*Notes*: Zhang *et al*. (2003) recorded, described and illustrated this species from China on leaves of *Castanea mollissima*. However, the Chinese collection does not agree with type material of *C. delectum*. Some duplicates of Fungi Columb. 164 contain mixtures of *Cladosporium herbarum*, *C. cladosporioides* and *Alternaria* sp.

**42. *Cladosporium delicatulum*** Cooke, Grevillea 5(33): 17. 1876. Figs 87–92.

*Holotype*: **India**, on dead leaves (litter), Colonel Hobsen, No. 23 (K [M] 121551). *Isotypes*: Vize, Micro-Fungi Exot. 24 (*e.g.*, B 700006230).

= *Cladosporium fasciculatum* f. *scirpi-lacustris* Roum., Fungi Sel. Gall. Exs., Cent. 17, No. 1688. 1881, *nom. nud.* [syntypes: *e.g.* FH].
= *Cladosporium fasciculatum* var. *densum* Ravenel, Fungi Amer. Exs., Cent. VII, No. 602. 1882, *nom. nud.* [syntype: BPI 426554]
= *Cladosporium tuberum* Cooke, Grevillea 12(61): 31. 1883 [lectotype: K].

*Lit*.: Saccardo (1886: 361–362), Bensch *et al.* (2010: 37–40).
*Ill*.: Bensch *et al.* (2010: 38–40, figs 22–25).
*Exs*.: Anonymous, Calif. Fungi 427; Herter, Plantae Urug. Exs. 1496; Ravenel & Cooke, Fungi Amer. Exs. 600, 602; Roumeguère, Fungi Sel. Gall. Exs. 1688; Thümen, Mycoth. Univ. 1767.

*Description based on poor type material*: Saprobic, on dead leaves, forming punctiform colonies, effuse, dark brown to blackish. *Mycelium* immersed. *Conidiophores* solitary or loosely aggregated,

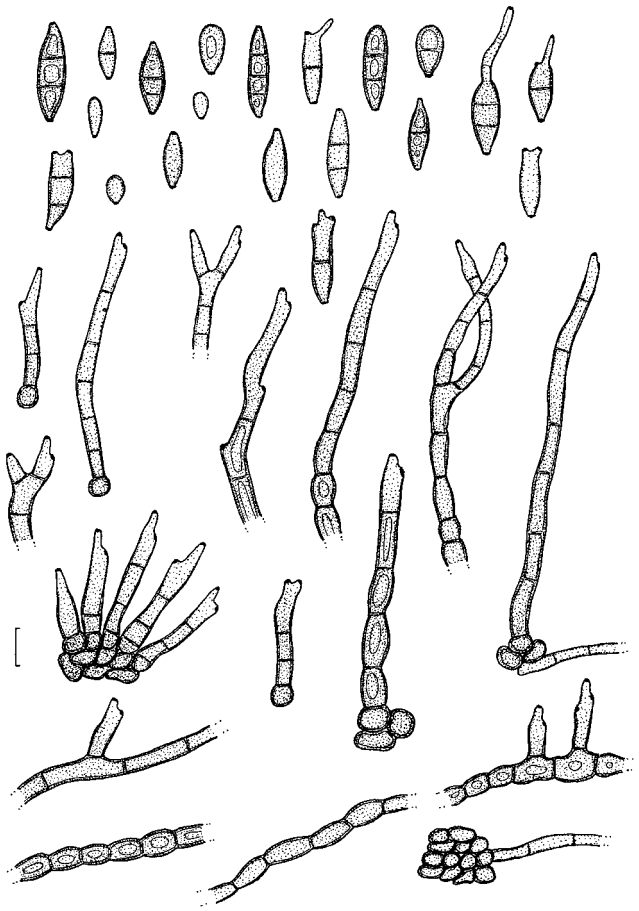


**Fig. 87.** *Cladosporium delicatulum*. Conidiophores and conidia *in vivo*. Scale bar = 10 µm. U. Braun *del*.

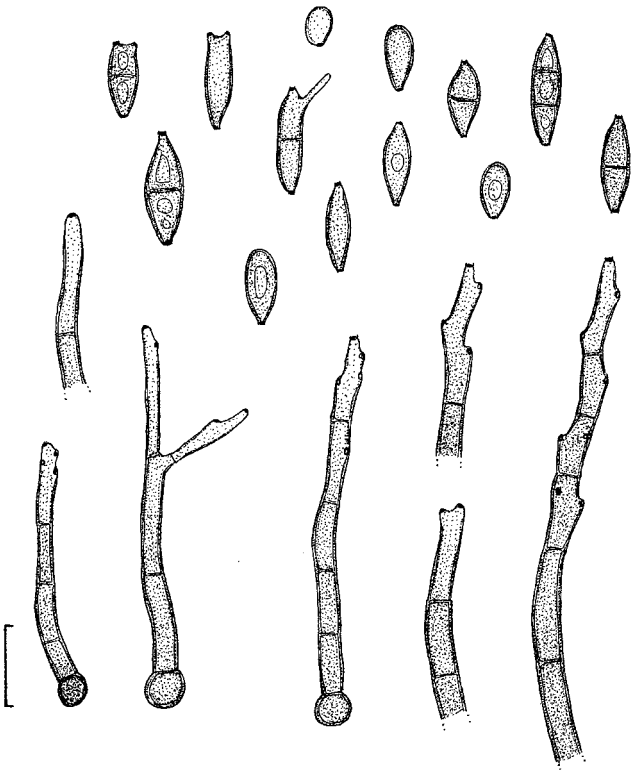


**Fig. 88.** *Cladosporium delicatulum* [K (M) 121551]. Conidiophores and conidia in vivo. Scale bar = 10 µm. U. Braun *del.*

caespitose, arising from immersed hyphae or aggregations of swollen, brown hyphal cells, 3–8 µm diam, erect, straight, subcylindrical-conical to usually distinctly geniculate-sinuous,

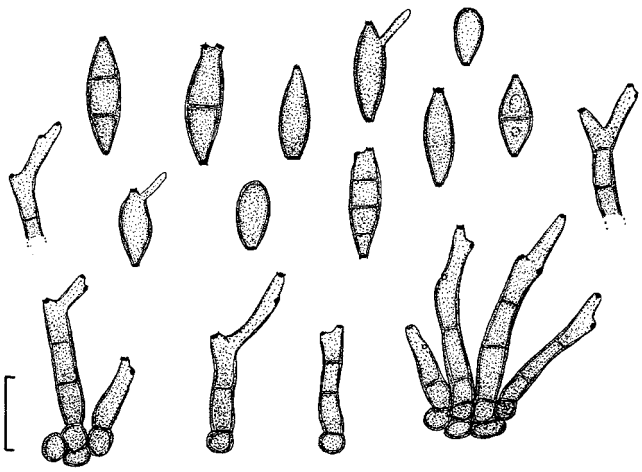


**Fig. 89.** *Cladosporium delicatulum* (K, lectotype of *C. tuberum*). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. U. Braun *del*.

usually unbranched, rarely once branched, 20–100 × 3–5.5 µm, pluriseptate, pale to medium dark brown, smooth to rough-walled, walls thickened, 0.5–1.5 µm wide. *Conidiogenous cells* integrated, terminal and intercalary, 10–30 µm long, conidiogenous loci conspicuous, coronate, 1–2 µm diam, somewhat protuberant. *Conidia* catenate, in simple or branched chains, 5–15 × 2.5–6 µm, terminal conidia obovoid, aseptate, intercalary conidia ellipsoid-fusiform, 0–1-septate, secondary ramoconidia ellipsoid-fusiform, subcylindrical, 0–1(–2)-septate, pale olivaceous to olivaceous-brown, smooth or almost so, thin-walled, but often with distinctly reduced lumen, with a single basal and 1–2 terminal hila, 1–1.5 µm diam.

Variation of other collections *in vivo*: Saprobic on dead leaves, fruits, stems, tubers or necrotic lesions caused by other fungi. *Colonies* punctiform, pustulate to effuse, forming loose to dense patches or covers, dingy dark brown to usually blackish. *Mycelium* immersed; hyphae simple or branched, 2–7 µm wide, septate, olivaceous to brown, wall thin to slightly thickened, smooth or almost so, forming strands and small to well-developed, stromatic hyphal aggregations, loose to dense, immersed to somewhat erumpent, composed of swollen hyphal cells 2.5–12 µm diam, olivaceous, olivaceous-brown to dark brown, wall thin to somewhat thickened. *Conidiophores* solitary or loosely aggregated, caespitose to almost fasciculate, arising from immersed hyphae or stromatic hyphal aggregations, on leaves erumpent or emerging through stomata, erect to decumbent, straight, subcylindrical to geniculate-sinuous, occasionally subnodulose, simple or occasionally branched, 10–200 × 3–7 µm wide, septate, usually pluriseptate throughout, sometimes constricted at the septa, pale to dark olivaceous-brown, brown to medium dark brown, sometimes paler towards the apex, wall thin to somewhat thickened, usually thick below and thinner towards the apex, 0.5–1.5(–2) µm, occasionally distinctly two-layered near the base, smooth to rough-walled. *Conidiogenous cells* integrated, terminal, sometimes also intercalary, 8–32 µm long, conidiogenous loci 1–2 µm diam, slightly protuberant, differentiation of the raised periclinal rim often not very distinct, somewhat darkened-refractive. *Conidia* in simple and branched chains, ellipsoid-ovoid, obovoid, fusiform, subcylindrical, rarely subglobose, 3–25(–30) × (2–)3–6(–7) µm, 0–3-septate, pale to medium olivaceous-brown or brown, smooth or almost so, occasionally smooth and rough-walled conidia mixed (above all small, aseptate conidia sometimes verruculose), cells sometimes with distinct lumen giving the conidia

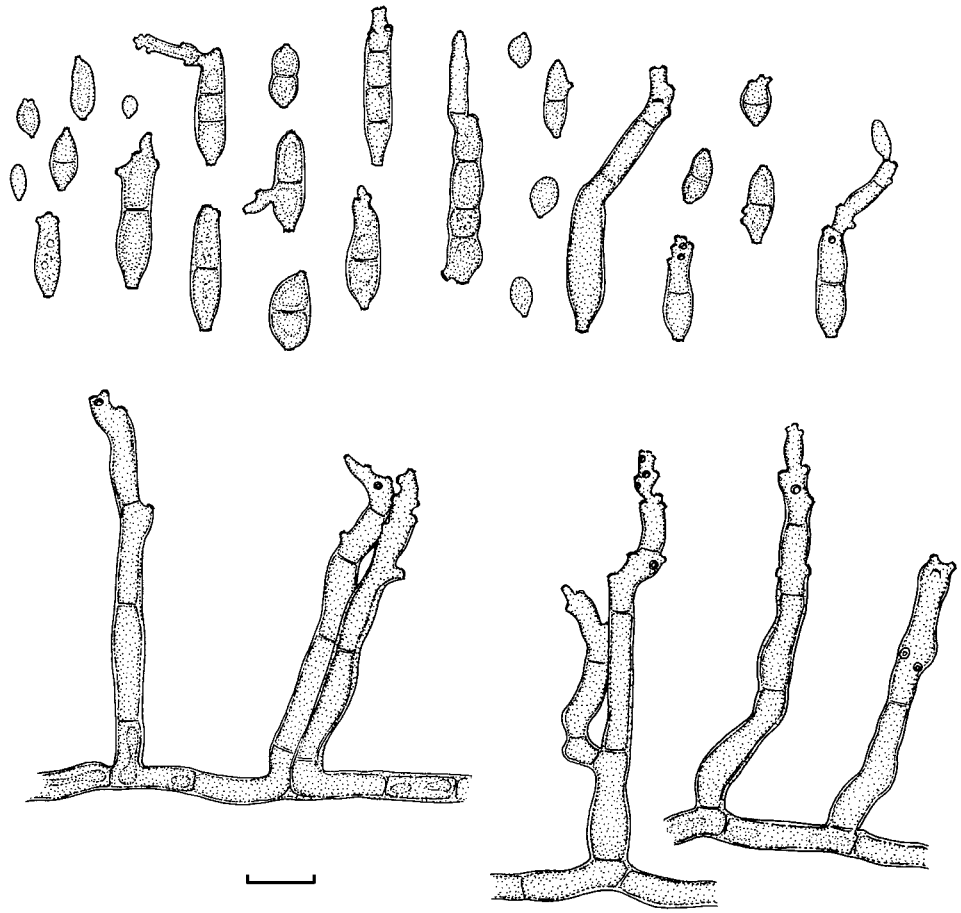


**Fig. 90.** *Cladosporium delicatulum* (CBS H-20430, reference material). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

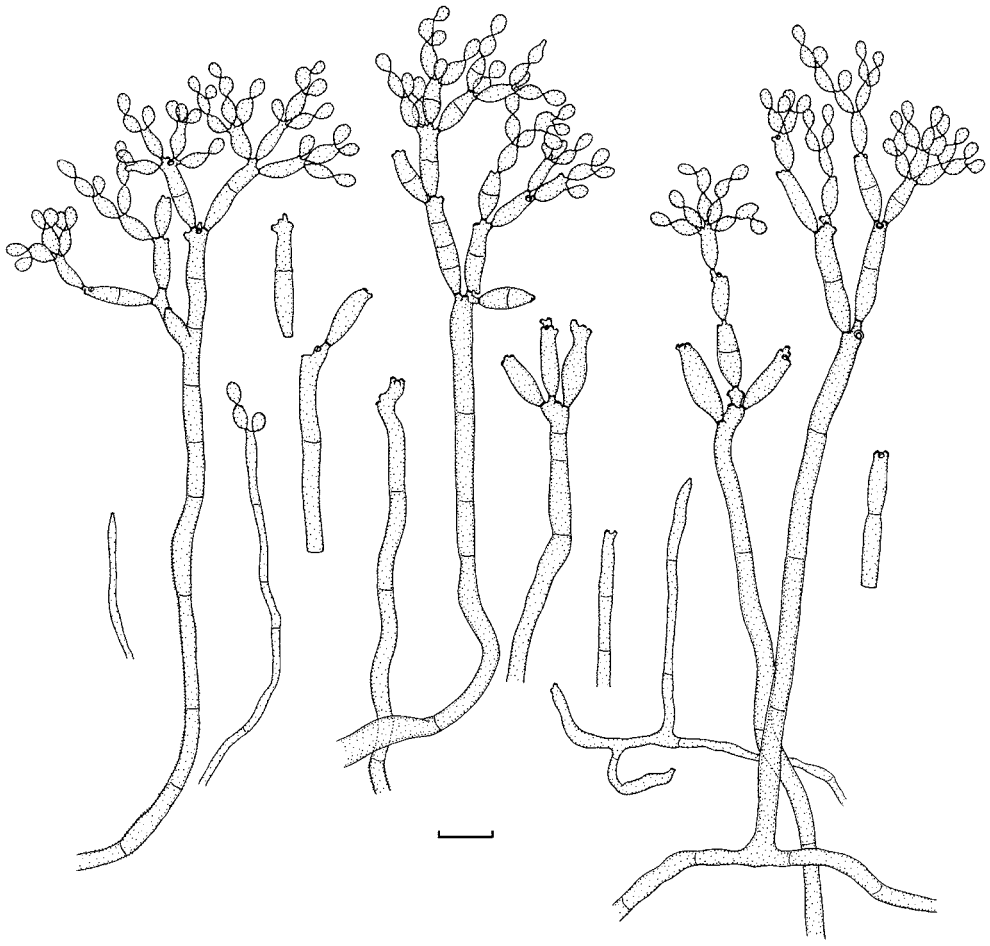


**Fig. 91.** *Cladosporium delicatulum* (CBS 126344). Macro- and micronematous conidiophores and conidial chains *in vitro*. Scale bar = 10 µm. K. Bensch *del*.

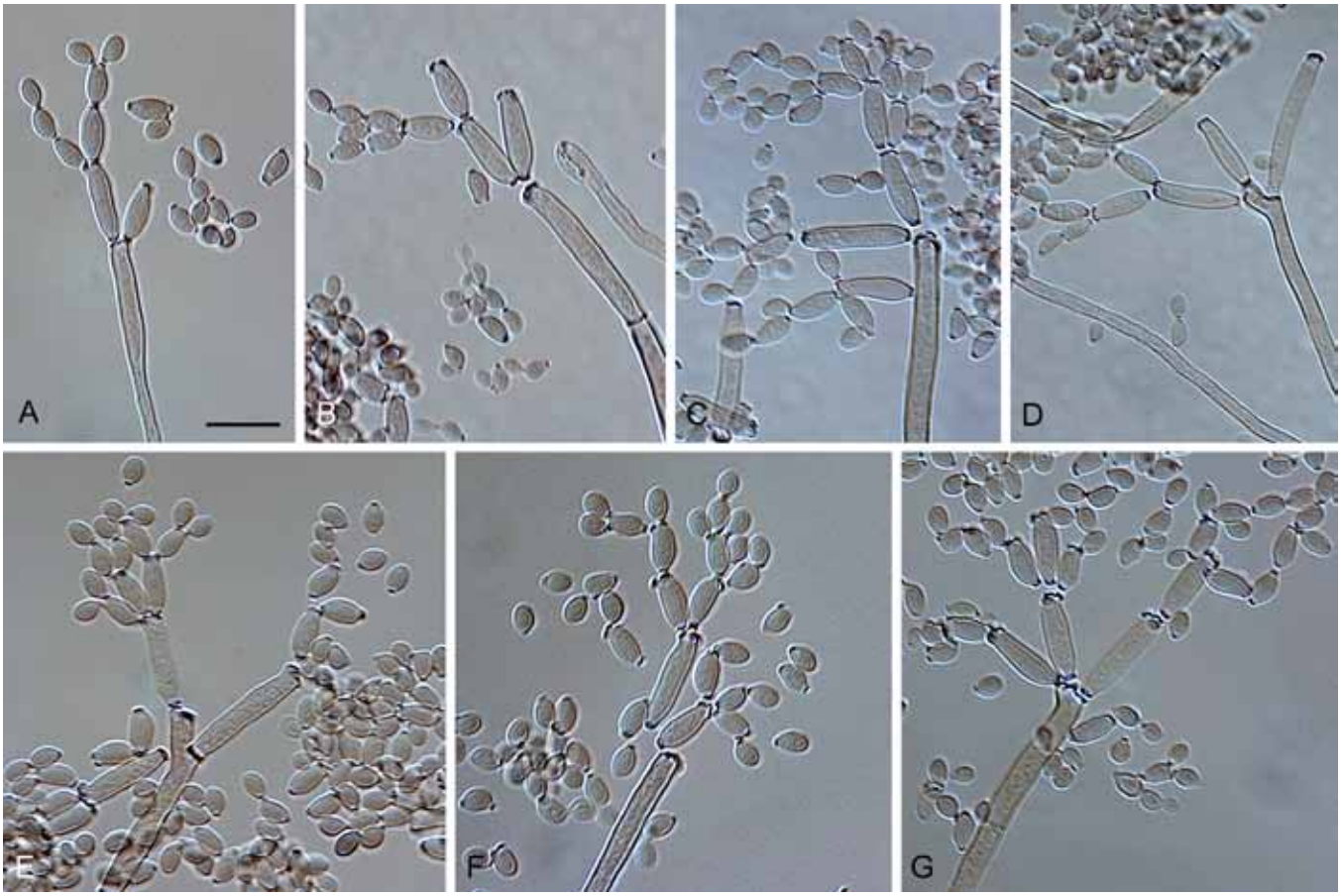



**Fig. 92.** *Cladosporium delicatulum* (CBS 126344). A–G. Macronematous conidiophores and conidial chains. Scale bar = 10 µm.

a rather thick-walled appearance, ends rounded to attenuated, wall thin (≤ 1 µm), hila 1–2 µm diam, barely to slightly protuberant, occasionally somewhat denticle-like; germination and microcyclic conidiogensis occurring.

*In vitro*: *Mycelium* immersed, rarely superficial; hyphae unbranched or sparingly branched, (0.5−)1−3(−4) µm wide, septate, without swellings and constrictions, subhyaline to pale olivaceous or pale olivaceous-brown, smooth to minutely verruculose, sometimes loosely verrucose. *Conidiophores* macronematous and micronematous, solitary, arising terminally and laterally from hyphae, erect, straight to somewhat flexuous, cylindrical-oblong, non-nodulose, sometimes slightly geniculate towards the apex, unbranched, occasionally branched, once or several times, often as short peg-like prolongations, 50−165(−200) × 3−4.5(−5) µm, 2−4(–7)-septate, sometimes attenuated at septa, pale olivaceous to pale medium olivaceous-brown, smooth, sometimes loosely minutely verruculose at the base, walls unthickened or almost so, about 0.5 µm wide, sometimes slightly attenuated towards the apex, up to 5.5 µm wide at the base; micronematous conidiophores narrower and pale olivaceous, 19−75(−100) × (1.5−)2−2.5 µm. *Conidiogenous cells* integrated, terminal, sometimes intercalary, situated on small peg-like prolongations, cylindrical-oblong, sometimes geniculate at or towards the apex, non-nodulose, occasionally the whole cell inflated in shape like a secondary ramoconidium, 11−37 µm long, with (1−)2−3(−4) apical loci, crowded at the apex, conspicuous, subdenticulate to denticulate, sometimes situated on small lateral outgrowths, quite broad, truncate, rim and dome not distinctly visible, 1.5−2.2 µm diam, thickened and darkenedrefractive. *Ramoconidia* cylindrical-oblong, 13−46 × 2.5−4(−5) µm, 0−1(−2)-septate, sometimes distinctly constricted at the median septum, base broadly truncate, 2−3 µm wide, neither thickened nor darkened-refractive. *Conidia* numerous, in densely branched chains, branching in all directions, up to four conidia in the terminal unbranched part of the chain, small terminal conidia obovoid, subglobose or globose, 2.5−4.5(−6) × (1.5−)2−2.5(−3.5) µm (av. ± SD: 3.7 ± 0.8 × 2.4 ± 0.4), aseptate, apex rounded, sometimes irregular due to additional lateral hila, intercalary conidia limoniform to ellipsoid-ovoid or sometimes irregular in outline due to lateral hila, 4−13(−17.5) × 2.5−3.5(−4) µm (av. ± SD: 7.8 ± 3.0 × 3.0 ± 0.4), 0−1-septate, attenuated towards apex and base, with 1−4(−6) distal hila, secondary ramoconidia ellipsoid-ovoid to subcylindrical or cylindrical, (6−)8−23.5(−31) × (2.5−)3−4.5(−5) µm (av. ± SD: 15.6 ± 5.4 × 3.6 ± 0.5), 0−1(−2)-septate, very rarely 3-septate, not constricted at septa, pale olivaceous to pale olivaceous-brown, smooth or almost so, walls unthickened, often only slightly attenuated towards apex and base, with (1−)2−4(−5) distal hila, hila conspicuous, subdenticulate or denticulate, 0.5−2.2 µm diam, thickened and darkened-refractive; microcyclic conidiogenesis not observed.

*Culture characteristics*: Colonies on PDA attaining 60−78 mm diam after 14 d, olivaceous-grey, grey-olivaceous to olivaceous and olivaceous-black, reverse olivaceous-black, floccose to villose, margins grey-olivaceous, feathery, regular, aerial mycelium scattered to abundant, covering almost the whole colony surface, floccose to villose, low to rarely high, growth flat, without prominent exudates, sporulation sparse. Colonies on MEA reaching 67−76 mm diam after 14 d, smoke-grey to pale olivaceous-grey, olivaceous-grey or glaucous-grey at margins, reverse olivaceousgrey, floccose,

fluffy, margins white, glabrous to feathery, regular, aerial mycelium abundant, covering the whole colony surface, floccose to fluffy, growth flat, radially furrowed and wrinkled in colony centre, without prominent exudates, sporulation sparse or absent. Colonies on OA reaching 55−74 mm diam after 14 d, smoke-grey to pale olivaceous-grey, grey-olivaceous or olivaceous due to abundant sporulation, reverse pale greenish grey to olivaceous-grey, velvety to floccose, margins regular, glabrous, narrow, colourless, aerial mycelium sparse to abundant, covering the whole surface, floccose, loose to dense, low, growth flat, without prominent exudates, sporulation sparse to profuse.

*Substrates and distribution*: Isolated from air, building material, dust, plant material; Europe (Denmark, Germany). Saprobic on dead leaves, fruits, stems, tubers, or occurring as secondary invader on necrotic lesions caused by other fungi *in vivo*, widely distributed, Asia (China, incl. Taiwan, India), Europe (France, Germany), North America (USA), South America (Uruguay).

*Additional specimens examined*: **Denmark**, isol. from indoor air, 2007, B. Andersen (BA 1679 = CPC 14285, BA 1680 = CPC 14286, BA 1681 = CBS 126342 = CPC 14287); isol. from building material, school, 2007, B. Andersen (BA 1698 = CBS 126343 = CPC 14299); isol. from building material, 2007, B. Andersen (BA 1683 = CPC 14289); Broenshoej, isol. from indoor air, control room, 2000, B. Andersen (BA 1724 = CPC 14363); indoor air sample, in cup board, water damaged room, 2000, B. Andersen (BA 1718 = CPC 14360); beach near Copenhagen, isol. from seaweed, 2007, B. Andersen (BA 1706 = CPC 14307); Valleroed, isol. from dust, school, 2000, B. Andersen (BA 1740 = CPC 14372). **France**, Lyon, on dead stems of *Schoenoplectus lacustris* (= *Scirpus lacustris*) (*Cyperaceae*), 1880, J. Therry, Roumeguère, Fungi Sel. Gall. Exs. 1688 (HBG), and Thümen, Mycoth. Univ. 1767 (HAL, HBG, syntypes of *C. fasciculatum* f. *scirpi-lacustris*). **Germany**, Bayern, Hitzing, on dead leaves of *Hedera helix* (*Araliaceae*), 15 Oct. 1915, Niessl (M-0057550); München, park of castle Nymphenburg, isol. from *Puccinia bromina* ssp. *symphyti-bromarum* var. *paucispora*, Jul. 2006, K. Schubert (CPC 13148); Sachsen-Anhalt, Halle (Saale), Robert-Franz-Ring, isol. from leaves of *Tilia cordata* (*Tiliaceae*), 2 Aug. 2004, K. Schubert (CBS H-20430, CBS 126344 = CPC 11389, reference strain of *C. delicatulum*). **India**, Gorakhpur, on necrotic patches on faded leaves of *Dianthus barbatus* (*Caryophyllaceae*), 23 Mar. 1972, Y.N. Srivastava, No. 2 (IMI 212469) (originally deposited as *C. cladosporioides*). **USA**, California, Marin County, San Rafael, on leaves of *Hedera helix*, as secondary invader, 11 Nov. 1935, L. Bonar, Anonymous, Calif. Fungi 427 (NY); South Carolina, Aiken, on faded and necrotic leaves of *Euonymus japonicus* (*Celastraceae*), Ravenel, Ravenel & Cooke, Fungi Amer. Exs. 602 (BPI 426554, syntype of *C. fasciculatum* var. *densum*); on tubers of *Ipomoea batatas* (*Convolvulaceae*), Ravenel, Ravenel & Cooke, Fungi Amer. Exs. 600 (K, lectotype of *C. tuberum* **designated here**). **Uruguay**, on dead pods of *Sesbania virgata* (= S. *marginata*) (*Fabaceae*), June 1932, S. José, Herter, Plantae Urug. Exs. 1496 (HBG).

*Notes*: In phylogenetic analyses, *Cladosporium delicatulum* clustered as a sister to *C. cladosporioides s. lat.* (Bensch *et al.* 2010, fig. 1, part a) and formed a distinct lineage. This species is undoubtedly a common and widespread saprobic hyphomycete. *Cladosporium inversicolor* and *C. cladosporioides* are two comparable taxa, but *C. delicatulum* differs from the latter species in having 0−1-septate intercalary conidia and secondary ramoconidia, only a few conidia in the terminal unbranched part of conidial chains, shorter often slightly geniculate conidiophores and shorter secondary ramoconidia. *Cladosporium inversicolor* is distinct by its longer conidial chains, longer small terminal and intercalary conidia, wider intercalary conidia and secondary ramoconidia, longer ramoconidia with a broader base, with conidia being smooth to loosely verruculose or irregularly rugose. The old, sparse type material of *C. delicatulum* is from India. New Indian collections and cultures are not available. Therefore, a formal epitypification of this species is not yet proposed, but the German strain from *Tilia cordata* can serve as reference strain to fix the application of *C. delicatulum* and agrees well with the Indian type material.

**43. *Cladosporium diaphanum*** Thüm., Mycoth. Univ., Cent. XIX, No. 1868. 1881. Figs 93–95.

*Lectotype* (selected by Braun 2001): **France**, Lyon, on dead leaves of *Photinia glabra* (*Rosaceae*), Jun. 1880, J. Therry, Thümen, Mycoth. Univ. 1868 (HAL). *Isolectotypes*: M-0057506 and Thümen, Mycoth. Univ. 1868 (*e.g.*, B 700006244, BPI 426451, BPI 426452, HBG, M-0057507). *Topotypes*: **France**, Rhone-Alpes, Rhone, Lyon, Parc de la Tete-d'Or, on *Photinia glabra*, J. Therry, Roumeguère, Fungi Sel. Gall. Exs. 5591 (*e.g.*, B 700006247).

*Lit.*: Saccardo (1892: 603), Ellis (1976: 342), Braun (2001: 56), Schubert (2005b: 64–67).
*Ill.*: Ellis (1976: 341, fig. 259 B), Braun (2001: 55, fig. 2), Schubert (2005b: 66, fig. 21, pl. 10, figs A–G).
*Exs.*: Roumeguère, Fungi Sel. Gall. Exs. 5591; Thümen, Mycoth. Univ. 1868.

*In vivo*: On faded or dead leaves and petioles, without distinct leaf spots, causing whitish to pale greyish discolorations, membranous. *Colonies* usually hypophyllous, sparsely developed on the upper leaf surface, caespitose, punctiform to effuse, loose to dense, olivaceous-brown to brown or even blackish brown, velvety, often covering large areas or almost the entire leaf surface. *Mycelium* internal, mostly substomatal, subcuticular to intraepidermal; hyphae sparingly branched, 3–6 µm wide, septate, sometimes slightly constricted at the septa, subhyaline to pale brown, smooth, walls slightly thickened. *Stromata* or stromatic hyphal aggregations small to extended, mostly several layers deep, composed of subglobose to somewhat angular-

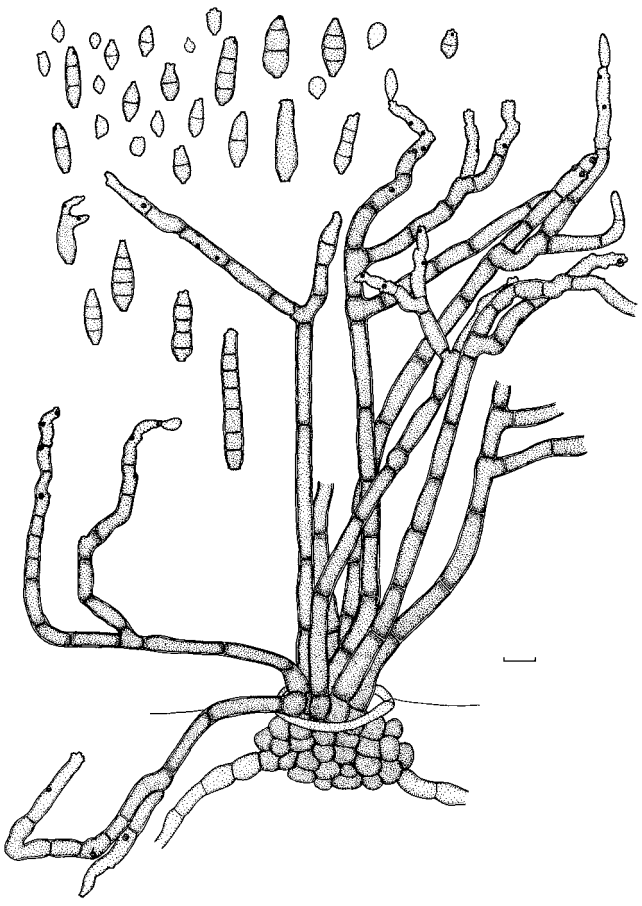


**Fig. 93.** *Cladosporium diaphanum* (M-0057507). Fascicle of conidiophores emerging through stomata and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

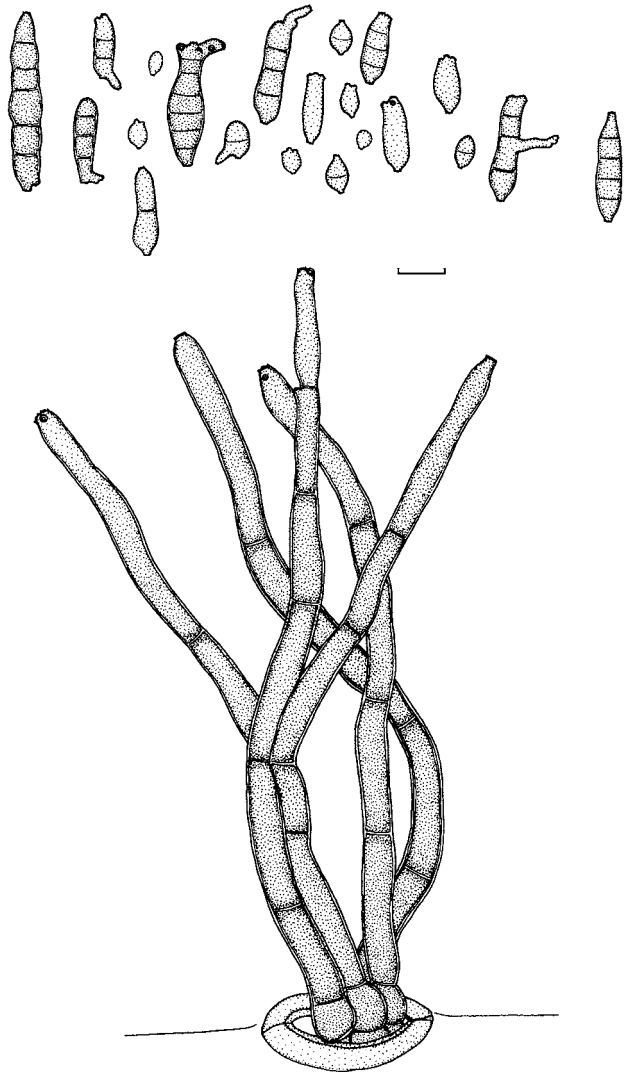


**Fig. 94.** *Cladosporium diaphanum* (B 700006247). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

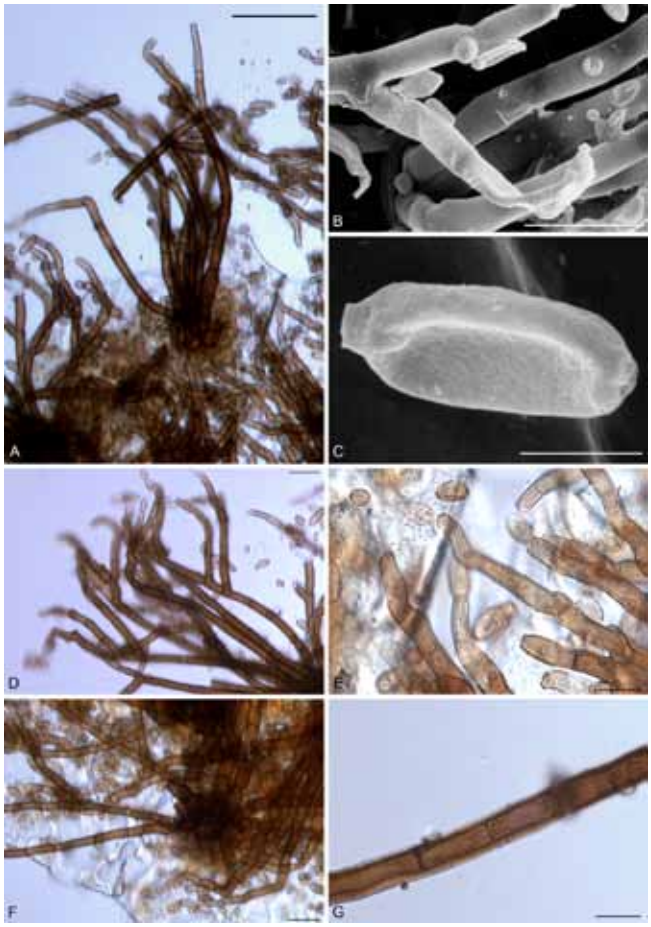


**Fig. 95.** *Cladosporium diaphanum* (M-0057507). A. Overview. B. Branched conidiophore and conidia. C. Conidium showing coronate scar structure. D. Branched conidiophores. E. Tips of conidiophores and conidia. F. Base of a fascicle emerging through stomata. G. Conidiophore showing cell structure, with thickened, two-layered walls and protoplasm aggregated at the septa. Scale bars = 5 (C), 10 (E, G), 20 (B, D, F), 50 (A) µm.

oblong, polygonal cells, 5–9 µm wide, pale to medium or even dark brown, smooth, slightly thick-walled. *Conidiophores* solitary or often fasciculate, in loose to dense fascicles, arising from stromata or swollen hyphal cells, usually emerging through stomata, but also erumpent through the cuticle, erect to decumbent, straight to flexuous, filiform-setiform, not or somewhat geniculate-sinuous towards the apex, not or hardly nodulose, unbranched or often basely or apically branched, once to several times (mostly unilateral), 40–250(–300) × (3–)4–7(–8) µm, pluriseptate, sometimes slightly constricted at the septa, medium brown to medium dark golden brown, base often somewhat darker, paler towards the apex, smooth, occasionally faintly rough-walled, thick-walled, sometimes distinctly two-layered, often somewhat wider or swollen at the base, up to 11(–13) µm wide, attenuated towards the apex, protoplasm of the cells somewhat aggregated at the septa, which appear to be thickened, similar to distoseptation, pale and not very conspicuous. *Conidiogenous cells* integrated, terminal and intercalary, 7–40 µm long, proliferation sympodial, with one to several conidiogenous loci, more or less protuberant, 1–2.5(–3) µm diam, dome only somewhat higher than the surrounding rim, thickened, darkened-refractive. *Ramoconidia* occasionally observed. *Conidia* catenate, in unbranched or branched chains, mostly straight, dimorphic, small aseptate conidia subglobose, ovoid, limoniform, ellipsoid, fusiform, (2–)3–14 × 2–6 µm, pale, walls thin to only slightly thickened, smooth to faintly rough-walled, larger conidia obovoid, ellipsoid, fusiform to cylindrical, 9–45 × 4–8 µm, (0–)1–6-septate, sometimes slightly constricted at the septa, pale olivaceous to medium brown, smooth to minutely verruculose, walls slightly thickened, apex rounded or slightly attenuated towards the apex and base, hila protuberant, 1–2.5(–3) µm diam, thickened, darkened-refractive; microcyclic conidiogenesis occurring.

*Substrates and distribution*: On *Photinia glabra*; France.

*Notes*: Conidiophores in lectotype and isolectotype material are often once or several times branched, whereas those in the authentic material distributed as “Roumeguère, Fungi Sel. Gall. Exs. 5591” are usually unbranched. *Cladosporium diaphanum* was collected in June on faded or dead leaves of *Photinia glabra*, but it remains unclear, whether this species caused the premature dying and leaf fall or whether it is a saprobic species. Additional collections are necessary to clarify the biology of this taxon.

Among the *Cladosporium* species occurring on leaves of various host genera and families some morphologically similar species with pluriseptate (more than three septa) conidia and non-nodulose conidiophores are easily distinguishable from *C. diaphanum* in having wider conidia [5–14(–17) µm wide in *C. coryphae*], shorter and partly narrower, usually unbranched conidiophores (35–130 µm long in *C. bosciae*; 5–90 × 3–5 µm in *C. spongiosum*), narrower conidiogenous loci (usually 0.5–1.5 µm diam in *C. spongiosum*) and differ in the formation and arrangement of conidiophores

(conidiophores solitary, arising as terminal or lateral branches of creeping hyphae in *C. spongiosum*; conidiophores arising from external mycelium in *C. coryphae*; conidiophores solitary or in loose groups arising from intraepidermal stromata or from swollen hyphal ropes in *C. bosciae*). The widespread saprobic *C. herbarum* is quite distinct in having verruculose to verrucose, 0–3-septate, shorter conidia and nodulose conidiophores with conidiogenous loci restricted to swellings.

In absence of a monograph of the genus *Cladosporium*, Braun (2001) assigned some collections on several basidiomycetes to *C. diaphanum*. During the course of a morphotaxonomic revision of fungicolous *Cladosporium* species these collections were re-examined and proved to be identical with *C. lycoperdinum* (Heuchert *et al*. 2005). The conidia of the latter species are shorter, (2–)6–28 µm long, 0–3-septate, narrow ramoconidia with up to 5 septa (21–32 × 4.5–5.5 µm) are occasionally formed and the walls of the conidiophores are only slightly thickened and not distinctly two-layered.

*Cladosporium diaphanum* has been recorded in literature from Georgia to occur on *Laurocerasus officinalis*, which could not be confirmed.

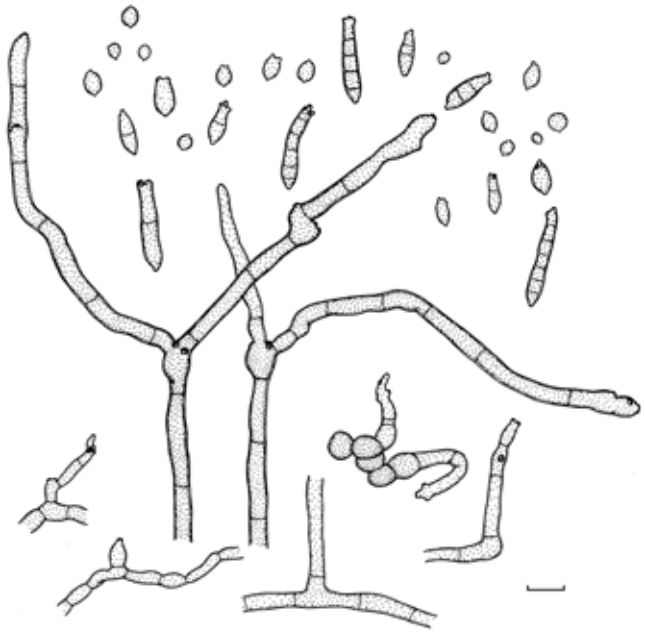


**Fig. 96.** *Cladosporium dieffenbachiae* (GENT). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

**44. *Cladosporium dieffenbachiae*** Verpl. & Van den Broecke, Ann. Soc. Sci. Bruxelles, Sér. B, 56: 105. 1936. Fig. 96.

*Holotype*: **Belgium**, Gent, botanical garden, on dead leaves of *Dieffenbachia seguine* (= *D. magnifica*) (*Araceae*), Sep. 1935, associated with *Septoria dieffenbachiae* (GENT).

*In vivo*: *Colonies* hypophyllous, effuse, dense, dark olivaceous-brown or brown, often along leaf veins. *Mycelium* internal and external; hyphae branched, 2–7 µm wide, septate, with swellings and constrictions, pale olivaceous-brown to medium brown, smooth, rarely minutely verruculose, forming loose to somewhat dense hyphal aggregations. *Stromata* lacking. *Conidiophores* solitary, arising from creeping hyphae or swollen hyphal cells, terminal and lateral, more or less erect, straight to slightly flexuous, dimorphic, small conidiophores unbranched, sometimes with small swellings, 8–30 × 3–5 µm, pale brown, large conidiophores distinctly nodulose, unbranched or branched, once or several times, 35–170 × 3–6 µm, swellings up to 10 µm wide, septate, pale brown to pale medium brown, somewhat paler towards the apex, smooth, walls thickened. *Conidiogenous cells* integrated, terminal and intercalary, nodulose, conidiogenous loci situated on multilateral swellings, with a single or few loci, somewhat protuberant, (0.5–)1–2 µm diam, thickened, slightly darkened-refractive. *Conidia* in branched chains, straight to slightly curved, small terminal conidia subglobose, ovoid, obovoid or limoniform, 3–7 × 2–4.5 µm, aseptate, smooth to verruculose, sometimes even verrucose, large conidia (secondary ramoconidia) subglobose, ellipsoid, subcylindrical to cylindrical, 4–27 × 3–6.5 µm, 0–6-septate, not constricted, olivaceous to medium pale brown, smooth to verruculose, walls slightly thickened, apex rounded or somewhat attenuated, often with few apical conidiogenous hila, subdenticulate, truncate to slightly convex, 0.5–1.5(–2) µm diam, thickened, somewhat darkened-refractive.

*Substrates and distribution*: On *Dieffenbachia seguine*; Belgium.

*Notes*: The biology of *C. dieffenbachiae* is unclear, but it is very probably a saprobic species. Due to nodulose conidiophores, it is comparable with *C. oxysporum* and the *C. herbarum* complex. *Cladosporium oxysporum* differs from this species in having much longer, setiform, non-dimorphic conidiophores and consistently smooth-walled, usually 0–1-septate conidia. Within the *C. herbarum* complex *C. dieffenbachiae* agrees well with *C. allicinum*, but the conidia are up to 6-septate. Furthermore, the conidiophores of the latter species are not dimorphic *in vivo*. Therefore, *C. dieffenbachiae* is tentatively maintained as a separate species. Cultures and molecular sequence analyses are urgently necessary. A single collection under the name *C. dieffenbachiae* from Mexico on leaves of *Dieffenbachia seguine* (as *D. picta*) is deposited at BPI.

**45. *Cladosporium dominicanum*** Zalar, de Hoog & Gunde-Cimerman, Stud. Mycol. 58: 169. 2007. Fig. 97.

*Holotype*: **Dominican Republic**, salt lake Enriquillo, isol. from hypersaline water, Jan. 2001, N. Gunde-Cimerman, isol. P. Zalar (CBS H-19733). *Ex-type culture*: EXF-732 = CBS 119415.

*Ill*.: Zalar *et al*. (2007: 170, fig. 6).

*In vitro*: *Mycelium* unbranched to sparingly branched, septate, not constricted at septa, pale olivaceous-brown, minutely verruculose to irregularly rough-walled, walls unthickened or almost so, protoplasm somewhat aggregated in the centre of the cells, granular, without extracellular polysaccharide-like material. *Conidiophores* micronematous and semimacronematous, hardly distinguishable from hyphae, arising laterally and terminally on erect or ascending hyphae, erect, somewhat flexuous, filiform to cylindrical-oblong, usually neither geniculate nor nodulose, unbranched or branched, once or several times, branches as short lateral prolongations below a septum, (5–)10–100(–200) × (1–)2–2.5(–3.5) µm, aseptate or with few septa, pale olivaceous-brown, smooth to minutely

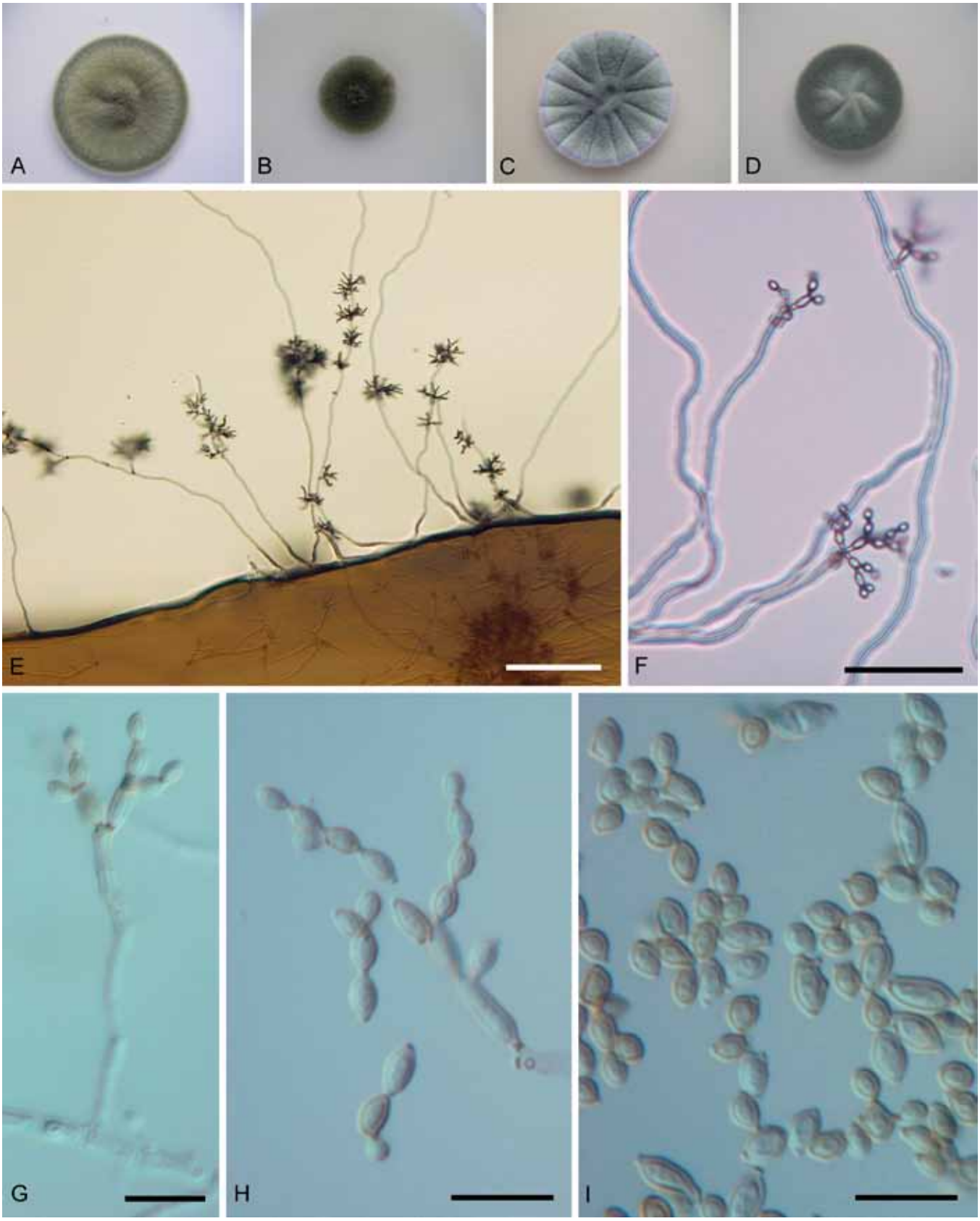



**Fig. 97.** *Cladosporium dominicanum* (CBS 119415) (from Zalar *et al.* 2007). A–D. Colony surface grown on PDA (A), OA (B), MEA (C) and MEA plus 5 % NaCl (D) of strains incubated for 14 d at 25 ºC in darkness. E–F. Habit of conidiophores. G. Conidiophore. H–I. Secondary ramoconidia and conidia. E–I. All from 7-d-old SNA slide cultures. A, D, F–H, from EXF-2519; B, C, E from EXF-727; I, EXF-732 (ex-type strain). Scale bars = 10 (G–I), 30 (F), 100 (E) µm.

verruculose, walls thin-walled to slightly thickened; micronematous conidiophores often only as short denticle- or peg-like lateral outgrowth of hyphae. *Conidiogenous cells* integrated, teminal, sometimes intercalary or conidiophores reduced to conidiogenous cell, cylindrical, with a single or few apical loci, protuberant, denticulate, 0.8–1.5 µm diam, thickened and darkened-refractive. *Ramoconidia* rarely formed. *Conidia* catenate, in branched chains, branching in all directions, up to eight conidia in the unbranched parts, small terminal conidia globose or subglobose to usually short-ovoid, narrower at both ends, (2–)3–3.5(–5.5) × 2–2.5 µm

[av. (± SD) 3.4 (± 0.6) × 2.2 (± 0.2)], aseptate, smooth to minutely verruculose, intercalary conidia ovoid, limoniform to ellipsoid, 3–8.5 × 2–3 µm, aseptate, smooth to minutely verruculose, with up to three distal hila, secondary ramoconidia cylindrical to almost spherical, attenuated towards apex and base, 6.5–24.5 × (2–)2.5–3(–4.5) µm, [av. (± SD) 10.3 (± 5.2) × 2.7 (± 0.6)], 0–1-septate, not constricted at the median septum, with up to four distal scars, subhyaline to pale olivaceous or light brown, smooth or almost so, walls unthickened to slightly thickened, hila protuberant, conspicuous, denticulate, 0.5–1.5 µm diam, thickened and darkenend-refractive; microcyclic conidiogenesis not occurring.

*Culture characteristics*: Colonies on PDA reaching 18–36 mm diam after 14 d, grey-olivaceous in colony centre due to abundant sporulation, glaucous-grey to greenish-grey, reverse greenish-grey, velvety to hairy or felty, margin regular, white, somewhat feathery, aerial mycelium aundant, high, fluffy to felty, covering most of the surface, flat or slightly furrowed, with flat margin, numerous small droplets of light reseda-green (2E6) exudates sometimes present. Colonies on OA reaching 19–34 mm diam after 14 d, dark mouse-grey, reverse black, velvety to loosely powdery with raised central part due to fasciculate bundles of conidiophores, aerial mycelium sparse, whitish to smoke-grey, without exudates, sporulating. Colonies on MEA reaching 30–32 mm diam after 14 d, reseda green (2E6), reverse dark green-brown, velvety, furrowed, with undulate margin. Colonies on MEA + 5 % NaCl reaching 37–41 mm diam, reseda-green (2E6), reverse brownish green, radially furrowed, velvety, sporulating in the central part or all over the colony, margin white and regular. *Maximum tolerated salt concentration*: 75 % of tested strains develop colonies at 20 % NaCl after 7 d, while after 14 d all strains grow and sporulate. *Cardinal temperatures*: No growth at 4 and 10 °C, optimum 25 °C (30–32 mm diam), maximum 30 °C (2–15 mm diam), no growth at 37 °C. *Differential parameters*: No growth at 10 °C, oval conidia, large amounts of sterile mycelium (from Zalar *et al.* 2007).

*Substrates and distribution*: Saprobic on fruit surfaces, hypersaline waters in (sub)tropical climates; Asia (Iran), Central America (Dominican Republic).

*Additional specimens examined*: **Dominican Republic**, isol. from hypersaline water, salterns (EXF-696, EXF-720, EXF-727); salt lake Enriquillo, isol. from hypersaline water (EXF-718). **Iran**, isol. from *Citrus* fruit (orange) (CPC 11683).

*Notes*: Cultures of *C. dominicanum* sporulate less abundantly than *C. sphaerospermum* and *C. halotolerans* and tend to loose their ability to sporulate with subculturing (Zalar *et al.* 2007).

**46. *Cladosporium dracaenatum*** Thüm., Mycoth. Univ., Cent. XIX, No. 1869. 1881. Figs 98–100.

*Lectotype* (**designated here**): **USA**, South Carolina, Aiken, on living leaves of *Cordyline fruticosa* (= *C. terminalis, Dracaena cooperi*) (*Asparagaceae*), 1876, H.W. Ravenel, Thümen, Mycoth. Univ. 1869 (B 700006248). *Isolectotypes*: *e.g.*, BPI 426454, BPI 426455, BR-MYC 8172,86, HAL, HBG, M-0057504.

*Lit.*: Saccardo (1892: 605), Schubert (2005b: 67–70).
*Ill.*: Schubert (2005b: 68–69, figs 22–23, pl. 11, figs A–G).
*Exs.*: Thümen, Mycoth. Univ. 1869.

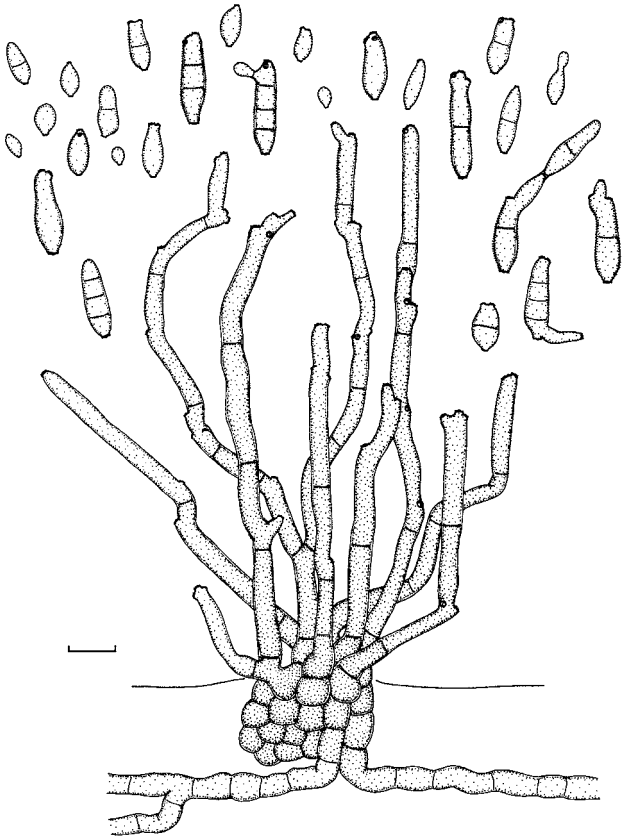


**Fig. 98.** *Cladosporium dracaenatum* (B 700006248). Fascicle of conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

*In vivo*: Lesions amphigenous, forming distinct patches, irregular in shape and size, pale to dark grey-brown or dark olivaceous-brown, without margin, sometimes confluent. *Colonies* amphigenous, scattered, in small tufts, caespitose, loose to dense, sometimes floccose, brown. *Mycelium* internal, intraepidermal, later also external, growing superficially; hyphae creeping, branched, 3–9 µm wide, septate, often constricted at the septa and then cells more or less irregularly swollen, subhyaline, pale olivaceous-green to pale brown, smooth, walls only slightly thickened, forming stromata and loose to dense hyphal aggregations. *Stromata* small to moderately large, usually well-developed, substomatal to intraepidermal, subglobose, 15–70 µm wide, few to several layers deep, composed of swollen hyphal cells, subglobose to somewhat angular or irregular, pale to medium brown, smooth, walls thickened. *Conidiophores* in small to moderately large fascicles, few to numerous, loosely arranged, arising from stromata, emerging through stomata or erumpent through the cuticle, or solitary arising from external hyphae or secondary conidia, erect, straight to more or less flexuous, often once to several times mildly to distinctly geniculate-sinuous, sometimes very slightly nodulose, unbranched or branched, once or twice, 20–240 × 3–5(–5.5) µm, pluriseptate, septa often not very conspicuous, pale brown, somewhat darker near the base, pale medium brown, smooth or minutely asperulate or somewhat irregularly rough-walled with age, sometimes minutely verruculose near the apex, walls slightly thickened, one-layered, often slightly swollen at the base. *Conidiogenous cells* integrated, terminal and intercalary, cylindrical to often geniculate, 8–40 µm long, proliferation sympodial, with a single or few conidiogenous loci, often situated on small lateral shoulders or unilateral swellings, protuberant, often subdenticulate, short cylindrical, 1–2(–2.5) µm diam, dome often somewhat higher than the surrounding rim, thickened and somewhat darkened-refractive. *Conidia* catenate,

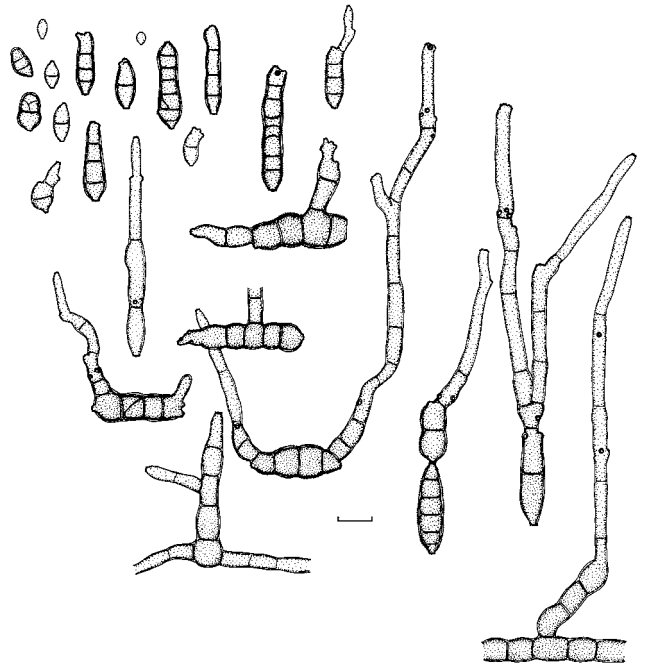


**Fig. 99.** *Cladosporium dracaenatum* (M-0057504). Conidiophores, old, swollen conidia and microcyclic conidiogenesis *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

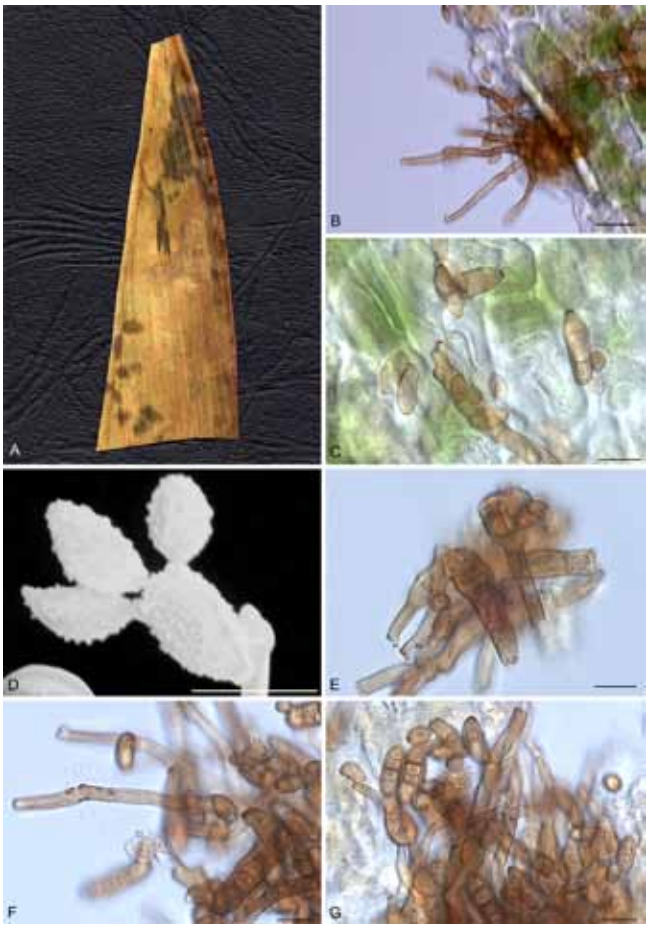


**Fig. 100.** *Cladosporium dracaenatum* (B 700006248 and M-0057504). A. Symptoms. B. Fascicle of conidiophores. C. Conidiophore and conidia. D. Small catenate conidia showing surface ornamentation. E. Old swollen conidia forming secondary conidiophores (microcyclic conidiogenesis). F, G. Conidiophores and old swollen conidia. Scale bars = 5 (D), 10 (C, E–G), 20 (B) µm.

in branched chains, straight, obovoid, ellipsoid to subcylindrical or cylindrical, 3.5–26 × 3–7(–8) µm, 0–3-septate, sometimes slightly constricted at the septa, pale brown, smooth or almost so to minutely or distinctly verruculose, walls only slightly thickened, apex and base rounded, sometimes slightly attenuated, with age conidia becoming longer and wider, distinctly swollen, up to 36 µm long or even longer and up to 11 µm wide, with up to seven septa, septa occasionally somewhat sinuous, darker, pale medium to medium brown or medium olivaceous-brown, thick-walled with a somewhat irregular surface ornamentation, sometimes with a single longitudinal septum, confusable with superficially growing swollen hyphae, hila protuberant, short cylindrical, truncate, 1–2(–2.5) µm diam, thickened and somewhat darkened-refractive; microcyclic conidiogenesis often occurring.

*Substrates and distribution*: On *Cordyline* and *Dracaena* spp. (*Asparagaceae*), *Ruscus* (*Asparagaceae*); North America – *Cordyline fruticosa* (USA), *C. indivisa* (USA), *Cordyline* sp. (USA), *Dracaena* sp. (USA), *Ruscus aculeatus* (USA).

*Additional specimen examined*: **USA**, California, Berkeley, Euclide Ave. & Regal Bldg., on *Ruscus aculeatus*, 17 Oct. 1942, L. Bonar (F 1167647).

*Notes*: Vanev & Taseva (1990) reported *C. dracaenatum* on *Dracaena draco* from Bulgaria. Baka & Krzywinski (1996) examined fungi associated with leaf spots of the endemic and now nearly extinct *Dracaena ombet* in Sudan and reported *C. dracaenatum* as one of the most common isolates and an important reason for the decline of this tree. They discussed the explosive spread of the disease either as pointing to an epidemic outbreak of a lethal pathogen influenced by external factors, or as a result of long-distance mass transport. Besides pathogenicity tests, SEM and TEM examination were carried out to detect and confirm the compatibility between *Dracaena* leaves and the pathogen. Remarkable ultrastructural changes of cell organelles after infection were noticed indicating that the fungus examined was a true pathogen. Baka & Krzywinski (1996) did not provide a detailed description of its morphology, but described branched conidiophores emerging through stomata and producing new conidia, so it is possible that they actually dealt with *C. dracaenatum*. Probably, *C. dracaenatum* is not confined to North America and more common than indicated under substrates and distribution.

The leaf-spotting fungus on *Ruscus aculeatus* from California is morphologically indistinguishable from *C. dracaenatum*.

**47. *Cladosporium echinulatum*** (Berk.) G.A. de Vries, Contr. Knowl. Genus *Cladosporium*: 49. 1952. Figs 101, 102. *Basionym*: *Helminthosporium echinulatum* Berk., Gard. Chron. 1870: 382. 1870.

≡ *Heterosporium echinulatum* (Berk.) Berk. & Broome, in Cooke, Grevillea 5(35): 123. 1877.

*Lectotype* (selected by David 1997): **Great Britain**, on *Dianthus caryophyllus* (*Caryophyllaceae*), Feb. 1870, ex herb. M.J. Berkeley (K).

= *Heterosporium circinale* Klotzsch, Herb. Viv. Mycol., No. 188. 1832, *nom. inval*. [syntypes: *e.g.* B, HAL, M].

= *Helminthosporium exasperatum* Berk. & Broome, Ann. Mag. Nat. Hist., Ser. 4, 11: 345. 1873 [lectotype: K].

≡ *Heterosporium exasperatum* (Berk. & Broome) Cooke, Grevillea 16(80): 109. 1888.

= *Heterosporium dianthi* Sacc. & Roum., Rev. Mycol. (Toulouse) 3(11): 57. 1881 [lectotype: PAD].

= *Mycosphaerella dianthi* C.C. Burt, Trans. Brit. Mycol. Soc. 20: 214. 1936.

≡ *Davidiella dianthi* (C.C. Burt) Crous & U. Braun, Mycol. Progr. 2(1): 10. 2003.

= *Heterosporium echinulatum* var. *dianthi* Losa, Collect. Bot. (Barcelona) 3:

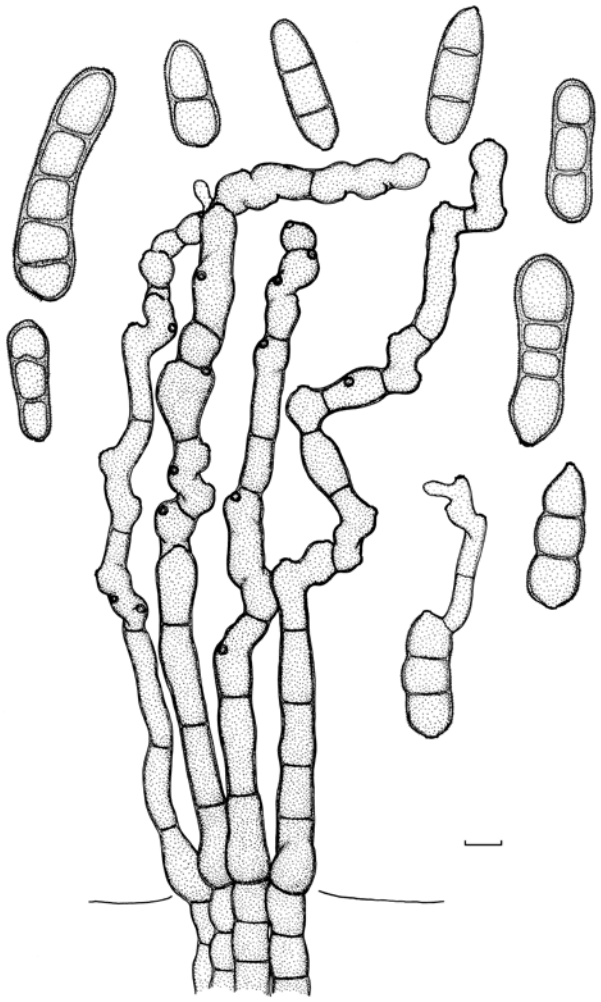


**Fig. 101.** *Cladosporium echinulatum* (M-0057503, isotype of *Heterosporium circinale*). Fascicle of conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

149. 1952 [holotype: BCF].
= ? *Heterosporium dianthi* Sawada, Bull. Gov. Forest Exp. Sta. 105: 98. 1958, *nom. illeg*., non *H. dianthi* Sacc. & Roum., 1881.

*Lit*.: Saccardo (1886: 481), Lindau (1910: 81–82), Ellis (1971: 311), Subramanian (1971: 291–293), Sivanesan (1984: 222), David (1988b, 1997: 34–40), Ho *et al*. (1999: 127), Zhang *et al*. (2003: 90–92).
*Ill*.: Lindau (1910: 82, fig.), Ellis (1971: 311, fig. 215 A), Subramanian (1971: 292, fig. 226), Sivanesan (1984: 223, fig. 119), David (1988b: fig.; 1997: 37–38, figs 7, 8 A–C), IMI Distribution Maps of Plant Diseases 593 (1988), Ho *et al*. (1999: 126, figs 15–16), Zhang *et al*. (2003: 91, fig. 54).
*Exs*.: Baenitz, Herb. Eur. 6728; Briosi & Cavara, Fung. Paras. Piante Colt. Utili Exs. 440; Kabát & Bubák, Fungi Imperf. Exs. 49; Klotzsch, Herb. Viv. Mycol. 188; Migula, Krypt. Germ., Austr. Helv. Exs. [Pilze] 69; Rabenhorst, Fungi Eur. Exs. 2884; Saccardo, Mycoth. Ven. 1043; Săvulescu, Herb. Mycol. Roman. 444; Sydow, Mycoth. March. 2565; Vestergren, Micromyc. Rar. Sel. Praec. Scand. 998; Vill, Fungi Bav. 995.

*In vivo*: On living leaves, stems and inflorescences especially the calyx, leaf spots amphigenous, at first more or less circular to ellipsoid, 10–20 mm diam, later becoming confluent, grey to olivaceous-green, surrounded by a somewhat darker greyish brown, purple or reddish margin, margin occasionally raised. *Colonies* amphigenous, scattered to subeffuse, caespitose, brown, velvety, often formed in the centre of the spots. *Mycelium* internal, subcuticular to sometimes intraepidermal; hyphae sparingly branched, 3–12 µm wide, septate, not constricted or only slightly so, subhyaline to olivaceous-brown, smooth, walls only slightly thickened; aerial hyphae only present in culture (according to David 1997). *Stromata* usually well-developed, compact, pseudoparenchymatous, mostly substomatal, sometimes intraepidermal, small, consisting of only a few swollen hyphal cells, sometimes larger, a few layers deep, swollen hyphal cells 8–17 µm diam, olivaceous-brown, smooth, thick-walled. *Conidiophores* in small loose fascicles, arising from stromata or swollen hyphal cells, usually emerging through stomata or sometimes erumpent through the cuticle, erect, substraight to more or less flexuous, several times distinctly geniculate-sinuous, torulose, subnodulose to nodulose, unbranched to occasionally branched, formed as short lateral branches, 40–200(–250) × 7–10(–12) µm, swellings up to 12–15 µm wide, septate, not or only slightly constricted at septa, pale brown, mostly medium brown, somewhat paler towards the apex, smooth to distinctly verruculose, walls thickened, sometimes appearing two-layered, about 1 µm thick, often swollen at the base, occasionally enteroblastically proliferating. *Conidiogenous cells* integrated, terminal and intercalary, several times geniculate-sinuous, nodulose, proliferation sympodial with conidiogenous loci confined to swellings, usually with 1–2 conidiogenous loci per cell, protuberant, coronate, about 3 µm wide, thickened, somewhat darkened-refractive. *Conidia* solitary or in short, unbranched chains, straight to slightly curved, broadly ellipsoid to cylindrical, sometimes soleiform with a swollen bulbous basal cell, (15–)25–55(–65) × (10–)12–15(–17) µm, (0–)1–4(–6)-septate, sometimes constricted at septa, septa becoming sinuous with age, pale to medium brown, coarsely verrucose to usually echinulate, projections up to 1 µm long, walls thickened, up to 1.5(–2) µm thick (including ornamentation), both ends obtuse, conidial hila raised in young conidia, in older conidia becoming incorporated in the conidial wall, 2.5–3.5(–4) µm wide, thickened, darkened-refractive; microcyclic conidiogenesis occurring.

*In vitro* (description based on MEA, sparingly fruiting on SNA): *Mycelium* branched, 3–8 µm wide, with swellings and constrictions, therefore sometimes irregular in outline, swellings up to 16 µm, single hyphal cells sometimes distinctly swollen, up to 21 µm wide, subhyaline to pale olivaceous, at the base of conidiophores somewhat darker, smooth, walls unthickened or slightly thickened. *Conidiophores* macronematous, arising mainly terminally from ascending hyphae, sometimes also laterally from plagiotropous hyphae, erect, straight to usually flexuous, cylindrical-oblong, once or several times slightly to distinctly geniculate due to sympodial proliferation, subnodulose with unilateral shoulders or nodulose with multilateral swellings, swellings up to 10 µm diam, unbranched, occasionally branched towards the apex, sometimes proliferating at the apex without forming additional loci appearing as hyphal apices, up to 730 µm long or even longer, 5–6 µm wide, pluriseptate, not constricted at septa, pale to medium olivaceous-brown, sometimes even dark olivaceous-brown, smooth, walls only slightly thickened (about 0.5 µm wide). *Conidiogenous cells* integrated, terminal and intercalary, cylindrical-oblong, once or twice slightly to distinctly geniculate, subnodulose with loci being situated on unilaterally swollen shoulders, length variable, with 1–5 loci per cell, sometimes verruculose, conidiogenous loci conspicuous, usually protuberant, 2–3 µm wide, about 1 µm high, thickened and

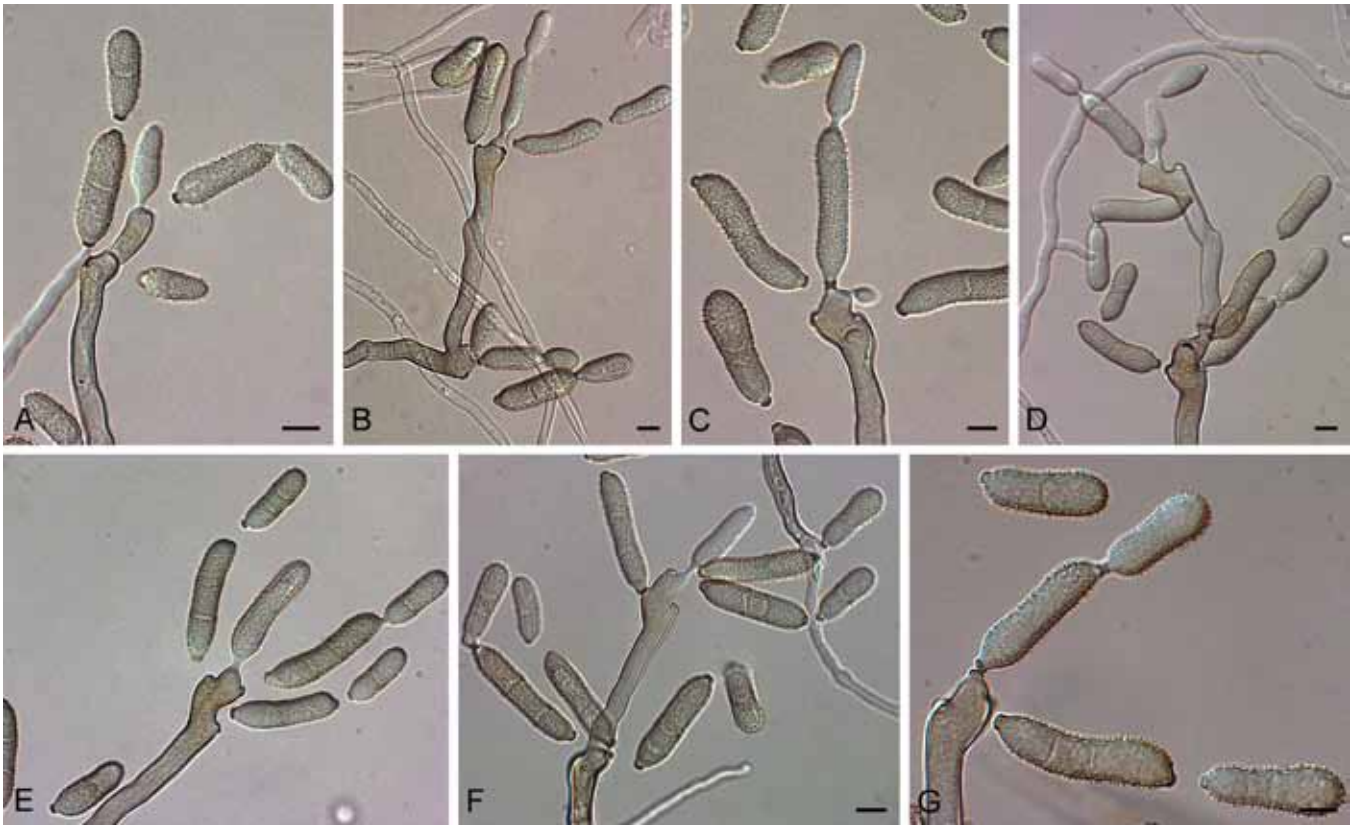



**Fig. 102.** *Cladosporium echinulatum* (CBS 123191). A–G. Conidiophores and conidial chains *in vitro*. Scale bars = 10 µm.

darkened-refractive. *Ramoconidia* occasionally formed. *Conidia* solitary or in short unbranched, rarely branched chains, straight, smaller conidia broadly ovoid, ellipsoid, sometimes obclavate, 8–17 × 5–8(–9) µm [av. (± SD) 13.4 (± 3.3) × 6.5 (± 1.1)], 0–1-septate, larger conidia broadly ellipsoid to subcylindrical, with age becoming soleiform, lower cell somewhat bulbous, 18–42 × 7–9.5(–10.5) µm [av. (± SD) 28.0 (± 6.9) × 7.9 (± 1.0)], 0–3-septate, septa not very conspicuous, becoming sinuous with age, pale to medium olivaceous-brown, verruculose to usually densely echinulate, due to surface ornamentation walls appear to be very thick-walled, up to 1.5 µm wide, attenuated towards apex and base, hila conspicuous, (1.5–)2–3 µm diam, thickened and darkened-refractive; conidia sometimes germinating; microcyclic conidiogenesis occasionally occurring.

*Culture characteristics:* Colonies on PDA attaining 24–29 mm after 14 d, pale olivaceous-grey to olivaceous-grey, grey-olivaceous towards margins, olivaceous-black reverse, floccose, margins white, glabrous to feathery, narrow, crenate to rarely fimbricate, aerial mycelium floccose, low, loose to dense, growth flat with somewhat elevated colony centre, without prominent exudates, sporulating. Colonies on MEA reaching 21–30 mm, olivaceous-grey to grey-olivaceous, whitish due to aerial mycelium, olivaceous-grey reverse, velvety to fluffy-floccose, margins narrow, white, glabrous to feathery, somewhat crenate, aerial mycelium fluffy-floccose, loose to dense, white or smoke-grey, growth flat with somewhat elevated colony centre, radially furrowed and wrinkled, without prominent exudates, sporulation profuse. Colonies on OA reaching 26–34 mm, grey-olivaceous, whitish due to fluffy-floccose aerial mycelium, leaden-grey or pale greenish-grey reverse, margin white, regular to somewhat crenate, aerial mycelium abundant, loose to dense, growth flat, sporulating.

*Substrates and distribution*: On *Dianthus* spp. (*Caryophyllaceae*); Africa, Asia, Europe, Oceania, North, Central and South America, widely distributed – *Dianthus barbatus* (Belgium, Czech Republic, Denmark, Switzerland, UK), *D. caryophyllus* (Austria, Brazil, Canada, China, Czech Republik, Denmark, Finland, France, Germany, Italy, Kenya, New Zealand, Portugal, Romania, Turkey, UK, USA), *D. carthusianorum* (Germany), *D. chinensis* (China), *D. deltoides* (Estonia), *D. plumarius* (Germany), *D. seguieri* (Spain), *D. superbus* (Taiwan), *Dianthus* spp. (Argentina, Austria, Belgium, Brazil, Bulgaria, Canada, Chile, Columbia, Cyprus, Denmark, El Salvador, Estonia, France, Germany, Hungary, Iceland, India, Iran, Israel, Italy, Japan, Kazakhstan, Kyrgystan, Lithuania, Mexico, Morocco, the Netherlands, Norway, Peru, Poland, Slovenia, South Africa, Spain, Sweden, Switzerland, Uganda, UK, Ukraine, Uzbekistan, former Yugoslavia).

*Additional specimens examined*: **Czech Republic**, Böhmen, near Turnau, on *Dianthus caryophyllus*, 29 Sep. 1902, J.E. Kabát, Kabát & Bubák, Fungi Imperf. Exs. 49 (HBG). **France**, La Varenne near Paris, on *Dianthus* sp., 1903, P. Hariot, Vestergren, Micromyc. Rar. Sel. Praec. Scand. 998 (M); Seine-et-Marne, Fontainebleau, on *D. caryophyllus*, Mar. 1894, Feuilleaubois, Société du Sud-Est 1894 No. 445 (M). **Germany**, Bavaria, Freising, on *D. caryophyllus*, Nov. 1877, Prof. J.E. Weiss, No. 69 (M); Neustift, in a garden, 3 Oct. 1897, Allescher (M); Schönow, 1897, Prof. J.E. Weiss (M); Oberfranken, Bamberg, on *D. carthusianorum*, without date, A. Vill (HBG); Unterfranken, Gerolzhofen, Rüdenhausen, in the castle garden, on *Dianthus* sp., Aug. 1907, A. Vill, Vill, Fungi Bav. 995 (M); Berlin, on *D. caryophyllus*, 1899, Dr. O. Appel (M); Berlin, garden, on *Dianthus plumarius*, 1992, P. Magnus (HBG); Brandenburg, Steglitz, near Berlin, on *D. caryophyllus*, Mar. 1890, P. Magnus (M); Tamsel, 20 Oct. 1909, P. Vogel, Flora marchica (M). **Israel**, Jerusalem, on *Dianthus* sp., 20 May 1936, Dr. T. Rayss, Flora Cryptogamica Palaestinae (M). **Italy**, Torino, on *D. caryophyllus*, Prof. P. Voglino, Cavara & Pollacci, Fung. Paras. Piante Colt. Utili Exs. 440 (M). **Romania**, Muntenia, distr. Ilfov, Bucureşti, on *D. caryophyllus*, 15 Aug. 1932, T. Săvulescu & C. Sandu, Săvulescu, Herb. Mycol. Roman. 444 (M); on *Dianthus* sp., 8 Oct. 1959 (M). **Slovenia**, "Krain, near Zicklach", on *Silene dioica*, 14 Mar. 1888, W. Voss (HBG). **South Africa**, Natal, on *Dianthus* sp., Nov. 1910, C. Fuller (HBG). **New Zealand**, Auckland, Old Government House, Auckland University Campus, on *Dianthus barbatus* 20 Apr. 2008, C.F. Hill (CPC 15386 = CBS 123191, reference strain).

*Notes*: This species has also been recorded from other members of the *Caryophyllaceae*, including *e.g.*, *Cerastium*, *Lychnis*, *Saponaria*, *Silene* and *Viscaria*. Collections on these hosts have not been seen and are not confirmed, except for a sample on *Silene dioica* (Slovenia, "Krain, near Zicklach", W. Voss, 14 Mar. 1888, HBG), which could be confirmed.

**48. *Cladosporium epichloës*** Lobik, Bolezni Rast. 17(3–4): 189. 1928. Fig. 103.

*Holotype*: **Russia**, "Bezirk Piatigorsk, im Walde am Abhange des Berges Maschuk, bei der Lermontowschen Haltestelle", on stromata of *Epichloë typhina* (*Clavicipitaceae*) on *Bromus inermis* (*Poaceae*), 26 Sep. 1923 (LE-40522).

*Lit*.: Heuchert *et al*. (2005: 18–19).
*Ill*.: Lobik (1928: pl. 8, fig. 86), Heuchert *et al*. (2005: 18, fig. 2).
*Exs*.: Keissler, Krypt. Exs. 3392.

*In vivo*: *Colonies* olivaceous to dark brown, effuse, diffuse to dense, confluent, velvety. *Mycelium* immersed and external; superficial hyphae creeping, branched, 2.5–6 µm wide, septate, often constricted at the septa, cells irregularly swollen, up to 8 µm wide, subhyaline to pale brown, smooth, walls slightly thickened. *Stromata* lacking. *Conidiophores* solitary or in loose groups, arising from hyphae or swollen hyphal cells, erect to decumbent, straight or often curved, subcylindrical, geniculate-sinuous, unbranched or branched, (9–)34–105 × 3–6 µm, slightly swollen at the base, up to 7 µm, 0–7-septate, not constricted at the septa, pale to medium brown, paler towards the apex, smooth, walls slightly thickened, rarely with subnodulose intercalary swellings, up to 7 µm wide, swellings mostly with conidiogenous loci. *Conidiogenous cells* integrated, terminal and intercalary, 10–44 µm long, polyblastic, proliferation sympodial, with (1–)2–9(–11) conspicuous conidiogenous loci which are sometimes situated on small unilateral swellings ("shoulders") protuberant, thickened, darkened-refractive, 1.5–2 µm diam. *Conidia* mainly in branched chains, straight, polymorphous, subglobose, ellipsoid, obovoid, fusiform, subcylindrical, 4–24(–26) × 3–7(–8) µm, 0–3(–5)-septate, usually not constricted at the septa, subhyaline to pale brown, almost smooth to faintly rough-walled, walls slightly to conspicuously thickened, apex rounded, with up to 4 hila, base truncate to convex, occasionally somewhat attenuated, hila protuberant, thickened, darkened, 1–2 µm diam; microcyclic conidiogenesis occurring.

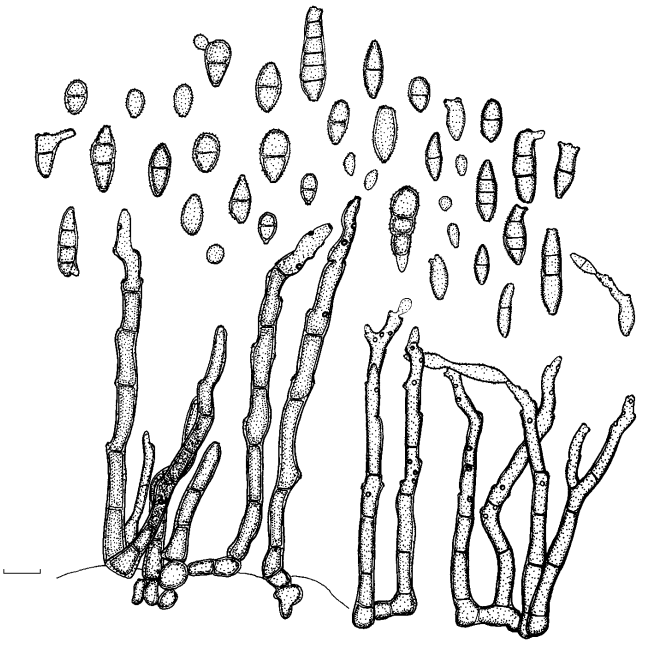


**Fig. 103.** *Cladosporium epichloës* (LE-40522 and HAL 1822). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. B. Heuchert *del*.

*Substrates and distribution*: On *Epichloë typhina* (*Clavitipitaceae*); Europe – *E. typhina* on *Bromus inermis* (Russia), *E. typhina* on *Dactylis polygama* (Germany), *E. typhina* on *Holcus lanatus* (Denmark), *E. typhina* (Austria).

*Additional specimens examined*: **Austria**, Mauerbach near Vienna, on *Epichloë typhina*, Jul., C. Keissler, Keissler, Krypt. Exs. 3392 (M-0057568). **Denmark**, Rømø, Lakolk, on *E. typhina* on *Holcus lanatus*, 24 Jul. 1901, O. Jaap (HBG). **Germany**, Sachsen-Anhalt, Harz, Sangerhausen, NNW Grillenberg, "N Kohlenstraße", deciduous forest, alt. *ca.* 379, on *E. typhina* on *Dactylis polygama*, 9 Nov. 2003, H. Jage (herb. Jage, No. 2967/03, HAL 1822).

*Notes*: This species, confined to *Epichloë typhina*, is morphologically close to the common, widespread saprobic species *C. herbarum*, which differs, however, in having characteristic intercalary nodes of 7–9 µm diam, such nodes encompassing the entire circumference of the conidiophore and not just swelling on one side of the conidiophore as in "shoulders". The conidiophores of *C. epichloës* are often geniculate, with small unilateral shoulders, but multilateral nodes are lacking. *Cladosporium epichloës* is morphologically barely distinguished from *C. aecidiicola*. Since the latter species is ecologically clearly discriminated from *C. epichloës* by being confined to aecia of rust fungi, we tentatively prefer to maintain two different species. Inoculation experiments and molecular examinations are necessary to adequately define the taxonomy of the two species and their relations.

**49. *Cladosporium epimyces*** Cooke, Grevillea 12(61): 31. 1883. Figs 104–106.

*Lectotype* (designated by Heuchert *et al*. 2005): **USA**, South Carolina, Aiken, on a gill of *Armillaria mellea* [≡ *Agaricus melleus*] (*Agaricaceae*), Ravenel & Cooke, Fungi Amer. Exs. 596 (NY). *Isolectotypes*: Ravenel & Cooke, Fungi Amer. Exs. 596 (*e.g.*, BPI 426471).

*Lit*.: Heuchert *et al*. (2005: 19–22).
*Ill*.: Heuchert *et al*. (2005: 20–21, figs 3–4).
*Exs*.: Ravenel & Cooke, Fungi Amer. Exs. 596.

*In vivo*: *Colonies* light to dark brown, effuse, caespitose, velvety, erect structures delicate, thin. *Mycelium* immersed and superficial, hyphae branched, 4–6 µm wide, cells 7–14 µm long, with constrictions at the septa, pale olivaceous-brown, occasionally subhyaline, smooth, walls somewhat thickened. *Stromata* diffuse, composed of subglobose to rectangular cells, 4–14 µm diam, subhyaline to pale brown, smooth, walls somewhat thickened. *Conidiophores* in loose to dense fascicles, arising from stromata or formed singly, arising from repent hyphae, erect, sometimes curved, subcylindrical to geniculate-sinuous, unbranched to branched, several times, 23–250(–280) × 3–5.5(–7) µm, sometimes swollen at the very base, up to 9 µm, rarely with some slight intercalary swellings, up to 7 µm, 0–8(–12)-septate, not or only slightly constricted at the septa, pale brown, at the base pigmentation

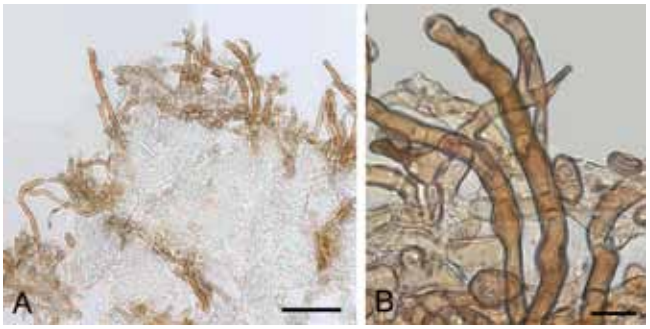



**Fig. 104.** *Cladosporium epimyces* (NY, lectotype). A. Overview showing loosely arranged conidiophores and conidia *in vivo*. B. Diffuse stromata, conidiophores and conidia *in vivo*. Scale bars = 10 (B), 50 (A) µm.

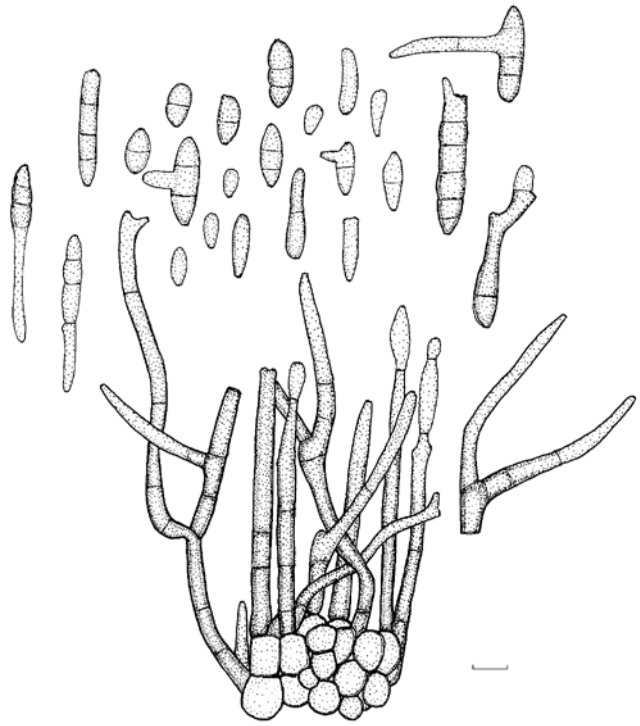


**Fig. 105.** *Cladosporium epimyces* (NY). Conidiophores arising from stromata, conidia and microcyclic conidiogenesis *in vivo*. Scale bar = 10 µm. B. Heuchert *del*.

stronger, paler towards the apex, smooth or almost so, young conidiophores and conidiophores with attached conidia often irregularly rough-walled, walls slightly thickened, tips and ultimate branchlets often unthickened. *Conidiogenous cells* integrated, terminal and intercalary, 9–52 µm long, polyblastic, with up to six conidiogenous loci, sympodially proliferating, conidiogenous loci somewhat protuberant, thickened, darkened-refractive, 1.5–3 µm diam. *Ramoconidia* straight, subcylindrical, 33–53 × 4.5–7 µm, 0–6-septate, occasionally constricted at the septa, basal hilum slightly convex, without convex dome and surrounding raised rim, 2–3 µm wide. *Conidia* catenate, usually in branched chains, straight to slightly curved, ellipsoid, fusiform, subcylindrical, 4–36(–44) × 4–7(–8) µm, 0–3-septate, sometimes constricted at the septa, subhyaline to pale brown, smooth or almost so, young conidia still attached to the conidiophores sometimes irregularly rough-walled, walls slightly thickened, sometimes thin-walled, apex with up to four hila, base truncate to convex, occasionally attenuated towards the base, hila protuberant, thickened, darkened-refractive, 1–2 µm diam; microcyclic conidiogenesis seen.

*Substrates and distribution*: On gill fungi (*Agaricales*); Europe, North America – *Armillaria mellea* (USA), *Hypholoma sublatentum* (USA), *Lactarius* sp. (Poland), *Leucopaxillus gentianeus* (USA).

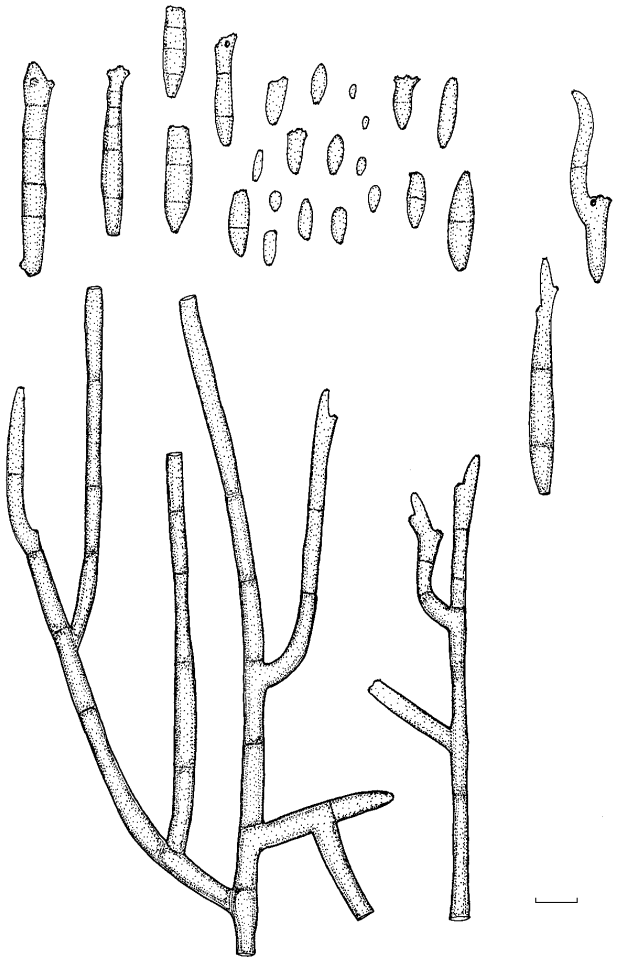


**Fig. 106.** *Cladosporium epimyces* (PH). Branched conidiophores, ramoconidia, conidia and microcyclic conidiogenesis. Scale bar = 10 µm. B. Heuchert *del*.

*Additional specimens examined*: **Poland**, Prószków, Arboret d. Pom. Institutes, on *Lactarius* sp., Sep. 1901, (HBG). **USA**, Pennsylvania, on *Hypholoma sublatentum*, 2 Aug. 1953, G.T. Reese (PH); Washington, Spokane County, [*Pseudotsuga taxifolia* Association, Douglas Fir Zone, Dense near-climax forest, bottom of east facing slope and adjacent level, 8.2. miles north of N.P. Ry, overpass north of spangle on west side of U.S. 195, 2300 feet, T. 24N, R. 43E., S. 17.], on *Leucopaxillus gentianeus* (= *Leucopaxillus amarus*), 10 Feb. 1948, W.B. & V.G. Cooke (NY).

*Notes*: Cooke (1883) described lanceolate, aseptate, hyaline conidia, 15–20 × 4 µm. The examination of type material and additional collections showed that the original description of *C. epimyces* is very poor and that this species is much more variable. Aarnaes (2000) recorded this species from Norway, but without any details about hosts.

**50. *Cladosporium episclerotiale*** Bubák, Ann. Mycol. 12: 213. 1914. Fig. 107.

*Holotype*: **Italy**, Tyrol, Arco, on sclerotia of *Monilinia laxa* (= *Sclerotinia cinerea*) (*Sclerotiniaceae*) on mummified fruits of *Prunus domestica* (*Rosaceae*), Mar. 1913, E. Diettrich-Kalkhoff (BPI 426531).

*Lit.*: Saccardo (1931: 797), Heuchert *et al*. (2005: 22–24).
*Ill.*: Heuchert *et al*. (2005: 23, fig. 5).
*Exs.*: Jaap, Fungi Sel. Exs. 175; Sydow, Mycoth. Germ. 1781.

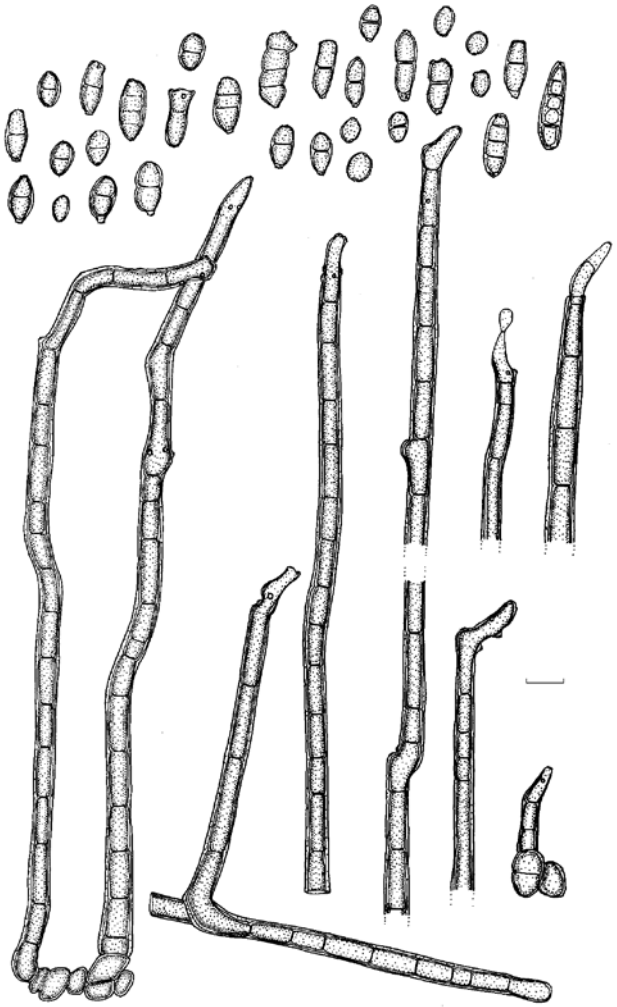


**Fig. 107.** *Cladosporium episclerotiale* (BPI 426531). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. B. Heuchert *del*.

*In vivo*: *Colonies* blackish brown, diffuse to dense, confluent, caespitose, velvety. *Mycelium* immersed and external, superficial; hyphae 3.5–7 µm wide, closely septate (with eu- and pseudosepta), often constricted at the septa, hyphal cells irregularly swollen, medium olivaceous-brown, smooth or almost so, walls thickened, conspicuously two-layered, outer layer slightly pigmented to subhyaline. *Stromata* diffuse, loose to dense, composed of swollen hyphal cells, subglobose, 3–10 µm diam, medium olivaceous-brown to dark brown, thick-walled, stromatic and hyphal cells with oil droplets. *Conidiophores* solitary, arising from hyphal cells, aggregations or from stromata, erect, straight to curved, subcylindrical, more or less geniculate-sinuous, unbranched or branched, (22–)97–295(–322) × 5–8(–10) µm, enlarged at the base, sometimes conspicuously swollen, 8–13 µm wide, somewhat attenuated towards the apex, 3–21-septate (with eusepta as well as pseudosepta), cells 10–20 µm long, olivaceous-brown to medium brown, pigmentation often stronger near the base, paler towards the apex, smooth or almost so, walls thickened below, less thickened towards the apex, wall near the tip often unthickened, occasionally with slightly intercalary swellings, up to 10 µm diam, often with conidiogenous loci, wall composed of two distinct layers, outer layer paler, often with an irregular surface, not constricted at the septa, conidiophores occasionally with oil droplets. *Conidiogenous* cells integrated, terminal and intercalary, 10–55 µm long, polyblastic, with 1–7 conidiogenous loci, proliferation sympodial, loci non- to slightly protuberant, sometimes on small shoulders, formed by sympodial geniculation, truncate, 1–2(–3) µm diam, convex dome and periclinal rim often not very conspicuous (light microscopy), thickened, darkened-refractive. *Conidia* usually in branched chains, straight, subglobose, ellipsoid, broadly ellipsoid, 6.5–23(–30) × 4–8 µm, 0–4-septate, often slightly constricted at the septa, cells often distinctly rounded, septa often thickened and darkened, occasionally with distosepta, olivaceous to dark brown, smooth to irregularly verruculose, walls thickened, mostly distinctly two-layered, apex rounded or truncate to convex, with up to four hila, base truncate to convex, hila mostly somewhat protuberant, 1–2.5(–3) µm wide and up to 1.5 µm high, thickened and mostly distinctly darkened, occasionally not darkened, *i.e.*, hila paler than the surrounding conidial base; microcyclic conidiogenesis occasionally occurring.

*Substrates and distribution*: On *Sclerotinia cinerea* (*Sclerotiniaceae*) and cap and gill fungi; Europe – on *Prunus domestica* (Germany, Italy), *Prunus spinosa* (Germany), *Suillus bovinus* (Germany), gill of a mushroom (Germany).

*Additional specimens examined*: **Germany**, Bavaria, Gerolzhofen, on dried fruits of *Prunus spinosa*, Apr. 1912, A. Vill (HBG, as *C. herbarum*); Brandenburg, Kreis Nieder-Barnim, forest between Sophienstädt and Ruhlsdorf, on decaying gills of *Boletus bovinus* (= *Suillus bovinus*), 7 Nov. 1917, P. Sydow, Sydow, Mycoth. Germ. 1781 (M-0057567, HBG, as *C. fuligineum*) [mixed collection with *C. herbarum*]; Kreis Prignitz, Triglitz, on a dead gill of a mushroom in a pine forest, 4 Oct. 1905, O. Jaap, Jaap, Fungi Sel. Exs. 175 (B 700006384, as *C. fuligineum* Bonord.);

*Notes*: The generic affinity of this species, based on the structure of the conidiogenous loci, was not clearly discernable by means of light microscopy since the central dome and periclinal raised rim are often not very distinct. However, it could clearly be demonstrated by SEM that *C. episclerotiale* belongs in *Cladosporium s. str*. (Heuchert *et al*. 2005).

The substrates of two of the examined collections are not quite certain. The collection "Jaap, Fungi Sel. Exs. 175" (B 700006384), on a dry gill of a mushroom, is totally overgrown with *C. herbarum*, but a few blackish brown, caespitose, effuse colonies proved to be morphologically indistinguishable from *C. episclerotiale*. In a collection on dried fruits of *Prunus spinosa* (HBG), it was not possible to ascertain if sclerotia were present.

## 51. *Cladosporium eriobotryae* Pass. & Beltrani, Transunti, Ser. 3, 7(1): 38. 1882. Fig. 108.

*Holotype*: **Italy**, Sicily, Monostalla, on dry leaves of *Eriobotrya japonica* (*Rosaceae*), Sep. 1878 (not preserved). *Neotype* (**designated here**): **Germany**, Berlin, Botanical Garden, on *Eriobotrya japonica*, 2 May 1899, P. Hennings (B 700006326).

*Lit*.: Saccardo (1886: 356), Lindau (1907: 824), Ferraris (1912: 344).

*In vivo*: On living leaves, leaf spots small, vein-limited to large, irregularly shaped, brown, margin indefinite or with a narrow darker marginal line. *Colonies* amphigenous, mainly hypophyllous, punctiform, scattered to loosely aggregated, dark brown to blackish. *Mycelium* internal, occasionally with a few superficial hyphae arising from swollen hyphal cells. *Stromata* well-developed, 10–60(–90) µm diam, substomatal to intraepidermal, brown, composed of swollen hyphal cells, 3–8 µm diam, walls somewhat thickened. *Conidiophores* in small to moderately large fascicles, loose to

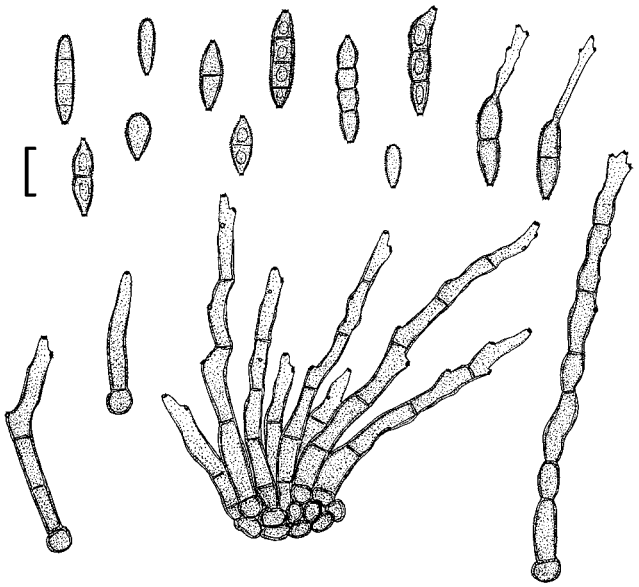


**Fig. 108.** *Cladosporium eriobotryae* (B 700006326). Conidiophores, conidia and microcyclic conidiogenesis *in vivo*. Scale bar = 10 µm. U. Braun *del*.

moderately dense, arising from stromata, emerging through stomata or erumpent, erect, unbranched, straight, subcylindrical or attenuated towards the tip to usually distinctly geniculate-sinuous or subnodulose, 20–120 × 3–8 µm, 1– pluriseptate throughout, olivaceous to medium brown throughout or paler towards the apex, smooth, occasionally rough-walled, walls up to 1 µm wide. *Conidiogenous cells* integrated, terminal and intercalary, (5–)10–20(–25) µm long, conidiogenous loci conspicuous, distinctly coronate, 1–2 µm diam, slightly protuberant, somewhat darkened-refractive. *Conidia* catenate, in simple or branched chains, ellipsoid-ovoid, obovoid, fusiform, subcylindrical, 7–22 × (2–)3–7 µm, 0–3(–4)-septate, pale olivaceous to medium brown or olivaceous-brown, verruculose, thin-walled (≤ 1 µm), ends rounded to somewhat attenuated, hila 0.75–1.5(–2) µm diam; microcyclic conidiogenesis occurring.

*Substrate and distribution*: On *Eriobotrya japonica*; Europe (Germany, Italy).

*Notes:* Type material of this species could not be traced. The German collection, proposed to serve as neotype, agrees well with the brief original description. Due to the description of up to 3-septate conidia, the original type of *C. eriobotryae* was undoubtedly not identical with *Fusicladium eriobotryae* [= *F. pomi*, see Schubert *et al.* 2003]. *Cladosporium eriobotryae* differs from *C. fusicladiiformis*, also described from *Eriobotrya japonica*, in having much shorter, non-dimorphic, unbranched conidiophores and darker, verruculose conidia with up to four septa.

## 52. *Cladosporium exasperatum* Bensch, Summerell, Crous & U. Braun, Stud. Mycol. 67: 40. 2010. Figs 109–111.

*Holotype*: **Australia**, Northern Territory, Edith Falls, S 14º05'20'' E 132º05'12'', isol. from *Eucalyptus tintinnans* (*Myrtaceae*), 23 Sep. 2007, coll. B.A. Summerell, isol. P.W. Crous (CBS H-20431). *Ex-type culture*: CBS 125986 = CPC 14638.

*Ill.*: Bensch *et al.* (2010: 41−42, figs 26−28).

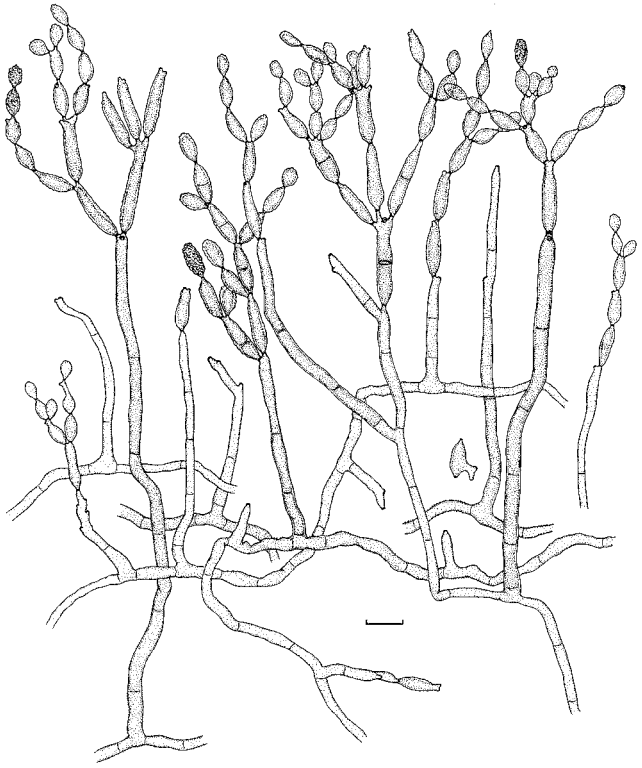


**Fig. 109.** *Cladosporium exasperatum* (CBS 125986). Macro- and micronematous conidiophores, mycelium and conidial chains *in vitro*. Scale bar = 10 µm. K. Bensch *del*.

*In vitro*: *Mycelium* immersed and superficial; hyphae loosely branched, (1−)1.5−4 µm wide, septate, not constricted at septa, subhyaline to pale or medium olivaceous-brown, smooth to verrucose or irregularly rough-walled, walls unthickened or almost so, sometimes irregular in outline due to swellings, occasionally swollen at the base of conidiophores, up to 6 µm wide. *Conidiophores* macro- and semimacronematous, solitary, arising laterally or terminally from hyphae, erect, straight to slightly flexuous, cylindrical-oblong, sometimes once, occasionally slightly to distinctly twice geniculate-sinuous below the apex or on a lower level, non-nodulose, unbranched or once branched, 15−100 × (2−)2.5−4 µm, septate, not constricted at septa, pale to usually medium olivaceous-brown, sometimes dark olivaceous-brown, asperulate or irregularly rough-walled, walls unthickened or only very slightly thickened, occasionally slightly attenuated towards the apex. *Conidiogenous cells* integrated, terminal, cylindrical-oblong, 11−40 µm long, sometimes once, rarely twice geniculate-sinuous, with loci situated on small lateral shoulders, with a single or up to 3(−4) apical loci, conspicuous, subdenticulate to denticulate, 1−1.5 µm diam, periclinal rim and central dome clearly visible, somewhat thickened and darkened-refractive. *Ramoconidia* cylindrical-oblong, 19−40 × 2.8−4 µm, 0−2-septate, concolorous with tips of conidiophores, smooth, base not cladosporioid, broadly truncate, 2.8−4 µm wide, unthickened and not darkened. *Conidia* catenate, in branched chains, 2−6 conidia in the unbranched terminal part of the chain, dichotomously branched or branching in all directions, small terminal conidia obovoid to ellipsoid-ovoid, sometimes subglobose, 4−9 × 3−4.5 µm (av. ± SD: 6.7 ± 1.6 × 3.9 ± 0.5), aseptate, apex usually rounded, intercalary conidia ellipsoid-ovoid to fusiform, 7−15 × 3−4.5 µm (av. ± SD: 10.5 ± 2.6 × 3.9 ± 0.4), 0(−1)-septate, not constricted, with 1−2 distal hila, secondary ramoconidia ellipsoid, fusiform to subcylindrical, 9.5−30(−37) × (2.5−)3.5−4.5(−5) µm (av. ± SD: 19.2 ± 6.2 × 3.9 ± 0.6),

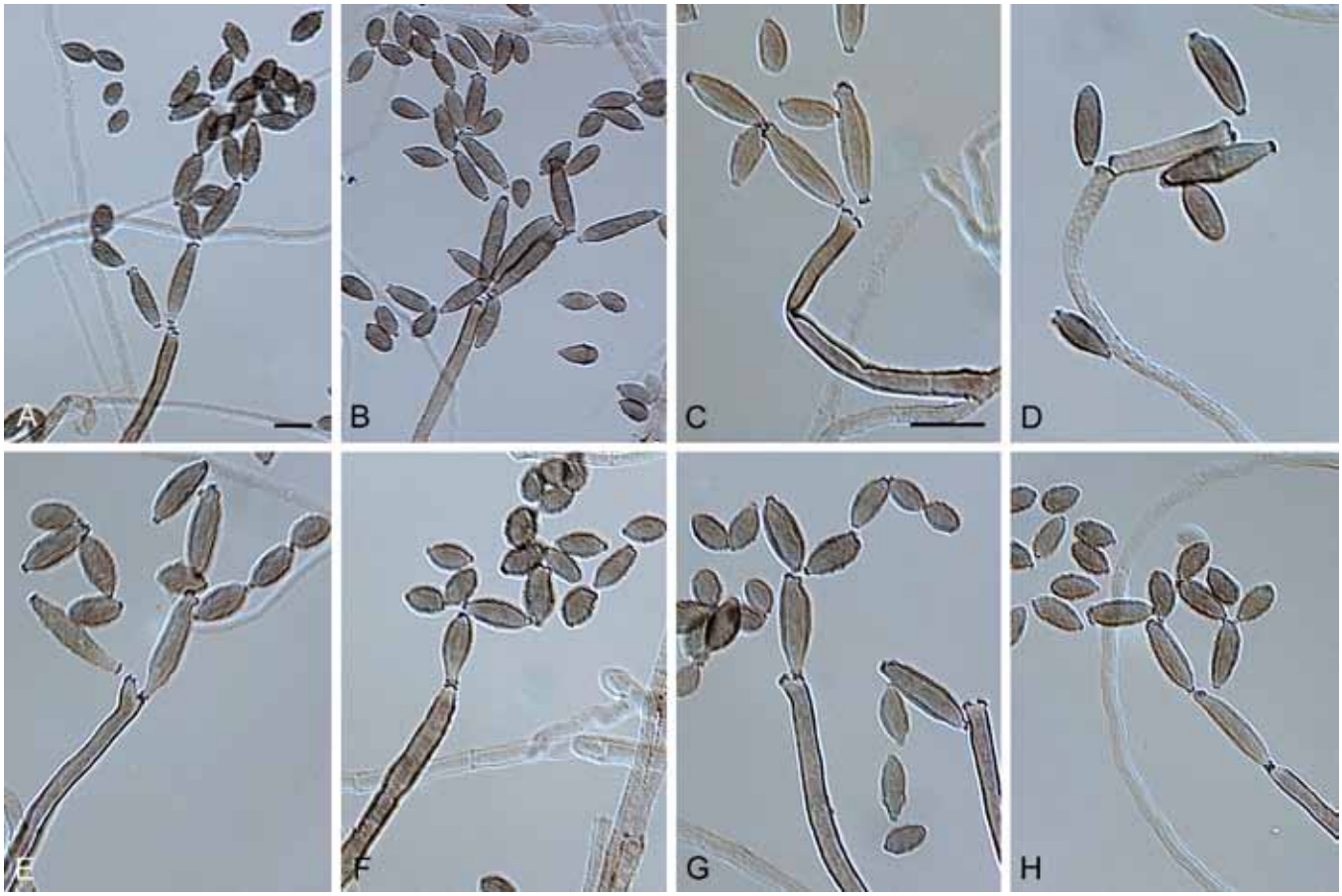



**Fig. 110.** *Cladosporium exasperatum* (CBS 125986). A–C, E–H. Macronematous conidiophores and conidial chains. D. Ramoconidium seceding at the tip of a conidiophore. Scale bar = 10 µm.

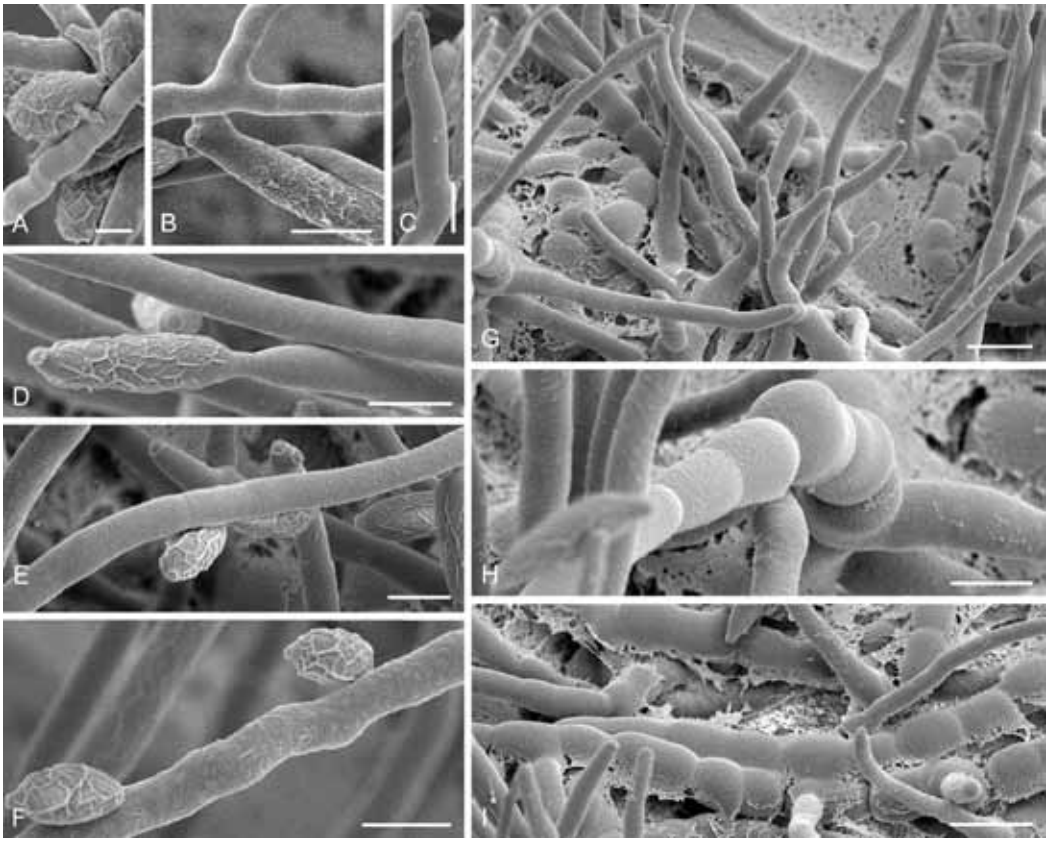



**Fig. 111.** *Cladosporium exasperatum* (CBS 125986). A. Ornamented conidia on aerial structures. Note the small scars with an ornamentation free zone. B. Secondary ramoconidium with a scar and aerial structures. C. Scars on a conidiophore. Note the smooth surface of the conidiophores. D. Ornamented secondary ramoconidium on a conidiophore with visible line of delineation. E. Septate aerial structure with conidiophores, conidia and scars as background. F. Two ornamented globose conidia adhered to an aerial structure showing an irregularly reticulate surface. G. Segmented differentiated hyphae on the agar surface giving rise to numerous conidiophores, conidiophore initials and aerial structures. H. Detail of differentiated substrate hyphae. I. Segmented differentiated hyphae in initials. Scale bars = 2 (A), 5 (B–F, H), 10 (G, I) µm.

0−2-septate, not constricted, sometimes slightly swollen or wider at septa, septa median, somewhat in the upper half or occasionally in the lower third, pale olivaceous to often medium or dark olivaceous-brown, slightly to distinctly irregularly verruculose-rugose (LM), surface with irregularly reticulate structure or embossed stripes under SEM probably caused by diminishing turgor and shriveling of tender conidia, walls thickened, occasionally distinctly constricted in the middle, attenuated towards apex and base, with 1−4 distal hila, hila conspicuous, subdenticulate to denticulate, 0.5−1.5 µm diam, more or less thickened and darkened-refractive; microcyclic conidiogenesis occurring.

*Culture characteristics*: Colonies on PDA attaining 26−38 mm diam after 14 d, zonate, centre olivaceous-grey, then grey-olivaceous, iron-grey and dull green, reverse iron-grey to dull green, floccose to fluffy, margin regular to undulate, white, glabrous to feathery, aerial mycelium floccose to fluffy, loose to dense, covering large areas of the colony, growth effuse, with elevated colony centre, without prominent exudates, sporulation profuse. Colonies on MEA attaining 12−15 mm diam after 14 d, surface and reverse olivaceous-grey, floccose, margins crenate, very narrow, white, glabrous, aerial mycelium abundant, floccose, dense, covering the whole surface, growth convex but radially furrowed and wrinkled in colony centre, no exudates, sporulating. Colonies on OA reaching 39−54 mm diam after 14 d, olivaceous-grey to grey-olivaceous due to abundant sporulation, reverse olivaceous-grey to pale greenish grey, velvety to floccose, margins regular, colourless to white, glabrous, aerial mycelium abundant, floccose to fluffy, loose to dense, covering large parts of the colony surface, growth flat, without exudates.

*Substrate and distribution*: On *Eucalyptus tintinnans*; Australia.

*Notes*: *Cladosporium exasperatum*, which formed a distinct lineage in phylogenetic analyses as sister to *C. scabrellum* (Bensch *et al.* 2010, fig. 1, part a), is a member of the *C. cladosporioides s.lat.* complex and belongs to a group of species with distinctly rough-walled conidia. It differs from all allied taxa in having a unique verruculose-rugose surface ornamentation. Furthermore, it is characterized *in vitro* by forming very slow growing small colonies on all media. *Cladosporium pini-ponderosae* and *C. acalyphae* are two comparable species with distinct surface ornamentation, which are, however, easily distinguishable by having much longer conidiophores and some differences in the size of the conidiogenous loci and size and shape of conidia (Bensch *et al*. 2010).

**53. *Cladosporium exile*** Bensch, Glawe, Crous & U. Braun, Stud. Mycol. 67: 43. 2010. Figs 112–114.

*Holotype*: **USA**, Washington, Seattle, University of Washington campus, isol. from chasmothecia of *Phyllactinia guttata* (*Erysiphales*) on leaves of *Corylus avellana* (*Betulaceae*), 12 Feb. 2004, D. Glawe (CBS H-20432). *Ex-type culture*: CBS 125987 = CPC 11828.

*Ill.*: Bensch *et al.* (2010: 43−45, figs 29−31).

*In vitro*: *Mycelium* immersed and superficial; hyphae sparingly branched, 2−4 µm wide, septate, sometimes constricted at septa, sterile hyphae subhyaline, fertile hyphae pale or medium olivaceous-brown, smooth to minutely verruculose or irregularly

**Fig. 112.** *Cladosporium exile* (CBS 125987). Macro- and micronematous conidiophores, mycelium sometimes forming ropes and conidial chains *in vitro*. Scale bar = 10 µm. K. Bensch *del*.

rough-walled where conidiophores are formed, walls unthickened to slightly thickened, sometimes forming ropes or swollen at the base of conidiophores, up to 7 µm wide. *Conidiophores* macro- and micronematous, solitary, arising terminally and laterally from hyphae, erect or ascending, straight to flexuous, cylindrical-oblong, slightly geniculate towards the apex, sometimes subnodulose, unbranched or sometimes once, occasionally twice branched, several long conidiophores up to 305 µm, but mostly shorter, 6−100 µm long, (2−)3−4(−5) µm wide, sometimes wider or even swollen at the base, up to 8 µmwide, pluriseptate, mostly 0−4 septa, long conidiophores with up to nine septa, sometimes slightly constricted at septa, pale brown to medium olivaceous-brown, sometimes paler towards the base, smooth or almost so to minutely verruculose or irregularly roughwalled, walls unthickened or slightly thickened, about 0.5 µm wide. *Micronematous conidiophores* narrower, shorter and paler, with 1−2 apical loci. *Conidiogenous cells* integrated, terminal, sometimes intercalary, cylindrical-oblong, sometimes geniculate-sinuous, occasionally subnodulose, 6−34 µm long, with up to six loci per cell, crowded at or towards the apex, sometimes loci situated on small lateral shoulders, subdenticulate to denticulate, (0.7−)1−2 µm diam, thickened and darkened-refractive. *Ramoconidia* cylindrical-oblong, 17−41 × 2.5−4(−5) µm, 0−1-septate, a single ramoconidium with four septa, base broadly truncate, 2.5−3 µm wide, unthickened, somewhat refractive. *Conidia* catenate, in branched chains, up to four conidia in the unbranched terminal part of the chain, small terminal conidia subglobose to mostly obovoid, 3.5−5(−5.5) × 2−3 µm (av. ± SD: 4.4 ± 0.7 × 2.4 ± 0.4), intercalary conidia ovoid to ellipsoid, (4−)5−8(−9) × (2−)2.5−3 µm (av. ± SD: 6.3 ± 1.2 × 2.9 ± 0.3), aseptate, with 1−2(−3) distal hila, secondary ramoconidia ellipsoid to subcylindrical or cylindrical, with up to three apical hila, 7−25(−35) × 2.5−3.5(−4) µm (av. ± SD: 15.6 ± 7.7 × 3.1 ± 0.4), 0−1(−3)-septate, not constricted at septa, subhyaline to pale olivaceous-brown, almost smooth to asperulate or minutely verruculose, under SEM surface almost smooth to reticulate or with embossed stripes caused by diminishing turgor and shriveling of tender young conidia, walls unthickened to slightly thickened, slightly attenuated towards apex and base, hila protuberant, subdenticulate to denticulate, 0.5−2 µm diam, thickened and darkened-refractive; microcyclic conidiogenesis sometimes occurring.


**Fig. 113.** *Cladosporium exile* (CBS 125987). A–G. Macronematous conidiophores and conidial chains. Scale bars = 10 µm.

*Culture characteristics*: Colonies on PDA olivaceous to glaucous-grey, reverse pale olivaceous-grey to olivaceous-grey, powdery to fluffy, margin white, narrow, somewhat feathery and shiny like metal, aerial mycelium diffuse, loose, fluffy, high, growth low convex, somewhat folded, without exudates, sporulation profuse. Colonies on MEA olivaceous-grey in the centre, greenish grey and glaucous-grey towards margins, zonate, reverse olivaceous-grey, woolly-felty, margin white, narrow, somewhat feathery, radially furrowed, folded and wrinkled, aerial mycelium low to high, loose to more dense, fluffy, without exudates, sporulating. Colonies on OA dark smoke-grey to olivaceous-grey and iron-grey, reverse leadengrey, powdery to woolly-felty, margin narrow, white or colourless, glabrous, aerial mycelium loose, fluffy to felty, growth flat to low convex, without exudates, sporulating.

*Substrate and distribution*: Isolated from chasmothecia of *Phyllactinia guttata* on leaves of *Corylus*; USA.

*Notes*: In phylogenetic analyses, this species formed a separate lineage as sister to *C. paracladosporioides* (Bensch *et al.* 2010, fig. 1, part a), *i.e.*, it belongs to the *C. cladosporioides* complex. The latter species is easily distinguishable by its usually smooth conidiophores and conidia, and somewhat longer and wider, mainly aseptate secondary ramoconidia.

## 54. *Cladosporium exobasidii* Jaap

**54.1. *Cladosporium exobasidii*** Jaap, Verh. Bot. Vereins Prov. Brandenburg 49: 29. 1907 **var. *exobasidii***. Fig. 115.

*Lectotype* (designated in Heuchert *et al.* 2005): **Germany**, Rhön, Gersfeld, Rotes Moor, on galls of *Exobasidium vaccinii* var. *vaccinii* (*Exobasidiales*) on *Vaccinium uliginosum* (*Ericaceae*), 30 Jul. 1906, O. Jaap (B 700006339). *Isolectotypes*: Jaap, Fungi Sel. Exs. 200 (*e.g.* HAL, M-0057603).

*Lit.*: Lindau (1907: 808, 1910: 796), Lind (1913: 522), Saccardo (1913a: 1371), Braun (2001: 57), Heuchert *et al.* (2005: 24–26).
*Ill.*: Braun (2001: 55, fig. 3), Heuchert *et al.* (2005: 25, fig. 6).
*Exs.*: Jaap, Fungi Sel. Exs. 200.

*In vivo*: *Colonies* on galls, olivaceous-brown to dark brown, occasionally greyish, loosely to densely caespitose, effuse, erect structures slightly shiny. *Mycelium* immersed; hyphae branched, 2−9 µm wide, cells 3−14 µm long, often constricted at the septa, subhyaline to olivaceous-brown, cells smooth, walls unthickened or only slightly thickened, swollen hyphal cells 3−13 µm diam, forming loose to dense aggregations. *Conidiophores* solitary or in

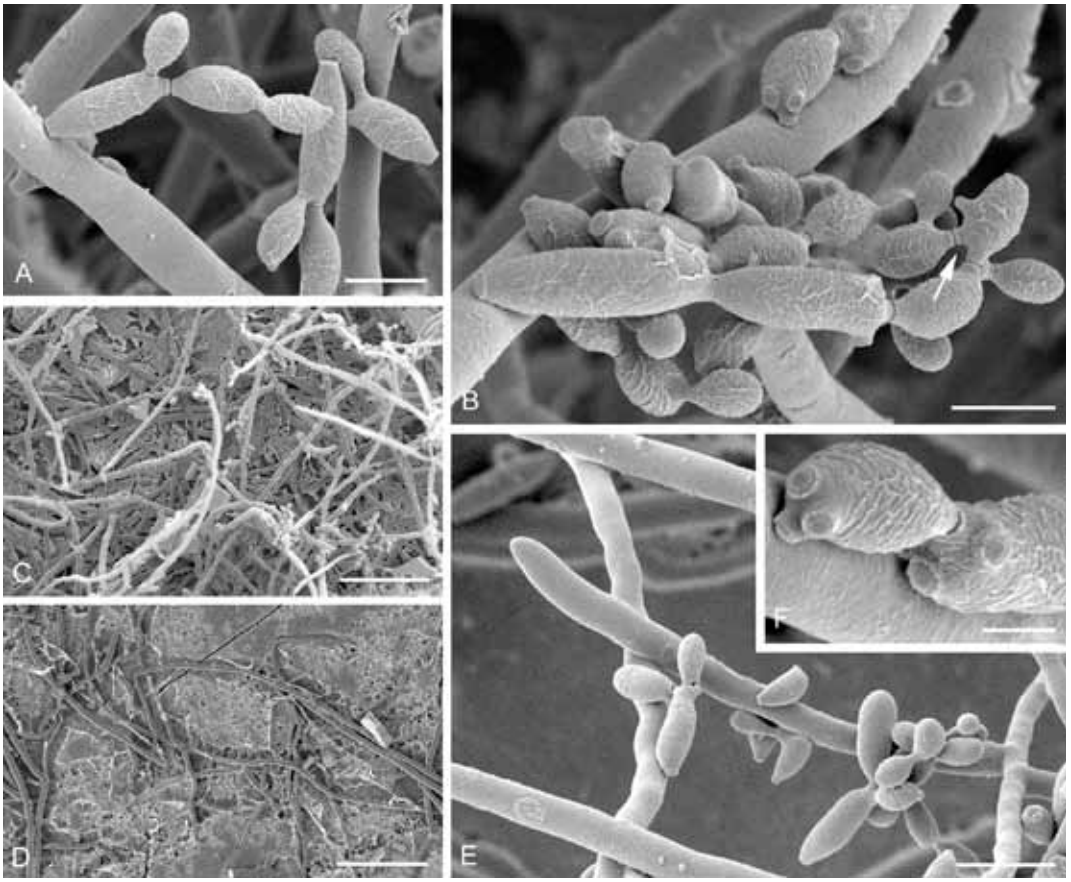



**Fig. 114.** *Cladosporium exile* (CBS 125987). A. Conidia and secondary ramoconidia with reticulate ornamentation, near long aerial hyphae or conidiophores. B. CryoSEM of different types of conidia on aerial structures. Note a remarkable pattern of blastoconidium formation (backwards) (arrow). C. Numerous hyphae and conidiophores in this overview of a colony of the fungus. D. Hyphae on the agar surface. E. Conidia and aerial structures. F. Detail of conidia and scars. Scale bars = 2 (F), 5 (A–B), 10 (E), 50 (C–D) µm.

loose to dense fascicles, arising from hyphal aggregations, erect to decumbent, straight to curved, subcylindrical, slightly geniculate-sinuous, usually unbranched, rarely branched in the upper third, 25-400 × 3.5−6.5(−8) µm, occasionally longer, sometimes somewhat swollen at the base, 6−11 µm wide, 3−11-septate, not constricted at the septa, pale to medium olivaceous-brown, paler towards the apex, tips often subhyaline, smooth, but occasionally rough-walled in the upper third, walls thickened, but often thin-walled near the tips, occasionally enterogenously proliferating, monopodial, sometimes with intercalary swellings, 5−9 µm wide, swellings often with numerous conidiogenous loci, tips often somewhat capitate and provided with numerous conspicuous loci. *Conidiogenous cells* integrated, terminal and intercalary, subcylindrical, 14−108 µm long, polyblastic, sympodially proliferating, conidiogenous loci crowded, usually conspicuously protuberant, thickened and darkened, 1.5−2.5 µm wide. *Ramoconidia* clavate, subcylindrical, 14−29(−30) × 4−5.5 µm, 0−1(−3)-septate, without any constrictions, base slightly convex, without dome and raised rim, 2.5−3 µm wide. *Conidia* numerous, usually in branched chains, straight, occasionally slightly curved, subglobose, obovoid, ellipsoid, subcylindrical, 2−19 × 2−6 µm, 0−1(−2)-septate, without any constrictions, subhyaline to pale olivaceous, smooth, wall unthickened to slightly thickened, apex rounded, somewhat attenuated to truncate, with up to five hila, base truncate, convex or slightly attenuated, hila protuberant, thickened and darkened, 1−2 µm diam; microcyclic conidiogenesis occurring.

*Substrates and distribution*: On *Exobasidium* spp. (*Exobasidiales*); Europe – on *E. rhododendri* (Austria), *E. vaccinii* on *Andromeda polifolia* (Sweden), *E. vaccinii* on *Vaccinium uliginosum* (Denmark, Germany), *E. vaccinii* on *V. vitis-idaea* (Germany), *E. vaccinii* on *Vaccinium* spp. (Poland, Ukraine).

*Additional specimens examined*: **Austria**, Kärnten, Oberseeland in the Karawanken, on *Exobasidium rhododendri*, 31 Jul. 1907, O. Jaap (HBG). **Denmark**, Jütland, Wilborg, on galls of *Exobasidium vaccinii* var. *vaccinii* on *Vaccinium uliginosum*, 14 Jun. 1906, J. Lind (B 700006341). **Germany**, Bavaria, Mittelfranken, near Girndorf, on *Exobasidium vaccinii* on *Vaccinium vitis-idaea*, 29 Jun. 1898, A. Schwarz (HBG); "Föhrenwald auf Diluvialsand", E of Nürnberg, 3 Jul. 1898, A. Schwarz (HBG); between Schwarzenbach and Unterburg near Nürnberg, 9 Jul. 1907, A. Schwarz (HBG); Brandenburg, forster's house Briese near Birkenwerder, 8 Jun. 1901, P. Röseler (HBG, as *C. fuligineum*); Kreis Prignitz, Putlitzer Heide bei Putlitz, on galls of *Exobasidium vaccinii* var. *vaccinii* on *Vaccinium uliginosum*, 1 Sep. 1900, O. Jaap (B 700006340).

*Notes*: The collection on *Exobasidium vaccinii* var. *vaccinii* on *Vaccinium uliginosum* from Denmark (B 700006341) cannot be considered a paratype as cited by Braun (2001: 57) since this collection was not cited by O. Jaap in the protologue of the original description. Another original collection from the herbarium in Berlin-Dahlem (B 700006339), cited by Jaap, was selected as lectotype (this sample cannot be considered the holotype since Jaap listed several original collections, but did note designate any types). Duplicates of the lectotype, distributed in Jaap's Fungi Sel. Exs. are isolectotypes.

De Vries (1952) and Ho *et al*. (1999) cited *C. exobasidii* as a synonym of *C. cladosporioides*, although in the latter species the conidiophores are characterised by lacking swellings and geniculations, and the conidiogenous loci are not crowded (Braun 2001). Oudemans (1919) and Lind (1934) regarded *C. exobasidii* to be a synonym of *C. fuligineum* (= *C. herbarum*), although the latter species is clearly distinguished by having verruculose to verrucose conidia. A collection on *Exobasidium rhododendri* (HBG) has been examined, but was too old and scarce to be provable.

**54.2. *Cladosporium exobasidii* var. *verruculosum*** Heuchert, U. Braun & K. Schub., Schlechtendalia 13: 27. 2005. Fig. 116.

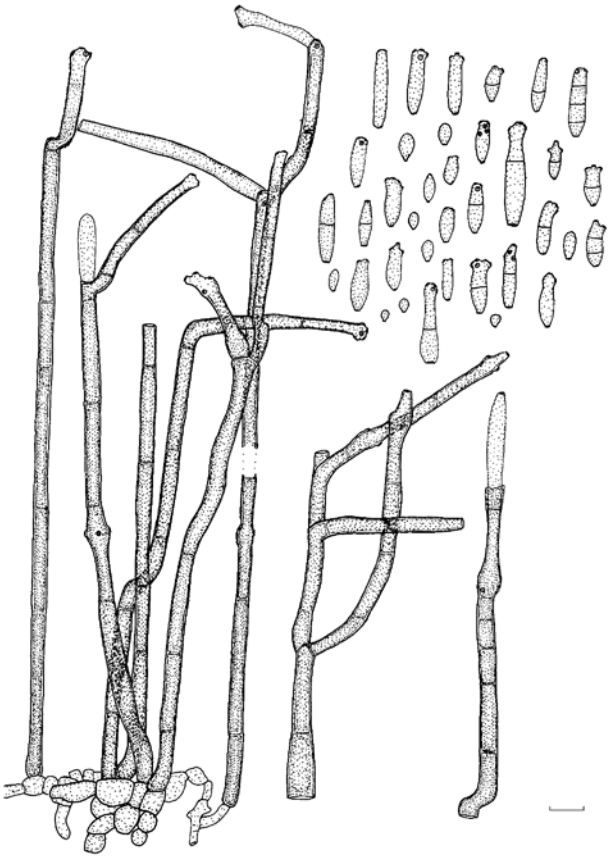


**Fig. 115.** *Cladosporium exobasidii* var. *exobasidii* (B 700006339). Conidiophores, ramoconidia and conidia *in vivo*. Scale bar = 10 µm. B. Heuchert *del*.

*Holotype*: **Czech Republic**, near Pontresina, on *Exobasidium vaccinii* var. *vaccinii* (*Exobasidiales*), 3 Sep. 1899, P. Magnus (HBG).

*Ill*.: Heuchert *et al*. (2005: 27, fig. 7).

*In vivo*: *Colonies* olivaceous, loose to dense, effuse, caespitose. *Mycelium* immersed; hyphae branched, 2−5 µm wide, cells 5−20 µm long, not constricted at the septa or only slightly so, olivaceous-brown, smooth, walls unthickened. *Stromata* lacking. *Conidiophores* solitary, arising from hyphae, often densely arranged, erect to decumbent, geniculate-sinuous, mostly unbranched, occasionally branched in the upper third, 2−217 × 2−6 µm, slightly enlarged at the base, up to 7 µm, 1−6-septate, without any constrictions, pale to dark olivaceous-brown, rarely subhyaline, usually paler towards the apex, smooth, walls slightly thickened. *Conidiogenous cells* integrated, terminal and intercalary, 14−53 µm long, polyblastic, conspicuously geniculate-sinuous, occasionally slightly widened, conidiogenous loci protuberant, thickened, darkened, 1−2 µm diam. *Conidia* usually in branched chains, rarely slightly curved, broadly ellipsoid, fusiform, obovoid, 5−23 × 3−7 µm, 0−1−2)-septate, secondary ramoconidia broadly ellipsoid, subcylindrical, 10−38 × 4−7 µm, 0−2(−3)-septate, at the apex with up to four hila, without any constrictions, pale olivaceous-brown to medium brown, verruculose, walls unthickened, apex rounded, truncate or somewhat attenuated, convex, base truncate to convex, hila conspicuously protuberant, thickened and darkened, 1−2 µm diam; microcyclic conidiogenesis not observed.

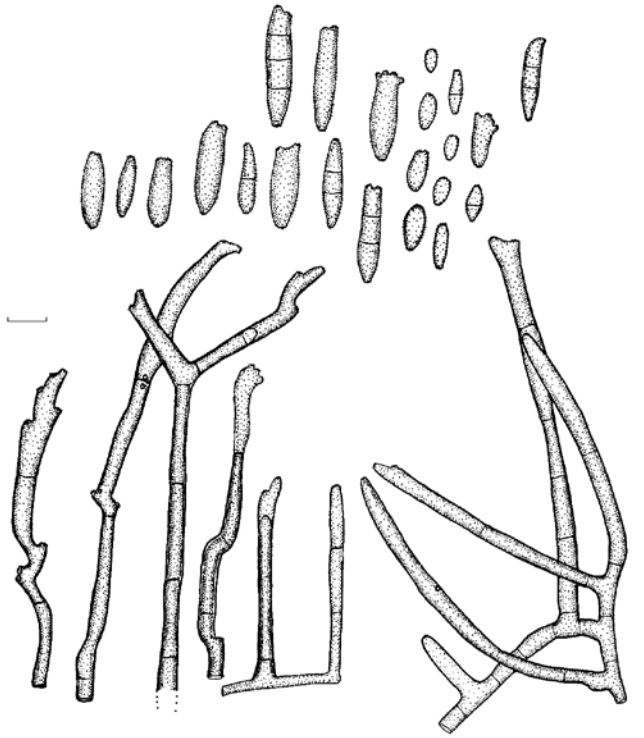


**Fig. 116.** *Cladosporium exobasidii* var. *verruculosum* (HBG). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. B. Heuchert *del*.

*Substrates and distribution*: On *Exobasidium* spp. (*Exobasidiales*); Europe – on *E. vaccinii* var. *vaccinii* (Czech Republic), on *Exobasidium warmingii* (Switzerland).

*Additional specimen examined*: **Switzerland**, near Davos, on *Exobasidium warmingii* on *Saxifraga aizoon*, 22 Jul. 1901, Travel (HBG).

*Notes*: This variety is distinguished from var. *exobasidii* by having verruculose conidia. Conidiophores with nodulose swellings and true ramoconidia are lacking in var. *verruculosum*, but swellings are also not consistently formed in var. *exobasidii*. Otherwise the two varieties are congruent.

**55. *Cladosporium ferox*** (Kabát & Bubák ex Lindau) J.C. David, Mycol. Pap. 172: 40. 1997. Fig. 117.

*Basionym*: *Heterosporium ferox* Kabát & Bubák ex Lindau, Rabenh. Krypt.-Fl., Ed. 2, 1(9): 83. 1910.

≡ *Heterosporium ferox* Kabát & Bubák, Fungi Imperf. Exs., Fasc. 9, No. 444. 1907, *nom. inval.*

*Lectotype* (selected by David 1997): **Czech Republic**, Tábor, botanic garden, on *Ranunculus arvensis* (*Ranunculaceae*), 12 Jul. 1906, Kabát & Bubák, Fungi Imperf. Exs. 444 (BPI 802184).

*Lit*.: Lindau (1910: 83).
*Ill*.: David (1997: 41–42, figs 9–10).
*Exs*.: Kabát & Bubák, Fungi Imperf. Exs. 444.

*In vivo*: Leaf spots amphigenous, small, regular, brown patches. *Mycelium* immersed, branched, septate, hyaline, 2.5–7.5 µm wide. *Stromata* absent. *Conidiophores* densely fasciculate, up to 30, arising from the host surface, erect, sometimes curved, subcylindrical to geniculate-sinuous, above all in the upper half, unbranched, 90–150(–200) × 6–8.5 µm, septate, uniformly pale to medium brown, thin-walled (< 1 µm), smooth, old conidiophores sometimes finely

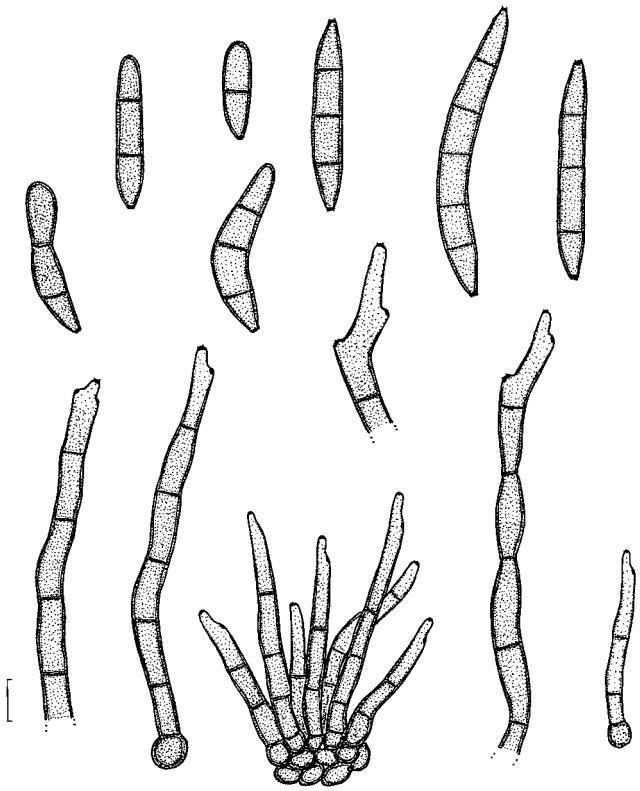


**Fig. 117.** *Cladosporium ferox* (BPI 802184). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. U. Braun *del*.

rough-walled. *Conidiogenous cells* integrated, terminal, 10–40 µm long, conidiogenous loci conspicuous, somewhat protuberant, thickened and darkened, broad and flat, 2.5–3.5 µm diam. *Conidia* solitary, cylindrical to subclavate, straight, occasionally somewhat curved, (25–)30–55(–65) × 7–9 µm, (1–)3–4(–5)-septate, not constricted at the septa, pale olivaceous, thin-walled, smooth, old conidia sometimes finely rough-walled, apex obtuse, broadly rounded, somewhat tapering towards the base, basal hilum not or somewhat protuberant, coronate, with a thickened periclinal rim which may be inclined inwards, central dome conical, 2 µm diam, with a distinct central pore.

*Substrates and distribution*: On *Ranunculus arvensis*; Czech Republic.

*Notes*: Lindau (1910) commented that this species infected aerial parts of the host plant, but not usually the flowers, gradually causing its degeneration until it dies.

## 56. *Cladosporium flabelliforme* Bensch, Summerell, Crous & U. Braun, Stud. Mycol. 67: 45. 2010. Figs 118, 119.

*Holotype*: **Australia**, Northern Territory, Fogg Dam, S 12º34'01" E 131º17'49" isol. from *Melaleuca cajuputi* (*Myrtaceae*), 23 Sep. 2007, coll. B.A. Summerell, isol. P.W. Crous (CBS H-20433). *Ex-type culture*: CBS 126345 = CPC 14523.

*Ill.*: Bensch *et al.* (2010: 46−47, figs 32−33).

*In vitro*: *Mycelium* immersed and superficial; hyphae filiform to cylindrical-oblong, unbranched or sparingly branched, 0.5−1 µm wide, at the base of conidiophores wider, 1.5−2.5 µm wide, septate, not constricted, septa often not very conspicuous, subhyaline to

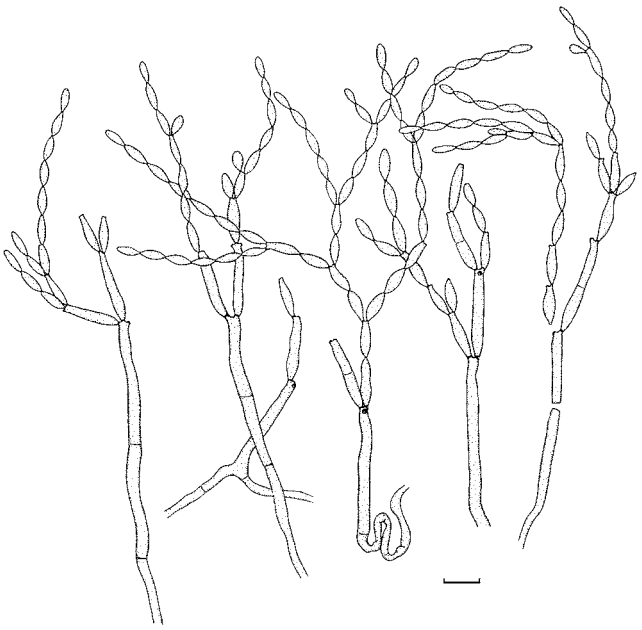


**Fig. 118.** *Cladosporium flabelliforme* (CBS 126345). Conidiophores and conidia in long often dichotomously branched chains *in vitro*. Scale bar = 10 µm. K. Bensch *del*.

very pale olivaceous or pale olivaceous-brown, smooth, walls unthickened, forming dense ropes or filiform hyphae often spirally twisted. *Conidiophores* macronematous, solitary, arising terminally and laterally from hyphae, erect, straight, cylindrical-oblong, neither nodulose nor geniculate, unbranched, 24−90 × 2−3.5(−4) µm, 0−3-septate, not constricted at septa, very pale olivaceous-brown or olivaceous, smooth or finely verruculose, asperulate, walls unthickened and somewhat irregular towards the base. *Conidiogenous cells* integrated, terminal, cylindrical-oblong, neither geniculate nor nodulose, 11−42 µm long, with 1−3 loci at the apex, conspicuous, subdenticulate, 1−1.5 µm diam, thickened and darkened-refractive. *Ramoconidia* occasionally formed, cylindrical-oblong, up to 50 µm long, asperulate as tips of conidiophores, not attenuated towards the base, base about 2.5 µm wide, unthickened and not darkened. *Conidia* catenate, in long branched chains, often dichotomously branched, up to 7(−9) conidia in the unbranched terminal parts of the chain, conidial chains flabellate (spread in a fan-like manner), small terminal conidia obovoid or ellipsoid, 4.5−8 × 1.5−2.5 µm (av. ± SD: 6.1 ± 1.2 × 2.0 ± 0.3), intercalary conidia fusiform to ellipsoid or subcylindrical, 7−16(−18) × 1.5−3 µm (av. ± SD: 10.0 ± 3.0 × 2.5 ± 0.5), aseptate, occasionally with a single septum, attenuated towards apex and base, with 1−2(−3) distal hila, secondary ramoconidia fusiform to cylindrical-oblong, 11−27 × (2−)2.5−3(−3.5) µm (av. ± SD: 19.2 ± 4.9 × 2.8 ± 0.3), aseptate, very pale olivaceous or olivaceous-brown, smooth, walls unthickened, with 2−3(−4) distal hila, hila conspicuous, subdenticulate, 0.5−1.5 µm diam, thickened and darkened-refractive; microcyclic conidiogenesis occasionally occurring.

*Culture characteristics*: Colonies on PDA attaining 50−57 mm diam after 14 d, grey-olivaceous, reverse grey-olivaceous to olivaceous-grey, paler parts olivaceous-buff, floccose to fluffy-felty, margins glabrous, somewhat shiny and slimy, white to olivaceous-buff, aerial mycelium diffuse to somewhat dense, pale olivaceous-grey, floccose to villose, growth low convex to dome-shaped with somewhat elevated colony centre, without conspicuous exudates, sporulation profuse. Colonies reaching 60−80 mm diam after 14 d, smoke-grey

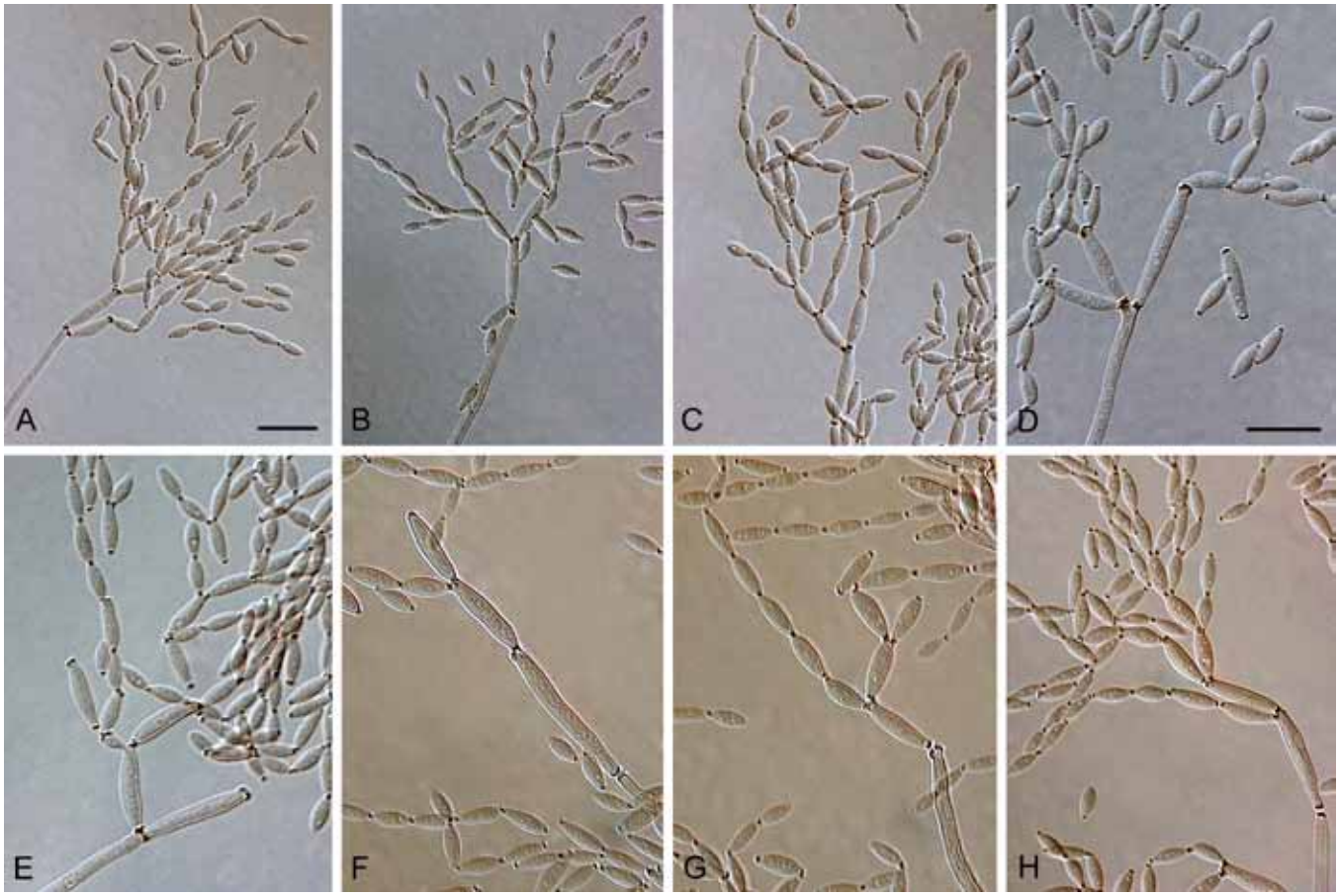



**Fig. 119.** *Cladosporium flabelliforme* (CBS 126345). A–H. Conidiophores and conidial chains. Scale bars = 10 µm.

to olivaceous, grey-olivaceous towards margins, reverse olivaceous-grey, floccose to fluffy, margins white, glabrous to feathery radially furrowed, aerial mycelium whitish forming dense patches, floccose to felty, growth effuse, without prominent exudates, sporulation profuse. Colonies on OA attaining 55−68 mm diam after 14 d, olivaceous-buff to greenish olivaceous, reverse pale olivaceous-grey to olivaceous-grey, greyish sepia in colony centre, floccose, margins colourless, glabrous, aerial mycelium sparse, diffuse, growth flat, somewhat wrinkled, sometimes concentric zones of higher conidiophores and areas of profuse sporulation, without exudates.

*Substrate and distribution*: On *Melaleuca*; Australia.

*Notes*: *Cladosporium flabelliforme*, which clustered as a basal sister to *C. exile* in phylogenetic analyses (Bensch *et al.* 2010, fig. 1, part a), belongs to the *C. cladosporioides* complex, but is well distinguished from allied species by its conidial chains spread in fan-like manner.

**57. *Cladosporium foliorum*** Ellis & Everh. ex K. Schub., Schlechtendalia 14: 65. 2006. Fig. 120, 121.

≡ *Cladosporium foliorum* Ellis & Everh., *in herb.*

*Holotype*: **USA**, California, Amador Co., Pine Grove, *ca.* 2200 m alt., on living leaves of *Angelica breweri* (*Apiaceae*), Aug. 1896, G. Hansen, No. 1362 (BPI 426581). *Isotype*: BPI 426580.

*Lit.*: Schubert (2005b: 70–71).
*Ill.*: Schubert (2005b: 71, fig. 24, pl. 9, figs F–I), Schubert *et al.* (2006: 66, fig. 4, pl. 1, fig. F).

*In vivo*: Leaf spots amphigenous, formed as extended pale ochraceous to yellowish orange discolorations, often limited by leaf veins, appearing somewhat angular-irregular, at first at leaf margins, later spreading towards the midrib, covering large areas of the leaf surface, later becoming somewhat darker, small segments orange-brown or pale to medium brown and somewhat shiny, without margin, rarely with a narrow brownish margin. *Colonies* amphigenous, sparingly fruiting and not very conspicuous, often at the tips of the leaves, loosely caespitose, pale brown to brown. *Mycelium* internal, subcuticular to intraepidermal; hyphae branched, 2–8 µm wide, septate, sometimes with small swellings and constrictions, subhyaline to pale olivaceous-green, smooth or almost so, walls slightly to distinctly thickened, radiating, forming loose to dense stromatic hyphal plates (*Fusicladium*-like growth), interconnecting stromata, hyphal cells angular, cylindrical-oblong, polygonal, 5–10(–15) µm long, sometimes irregularly lobed, pale yellowish to pale yellowish-brown. *Stromata* compact, 15–50 µm diam, usually substomatal, composed of swollen hyphal cells, 3–10 µm wide, medium brown to somewhat reddish brown, smooth or almost so, thick-walled. *Conidiophores* fasciculate, in small to moderately large fascicles, arising from stromata, emerging through stomata, rarely solitary, arising from hyphae, erect, substraight to somewhat flexuous, narrowly cylindrical-oblong to filiform, often apically slightly geniculate-sinuous, non-nodulose, unbranched or once branched, 25–120 × 3–5 µm, 1–4-septate, septa not very conspicuous, subhyaline to pale brown, almost smooth to minutely verruculose throughout, walls one-layered, somewhat thickened, sometimes slightly swollen at the base, up to 7 µm wide, protoplasm of the cells somewhat aggregated at the septa, but not very conspicuous. *Conidiogenous cells* integrated, terminal and intercalary, cylindrical-oblong, often slightly geniculate, 13–51 µm

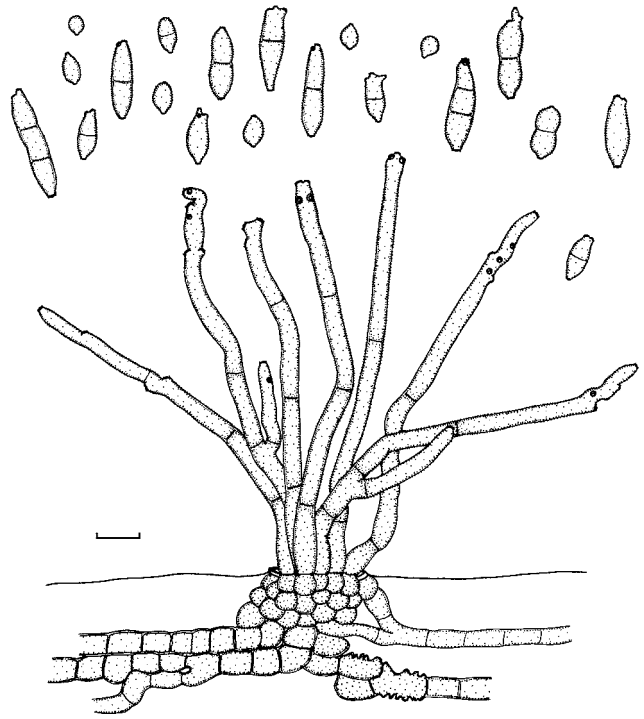


**Fig. 120.** *Cladosporium foliorum* (BPI 426581). Fascicle of conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

long, proliferation sympodial, with few conidiogenous loci situated on small lateral shoulders, protuberant, well differentiated in a raised dome and a periclinal rim, 1–2 µm diam, thickened, somewhat darkened-refractive. *Conidia* catenate, in branched chains, straight to slightly curved, subglobose, obovoid, ellipsoid to cylindrical, 4–26 × (2.5–)3.5–6 µm, 0–1(–2)-septate, sometimes slightly constricted at the septa, pale brown, verruculose, walls slightly thickened, apex and base rounded or somewhat attenuated, hila protuberant, (0.5–)1–2 µm diam, thickened, somewhat darkened-refractive; microcyclic conidiogenesis occurring.

*Substrate and distribution*: On *Angelica breweri*; USA.

*Notes*: With its radiating hyphal plates *C. foliorum* resembles species of the genus *Fusicladium*, but it is quite distinct from the latter genus in having cladosporioid conidiogenous loci and hila with a central convex dome and a raised periclinal rim. *Cladosporium dracaenatum* is morphologically close to *C. foliorum* but clearly separated by longer, pluriseptate conidiophores and 0–3-septate conidia. With age the conidia become more frequently septate (up to 7), longer and above all wider, giving rise to secondarily formed conidiophores. Other *Cladosporium* species described on a host belonging to *Apiaceae* were excluded from this genus and reallocated to *Passalora* [*e.g. C. depressum* ≡ *Passalora depressa*] or *Pseudocercospora* [*C. punctiforme* = *Pseudocercospora saniculae-europaeae*].

**58. *Cladosporium fraxinicola*** K. Schub. & Mułenko, Schlechtendalia 14: 67. 2006. Figs 122–125.

*Holotype*: **Germany**, Sachsen-Anhalt, Halle (Saale), Neuwerk/ Jägerplatz, Kindergarten, on *Fraxinus excelsior* (*Oleaceae*),

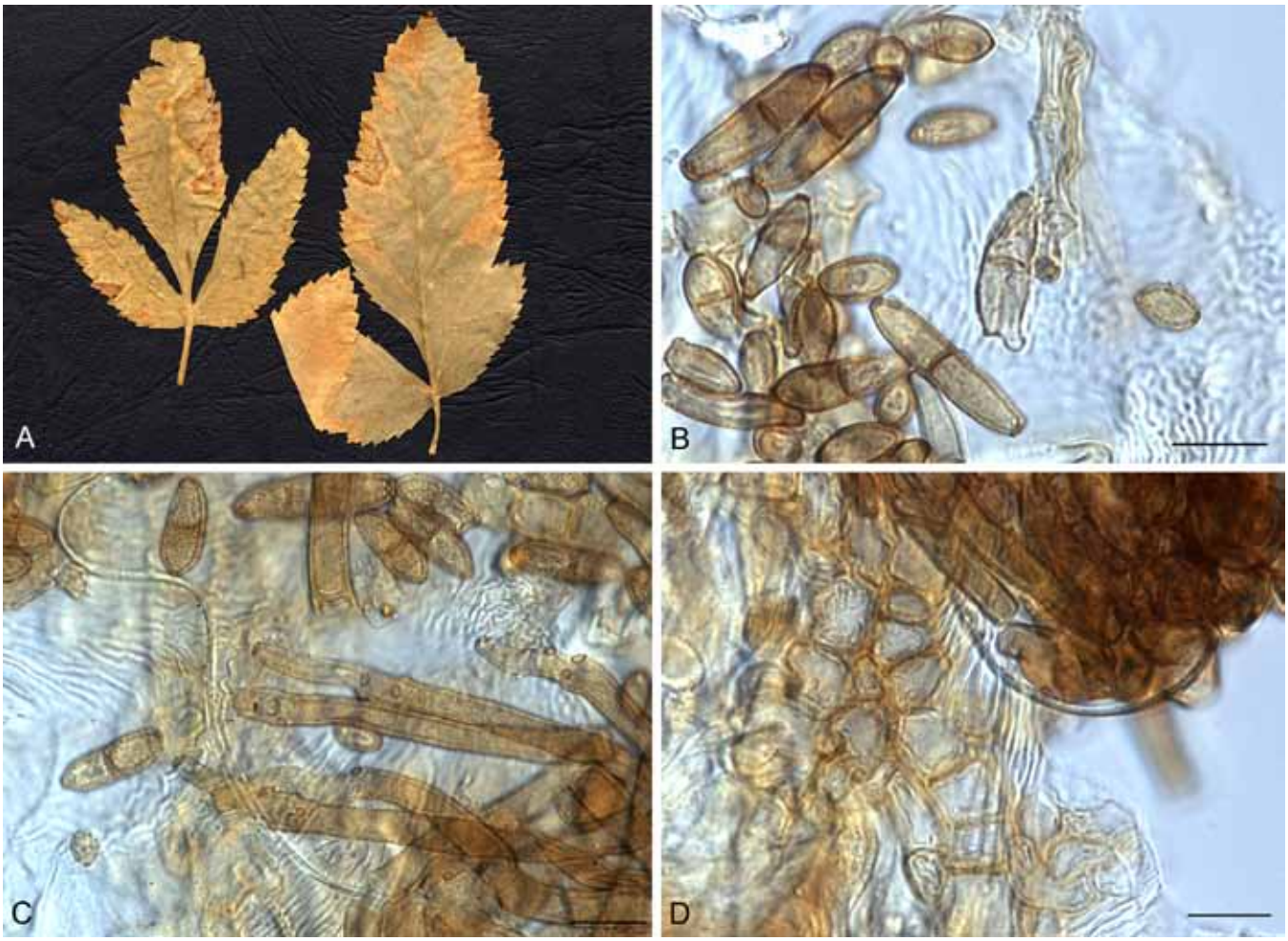



**Fig. 121.** *Cladosporium foliorum* (BPI 426581). A. Symptoms. B. Conidia. C. Conidiophores and conidia. D. Mycelium. Scale bars = 10 (B–D) µm.

23 Jun. 2004, K. Schubert (HAL 1829 F). *Paratypes*: **Germany**, Sachsen-Anhalt, Halle (Saale), Neuwerk/Jägerplatz, Kindergarten, on *Fraxinus excelsior*, 2 Aug. 2004, K. Schubert (HAL 1830 F) and Braun, Fungi Sel. Exs. 47; **Poland**, Lublin, street margin, 10 Aug. 2004, W. Mułenko (HAL 1831 F) and Braun, Fungi Sel. Exs. 48.

*Lit*.: Schubert (2005b: 73).
*Ill*.: Schubert (2005b: 72–75, figs 25–27, pl. 12, figs A–H), Schubert *et al*. (2006: 68–70, figs 5–7, pl. 1, figs H–I).
*Exs*.: Braun, Fungi Sel. Exs. 47, 48.

*In vivo*: On living leaves, causing leaf spots, amphigenous, variable in shape and size, subcircular to oval-elliptical or irregularly in outline, 3–8 mm wide, effuse, then usually irregular in shape, up to 45 mm long or even longer, confluent, covering large areas of the leaf surface, pale to medium brown or even dark brown, somewhat darker in the centre, somewhat zonate, surrounded by a narrow, irregular, dark brown or even reddish brown margin, on the lower leaf surface spots paler. *Colonies* epiphyllous or hypophyllous, scattered, punctiform, caespitose, loose to somewhat denser, pale to dark brown or blackish, villose. *Mycelium* internal and external, hyphae sometimes emerging through stomata and growing superficially; hyphae sparingly branched, 3.5–6(–8) µm wide, septate, subhyaline to very pale olivaceous, smooth, walls only slightly thickened, often swollen, swollen hyphal cells subglobose to somewhat angular, 7–14 µm wide, pale to medium olivaceous-brown. *Stromata* absent. *Conidiophores* solitary or in small loose groups, arising from internal and external hyphae or swollen hyphal cells, erumpent through the cuticle, emerging through stomata or growing superficially, erect, straight to slightly flexuous, often geniculate-sinuous, somewhat subnodulose, unbranched or branched, 12–265 × (2.5–)4–9 µm, septate, pale olivaceous to olivaceous-brown, smooth, walls slightly to distinctly thickened, sometimes even two-layered, slightly attenuated towards the apex, lumen sometimes granular. *Conidiogenous cells* integrated, terminal or intercalary or conidiophores reduced to conidiogenous cells, 10–52 µm long, proliferation sympodial, with a single to several protuberant conidiogenous loci, 1–3 µm diam, thickened, darkened-refractive. *Conidia* catenate, in branched chains, straight, small terminal conidia (without apical hila) subglobose, ovoid, obovoid to ellipsoid, 2.5–10 × 2–4.5 µm, intercalary conidia and secondary ramoconidia limoniform, ellipsoid, fusiform to cylindrical, 6.5–31 × 3.5–6 µm, 0–2(–3)-septate, rarely somewhat constricted at the septa, pale olivaceous, smooth to minutely verruculose, walls only slightly thickened, lumen sometimes appearing to be granular, apex rounded or truncate, somewhat attenuated towards the apex and base, base truncate to slightly convex, hila (0.5–)1–3 µm diam, thickened, darkened-refractive; microcyclic conidiogenesis occurring.

*Substrate and distribution*: On *Fraxinus excelsior*; Europe (Germany, Poland).

*Notes*: *Cladosporium fraxinicola* is comparable with *C. myrtacearum* (Braun *et al*. 2005) and *C. psoraleae* (Ellis 1976) but has deviating characters of conidiophores, conidia and conidiogenous loci (Schubert *et al.* 2006). Attempts to grow *C. fraxinicola* in culture failed.

Several *Cladosporium* taxa have been described from *Fraxinus* spp. *Cladosporium acutum* is conspecific with *C. herbarum*. *Cladosporium desmotrichum* (Desmazières 1851) was described to have fasciculate conidiophores with hyaline tips and 0–1-septate, colourless conidia. Type material of this species could not be traced at PC. Original material of *C. fumago* f. *fraxini* (*nom. nud*., Thümen, Herb. Mycol. Oecon. 375, B 700006422) consists of green leaves

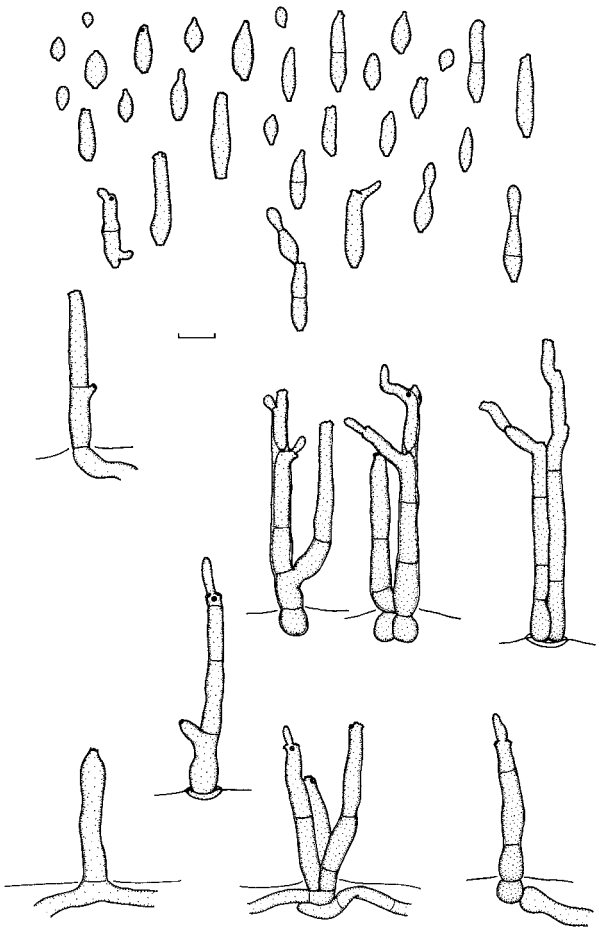


**Fig. 122.** *Cladosporium fraxinicola* (HAL 1829 F). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

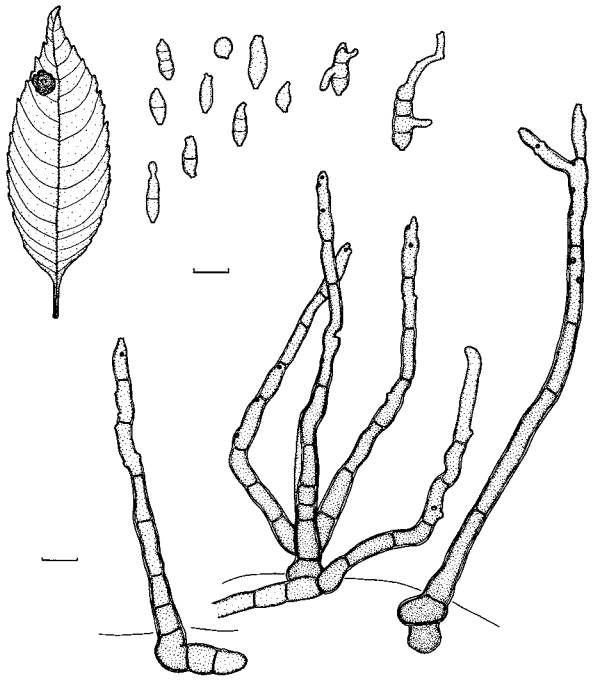


**Fig. 123.** *Cladosporium fraxinicola* (HAL 1830 F, paratype). Symptoms, conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

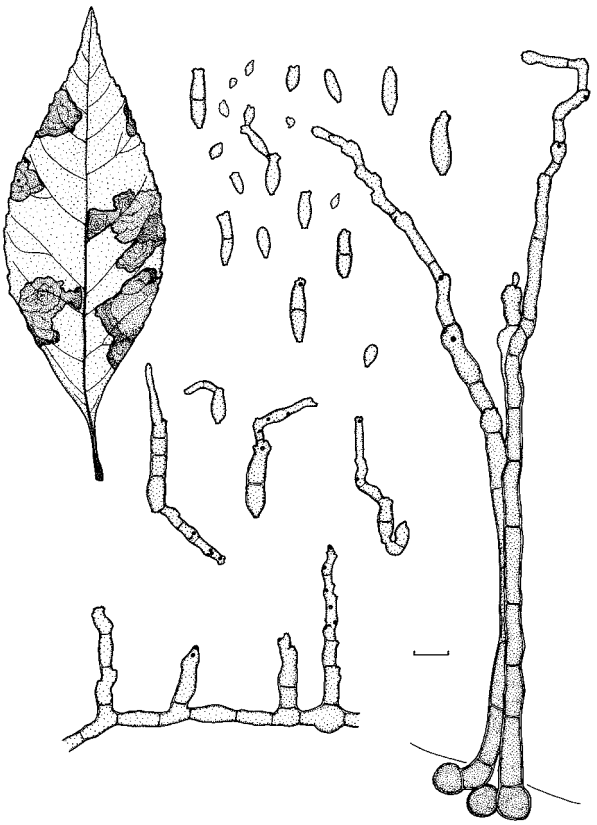


**Fig. 124.** *Cladosporium fraxinicola* (HAL 1831 F, paratype). Symptoms, conidiophores, conidia and microcyclic conidiogenesis *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

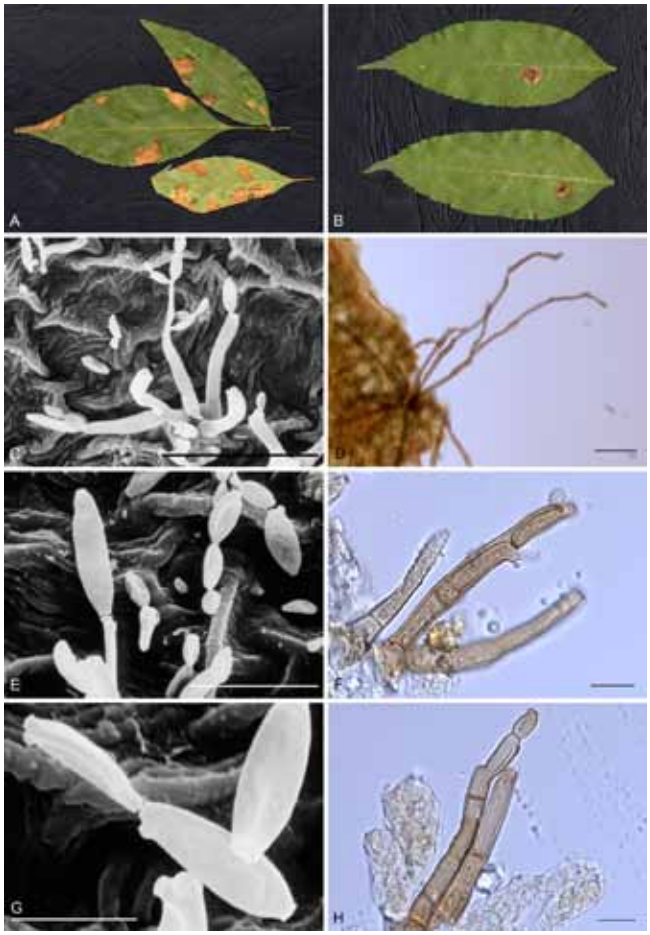


**Fig. 125.** *Cladosporium fraxinicola* (HAL 1829 F and paratype HAL 1831 F). A, B. Symptoms. C, D. Fascicle of conidiophores. E. Tip of a conidiophore with still attached conidium and several conidia. F, H. Conidiophores. G. Conidial chain with conidia just separating but still attached at the central domes. Scale bars = 10 (F–H), 20 (E), 50 (C–D) µm.

infected with several hyphomycetes, including a *Trimmatostroma*-like hyphomycete and *C. herbarum*. The taxonomic status of *C. simplex* Schwein., described from the USA, is quite unclear since the type material is too meagre and the original description (Schweinitz 1832) too brief and non-informative for a final conclusion.

**59. *Cladosporium fumagineum*** Sacc., Nuovo Giorn. Bot. Ital., N.S., 27: 86. 1920. Fig. 126, 127.

*Lectotype* (**designated here**): **USA**, Wyoming, Cook Co., Devils Tower, on living leaves of *Quercus* sp. (*Fagaceae*), 28 Jul. 1918, J.R. Weir, No. 10025 (PAD). *Isolectotype*: BPI 426763.

*Lit.*: Saccardo (1931: 791), Schubert (2005b: 76–77).
*Ill.*: Schubert (2005b: 76, fig. 28, pl. 13, figs A–C).

*In vivo*: Leaf spots amphigenous, oval to somewhat irregular, often confluent, epiphyllous spots pale greyish brown to pale reddish brown, margin indefinite or narrow and somewhat darker reddish brown, sometimes surrounded by a narrow whitish grey halo, hypophyllous olivaceous-brown to dark brown, surrounded by a narrow pale yellowish to pale reddish brown halo. *Colonies* hypophyllous, effuse, densely caespitose, dark brown, not vein-limited, velvety. *Mycelium* internal and external; hyphae branched, 2–5 µm wide, septate, often slightly constricted at the septa, pale olivaceous to olivaceous-brown, smooth, walls slightly thickened, often with small swellings, up to 7 µm wide, forming a loose hyphal network. *Conidiophores* solitary or in small loose groups of 2–3, arising from internal and external creeping hyphae, terminal and lateral, erect, straight to somewhat flexuous, slightly geniculate-sinuous towards the apex, unbranched or once branched, 14–150 × 3–5.5 µm, septate, olivaceous-brown, somewhat paler towards the apex, smooth, walls thickened. *Conidiogenous cells* integrated, terminal and intercalary, cylindrical, 7–25 µm long, somewhat geniculate-sinuous, proliferation sympodial, with a single to several conidiogenous loci, subdenticulate, truncate to slightly convex, 1–2 µm diam, thickened, darkened-refractive. *Conidia* catenate, in unbranched or branched chains, straight to slightly curved, subglobose, ovoid, obovoid, ellipsoid, fusiform to subcylindrical, 2.5–25 × 2.5–5.5 µm, 0–2(–3)-septate, sometimes constricted

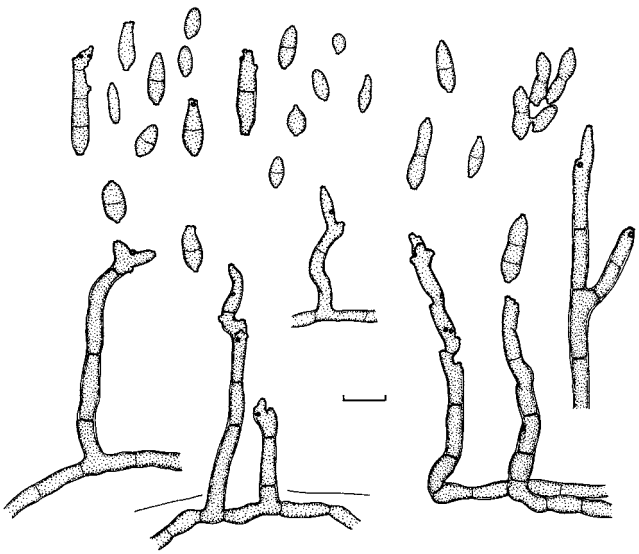


**Fig. 126.** *Cladosporium fumagineum* (PAD). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.


**Fig. 127.** *Cladosporium fumagineum* (PAD). A. Conidiophores, somewhat geniculate-sinuous towards the apex. B, C. Conidia. Scale bars = 10 (A–C) µm.

at the septa, olivaceous to olivaceous-brown or medium brown, smooth, walls only slightly thickened, apex often rounded, hila protuberant, truncate to slightly convex, 0.5–2 µm diam, somewhat thickened and darkened-refractive; microcyclic conidiogenesis not observed.

*Substrate and distribution*: On *Quercus* sp.; USA.

*Notes*: This species is morphologically close to some collections of *C. uredinicola* on *Phyllactinia angulata* on leaves of *Quercus* sp. However, no powdery mildew fungi could be observed on the leaves of the lectotype material, and leaf spots are formed. Since *C. uredinicola* is a fairly variable, fungicolous species mainly occurring on uredospores of several rust fungi, which mostly produces much longer conidia (Heuchert *et al*. 2005), *C. fumagineum* is tentatively maintained as a separate species. Additional collections are needed to clarify the taxonomic status of this taxon.

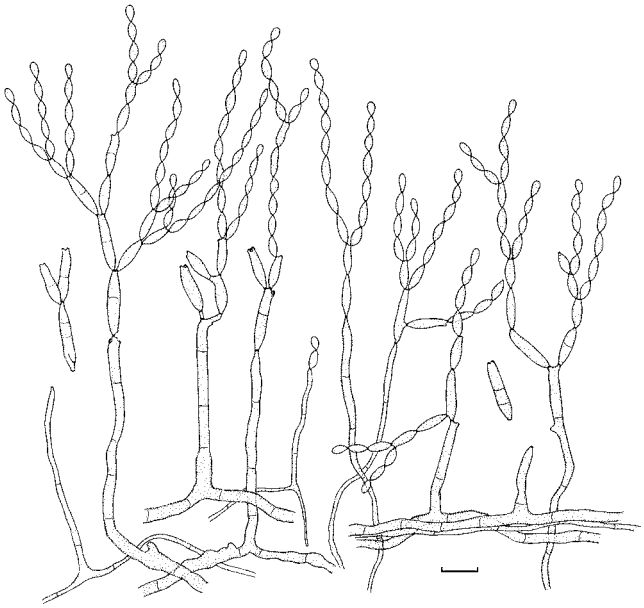


**Fig. 128.** *Cladosporium funiculosum* (CBS 122129). Macro- and micronematous conidiophores, mycelium sometimes formed in ropes and conidial chains *in vitro*. Scale bar = 10 µm. K. Bensch *del*.

**60. *Cladosporium funiculosum*** W. Yamam., Sci. Rep. Hyogo Univ. Agric., Ser. Agric. 4(1): 5. 1959. Figs 128, 129.

*Holotype*: **Japan**, isol. from leaves of *Vigna umbellata* [= *Phaseolus chrysanthos*] (*Fabaceae*), probably authentic strain of *C. funiculosum*. *Ex-type culture*: CBS 122129 = ATCC 38010 = IFO 6537 = JCM 10683.

*Lit*.: Bensch *et al.* (2010: 47−49).
*Ill*.: Bensch *et al.* (2010: 48, figs 34−35).

*In vitro*: *Mycelium* immersed and superficial, hyphae loosely branched, filiform to cylindrical-oblong or irregular in outline due to swellings, 1–3 µm wide, septate, smooth or mostly loosely verruculose to densely verruculose *Zasmidium*(*Stenella*)-like, walls unthickened, sometimes forming ropes. *Conidiophores* micronematous to semimacronematous, solitary, arising terminally and laterally from plagiotropous or ascending hyphae or hyphal strains, filiform to narrowly cylindrical-oblong, neither geniculate nor nodulose, unbranched, occasionally once branched, 10−120 × 2−3(−4) µm, usually rather short, 0−2(−5)-septate, not constricted at septa, subhyaline to pale olivaceous, smooth to minutely verruculose, walls unthickened, sometimes hardly distinguishable from hyphae, sometimes irregular in outline due to swellings and constrictions. *Conidiogenous cells* integrated, terminal, sometimes intercalary, proliferation often distinctly sympodial, but neither geniculate nor nodulose, 10−33 µm long, with 1−3 loci at the apex, sometimes few additional loci at a lower level, subdenticulate, 1−1.5 µm diam, somewhat thickened and darkened-refractive. *Ramoconidia* not formed. *Conidia* catenate, in long unbranched or basely, often dichotomously branched chains, up to 8(−14) conidia in the unbranched terminal part, straight, small terminal conidia subglobose, obovoid, narrowly ovoid, ellipsoid, sometimes narrowly obclavate, 2.5−5 × 1.5−2 µm (av. ± SD: 4.3 ± 1.0 × 1.7 ± 0.3), aseptate, intercalary conidia narrowly ellipsoid, fusiform to subcylindrical, 5−16 × (1.5−)2−3 µm (av. ± SD: 9.3 ± 3.3 × 2.6 ± 0.4), 0−1-septate, with 1−2 distal hila, secondary ramoconidia ellipsoid to subcylindrical or cylindrical, 7−23(−27) × 2.5−3.2(−4) µm (av. ± SD: 15.6 ± 5.1 × 2.9 ± 0.3), 0−1(−2)-septate, not constricted at septa, septum often somewhat in the upper half, with (1−)2−3 distal hila, often

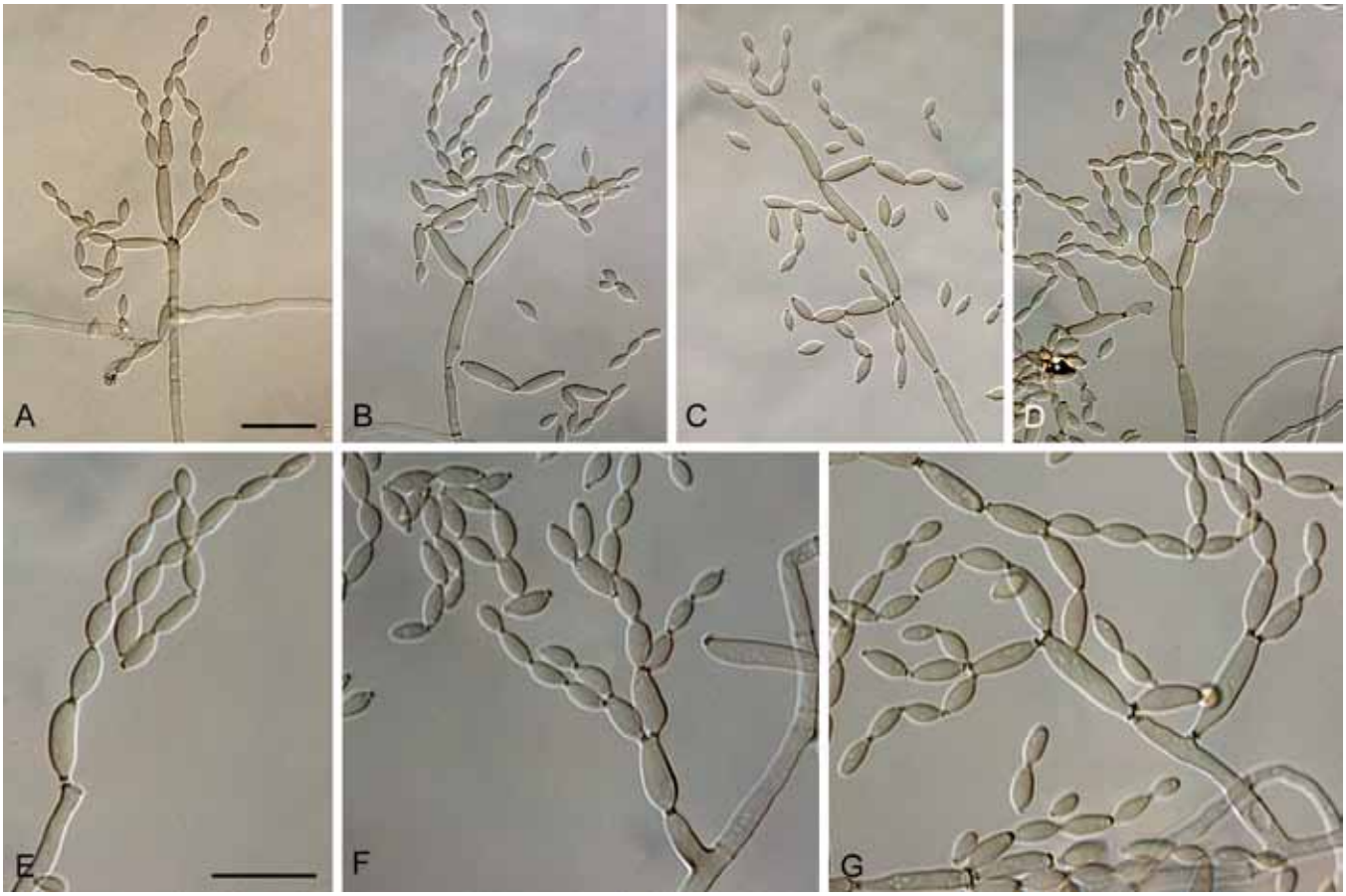



**Fig. 129.** *Cladosporium funiculosum* (CBS 122129). A–E, G. Macronematous conidiophores and conidial chains. F. Micronematous conidiophore with conidial chains. Scale bars = 10 µm.

with a second hilum near the base forming additional conidia "backwards", subhyaline to pale olivaceous, smooth, walls unthickened, slightly to distinctly attenuated towards apex and base, cell structure granular, hila conspicuous, subdenticulate, 0.5−1.5 µm diam, somewhat thickened and darkened-refractive; microcyclic conidiogenesis not observed.

*Culture characteristics*: Colonies on PDA attaining 65−78 mm diam after 14 d, glaucous-grey or iron-grey to black, olivaceous towards margins, reverse greenish grey to grey-olivaceous or dark mouse-grey to black, floccose, felty-woolly to shiny, margin white to olivaceous, feathery, regular, aerial mycelium abundant, floccose to villose, low to high, mainly in colony centre, growth effuse to low convex, somewhat wrinkled, with numerous small to large prominent exudates, sometimes coalescing, forming slimy ring-like structures in colony centre, not sporulating. Colonies on MEA reaching up to 80 mm diam after 14 d, pale olivaceous-grey to buff or rosy-buff, reverse olivaceous-grey, brick to dark brick towards margins, zonate, floccose to felty, margin white, glabrous to feathery, narrow, regular, aerial mycelium abundant, covering most of the colony surface, floccose to felty, dense, low, growth effuse, radially furrowed and wrinkled, without prominent exudates, not sporulating. Colonies on OA attaining 58−67 mm diam after 14 d, white to smoke-grey, pale olivaceous-grey or olivaceous-grey, colony centre buff or rosy-buff, reverse pale olivaceous-grey to fawn, floccose to felty, margins colourless to white, glabrous, regular, aerial mycelium abundant, covering the whole surface, floccose to felty, growth flat, with numerous small prominent exudates, not sporulating.

*Substrate and distribution*: On *Vigna*; Japan.

*Notes*: Due to smooth conidia, *C. funiculosum* belongs to the *C. cladosporioides* complex. The history of description, typification and deposited cultures of this species is, however, somewhat confusing and intricate. CBS strains of *C. funiculosum* are subcultures of authentic strains deposited at the IFO culture collection. Bensch *et al.* (2010) included two strains of *C. funiculosum* in the phylogenetic studies of this complex. One of these (CBS 122128 = ATCC 16160 = IFO 6536 = JCM 10682) was named *C. coralloides* and should represent an authentic strain of the latter species but this seems to be a different species. The two strains are both phylogenetically (see Bensch *et al.* 2010, fig. 1, part b as sister to *C. pseudocladosporioides*) and morphologically identical whereas *C. coralloides*, an invalidly published name isolated from *Ficus carica* and *Oryza sativa*, is to be excluded from the genus *Cladosporium* since the scar structure is not cladosporioid. A dried specimen from BPI was re-examined agreeing with the species description published in Yamamoto (1959) and shows *Metulocladosporiella*-like structures. The "lectotype" of *C. coralloides* in Ho *et al.* (1999) was inappropriately designated since it was not an element from the protologue of the original description. Furthermore, sequence data of DNA from ATCC 16160 do not cluster with *C. funiculosum* but represent another species. Conidiophore measurements and the species epithet "*funiculosum*" introduced in Yamamoto (1959) very probably refer to hyphal strands and not conidiophores since these are often hardly distinguishable from hyphae or hyphal strands.

**61. *Cladosporium fusicladiiformis*** Gonz. Frag., Trab. Mus. Nac. Ci. Nat., Ser. Bot. 10: 188. 1916. Figs 130, 131.

*Holotype*: **Spain**, near Dos Hermanas, Sevilla, on living leaves of *Eriobotrya japonica* (*Rosaceae*), 22 Mar. 1915, Gonzáles-Fragoso (MA 06413).

*Lit*.: Gonzáles-Fragoso (1927: 205), Saccardo (1931: 795), Schubert (2005b: 77–79).
*Ill*.: Schubert (2005b: 78, fig. 29, pl. 14, figs A–G).

*In vivo*: On living leaves, leaf spots amphigenous, numerous, scattered, rarely somewhat oblong, up to 8 mm diam, later confluent, later pale greyish brown by the detached cuticle, margin indefinite or surrounded by a narrow, dark brown margin. *Colonies* mostly hypophyllous, in small tufts, loosely scattered over leaf spots, filiform, brown, villose. *Mycelium* internal, subcuticular to intraepidermal, sometimes also external, growing superficially, occasionally growing in leaf hairs; hyphae branched, (1–)2–5(–7) µm wide, septate, often with swellings and constrictions, subhyaline, pale to pale medium brown or somewhat yellowish brown, smooth, walls somewhat thickened. *Stromata* usually well-developed, substomatal, occasionally intraepidermal, 20–50 µm diam, few layers deep, composed of swollen hyphal cells, more or less subglobose, 3–11 µm diam, medium brown or somewhat yellowish brown, smooth, thick-walled. *Conidiophores* dimorphic, fasciculate, usually in small loose fascicles (up to 10), arising from stromata, mostly emerging through stomata, sometimes erumpent through the cuticle, erect, more or less flexuous, cylindrical-oblong to filiform, shorter conidiophores geniculate-sinuous, unbranched or branched, 20–300 × 3–6.5(–8) µm, sometimes nodulose, with small intercalar swellings, up to 7 µm diam, attenuated towards the apex and slightly swollen at the base, up to 10 µm wide, pluriseptate, sometimes slightly constricted at the septa, medium brown, paler towards the apex, sometimes subhyaline at the apex, smooth to somewhat asperulate, especially in the lower part, thick-walled, often distinctly two-layered, 0.5–1.5 µm wide, walls thinner towards the apex, occasionally enteroblastically proliferating, cell structure apparently distoseptate, with protoplasm aggregated near the septa and a paler cavity in the centre of the cells; second type of conidiophores shorter, narrower and paler, solitary, arising from superficially growing hyphae or swollen hyphal cells, erect, more or less straight, unbranched, 8–45 × 2–4 µm, septate, pale olivaceous, smooth, walls somewhat thickened, not distinctly two-layered. *Conidiogenous cells* integrated, terminal and intercalary, cylindrical-oblong, 5–30 µm long, proliferation sympodial, with few to numerous, sometimes crowded conidiogenous loci, sometimes situated on small lateral shoulders or intercalar and terminal swellings, but not confined to them, somewhat protuberant, truncate and flat to slightly convex, 1–2 µm diam, thickened, often not darkened, but somewhat refractive. *Ramoconidia* not observed. *Conidia* catenate, in branched chains, obovoid, ellipsoid, fusiform, subcylin-drical, 3.5–14(–20) × 2.5–6 µm, 0–1(–2)-septate, septa not very conspicuous, sometimes slightly constricted at the septa, very pale, subhyaline to very pale brown, smooth or almost so, occasionally minutely verruculose, walls somewhat thickened, sometimes apparently two-layered, ends rounded or slightly attenuated, hila more or less protuberant, slightly convex, 0.5–2 µm diam, thickened, refractive, sometimes slightly darkened; microcyclic conidiogenesis sometimes observed.

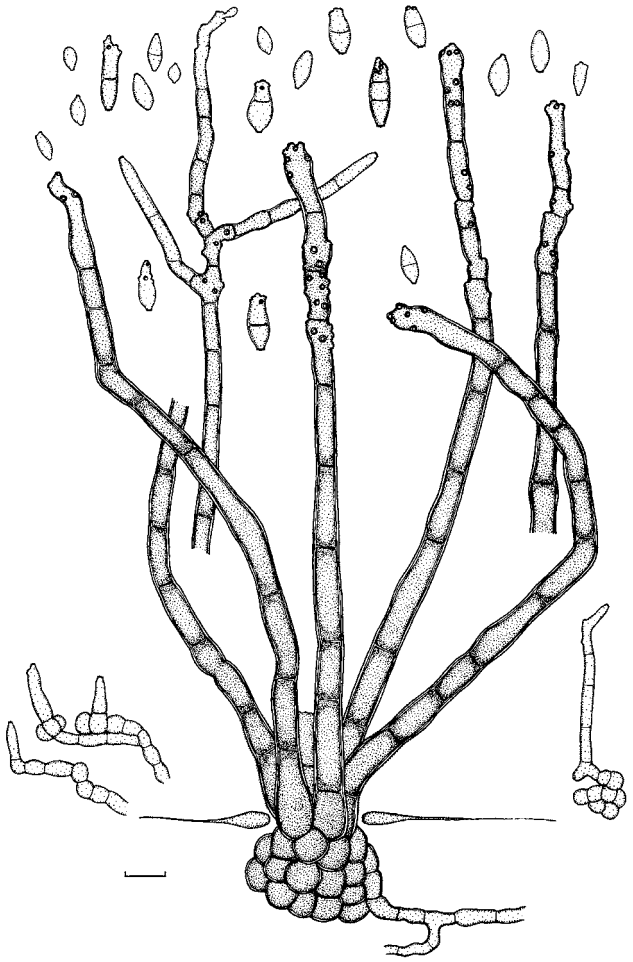


**Fig. 130.** *Cladosporium fusicladiiformis* (MA 06413). Dimorphic conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

*Substrate and distribution*: On *Eriobotrya japonica*; Spain.

*Notes*: In Saccardo (1931), *C. fusicladiiformis* was discussed as being similar to *Fusicladium eriobotryae*, but the latter species, which proved to be conspecific with *F. pomi* (Schubert *et al*. 2003), is quite distinct by having percurrently proliferating conidiogenous cells and non-coronate conidiogenous loci. Furthermore, Saccardo (1931) stated that *C. eriobotryae* and *C. nervisequum*, both described on leaves of *Eriobotrya japonica* and antedating *C. fusicladiiformis*, differ from the latter species. The conidia of *C. nervisequum* were described to be oblong, 1–3-septate, longer and abobe all wider, 10–25 × 5–10 µm (Montagne 1857), but type material of the latter species could not be traced and re-examined. The conidiophores of *C. eriobotryae*, neotypified above by a collection from Germany (Botanical Garden, Berlin), are caespitose, usually unbranched and short, 20–120 × 3–8 µm, and the conidia 1–3(–4)-septate, verruculose and darker. Dimorphic conidiophores have not been seen. Most of the other *Cladosporium* species described on hosts belonging to the *Rosaceae* have been excluded from the genus (Braun *et al*. 2003, Schubert *et al*. 2003, Schubert 2005b) or proved to be synonyms of the widespread *C. herbarum* and *C. cladosporioides*. *Cladosporium diaphanum* on *Photinia glabra* is distinguished by having 0–6-septate, longer and wider conidia and somewhat wider conidiogenous loci and hila.

*Cladosporium apicale* on *Cycas circinalis* and *C. ushuwaiense* known from Argentina on *Berberis ilicifolia* are morphologically comparable with *C. fusicladiiformis* but do not possess dimorphic conidiophores. Furthermore, they deviate in having conidiophores

**Fig. 131.** *Cladosporium fusicladiiformis* (MA 06413). A. Symptoms. B. Overview, fascicle of conidiophores. C. Dimorphic conidiophores, second type. D. Tip of a conidiophore. E, G. Conidiophores showing cell structure, with thickened, two-layered walls and protoplasm aggregated at the septa. F. Conidia. Scale bars = 10 (C–G), 50 (B) µm.

with thicker walls [0.75–3 µm wide in *C. apicale*; 0.5–2(–3) µm wide in *C. ushuwaiense*], the conidia of *C. apicale* are 0–3-septate, and the conidia of *C. ushuwaiense* differ in being usually verruculose.

**62. *Cladosporium fusiforme*** Zalar, de Hoog & Gunde-Cimerman, Stud. Mycol. 58: 169. 2007. Fig. 132.

*Holotype*: **Slovenia**, Sečovlje salterns, isol. from hypersaline water, Dec. 1999, L. Butinar (CBS H-19732). *Ex-type culture*: EXF-449 = CBS 119414.

*Ill.*: Zalar *et al*. (2007: 171, fig. 7).

*In vitro*: *Mycelium* sparingly branched, 1−4 µm wide, septate, pale to medium olivaceous-brown, sometimes subhyaline, minutely verruculose or smooth, walls unthickened, without extracellular polysaccharide-like material. *Conidiophores* solitary, semimacronematous to macronematous, arising terminally and laterally from hyphae, erect, straight to slightly flexuous, cylindrical-oblong to filiform, neither nodulose nor geniculate, unbranched to branched, branches often only as short denticle-like lateral prolongation just below a septum, sometimes almost every single cell with a peg-like lateral outgrowth, often to the same direction, (10−)20−170(−200) × (2−)2.5−3.5(−5) µm, regularly septate with 0−8 septa, not constricted at the often darkened septa, subhyaline, pale to medium olivaceous-brown, smooth or almost so to asperulate or irregularly rough-walled, walls only slightly thickened, < 1 µm wide, conidiophores often secede at septa forming ramoconidia and fragments. *Conidiogenous cells* integrated, terminal and intercalary, cylindrical-oblong, (11−)15−57 µm long, with 2−3 apical subdenticulate loci, 1−1.8 µm diam, thickened and darkened-refractive. *Ramoconidia* often formed, subcylindrical to cylindrical-oblong, 15−40 × 3−3.5(−4) µm, 0(−1)-septate. *Conidia* catenate, in branched chains, branching in all directions, with up to five conidia in the unbranched part, small terminal conidia obovoid to fusiform, 3.5−5(–6.5) × 2−2.5(–3) µm (av. ± SD: 3.9 ± 0.6 × 2.3 ± 0.3), intercalary conidia fusiform to ellipsoid, 5−8(−9) × 2−3(−3.5) µm (av. ± SD: 6.5 ± 1.1 × 2.8 ± 0.4), with up to three distal hila, secondary ramoconidia ellipsoid, fusiform to subcylindrical or cylindrical, (7−)8−24(−31) × (2−)3−3.5(−4) µm (av. ± SD: 14.1 ± 5.5 × 3.2 ± 0.4), aseptate, with 2−3(−4) distal hila, pale brown, smooth or almost so to minutely verruculose, walls unthickened or only slightly thickened, attenuated towards apex and base, hila conspicuous, 0.5−1.8 µm diam, thickened and darkened-refractive; microcyclic conidiogenesis not occurring.

*Culture characteristics*: Colonies on PDA reaching 32−46 mm diam after 1 month, grey-olivaceous to dark herbage-green at margins, reverse leaden-grey to iron-grey, velvety, margin narrow, feathery, aerial mycelium sparse, hairy, diffuse, growth flat or sometimes with elevated colony centre, without prominent exudates. Colonies on MEA reaching 38 mm diam after 1 month, pale olivaceous to olivaceous or grey-olivaceous, reverse olivaceous-grey to iron-grey, velvety to powdery, sometimes felty, margin narrow, white, feathery, regular, radially furrowed, aerial mycelium sparse, felty, loose, high, without prominent exudates. Colonies on MEA + 5 % NaCl reaching 28–43 mm diam, olive, granular due to profuse sporulation, slightly furrowed with flat, olive-grey margin, reverse dark green. Colonies on OA attaining 53−64 mm diam after 1 month, pale olivaceous to olivaceous, reverse iron-grey to leaden-grey, velvety to powdery, margin white, feathery, aerial mycelium absent or sparse, growth flat, prominent exudates not formed, sporulation profuse on all media. *Maximum tolerated salt concentration*: 75 % of tested strains develop colonies at 20 % NaCl after 7 d, while after 14 d all strains grow and sporulate. *Cardinal temperatures*: No growth at 4 and 10 °C, optimum 25 °C (30–32 mm diam), maximum 30 °C (2–15 mm diam), no growth at 37 °C (from Zalar *et al.* 2007).

*Substrates and distribution*: Saprobic, isolated from chicken food (Canada), hypersaline water (Slovenia) and on chasmothecia of powdery mildew fungi (USA).

*Additional specimens examined*: **Canada**, Saskatchewan, Saskatoon, isol. from chicken food by Riddell (CBS 452.71). **Slovenia**, Sečovlje saltern, isol. from hypersaline water (EXF-397). **USA**, Washington, Seattle, University of Washington campus, isol. from chasmothecia of *Phyllactinia guttata* (*Erysiphales*) on leaves of *Corylus avellana* (*Betulaceae*), 12 Feb. 2004, D. Glawe (CPC 11835).

Notes: This species was treated by Zalar *et al*. (2007) within the *C. sphaerospermum* complex, but differs from other taxa of this complex in having fusiform terminal conidia and usually unbranched conidiophores.

**63. *Cladosporium galii*** Mułenko, K. Schub. & M. Kozłowska, Mycotaxon 90(2): 272. 2004. Figs 133, 134.

*Holotype*: **Poland**, Nizina Północnopodlaska, Białowieża Forest, Białowieża National Park, Forest Compartment 342, Permanent

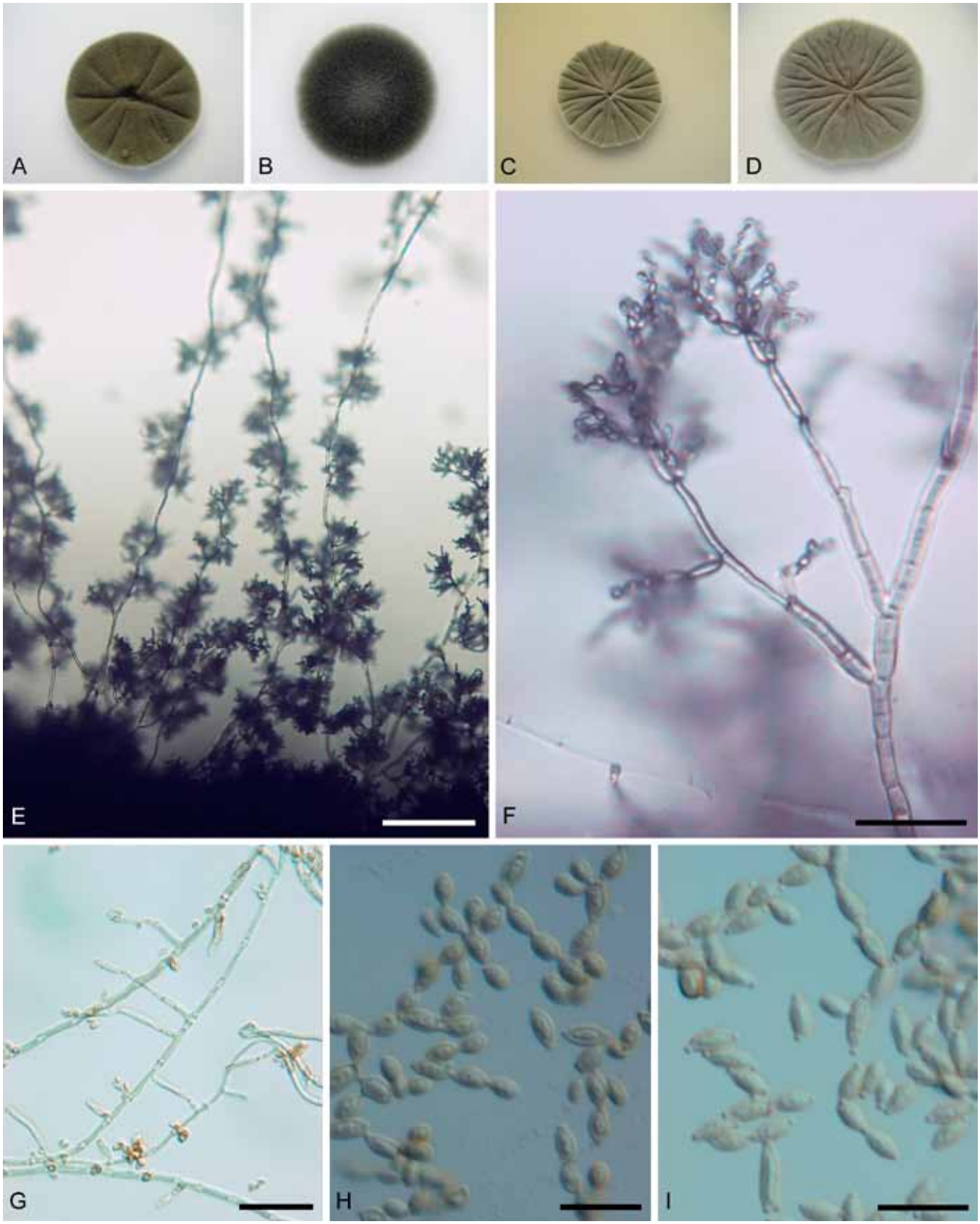



**Fig. 132.** *Cladosporium fusiforme* (CBS 119414) (from Zalar *et al.* 2007). A–D. Colony surface grown on PDA (A), OA (B), MEA (C) and MEA plus 5 % NaCl (D) of strains incubated for 14 d at 25 ºC in darkness. E–G. Habit of conidiophores. H–I. Ramoconidia and conidia. E–I. All from 7-d-old SNA slide cultures. A–H, from EXF-449 (ex-type strain); I, from CBS 452.71. Scale bars = 10 (H–I), 30 (F–G), 100 (E) µm.

plot No 40 BSG UW, single collection in oak-linden-hornbeam forest (*Tilio-Carpinetum*), on living leaves of *Galium odoratum* (*Rubiaceae*), 26 Sep. 1992, W. Mułenko (LBLM–8459). *Isotype*: HAL 1811 F.

*Lit.*: Schubert (2005b: 79–81).
*Ill.*: Mułenko *et al*. (2004: 273, fig. 1), Schubert (2005b: 80, fig. 30, pl. 13, figs D–F).

*In vivo*: On living leaves, distinct leaf spots lacking, but with pale olivaceous-brown to greyish discolorations. *Colonies* hypophyllous, rarely epiphyllous, punctiform, in small tufts, scattered, pale to dark brown, sometimes almost blackish. *Mycelium* internal, subcuticular to subepidermal, immersed; hyphae branched, (3–)4–8(–10) µm wide, septate, with swellings and constrictions, pale to medium brown, smooth, walls slightly thickened, forming loose to somewhat denser stromatic hyphal aggregations. *Stromata* 37.5–82.5(–100) µm diam, composed of swollen, subcircular, ellipsoid to somewhat angular-irregular, thick-walled hyphal cells, (5–)7–16(–20) µm wide, olivaceous to dark brown, smooth. *Conidiophores* solitary, arising from hyphae or in loose to dense fascicles arising from stromatic hyphal aggregations, erumpent through the cuticle or emerging through stomata, erect, straight or slightly flexuous, unbranched or rarely branched, 25–280 × (2.5–)4.5–8(–10) µm, septate, but only few septa (up to four), subhyaline, pale to medium olivaceous-brown, somewhat paler towards the apex, smooth, sometimes minutely verruculose at the apex, walls slightly thickened, more thick-walled near the base, sometimes even two-layered, usually swollen and somewhat darker at the base, up to 12 µm wide, often with small, head-like, terminal swellings, up to 8 µm wide, with a single or several distinct scars at the apex. *Conidiogenous cells* integrated, terminal or intercalary, cylindrical or often with small swellings, 18–80 µm long, proliferation sympodial, with a single or few conidiogenous loci, often situated on swellings but not restricted to them, protuberant, mostly short cylindrical, (1–)1.5–2.5 µm diam, somewhat thickened and darkened–refractive. *Conidia* catenate, in simple or branched acropetal chains, sometimes solitary, straight to slightly curved, primary conidia small, obovoid, ellipsoid, 3–7 × 2–4 µm, smooth, secondary conidia ellipsoid, fusiform to cylindrical, 6–30(–40) × (2.5–)3–6.5 µm, mostly 0(–2)-, very rarely 3-septate, not constricted at the septa, subhyaline, very pale to medium pale brown, smooth to usually minutely verruculose, walls only slightly thickened, somewhat rounded or attenuated at the ends, with protuberant hila at one end or both ends, slightly convex, (0.5–)1–2.5 µm diam, well differentiated in a central convex dome, surrounded by a raised fine rim, thickened, somewhat darkened-refractive.

*Substrate and distribution*: On *Galium odoratum*; Poland.

*Notes*: *Cladosporium pilicola* (Saccardo 1892: 602) was described from France on dry stems of *Galium mollugo*. Type material of this species could not be traced, and other collections are unknown. However, based on the original description, *C. pilicola* is quite distinct from *C. galii* (probably saprobic; conidiophores branched; conidia cylindrical, 1–3-septate). *Cladosporium cladosporioides* is morphologically close to *C. galii*, but differs in having narrower, cylindrical conidiophores, 2–5.5 µm wide, without swellings, usually formed singly, and usually smooth, narrower conidia, 2–5 µm wide. Nodulose conidiophores are known from some other *Cladosporium* species, *e.g.*, *C. colocasiae*, *C. herbarum*, *C. macrocarpum*, *C. oxysporum* and *C. variabile*. The conidia of *C. herbarum* and *C. variabile* are coarsely verruculose and wider. In addition, *C. variabile*, confined to *Spinacia oleracea*, is well-distinguished by forming tortuose, spirally twisted aerial hyphae. *Cladosporium colocasiae*, a common parasite of *Colocasia* species, has much wider, usually

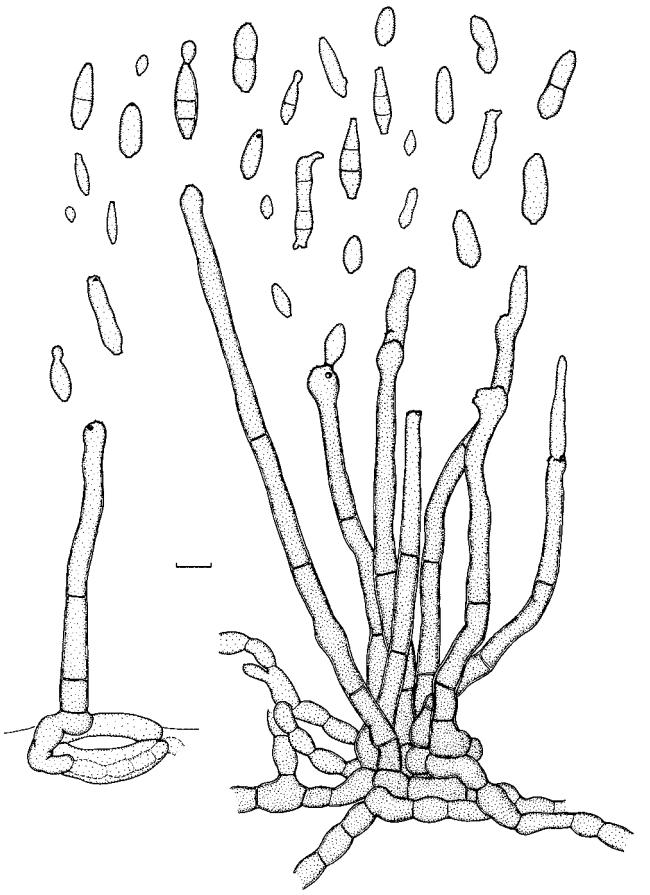


**Fig. 133.** *Cladosporium galii* (HAL 1811 F). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

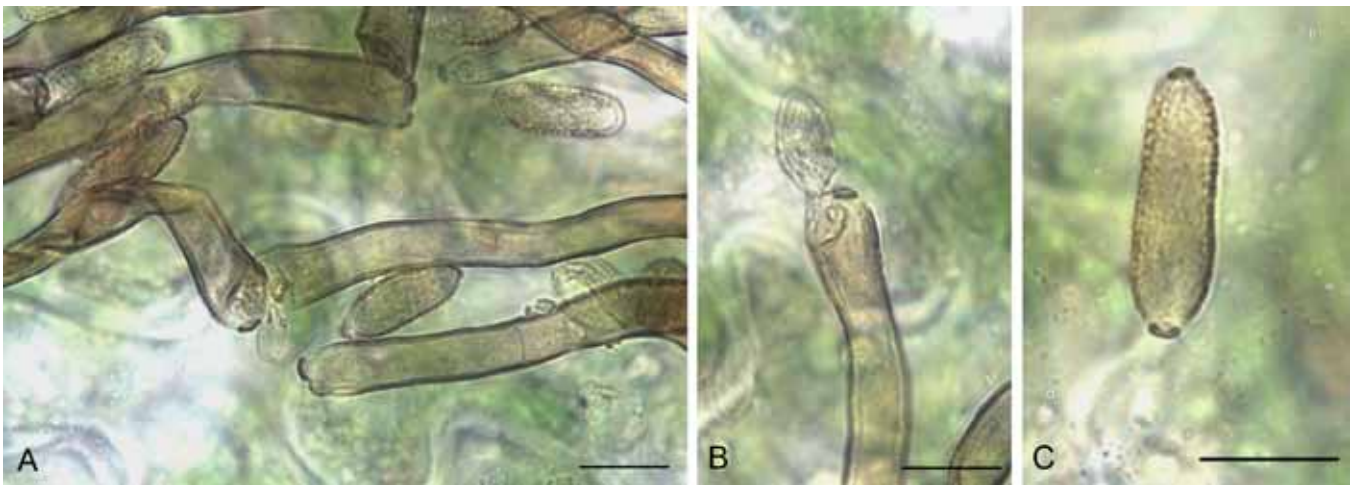



**Fig. 134.** *Cladosporium galii* (HAL 1811 F). A. Conidiophores. B. Conidiogenesis. C. Conidium. Scale bars = 10 (A–C) µm.

6–9 µm broad, smooth conidia, and the widespread saprobic species *C. oxysporum* differs in having very long conidiophores, up to 500 µm long or even longer, and smooth conidia.

**64. *Cladosporium gallicola*** B. Sutton, Mycol. Pap. 132: 37. 1973. Figs 135–137.

*Holotype*: **Canada**, Saskatchewan, 27'S. Meadow Lake, on galls of *Endocronartium harknessii* (*Cronartiaceae*) on twigs of *Pinus banksiana* (*Pinaceae*), 25 May 1967, C. Rentz, WINF (M) 6898e (IMI 145204).

*Lit*.: Ellis (1976: 329), Heuchert *et al*. (2005: 28–33).
*Ill*.: Sutton (1973: 38–39, figs 17, 18), Ellis (1976: 329, fig. 247), Heuchert *et al*. (2005: 29, fig. 8).

*In vivo*: *Colonies* on galls and intact as well as empty aecia, medium olivaceous-brown to dark brown, in loose to dense fascicles or solitary, spreading to the surrounding tissue of the host plant, effuse, caespitose, velvety, confluent, affected needles discoloured, reddish brown. *Mycelium* immersed and external, superficial; hyphae branched, 1–4(–8) µm wide, cells 7–15 µm long, often irregularly swollen, 5–7 µm diam, pale to medium brown, occasionally subhyaline. *Stromata* hemisphaerical, 45–130 × 30–90 µm, composed of subglobose to subangular cells, 4–12 µm diam, dark brown, smooth. *Conidiophores* solitary, arising from hyphae, or mostly formed in loose to dense fascicles, mostly more than 10, arising from stromata, erumpent, erect, straight to slightly curved, subcylindrical, 34–260 × (3.5–)6–9 µm, at the base up to 10 µm wide, somewhat attenuated towards the apex, up to 15-septate, usually not constricted at the septa, medium to dark brown, paler towards the apex, smooth to faintly verruculose, walls thickened, less thickened or unthickened towards the apex, occasionally enteroblastically proliferating, monopodial, usually branched in the upper third, branchlets 11–43(–65) × 4–5(–7) µm, 0–3(–5)-septate, subhyaline to pale brown. *Conidiogenous cells* integrated, terminal and intercalary, subcylindrical or somewhat attenuated towards the tip, 6–35 µm long, polyblastic, with numerous conspicuous conidiogenous loci (up to 10 or even more), proliferation sympodial, appearing to be coarsely verrucose by numerous densely arranged protuberant conidiogenous scars, loci slightly to conspicuously protuberant, truncate, denticle-like, somewhat thickened and refractive, 1–3 µm diam, convex dome sometimes indistinct. *Ramoconidia* lacking. *Conidia* usually in branched chains, straight, small terminal conidia subglobose, obovoid, limoniform, ellipsoid, fusiform to broadly subcylindrical, 3–17 × 2–6(–7) µm, 0(–1)-septate, without any constrictions, subhyaline to pale brown, smooth, walls thin to slightly thickened, intercalary conidia and secondary ramoconidia broadly ellipsoid to subcylindrical, 12–29 × 6–8 µm, 2–3(–4)-septate, occasionally constricted at the septa, medium brown, smooth, walls thickened, apex rounded or provided with up to six hila, base rounded to attenuated, truncate, more or less protuberant, slightly thickened and refractive, convex dome sometimes not very distinct, (0.5–)1–2.5 µm diam; microcyclic conidiogenesis occurring.

*Substrates and distribution*: On rust fungi (*Uredinales*); North America – *Cronartium comandrae* on *Pinus contorta* var. *latifolia* (Canada, widespread), *Endocronartium harknessii* on *Pinus banksiana* (Canada, widespread), *Pucciniastrum goeppertianum* on *Abies grandis* (USA, WA).

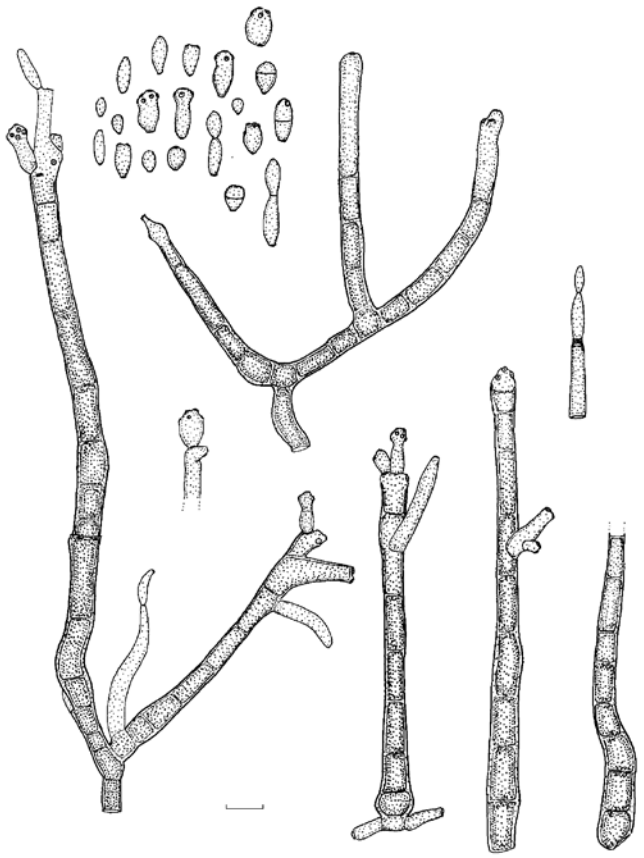


**Fig. 135.** *Cladosporium gallicola* (IMI 145204). Conidiophores, conidiogenous cells and conidia *in vivo*. Scale bar = 10 µm. B. Heuchert *del*.

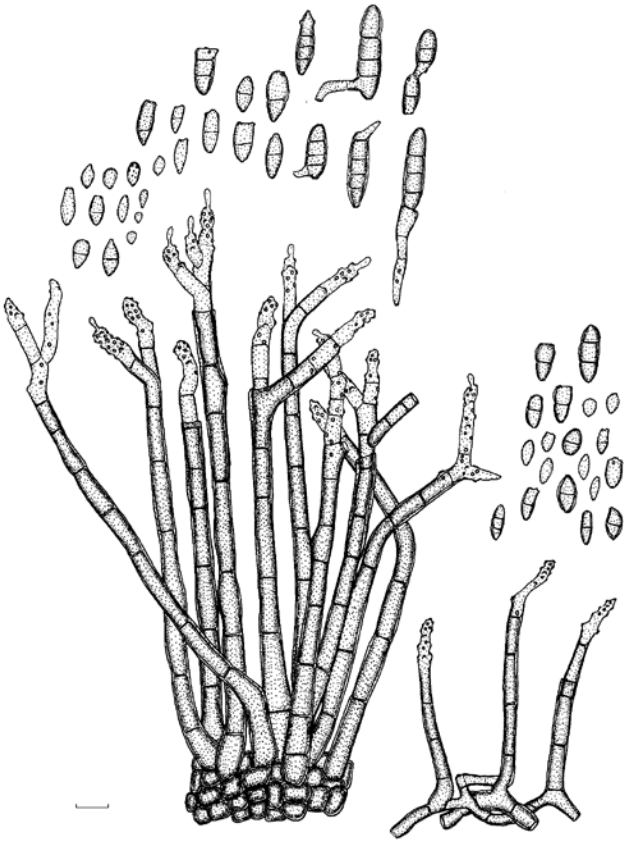


**Fig. 136.** *Cladosporium gallicola* (BPI, as "*C. peridermiicola*"). Dense fascicle of conidiophores arising from stromata, conidiophores arising from hyphae and conidia *in vivo*. Scale bar = 10 µm. B. Heuchert *del*.

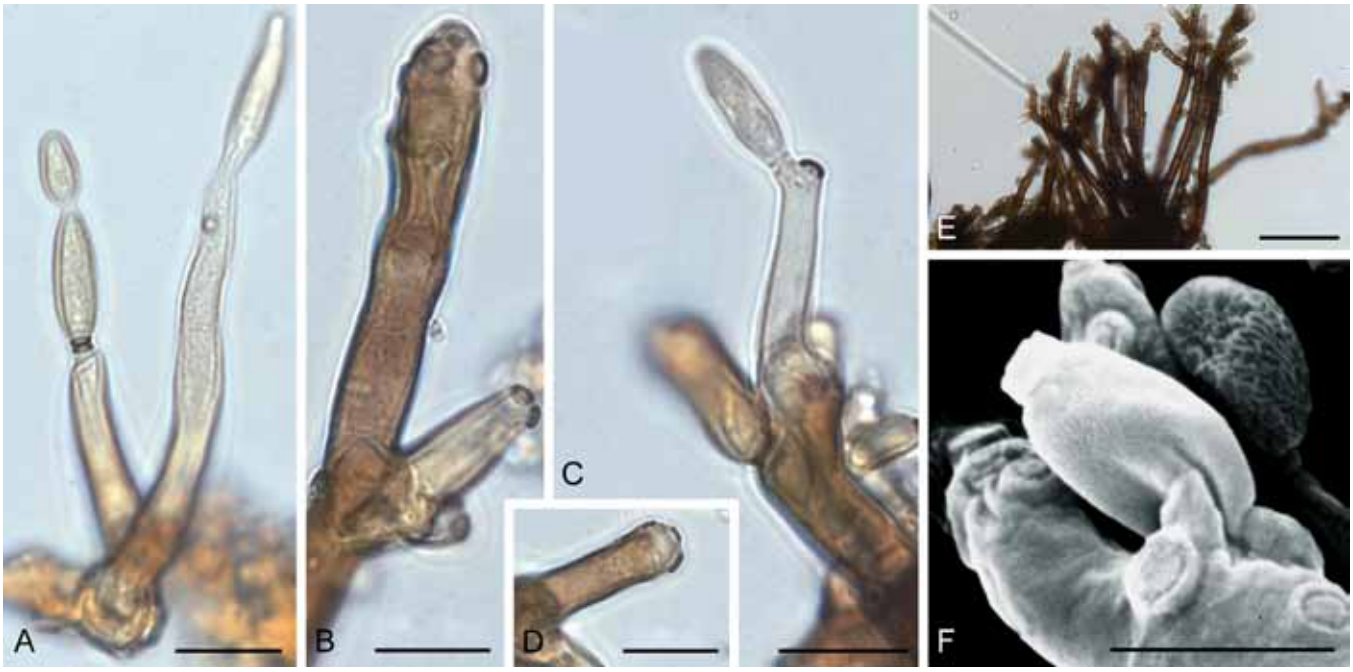



**Fig. 137.** *Cladosporium gallicola* (BPI, as "*C. peridermiicola*"). A–D. Conidiophores with darkened-refractive conidiogenous loci. E. Dense fascicle of commonly branched conidiophores. F. Details of scar structure on a conidiophore and secondary ramoconidium. Scale bars = 5 (F), 10 (A–D), 50 (E) µm.

*Additional specimens examined*: **USA**, Washington, Metalline Falls, on *Peridermium columnare* (= *Pucciniastrum goeppertianum*) on *Abies grandis*, 6 Jun. 1930, G.G. Hedgcock (BPI 427386, deposited as *C. peridermiicola in herb.*); Sullivan Lake, 9 Jun. 1930, G.G. Hedgcock (BPI 427385); 5 Jul. 1929 (BPI 427383).

*Notes*: Under light microscopy, the cladosporioid structure of the conidiogenous loci with distinct central dome and periclinal raised rim was not quite evident, but SEM (Heuchert *et al*. 2005, pl. 2, fig. 8) conclusively showed that *C. gallicola* belongs in *Cladosporium s. str*. Strongly branched conidiophores, as described and depicted by Sutton (1973), could be found in the type collection, but were less branched in the other specimens examined. Several specimens deposited at BPI under the herbarium name *C. peridermiicola* proved to be identical with *C. gallicola*. Stromata are present and the conidia are broadly ellipsoid-subcylindrical, 12–29 × 6–8 µm, 2–3(–4)-septate, occasionally somewhat constricted at the septa, but otherwise these collections agree well with *C. gallicola.* Records of *Cladosporium* sp. on *Cronartium conigenum* and *C. coleosporioides* from Canada, Alberta, by Powell (1971) possibly belong to *C. gallicola*.

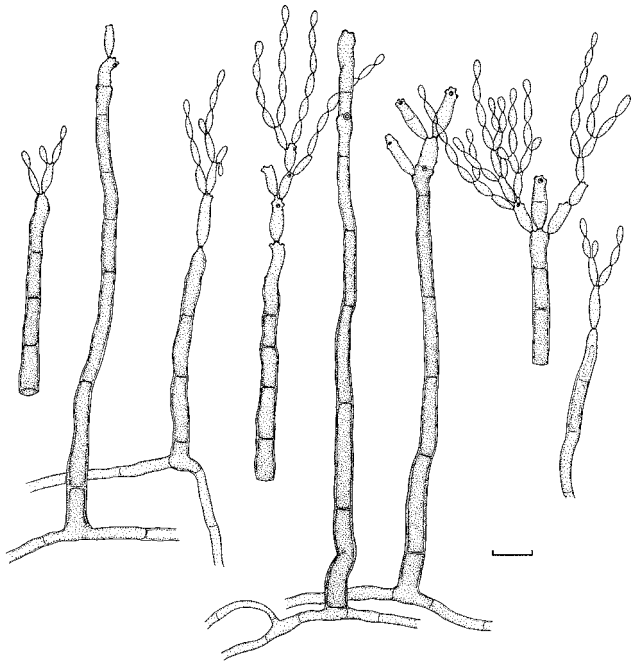


**Fig. 138.** *Cladosporium gamsianum* (CBS 125989). Conidiophores and conidial chains *in vitro*. Scale bar = 10 µm. K. Bensch *del*.

## 65. *Cladosporium gamsianum* Bensch, Crous & U. Braun, Stud. Mycol. 67: 49. 2010. Figs 138, 139.

*Holotype*: **South Africa**, Pretoria, Walter Sisulu Botanical Garden, 25.706944, 28.229444, isol. from *Strelitzia* sp. (*Strelitziaceae*), 17 Feb. 2005, coll. W. Gams, isol. P.W. Crous (CBS H-20434). *Ex-type culture*: CBS 125989 = CPC 11807.

*Ill.*: Bensch *et al.* (2010: 50, figs 36−37).

*In vitro*: *Mycelium* sparingly branched, 1−3.5 µm wide, at the base of conidiophores wider, up to 5 µm wide, septate, subhyaline to pale olivaceous or pale olivaceous-brown, with age hyphae becoming dark brown, smooth, sometimes constricted at septa and minutely verruculose towards the base of conidiophores, walls unthickened, forming ropes. *Conidiophores* solitary or in small groups of four or sometimes fasciculate, macronematous, arising terminally and laterally from hyphae or hyphal ropes, erect, straight or slightly flexuous, cylindrical-oblong, not geniculate, sometimes slightly swollen at the apex, sometimes with monopodial rejuvenations (monopodially proliferating without conidiogenesis) and a single rather inconspicuous annellation, unbranched, 10−146 × 3−5 µm, pluriseptate, sometimes slightly constricted at septa, medium olivaceous-brown, paler towards or at the uppermost apex, with age dark brown, more thick-walled and two-layered, walls about 1 µm wide, slightly attenuated towards the apex, base sometimes up to 6.5 µm wide. *Conidiogenous cells* integrated, sympodially

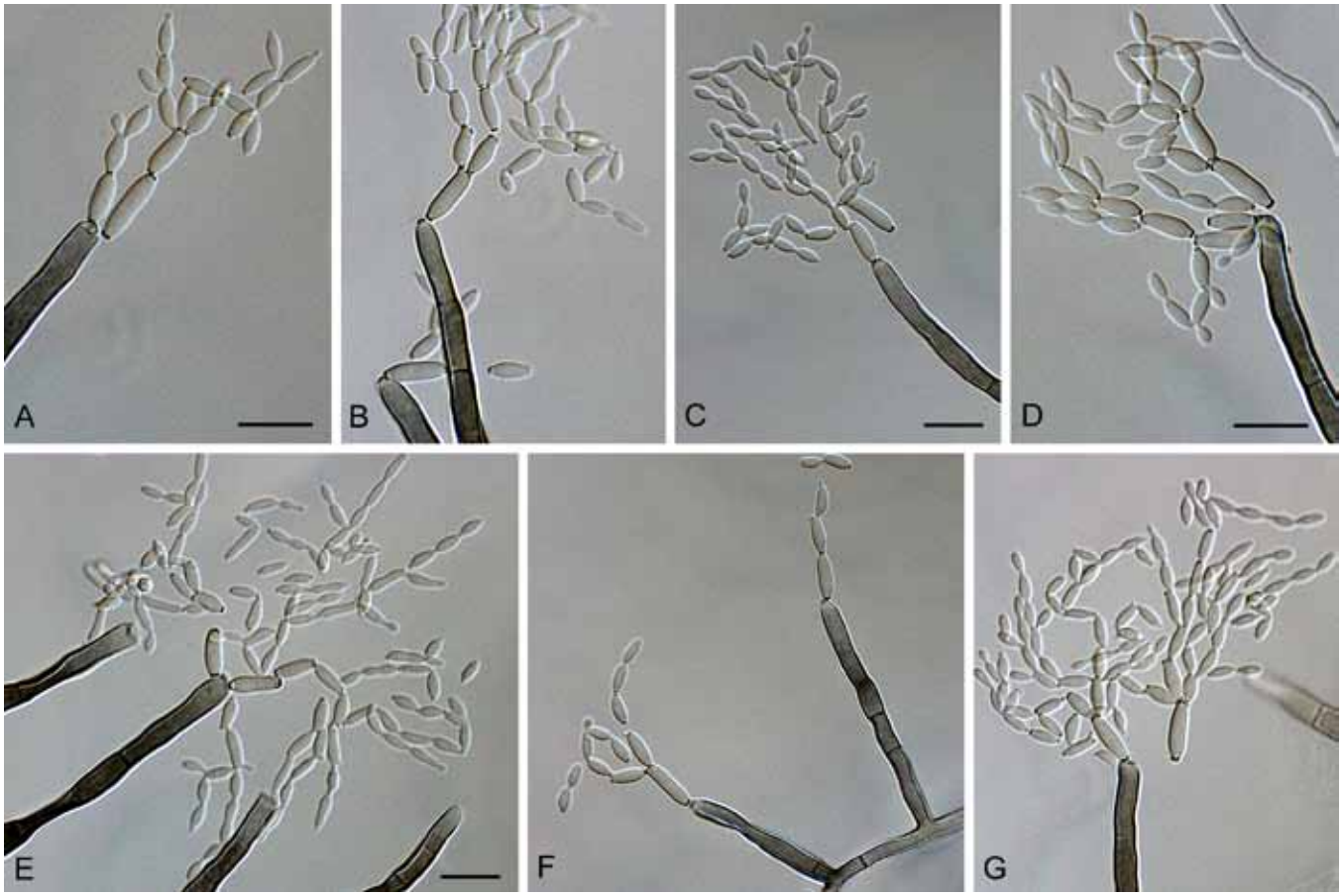



**Fig. 139.** *Cladosporium gamsianum* (CBS 125989). A–G. Conidiophores and conidial chains. Scale bars = 10 µm.

proliferating, usually terminal, with age intercalary, cylindrical-oblong, not geniculate, with age slightly swollen, subnodulose at or towards the apex with loci situated at these lateral shoulders, 9−18 µm long, rupturing the outer wall layer around some of the scars, resulting in a lateral displacement of scars, leaving more or less conspicuous circumferential annular fringes of the torn wall, lateral scars in face view conspicuous, flat, non-protuberant or only slightly so, slightly thickened and darkened, with 1−4 loci at the apex, with age up to eight loci crowded towards the apex, loci conspicuous, subdenticulate, 1−1.5(−1.8) µm diam, thickened and darkened-refractive. *Conidia* catenate, in branched chains, branching dichotomously or in all directions, narrow, straight, small terminal conidia obovoid, 3−6 × 1−1.5(−2) µm (av. ± SD: 5.0 ± 0.9 × 1.4 ± 0.3), aseptate, intercalary conidia fusiform to narrowly ellipsoid-ovoid, 4.5−12 × 1.5−2.5 µm (av. ± SD: 7.4 ± 2.0 × 1.9 ± 0.4), aseptate, with 1−3(−5) distal hila, secondary ramoconidia narrowly ellipsoid to subcylindrical, (6−)7−14.5 × (1.2−)1.5−3(−3.5) µm (av. ± SD: 10.3 ± 2.4 × 2.6 ± 0.6), 0(−1)-septate, sometimes constricted at the median septum, subhyaline to pale olivaceous or pale olivaceous-brown, smooth, walls unthickened or almost so, attenuated towards apex and base, with 1−5 distal hila, conspicuous, subdenticulate, 0.5−1.5(−1.8) µm diam, thickened and darkened-refractive; microcyclic conidiogenesis not observed.

*Culture characteristics*: Colonies on PDA olivaceous-grey to iron-grey, grey-olivaceous towards margins, somewhat zonate, reverse olivaceous-grey to greyish-blue, grey-olivaceous towards margins, woolly-felty, margin white, glabrous, aerial mycelium abundant, covering almost the whole colony surface, woolly-felty, sometimes high, growth flat, numerous small or large prominent exudates formed, sporulation profuse. Colonies on MEA olivaceous-grey, iron-grey or black towards margins, reverse iron-grey, velvety to woolly, margin white, glabrous, sometimes radially furrowed, aerial mycelium abundant, covering the whole colony surface, growth low convex, without prominent exudates, sporulating. Colonies on OA olivaceous to grey-olivaceous, olivaceous-grey towards margins, reverse leaden-grey to leaden-black, velvety to powdery, margin white, narrow, glabrous, aerial mycelium absent or sparse, growth flat, sporulation profuse.

*Substrate and distribution*: On *Strelitzia*; South Africa.

*Notes*: *Cladosporium gamsianum*, which is an element of the *C. cladosporioides* complex, clustered as a sister to *C. verrucocladosporioides* (Bensch *et al.* 2010, fig. 1, part b) but formed a separate lineage in all phylogenetic analyses. This species is unique within the genus *Cladosporium* by its special mode of rejuvenation leaving more or less conspicuous annellations and conspicuous lateral conidiogenous loci that are somewhat reminiscent of the genus *Annellosympodia* (McTaggart *et al.* 2007).

**66. *Cladosporium gentianae*** Lobik, Bolezni Rast. 17(3–4): 189. 1928. Figs 140, 141.

*Holotype*: **Russia**, on leaves of *Gentiana cruciata* (*Gentianaceae*), 15 Sep. 1927 (LE 40527).

*Lit.*: Shvartsman *et al*. (1975: 95), Schubert (2005b: 81–83).
*Ill.*: Lobik (1928: tab. 8, fig. 87), Schubert (2005b: 82, fig. 31, pl. 13, figs G–J).

*In vivo*: On living leaves, leaf sheaths and stems, leaf spots at leaf margins or starting at leaf margins and extending towards the mid, sometimes even covering the whole leaf surface, fading, turning yellowish brown, ochraceous, margin indefinite, somewhat raised at the border to the healthy leaf tissue, stems yellowish brownish discoloured, fading. *Colonies* amphigenous, solitary or in small tufts, effuse, scattered, loosely to moderately dense, caespitose, dark brown to blackish. *Mycelium* internal, subcuticular to intraepidermal; hyphae conspicuous, sparingly branched, 3.5–11 µm wide, septate, sometimes distinctly constricted at the septa, subhyaline, pale olivaceous to medium olivaceous-brown, smooth or almost so to minutely verruculose, thick-walled, wall appearing yellowish, somewhat darker than the lumen and refractive, often with small to large, subglobose to somewhat irregular oil droplets, forming hyphal aggregations and stromata. *Stromata* substomatal to intraepidermal, small, subglobose, later somewhat flattened, 15–50 µm diam, only few layers deep, usually composed of only few but large swollen hyphal cells, up to 20 µm wide, subglobose to somewhat angular or irregular, medium to medium dark olivaceous-brown or brown, rarely pale olivaceous-brown, smooth to minutely verruculose, thick-walled. *Conidiophores* mostly loosely fasciculate, with 2–8 per fascicle, arising from stromata, sometimes solitary, arising from internal hyphae, emerging through stomata or erumpent through the cuticle, erect, rarely subdecumbent, more or less straight, cylindrical-oblong, robust, non-nodulose, usually not geniculate, unbranched, 26–120(–180) × (4–)5–10 µm, septate, not constricted at the septa, dark olivaceous-brown to brown, minutely verruculose or somewhat irregularly rough-walled, walls thickened, usually distinctly two-layered, 1–1.5 µm wide, slightly attenuated towards the apex, sometimes somewhat swollen at the base, protoplasm somewhat aggregated near the septa, which

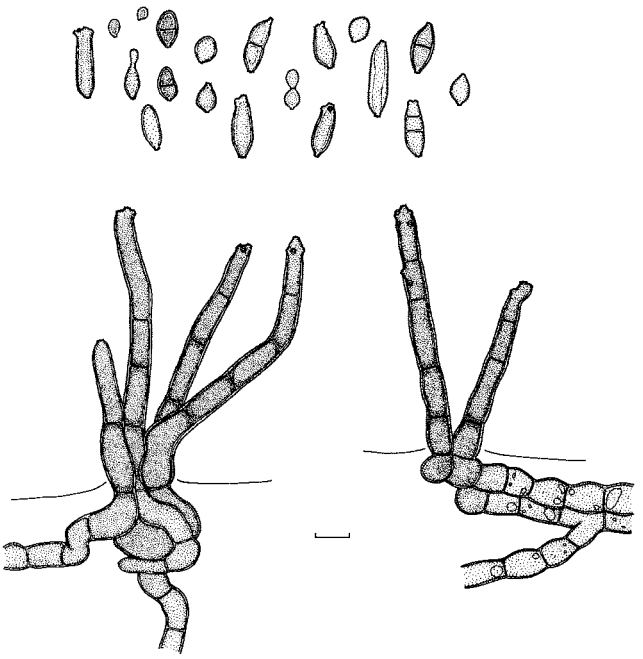


**Fig. 140.** *Cladosporium gentianae* (LE 40527). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.


**Fig. 141.** *Cladosporium gentianae* (LE 40527). A. Overview, fascicle of conidiophores. B. Conidiophore. C. Conidiophore and conidia. D. Mycelium. Scale bars = 10 (B–D), 20 (A) µm.

appear to be thickened, similar to distoseptation, occasionally enteroblastically proliferating. *Conidiogenous cells* integrated, terminal, occasionally intercalary, 13–36 µm long, proliferation sympodial, with 1–8 conidiogenous loci, often crowded at the apex, protuberant, short cylindrical, subdenticulate, 1.5–2(–2.5) µm diam, thickened, somewhat darkened-refractive. *Conidia* catenate, usually in branched chains, straight, subglobose, obovoid, ovoid, narrowly to broadly ellipsoid to subcylindrical, 3.5–23 × 3–6(–8) µm, 0–1(–2)-septate, septum more or less median, not constricted at the septa, pale olivaceous-green to olivaceous-brown or brown, smooth or almost so to verruculose or irregularly rough-walled, walls thickened, up to 1 µm wide, rarely appearing two-layered, often with a distinct, clearly delineated lumen, apex rounded or with up to 4 hila, slightly attenuated towards the base, hila protuberant, short cylindrical, 1–2 µm diam, thickened, somewhat darkened-refractive; microcyclic conidiogenesis not observed.

*Substrates and distribution*: On *Gentiana* spp. (*Gentianaceae*), Europe – *Gentiana cruciata* (Kazakhstan, Russia).

*Notes*: Lobik (1928) described and illustrated up to 3-septate conidia, which could not be observed. *Cladosporium gentianae* is the only species in this genus known to attack a member of the *Gentianaceae*. The seta-like, non-nodulose, very dark conidiophores and the conspicuous, often wide hyphae chiefly characterise this species, defining and distinguishing it from morphologically allied taxa. *Cladosporium episclerotiale* known from galls of *Endocronartium harknessii* possesses longer conidiophores, (22–)97–295(–322) µm, with frequently branched apices and 0–4-septate conidia (Heuchert *et al*. 2005), and *C. populicola* differs in having shorter, obovoid-ellipsoid conidia, 4–14 µm long, and narrower hyphae, (2–)3–4.5 µm wide.

**67. *Cladosporium gerwasiae*** Heuchert, U. Braun & K. Schub., Schlechtendalia 13: 31. 2005. Figs 142, 143.

*Holotype*: **Guatemala**, Chimaltenango, Tecpan, Xecoxol, "plantation ex *Rubus urticifolius*", N 140°51.8; W 90°59, on *Gerwasia* sp. (*Uredinales*) on leaves of *Rubus urticifolius* (*Rosaceae*), G.A. Alvarez (KR-5684).

*Ill*.: Heuchert *et al*. (2005: 32, fig. 10 and pl. 1, fig. 1–2).

*In vivo*: Hyperparasitic. *Colonies* confined to epiphyllous sori of *Gerwasia* sp. and the surrounding deformed leaf tissue, but not spreading onto green leaf tissue which is not affected by the rust, dark olivaceous-brown, visible (at 10–50×) as diffuse to mostly dense tufts. *Mycelium* immersed and external, superficial; hyphae sparingly branched, 2–6 µm wide, septate, often slightly constricted at the septa, pale brown, smooth, walls slightly thickened or unthickened. *Stromata* formed by swollen hyphal cells, subglobose to somewhat angular, 4–9 µm diam, pale to medium brown, walls slightly thickened. *Conidiophores* in loose to dense fascicles, arising from stromata, or solitary, arising from swollen hyphal cells, erect, straight to curved, cylindrical, unbranched or branched at the base as well as near the tips, 24–366(–630) × (3–)4–7(–8) µm, often somewhat wider near the base, tips often elongated and narrowed, only 2.5 µm wide, 1–22-septate, not or only slightly constricted at the base, pale to medium brown, tips paler, occasionally subhyaline, smooth, occasionally minutely rough-walled near the base,

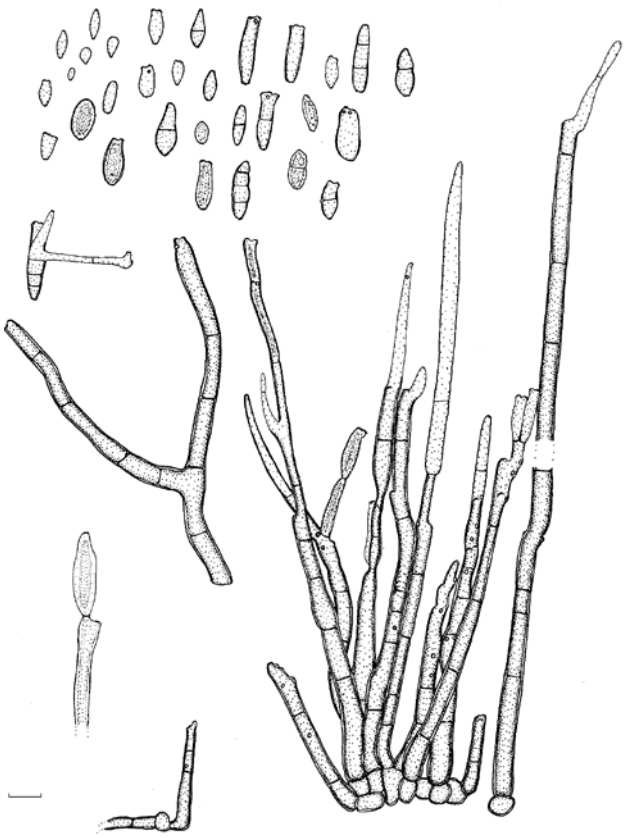


**Fig. 142.** *Cladosporium gerwasiae* (KR-5684). Conidiophores in loose to dense fascicles arising from stromata and conidiophores arising from swollen hyphal cells, conidiogenous cells, ramoconidia and conidia *in vivo*. Scale bar = 10 µm. B. Heuchert *del.*

pigmented walls thickened, (0.5–)1–1.25 µm wide, often distinctly two-layered towards the base, unthickened and one-layered above, lumen often distinct, diminished, granular, surrounded by a wide, colourless to greyish layer (under phase-contrast), giving a very thick-walled appearance, some cells of the conidiophores conspicuously attenuated. *Conidiogenous cells* integrated, terminal and intercalary, cylindrical, 7–50 µm long, polyblastic, proliferation subtly to markedly sympodial, conidiogenous loci protuberant, almost denticle-like, more or less thickened, darkened-refractive, 1.5–2.5 µm diam. *Ramoconidia* 14–26 × 3–5 µm, 0–2(–3)-septate, base slightly convex, without a coronate hilum, up to 3 µm wide. *Conidia* usually in branched chains, ellipsoid, obovoid, subcylindrical, 4–24 × 2.5–8 µm, 0–1(–3)-septate, not or only slightly constricted at the septa, very pale brown, smooth, external pigmented wall layer slightly thickened, with phase-contrast showing a granular lumen surrounded by a distinct hyaline to greyish layer, giving a thick-walled appearance, apex rounded to slightly attenuated, with up to four hila, base truncate to convex, occasionally somewhat attenuated, hila protuberant, more or less thickened and conspicuously darkened-refractive, 0.5–2.5 µm diam; microcyclic conidiogenesis occurring.

*Substrate and distribution*: On *Gerwasia* sp.; Guatemala.

*Notes*: This species is easily distinguishable from *C. uredinicola* by its obviously fasciculate habit, usually wider conidiophores, 4–7 µm, with thicker, often two-layered walls, (0.5–)1–1.25 µm wide. Colonies of *C. uredinicola* are effuse, consistently non-fasciculate, the conidiophores are 2–5 µm wide, thin-walled, 0.5–0.75 µm, and not two-layered. *Cladosporium gallicola*, also occurring on

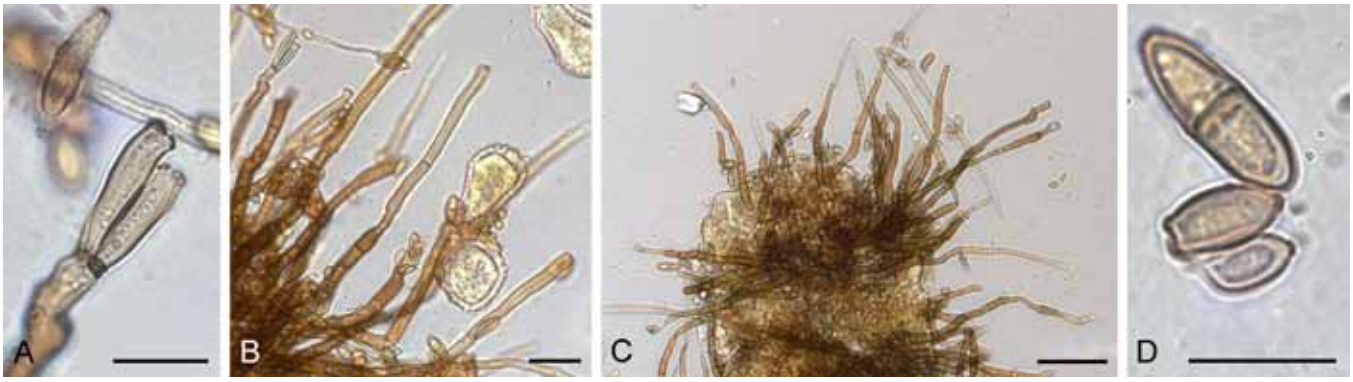



**Fig. 143.** *Cladosporium gerwasiae* (KR-5684). A. Tip of a conidiophore with still attached conidia. B. Conidiophores intermixed with uredospores of *Gerwasia*. C. Overview showing fasciculate conidiophores and conidia *in vivo*. D. Conidia. Scale bars = 10 (A–B, D), 50 (C) µm.

rust fungi, differs in having strongly branched conidiophores with conidiogenous cells which are seemingly coarsely verrucose by being densely covered with numerous conidiogenous loci. *Cladosporium aecidiicola* has verruculose conidia (Heuchert *et al.* 2005).

**68. *Cladosporium gleditschiae*** Cooke, Grevillea 17(83): 66. 1889. Figs 144, 145.

*Lectotype* (**designated here**): **USA**, South Carolina, Aiken, on legumes of *Gleditsia* sp. (*Fabaceae*), Ravenel, Fungi Amer. Exs. 297 (K 121559). *Isolectotype*: BPI 426765, NY, PH.

*Lit.*: Saccardo (1892: 603, 1895: 621).
*Exs.*: Ravenel, Fungi Amer. Exs. 297.

*In vivo*: On pods, causing sometimes discolorations or small spots. *Colonies* caespitose, effuse, loose to dense, dark olivaceous-brown to brown or almost blackish, velvety or somewhat crustaceous, covering large areas of the pod surface. *Mycelium* internal and external, superficial, hyphae creeping, branched, 3–5(–6) µm wide, septate, with swellings and constrictions, pale to medium or even dark brown, smooth to minutely verruculose, thick-walled, forming extended, dense stromatic hyphal aggregations, swollen hyphal cells subglobose, 5.5–10 µm wide, protoplasm often aggregated at walls and septa forming a small to somewhat large cavity in the centre, sometimes forming dense, compact, medium to dark brown conglomerations. *Conidiophores* solitary or in loose groups of 2–3, arising from hyphae or swollen hyphal cells, erect to subdecumbent, straight to flexuous, often geniculate-sinuous, non-nodulose, unbranched or branched, 16–105 × (3.5–)4–6 µm, pluriseptate, sometimes slightly constricted at septa, pale to medium brown, often somewhat paler towards the apex, smooth or almost so to minutely verruculose or rugose, thick-walled, often somewhat swollen at the base, up to 8 µm wide, attenuated towards the apex, protoplasm often aggregated at walls and septa forming a distinct lumen in the centre, sometimes forming distosepta. *Conidiogenous cells* integrated, terminal or intercalary, short cylindrical to oblong, geniculate-sinuous, 4–18 µm long, proliferation sympodial, with a single or a few conidiogenous loci, protuberant, subdenticulate, 1–2 µm diam, thickened, darkened-refractive. *Conidia* catenate, in simple or branched chains, straight, obovoid, broadly ellipsoid, fusiform to cylindrical, 5–28.5 × 3.5–8.5 µm, 0–3(–4)-septate, sometimes slightly constricted at septa, rarely with 1–2 additional transversal septa, pale to medium brown, smooth to minutely verruculose or rugose, walls

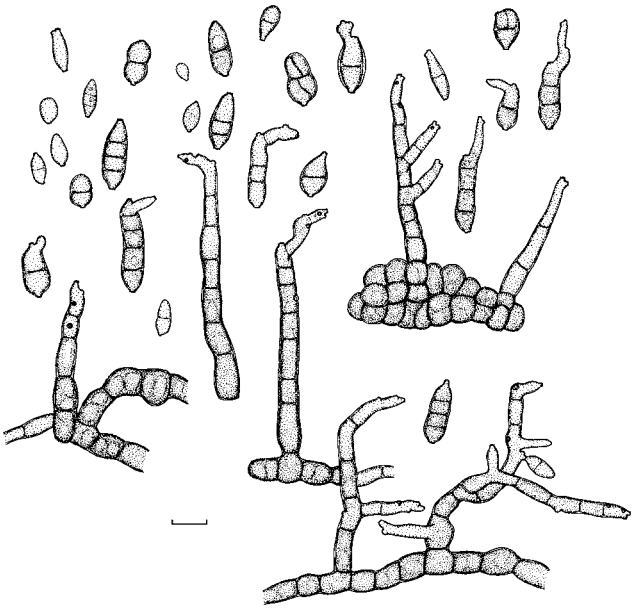


**Fig. 144.** *Cladosporium gleditschiae* (K 121559). Conidiophores arising from swollen hyphal cells, conidia and microcyclic conidiogenesis *in vivo*. Scale bar = 10 µm. K. Bensch *del.*

slightly thickened, apex rounded or somewhat attenuated towards apex and base, protoplasm often aggregated at walls and septa forming a distinct lumen in the centre, hila more or less protuberant, truncate to slightly convex, 1–2 µm diam, thickened, darkened-refractive; microcyclic conidiogenesis occurring.

*Substrate and distribution*: On *Gleditsia* sp.; USA.

*Notes*: The species has also been reported on *Gleditsia triacanthos* from Turkmenistan (Koshkelova & Frolov 1973). *Cladosporium vignae*, causal agent of the scab, leaf and pod blight on *Vigna* and *Lespedeza* spp., is morphologically comparable but distinct in having 0–1-septate, narrower conidia (2–6 µm).

**69. *Cladosporium globisporum*** Bensch, Crous & U. Braun, Stud. Mycol. 67: 51. 2010. Figs 146–148.

*Holotype*: **Sweden**, isol. from meat stamp, 1986, M. Olsen, No. M291 (CBS H-20435). *Ex-type culture*: CBS 812.96.

*Ill.*: Bensch *et al.* (2010: 51−53, figs 38−40).

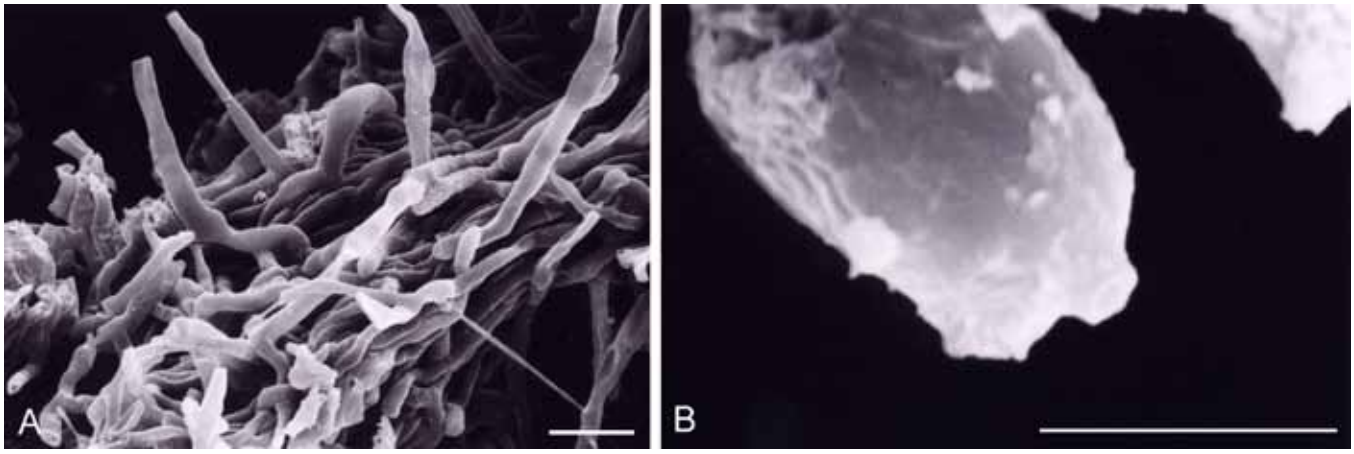



**Fig. 145.** *Cladosporium gleditschiae* (K 121559). A. Conidiophores arising from hyphal ropes. B. Detail of the scar on a conidium. Scale bars = 10 (A), 5 (B) µm.

*In vitro*: *Mycelium* mainly immersed, sparingly branched, 2−5 µm wide, septate, not constricted at septa, pale brown, smooth to minutely verruculose, walls unthickened. *Conidiophores* macro- and micronematous, solitary, arising terminally and laterally from ascending or plagiotropous hyphae, erect, straight to slightly flexuous, cylindrical-oblong to filiform, non-nodulose, sometimes geniculate, unbranched to once branched, branches as short denticle-like lateral outgrowth, later becoming longer, 17−165 × 3−5 µm, micronematous conidiophores (1−)2−2.5(−3) µm wide, 0−4-septate, cells quite long, not constricted at septa, septa often darkened, pale to pale medium brown, slightly paler towards the apex, minutely verruculose, asperulate, walls unthickened or slightly thickened, up to 1 µm wide. *Conidiogenous cells* integrated, often distinctly sympodially proliferating, terminal, usually non-nodulose, sometimes slightly geniculate, filiform to cylindrical-oblong, somewhat flexuous, 17−55 µm long, with up to three apical loci, sitting close together at the apex, conspicuous, subdenticulate to denticulate, (1.2−)1.5−2(−2.2) µm diam, thickened and darkened-refractive. *Ramoconidia* cylindrical-oblong, 19−41(−56) × 3−4(−5) µm, 0(−2)-septate, base broadly truncate. *Conidia* catenate, in densely branched chains, straight to slightly curved, small terminal conidia globose, subglobose to obovoid, 2.5−6(−8) × (2.5−)3−4 µm (av. ± SD: 4.5 ± 1.6 × 3.2 ± 0.5), broadly rounded at the apex, intercalary conidia subglobose, broadly ellipsoid-ovoid, (4−)5−9(−14) × 3−4(−5) µm (av. ± SD: 6.6 ± 2.2 × 3.7 ± 0.5), aseptate, with up to 3(−5) distal hila, often distinctly denticulate, secondary ramoconidia ellipsoid to subcylindrical, 9−25(−30) × (3−)4−5(−6) µm (av. ± SD: 16.6 ± 5.6 × 4.3 ± 0.5), 0(−1)-septate, with 3−4 distal hila, sometimes hila not only distal but also lateral in the middle of the cell, pale brown, smooth or almost so, under SEM surface reticulate or with somewhat embossed stripes caused by diminishing turgor and shriveling of tender young conidia, walls unthickened or only slightly so, attenuated towards apex and base, hila conspicuous, often distinctly denticulate, 0.5−2 µm diam, thickened and darkened-refractive; microcyclic conidiogenesis not observed.

*Culture characteristics*: Colonies on PDA grey-olivaceous to olivaceous, reverse leaden-grey, velvety to powdery, margin colourless to white, feathery, aerial mycelium sparse, loose, fluffy, only few areas covered, growth flat, without exudates, sporulation profuse. Colonies on MEA grey-olivaceous, pale olivaceous-grey towards margins, reverse olivaceous-grey, velvety, due to aerial mycelium several white patches, fluffy, loose to dense, without exudates, sporulation profuse. Colonies on OA grey-olivaceous to pale olivaceous due to profuse sporulation or olivaceous-buff, reverse leaden-grey to iron-grey, velvety to powdery, glittering due to numerous small, not very prominent exudates (like little water drops), margin colourless, feathery, aerial mycelium absent or sparse, growth flat.

**Fig. 146.** *Cladosporium globisporum* (CBS 812.96). Macro- and micronematous conidiophores, ramoconidia and conidial chains *in vitro*. Scale bar = 10 µm. K. Bensch *del.*

*Substrate and distribution*: Isolated from meat stamp; Sweden.

*Notes*: *Cladosporium globisporum*, which clustered in phylogenetic analyses as a basal sister to *C. phyllophilum* (Bensch *et al.* 2010, fig. 1, part a), is morphologically somewhat intermediate between the *C. cladosporioides* and *C. sphaerospermum* complex. The

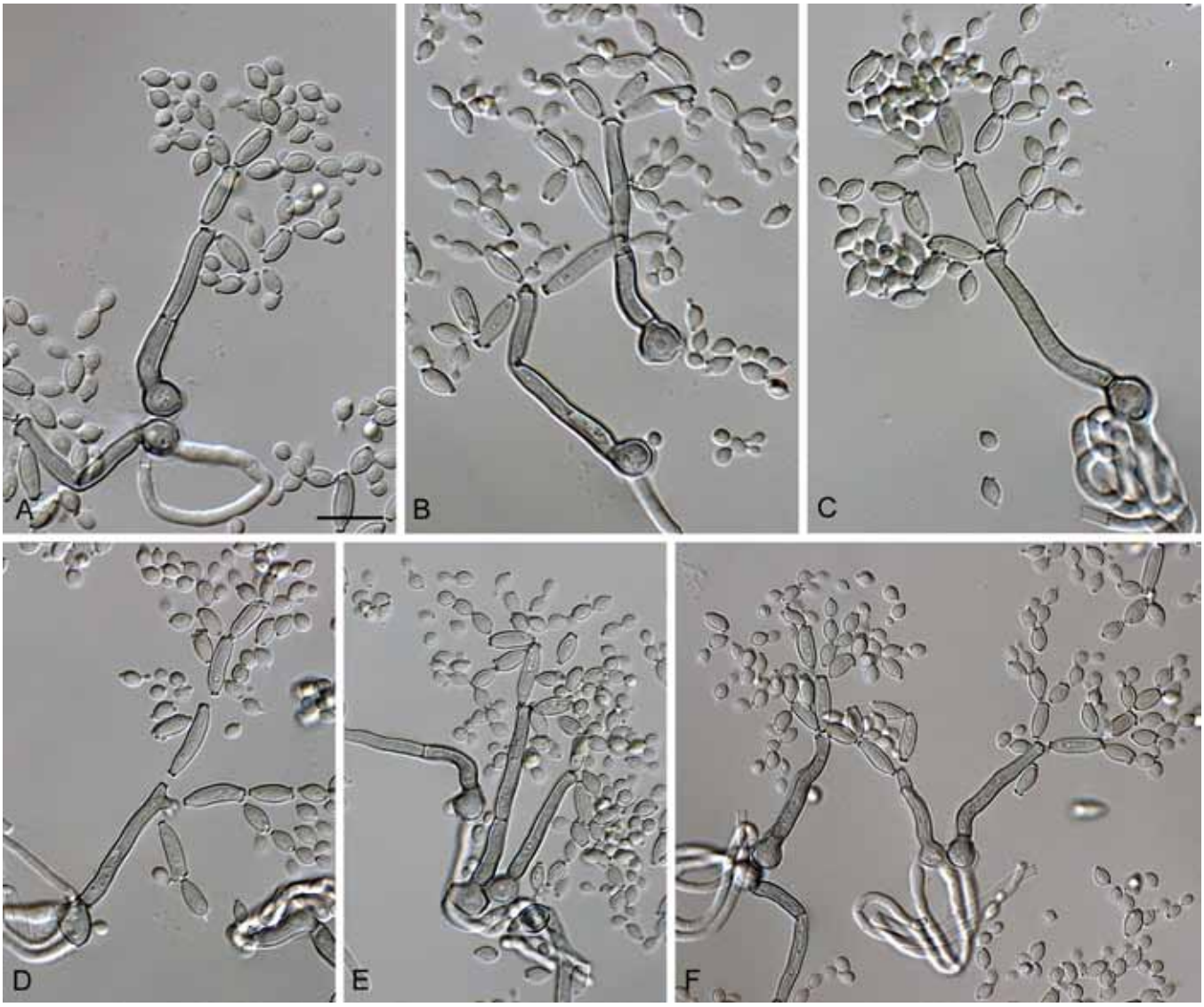



**Fig. 147.** *Cladosporium globisporum* (CBS 812.96). A–F. Macronematous conidiophores and conidial chains. Scale bar = 10 µm.

conidiophores are rather *C. cladosporioides*-like, whereas the terminal and intercalary globose or subglobose conidia are rather reminiscent of *C. sphaerospermum*, although they are smooth and not verruculose as in the latter species.

**70. *Cladosporium grech-delicatae*** Sacc., Ann. Mycol. 11: 564. 1913 [and Nuovo Giorn. Bot. Ital., N.S. 21(1): 125. 1914]. Fig. 149, 150.

*Holotype*: **Malta**, Uied Bufula, on still living stems of *Ranunculus aquatilis* (*Ranunculaceae*), Apr. 1913, Doct. Borg (PAD).
*Lit.*: Saccardo (1931: 794), Schubert (2005b: 83–85).
*Ill.*: Schubert (2005b: 84, fig. 32, pl. 15, figs A–C).

*In vivo*: On still living stems, forming small oblong patches, 1–3 mm long, 1 mm wide, dark, blackish, sometimes confluent. *Colonies* loose to dense, compact, pale to dark brown, villose to somewhat floccose when well fruiting. *Mycelium* internal, subcuticular to intraepidermal; hyphae sparsely branched, 3–8 µm wide, septate, sometimes slightly constricted at the septa, pale to medium olivaceous-brown or somewhat darker at the base of conidiophores, sometimes subhyaline, smooth, walls slightly thickened, sometimes with small swellings, forming loose to somewhat denser stromatic hyphal aggregations or plates, occasionally with irregularly lobed cells. *Conidiophores* solitary or in small loose groups, but not fasciculate, arising from hyphae, swollen hyphal cells or from hyphal aggregations, erumpent through the cuticle, erect to rarely subdecumbent, straight or almost so to slightly flexuous, cylindrical-oblong to filiform, usually not geniculate, non-nodulose, unbranched, sometimes once branched, 40–235 µm long or even longer, 3.5–8(–9) µm wide, pluriseptate, sometimes slightly constricted at the septa, medium to dark olivaceous-brown or brown, walls thickened, often distinctly two-layered, walls up to 1 µm wide, smooth to somewhat asperulate or irregularly rough-walled, slightly attenuated towards the apex, protoplasm of the cells sometimes aggregated near the septa, appearing to be somewhat thickened, similar to distoseptation. *Conidiogenous cells* integrated, terminal, rarely intercalary, cylindrical-oblong, 14–43 µm long, proliferation sympodial, at the apex with few subdenticulate conidiogenous loci, protuberant, truncate

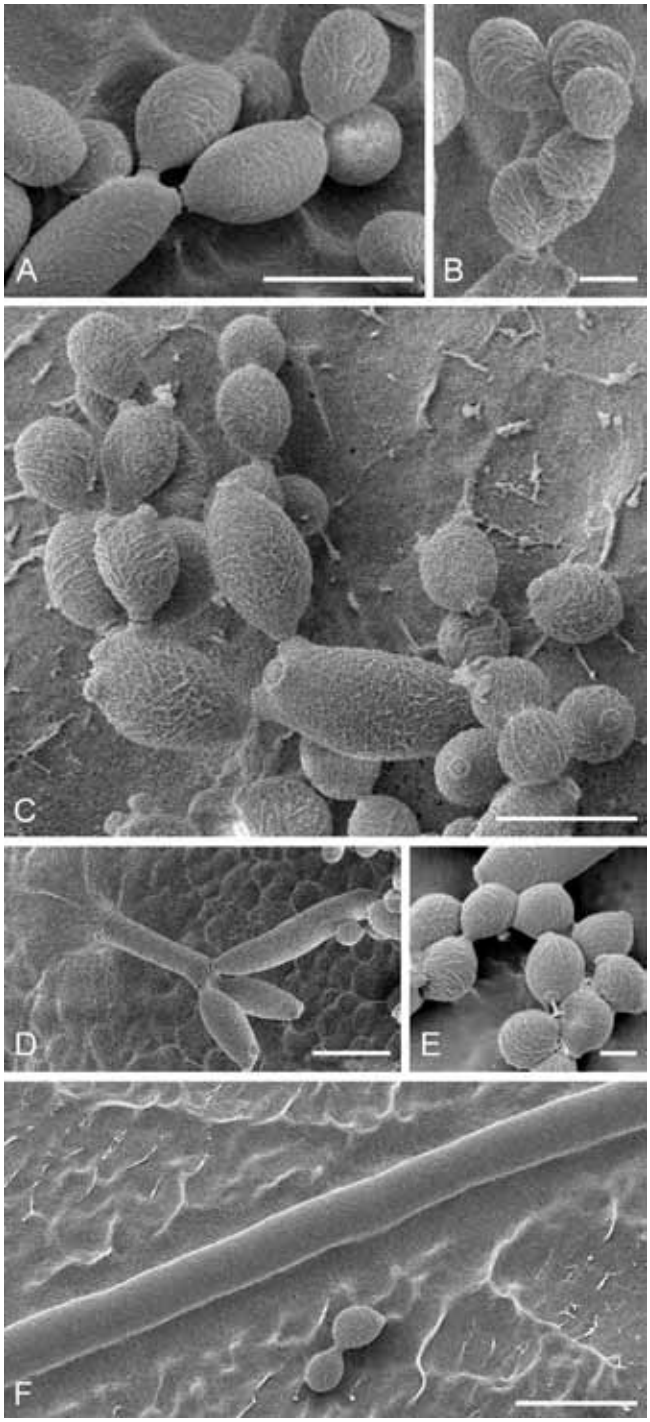



**Fig. 148.** *Cladosporium globisporum* (CBS 812.96). A–B. Delicately ornamented conidia showing a somewhat irregularly reticulate surface or slightly embossed stripes probably caused by diminishing turgor and shriveling of tender young conidia. C. Conidia, secondary ramoconidia and scars. D. Conidiophore with secondary ramoconidia. E. Globose ornamented small terminal conidia. F. Running hyphae on agar and conidia. Scale bars = 2 (B, E), 5 (A, C), 10 (D, F) µm.

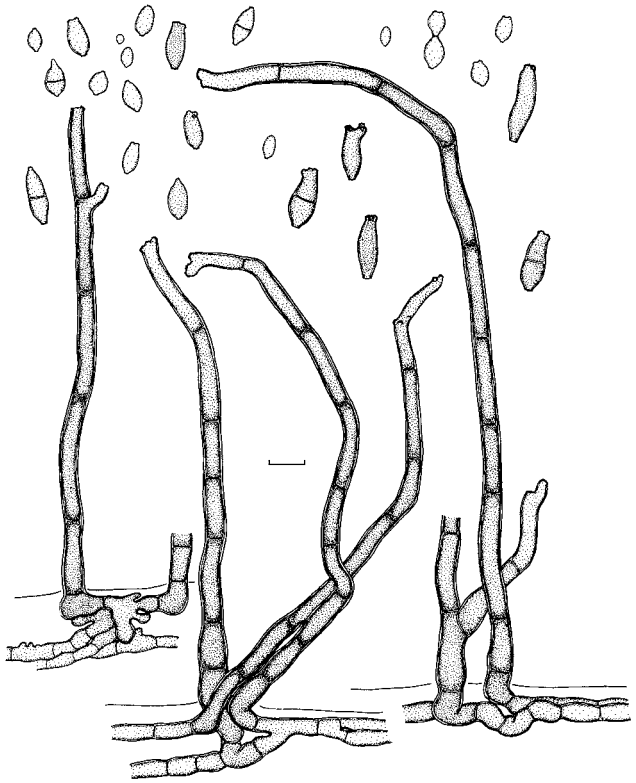


**Fig. 149.** *Cladosporium grech-delicatae* (PAD). Conidiophores, ramoconidia and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

or obconically truncate, 1.5–2(–2.5) µm diam, dome and surrounding rim sometimes not very conspicuous, somewhat thickened and darkened-refractive. *Ramoconidia* ellipsoid, subcylindrical to cylindrical, 15–23 × 5–7.5 µm, 0(–1)-septate, pale to medium brown or olivaceous-brown, with few apical hila, base truncate, 2–3 µm wide, without dome and raised rim, unthickened. *Conidia* catenate, usually in branched chains, subglobose, obovoid, narrowly to broadly ellipsoid or subcylindrical, (2.5–)5–17 × (2.5–)3.5–6 µm, 0–1-septate, not constricted at the septa, pale to medium brown or olivaceous-brown, smooth, walls somewhat thickened, lumen apparently somewhat distinct, apex often obtuse, rounded or with a single or few hila, hila truncate to slightly convex, slightly protuberant, 0.5–1.5(–2) µm diam, somewhat thickened and refractive.

*Substrate and distribution*: On *Ranunculus aquatilis* (≡ *Batrachium aquatile*); Malta.

*Notes*: This species is comparable with *C. cladosporioides* but distinct in having shorter and wider conidia, wider, thick-walled, often distinctly two-layered conidiophores and sometimes irregularly lobed hyphae.

**71. *Cladosporium grevilleae*** Crous & Summerell, IMA Fungus 2(1): 51. 2011. Figs 151, 152.

*Holotype*: **Australia**, New South Wales, Mount Annan Botanical Garden, on leaves of *Grevillea* sp. (*Proteaceae*), Aug. 1999, P.W. Crous & B.A. Summerell JT 974 (DAR 74881). *Ex-type cultures*: CPC 2913–2916 = CBS 114271.

*Ill.*: Crous *et al.* (2011b: 63, figs 2–3).

*In vivo*: Leaf spots absent. *Ascomata* occurring in leaf litter, amphigenous, black, subepidermal, erumpent to superficial, globose, to 100 µm diam, with central, periphysate ostiole, 10–15 µm diam; wall of 3–4 layers of brown *textura angularis*. *Asci* aparaphysate, fasciculate, bitunicate with fissitunicate discharge, subsessile, obovoid to broadly ellipsoid, slightly curved, 8-spored, 35–45 × 9–12 µm, with visible apical apiculus. *Ascospores* tri- to

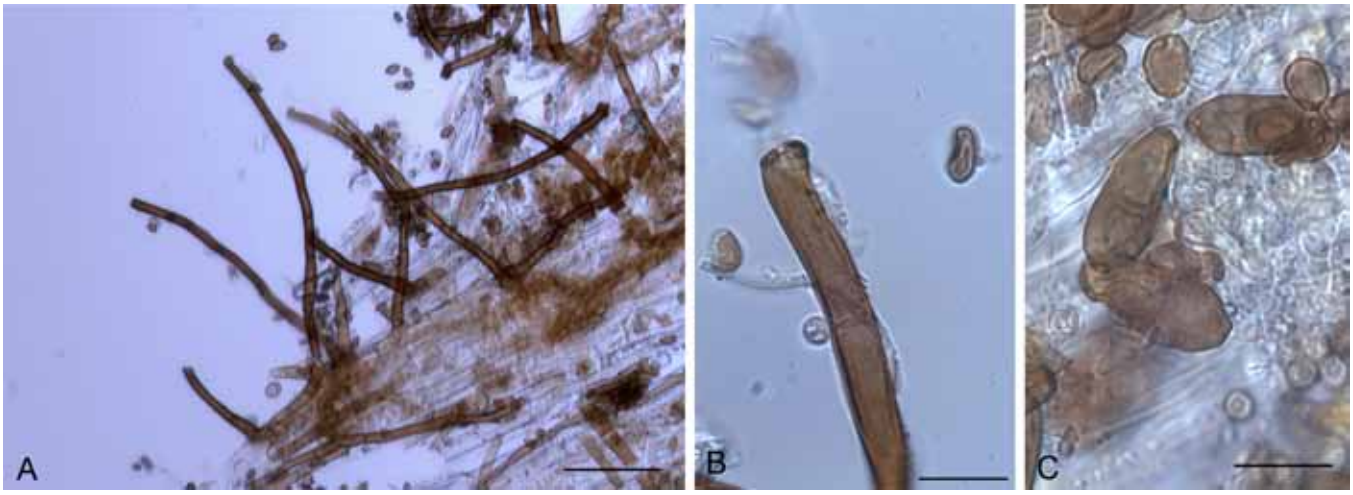



**Fig. 150.** *Cladosporium grech-delicatae* (PAD). A. Overview. B. Tip of a conidiophore. C. Ramoconidium and conidia. Scale bars = 10 (B–C), 50 (A) µm.

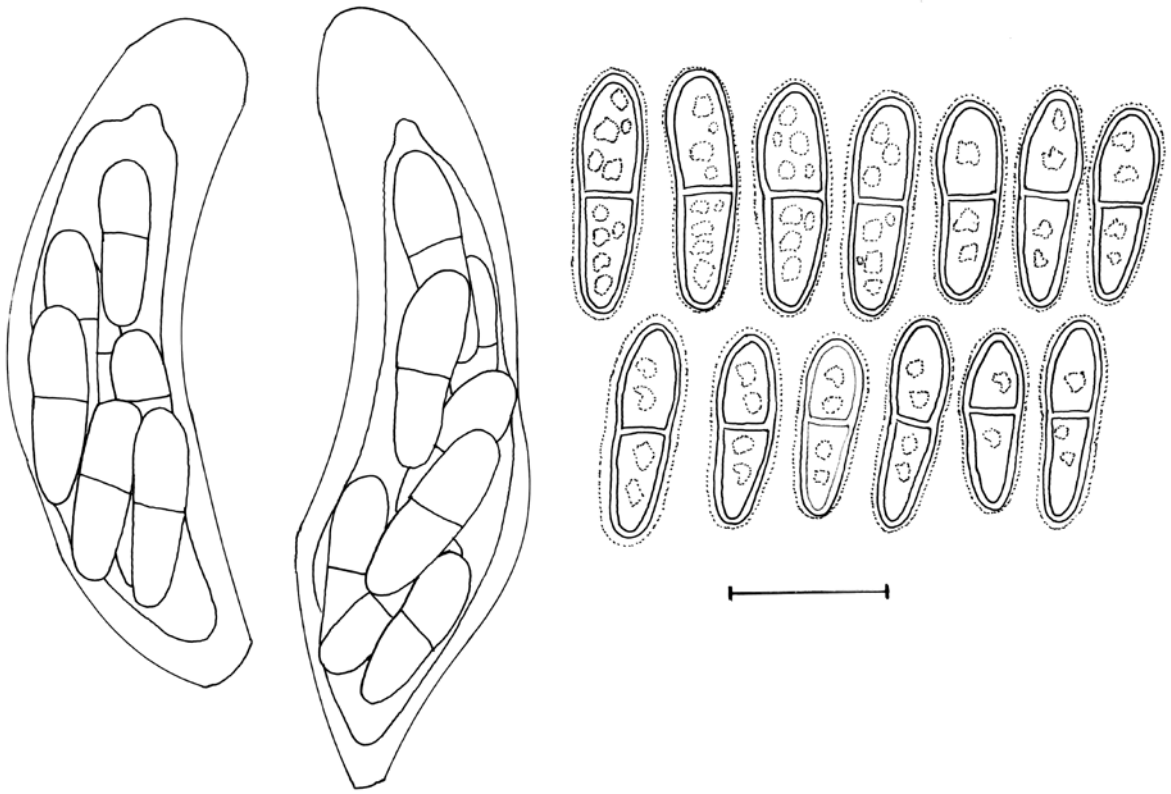


**Fig. 151.** *Cladosporium grevilleae* (DAR 74881). Asci with ascospores. Ascospores showing sheath, and angular inclusions. Scale bar = 10 µm. P. Crous *del.*


**Fig. 152.** *Cladosporium grevilleae* (DAR 74881). A–B. Asci. C. Ostiolar region (arrowed). D. Ascus with ascospores. Scale bars = 10 µm.

multi-seriate, hyaline, guttulate with angular inclusions, thick-walled, straight to slightly curved, fusoid-ellipsoid with obtuse ends, medianly 1-septate, widest in middle of apical cell, slightly constricted at the septum, tapering towards both ends, but slightly more to lower end, (9–)11–12(–13) × 3.5–4(–4.5) µm; ascospores surrounded with a thin sheath when mounted in water, becoming brown and verruculose with age; ascospore germination with germ tubes parallel to the long axis of the spore, but distorting prominently (original spore cells up to 8 µm wide), germinating with numerous germ tubes, forming dense clusters of hyphae, but mostly remaining hyaline after 24 h on MEA.

*Culture characteristics*: Colonies after 2 wk at 24 °C spreading, reaching 15–20 mm diam. On MEA erumpent, with even, lobed margins; surface folded, with sparse aerial mycelium, olivaceous-grey; reverse iron-grey. On OA flat, with sparse aerial mycelium, and lobed, somewhat feathery margins; surface pale olivaceous-grey in middle, iron-grey in outer region. On PDA erumpent, with lobed, feathery margins; surface folded, with sparse aerial mycelium, grey-olivaceous; reverse iron-grey.

*Substrate and distribution*: On *Grevillea*; Australia.

*Notes*: *Cladosporium grevilleae* forms only the sexual state of the life-cycle, *i.e.*, its anamorph was neither observed *in vivo* nor formed *in vitro*. The ascospores are typical of a *Cladosporium* teleomorph, having thick walls, and angular inclusions (Aptroot 2006), becoming brown and verruculose with age. Although four analysed loci supported the association of the species with *Cladosporium*, it did not match any of the *Cladosporium* sequences currently available on the GenBank nucleotide database (closest match on ITS was *Davidiella macrospora* GenBank EU167591 with 95 % identity, on EF-1α was *Cladosporium myrtacearum* GenBank HM148360 with 97 % identity and on ACT it was *Cladosporium iranicum* GenBank HM148599 with 89 % identity). (Crous *et al.* 2011b).

**72. *Cladosporium halotolerans*** Zalar, de Hoog & Gunde-Cimerman, Stud. Mycol. 58: 172. 2007. Fig. 153.

*Holotype*: **Namibia**, isolated from hypersaline water of salterns, 1 Sep. 2000, N. Gunde-Cimerman, isolated by P. Zalar, 1 Oct. 2000 (CBS H-19734). *Ex-type culture*: EXF-572 = CBS 119416.

*Lit.*: Haubold *et al.* (1998a), Buzina *et al.* (2003), Meklin *et al.* (2004).
*Ill.*: Zalar *et al.* (2007: 172, fig. 8).

*In vitro*: *Mycelium* party submerged, partly superficial; hyphae sparingly branched, (1–)2–4 µm wide, pluriseptate, septa often appearing somewhat darkened, usually not constricted, pale brown or pale olivaceous-brown, almost smooth or minutely verruculose, walls unthickened, without extracellular polysaccharide-like material. *Conidiophores* micronematous to semimacronematous, arising laterally and terminally from hyphae, erect, straight to somewhat flexuous, narrowly cylindrical-oblong, occasionally slightly geniculate, non-nodulose, micronematous conidiophores filiform or only as short peg-like or denticle-like lateral outgrowths of hyphae, usually unbranched, sometimes intercalary with short lateral denticulate outgrowths just below a septum, 4–150(–300) × 2–3.5(–5.5) µm, micronematous conidiophores 1–1.5 µm wide, 0–3-septate, septa often appearing darkened, sometimes pluriseptate with septa in short succession, especially towards the apex, septa not constricted, pale olivaceous-brown, smooth to minutely verruculose, walls unthickened or almost so, sometimes forming ramoconidia and fragments. *Conidiogenous cells* integrated, terminal or sometimes intercalary, or conidiophores reduced to conidiogenous cells, cylindrical, 4–18 µm long, usually neither geniculate nor nodulose, with a single or up to three protuberant, subdenticulate or denticulate conidiogenous loci, 0.7–1.5(–2) µm diam, thickened and darkened. *Ramoconidia* 15–37 × 2–2.5(–3) µm, with up to five septa, base broadly truncate, about 2 µm wide, slightly thickened and somewhat darkened-refractive. *Conidia* catenate, in branched chains, conidial chains branching in all directions, terminal chains with up to nine conidia, small terminal conidia globose or subglobose, 2–5(–6) × 2–3(–5) µm (av. ± SD: 3.3 ± 0.7 × 2.5 ± 0.4), aseptate, intercalary conidia subglobose, ovoid or ellipsoid, 3.5–9 × (2–)2.5–3 µm (av. ± SD: 6.2 ± 1.5 × 2.8 ± 0.2), aseptate, pale to medium brown, minutely verruculose or verruculose, secondary ramoconidia ellipsoid, fusiform or cylindrical, 7–25(–31) × 2–3.5(–6.5) µm (av. ± SD: 16.2 ± 6.1 × 2.5 ± 0.4), 0–3(–4)-septate, mostly 1-septate, not constricted at septa, septa often somewhat darkened, pale to medium brown, almost smooth to minutely verruculose, walls unthickened, slightly attenuated towards apex and base, with up to four distal hila, hila protuberant, subdenticulate or denticulate, 0.5–1.5(–2) µm diam, thickened and darkened-refractive; microcyclic conidiogenesis not occurring.

*Culture characteristics*: Colonies on PDA attaining 27–43 mm diam after 14 d, olivaceous, grey olivaceous or olivaceous-grey, reverse olivaceous-grey to leaden-grey or olivaceous-black, velvety, powdery to felty-wooly, margins white, regular, glabrous or feathery, aerial mycelium absent or sparse, growth flat with a somewhat elevated colony centre, without prominent exudates, sporulation profuse. Colonies on MEA attaining 18–44 mm diam after 14 d, smoke-grey, pale olivaceous-grey or olivaceous-grey, sometimes glaucous-grey at margin, reverse olivaceous-grey, powdery to felty-wooly, margin colourless to white, glabrous or feathery, colony centre furrowed, aerial mycelium felty, abundant, covering most of the colony surface, sporulating. *Colonies on MEA + 5 % NaCl* 24–48 mm diam, olive, furrowed, velvety, with more pale, undulate margins, reverse dark green to black. Colonies on OA reaching 29–40 mm diam after 14 d, smoke-grey to grey-olivaceous or dark mouse-grey, reverse olivaceous or olivaceous-grey, velvety to felty, fluffy, margin white, somewhat feathery, aerial mycelium sparse, diffuse or abundantly formed, high, dense, whitish, growth flat with papillate surface, sporulation profuse. *Maximum tolerated salt concentration*: Only 15 % of tested strains develop colonies at 20 % NaCl after 7 d, whereas after 14 d all cultures grow and sporulate. *Cardinal temperatures*: No growth at 4 °C, optimum at 25 °C, maximum at 30 °C. No growth at 37 °C (from Zalar *et al.* 2007).

*Substrates and distribution*: Saprobic, isolated from hypersaline water in subtropical climates, indoor environments, Arctic ice and biomats, contaminant in lesions of humans and animals, plants, rock, conifer wood and window frame, from mycorrhizal roots; probably circumglobal, Africa (Namibia, South Africa), Arctics, Asia (India, Israel, Turkey), Australasia (New Zealand), Europe (Belgium, Bosnia and Herzegovina, Denmark, Germany, Italy, Russia, Slovenia, Spain, Sweden, Switzerland, UK), North

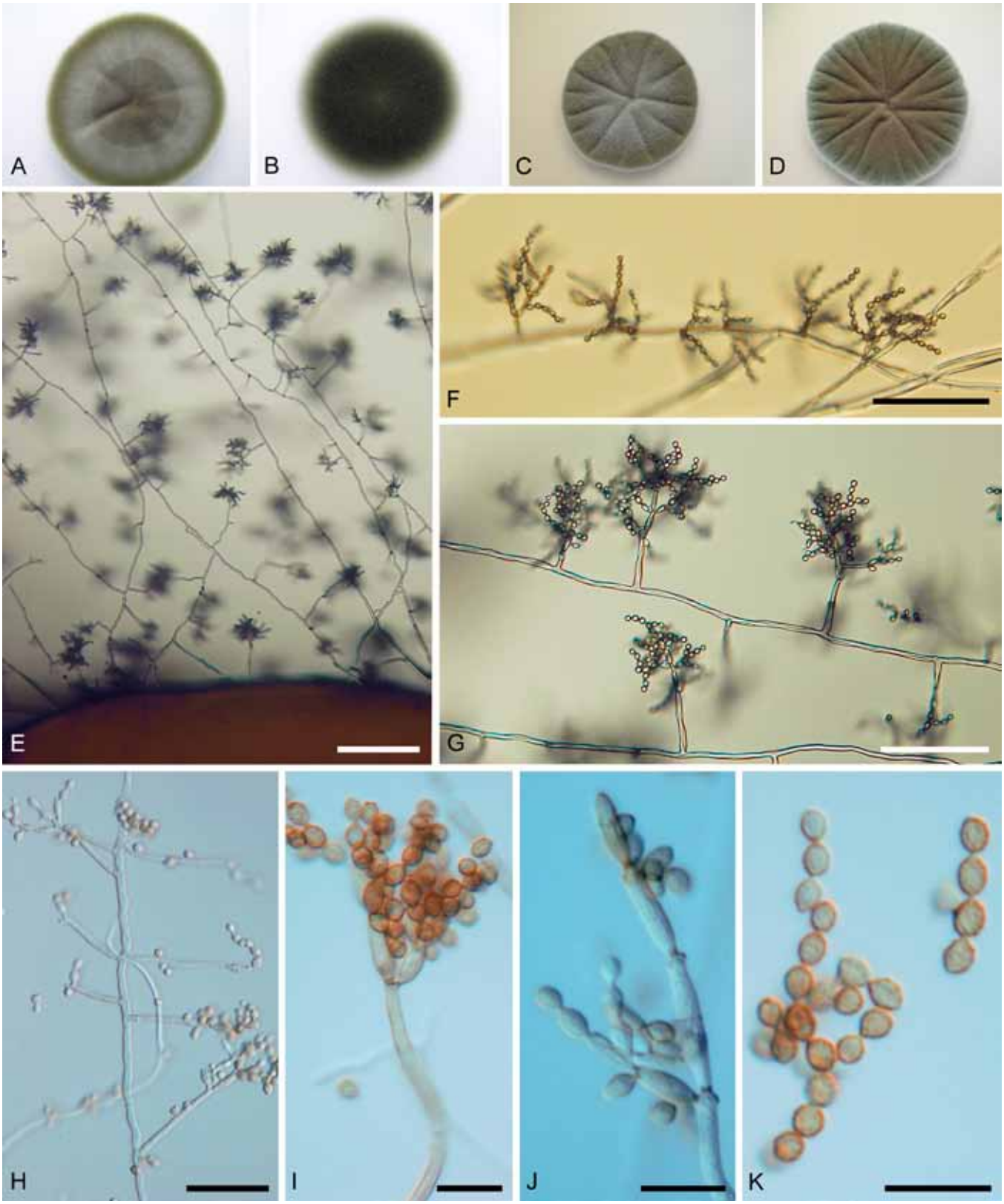



**Fig. 153.** *Cladosporium halotolerans* (CBS 119416) (from Zalar *et al.* 2007). A–D. Colony surface grown on PDA (A), OA (B), MEA (C) and MEA plus 5 % NaCl (D) of strains incubated for 14 d at 25 ºC in darkness. E–H. Habit of conidiophores. I. Conidiophore. J. Succession of secondary ramoconidia. K. Conidia. E–K. All from 7-d-old SNA slide cultures. A–B, from EXF-572 (ex-type strain); C–D, from EXF-977; E, G, from EXF-972; F, from EXF-564; H, I, K, from EXF-1072; J, from dH 12862. Scale bars = 10 (I–K), 30 (H), 50 (F–G), 100 (E) µm.

America (USA) and Central and South America (Brazil, Dominican Republic).

*Additional specimens examined*: *Sine loco*, isol. from *Citrus*, 2007, B. Anderson, BA 1701 (CPC 14302). **Arctic**, isol. from ice (dH 13911 = EXF-2422). **Bosnia and Herzegovina**, ston salterns (EXF-944). **Brazil**, culture contaminant (dH 12862 = EXF-2533); Fortaleza, isol. from nuts, 18 Jul. 2005, U. Braun (CPC 12224). **Denmark**, isol. from water, 2006, B. Anderson, V 2515 (CPC 13641); Bronshoy, isol. from indoor environment, wall over a door frame, old water damage, 2000, B. Anderson, BA 1727

(CPC 14366). **Dominican Republic**, salterns (EXF-698); salt lake Enriquilio (EXF-703). **India**, isol. from *Musa* sp. (*Musaceae*), 25 Oct. 2004, M. Arzanlou (CPC 11615). **Israel**, Dead Sea, isol. from hypersaline water (EXF-1072). **Namibia**, salterns (EXF-565, EXF-567, EXF-571). **New Zealand**, Auckland, Mount Albert, isol. from leaf litter, 20 Jun. 2005, C.F. Hill (CPC 12316, stored as *C. sphaerospermum*); Coromandel, Hahai, isol. from leaf lesions on *Ficus benjamina* (*Moraceae*), 28 Sep. 2005, C.F. Hill, Hill 1259 (CPC 12479). **Russia**, Moscow region, isol. from *Aureobasidium caulivorum* (CBS 573.78). **Slovenia**, bathroom (EXF-972, EXF-977); Sečovlje salterns (EXF-228 = MZKI B-840; EXF-380; EXF-2372). **South Africa**, Bethal, isol. from thatch, 2002, CAMS 000863 (CPC 13997); Durban, isol. from thatch, 2002, CAMS 000825 (CPC 13996). **Spain**, Santa Pola salterns (EXF-646). **Turkey**, isol. from brain (dH 12991 = EXF-2535). **UK**, isol. from laboratory air (CBS 191.54).

*Notes*: This species, which according to Zalar *et al*. (2007) probably prefers (hyper)osmotic ecological niches, is morphologically close to *C. sphaerospermum*. Its distribution is insufficiently known, but based on the recorded collections from various indoor habitats and as a culture contaminant in different parts of the world (Zalar *et al*. 2007), *C. halotolerans* is possibly cosmopolitan.

**73. *Cladosporium haplophylli*** (Vasyag. & Tartenova) J.C. David, Mycol. Pap. 172: 85. 1997. Fig. 154.
*Basionym*: *Heterosporium haplophylli* Vasyag. & Tartenova, Krypt. Fl. Kazakhst. 8(2): 164. 1975.

*Holotype*: **Kazakhstan**, Chimkentskaya Oblast, southern Kyzyl-Kum desert, on *Haplophyllum latifolium* (*Rutaceae*), 10 Jun. 1957, M.A. Tartenova (probably not preserved). *Paratype*: **Kazakhstan**, Chimkentskaya Oblast, Talasskii Alatau, Zapovednik Aksu-Dzhabagly, river Aksu, on *Haplophyllum latifolium*, 23 Jul. 1968, M.P. Vasyagina (AA).

*Ill*.: David (1997: 87, fig. 20).

*In vivo*: Leaf spots amphigenous, elliptical-subcircular, often at the tips of the leaves or marginal, 1–4(–5) mm wide, pale beige to medium brown, occasionally with a narrow somewhat raised margin, surrounded by a diffuse yellowish halo. *Colonies* amphigenous, mainly hypophyllous, punctiform, scattered to dense, dark brown. *Mycelium* immersed. *Stromata* lacking, only with single swollen hyphal cells, 4–18 µm diam, or small aggregations of swollen hyphal cells, 10–40 µm diam, brownish. *Conidiophores* solitary or in small groups or fascicles, arising from single swollen hyphal cells or cell aggregations, erumpent, erect, straight, subcylindrical to usually narrowed towards the apex, barely to slightly geniculate-sinuous, unbranched, 8–40 × 4–10 µm, aseptate, pale to medium yellowish brown or brown, wall thin, ≤ 1 µm, smooth to faintly rough-walled; conidiophores usually reduced to conidiogenous cells, with 1–2(–3) conidiogenous loci, conspicuously coronate, 2–3 µm wide and 1 µm high. *Conidia* solitary or in short chains, ramoconidia lacking, ellipsoid-ovoid, obovoid, pyriform, subcylindrical, 15–30 × 8–12(–13) µm, 0–2-septate, pale to medium olivaceous-brown or brown, wall thin, ≤ 1 µm, densely verruculose or verrucose, ends broadly rounded or somewhat attenuated, with a single coronate hilum, 1–2.5 µm diam.

*Substrates and distribution*: On *Haplophyllum* spp. (*Rutaceae*), Central Asia – *H. acutifolium* (Turkmenistan), *H. latifolium* (Kazakhstan).

*Additional specimen examined*: **Turkmenistan**, Maryskaya Oblast, Badkhyzskii Zapovednik, Urochishche Er-Oilan-Duz, on *Haplophyllum acutifolium*, 20 Apr. 1978, V.A. Mel'nik (IMI 269572, LE).

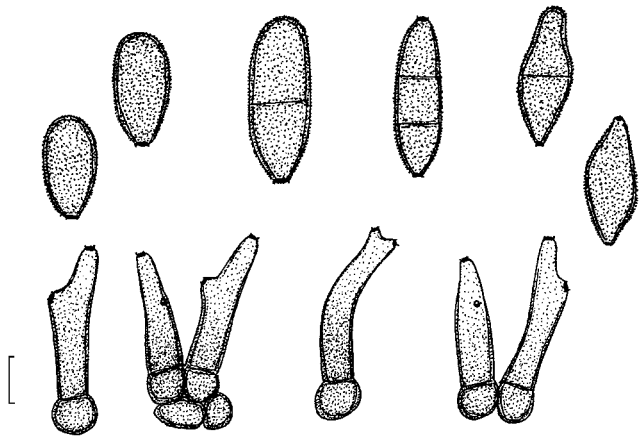


**Fig. 154.** *Cladosporium haplophylli* (IMI 269572). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. U. Braun *del*.

*Notes*: This is a leaf-spotting phytopathogenic fungus, well-characterised by having very short, aseptate conidiophores, arising from basal swollen hyphal cells, and large, above all rather broad, densely verruculose-verrucose conidia.

**74. *Cladosporium heleophilum*** J.C. David, Mycol. Pap. 172: 80. 1997. Fig. 155.

*Holotype*: **USA**, Washington, Seattle, on *Typha latifolia* (*Typhaceae*), 26 Aug. 1912, E. Bartholomew, Bartholomew, Fungi Columb. 4407 (K). *Isotypes*: Bartholomew, Fungi Columb. 4407.

*Ill*.: David (1997: 62, fig. 17 J–L).
*Exs*.: Bartholomew, Fungi Columb. 4407; Krieger, Fungi Saxon. Exs. 2091 p.p.

*In vivo*: Saprobic on dead leaves. *Colonies* effuse or forming small, brown, punctiform to oblong speckles on the leaf surface composed of conidiophore tufts, often arranged in a line alongside furrows in the leaf. *Mycelium* immersed; hyphae forming loose stromatic aggregations, sometimes erumpent through the cuticle. *Conidiophores* usually fasciculate, occasionally solitary, erect, straight, subcylindrical to moderately geniculate-sinuous, unbranched, 30–120 × 4–6 µm, septate, pale olivaceous-brown to medium brown, sometimes paler towards the apex, wall thin to slightly thickened (≤ 1 µm), smooth or almost so, cells occasionally with distinct lumen, protoplasm aggregated at the septa, which appear to be thickened. *Conidiogenous cells* integrated, terminal and intercalary, sympodially proliferating, slightly to moderately geniculate-sinuous, 10–30 µm long, usually with 1–4 distinctly coronate conidiogenous loci, somewhat protuberant, 1.5–2 µm diam. *Conidia* in simple or branched chains, elongate-ellipsoid to cylindrical, short conidia sometimes ellipsoid-ovoid, 8–30(–35) × (3–)4–6(–7) µm, 0–3(–5)-septate, usually without any constrictions, septate conidia and secondary ramoconidia 12–30 µm long, pale olivaceous to olivaceous-brown, thin-walled, almost smooth to usually verruculose, ends obtuse to slightly attenuated, hila 1–2 µm diam, distinctly coronate, slightly protuberant, somewhat thickened and darkened-refractive; microcyclic conidiogenesis not observed.

*Substrates and distribution*: On dead leaves of *Typha latifolia* (*Typhaceae*) – Europe (Germany, Latvia, UK), North America (USA, WA).

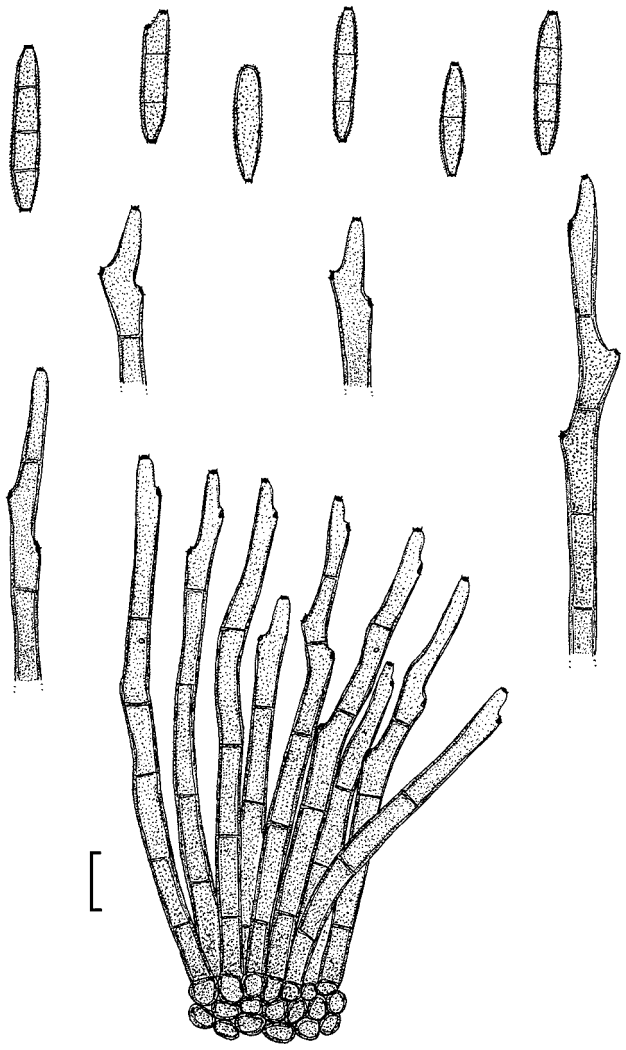


**Fig. 155.** *Cladosporium heleophilum* (K). Fascicle of conidiophores, conidiogenous cells and conidia *in vivo*. Scale bar = 10 µm. U. Braun *del*.

*Additional specimens examined*: **Germany**, Mittelfranken, on *Typha* sp., 11 Oct. 1902, Zahn (HBG); Saxony, Ostrau near Schandau, on *Typha latifolia*, Jul. 1901/ Oct. 1904, Krieger, Fungi Saxon. Exs. 2091 (HAL, as *Cladosporium typharum* mixed with *C. macrocarpum*); ex "Station für Pflanzenschutz zu Hamburg", on *Typha latifolia*, June 1903, without exact locality and collector (HBG). **Latvia**, Vidzeme, Vestiena, on *Typha latifolia*, 20 Jul. 1933, K. Starcs (M-0057703).

*Notes*: This species, which is only known from a few herbarium samples, is insufficiently known. It is undoubtely a saprobic fungus. The size of the conidiophores and, above all, the width of the conidia remind one of *Cladosporium allicinum*, but the latter species differs from *C. heleophilum* in having distinctly nodulose conidiophores. *Cladosporium heleophilum* belongs to a group of *C. herbarum*-like species, but it is distinguished from the *C. herbarum* complex by their non-nodulose conidiophores. Within this group of species, *C. heleophilum* resembles *C. antarcticum*, isolated from a lichen, and the saprobic *C. subtilissimum*. The latter species is, however, distinct by having numerous small, usually narrowly obovoid, limoniform to fusiform conidia and somewhat narrower, usually 0–1-septate secondary ramoconidia. The conidiophores of *C. antarcticum* are usually distinctly geniculate, with numerous, often crowded, denticle-like conidiogenous loci. The differentiation between *C. heleophilum* and allied species, above all *C. subtilissimum*, is rather difficult and only tentative, since David's species is not yet known *in vitro*.

A collection on necrotic patches on *Rosa* sp. (Brazil, State of Ceará, São Benedito City, 30 Oct. 2001, F. Freire, HAL) agrees morphologically well with *C. heleophilum* [conidiophores fasciculate, 20–70 × 2–6 µm, geniculate; conidia in branched chains, obovoid, ellipsoid to cylindrical, (6–)10–25 × 3–6(–7) µm, 0–3-septate, almost smooth to verruculose].

**75. *Cladosporium heliotropii*** Erikss., Bot. Centralbl. 47: 299, 1891 and Fungi Paras. Scand. Exs., Fasc. 8, No. 396. 1891. Figs 156–158.

*Lectotype* (**designated here**): **Sweden**, Stockholm, Rosendal, on leaves of *Heliotropium arborescens* (= *H. peruvianum*) (*Boraginaceae*), 1882, J. Eriksson, Erikss., Fungi Paras. Scand. Exs. 396 (BPI 426853). *Isolectotypes*: Erikss., Fungi Paras. Scand. Exs. 396 (*e.g.* HAL, HBG).

*Lit.*: Saccardo (1892: 602), Ferraris (1914: 884), Schubert (2005b: 85–87).
*Ill.*: Schubert (2005b: 86–87, figs 33–34, pl. 16, figs A–F).
*Exs.*: Eriksson, Fungi Paras. Scand. Exs. 396.

*In vivo*: On living leaves, forming pale to dark brown, dense patches. *Colonies* epiphyllous, punctiform, scattered, caespitose, pale brown to olivaceous-brown, floccose-villose. *Mycelium* external, superficial; hyphae branched, septate, at first 3–6 µm wide, later distinctly swollen and often constricted at the septa, up to 10 µm wide or even wider, almost subhyaline or pale olivaceous, later pale olivaceous to medium brown or somewhat reddish brown, smooth or almost so to irregularly rough-walled, rugose, walls slightly to distinctly thickened, sometimes even two-layered, protoplasm of the cells often aggregated at the septa, olivaceous-yellowish, refractive and somewhat granular, surrounding walls much paler, sometimes almost hyaline, sometimes with distinct lumen in the centre, hyphae aggregated, forming loose to dense superficial, stromatic hyphal aggregations. *Stromata* lacking. *Conidiophores* solitary, arising from external, creeping hyphae, swollen hyphal cells or stromatic hyphal aggregations, lateral or terminal, often also formed secondarily (microcyclic conidiogenesis), arising from swollen conidia, erect, straight to flexuous, narrowly cylindrical-oblong or filiform, sometimes growing like and confusable with hyphae, usually not geniculate, sometimes subnodulose, unbranched or branched, 5–150(–210) × (2–)3–6 µm, septate, sometimes slightly constricted at the septa, almost hyaline, subhyaline to pale olivaceous-brown, smooth or almost so, sometimes asperulate, walls somewhat thickened, cell structure similar to hyphae, protoplasm distinct, clearly delineated from the inner wall, sometimes with distinct, irregular lumen in the centre, sometimes appearing to be distoseptate. *Conidiogenous cells* integrated, mostly terminal, occasionally intercalary, cylindrical, 8–32 µm long, proliferation sympodial, with 1–3 conidiogenous loci, often near the apex, sometimes situated on small lateral shoulders or unilateral swellings, protuberant, subdenticulate, 1–2 µm diam, thickened, refractive to somewhat darkened. *Conidia* catenate, in unbranched or branched chains, subglobose, obovoid, ellipsoid, fusiform to subcylindrical, occasionally cylindrical, 4–20(–25) × 3–7 µm wide, 0–1(–3)-septate, sometimes slightly constricted at the septa, pale olivaceous or pale olivaceous-brown, smooth or almost so to minutely verruculose, walls more or less thickened, with age becoming distinctly swollen, longer and wider, up to 12 µm or even

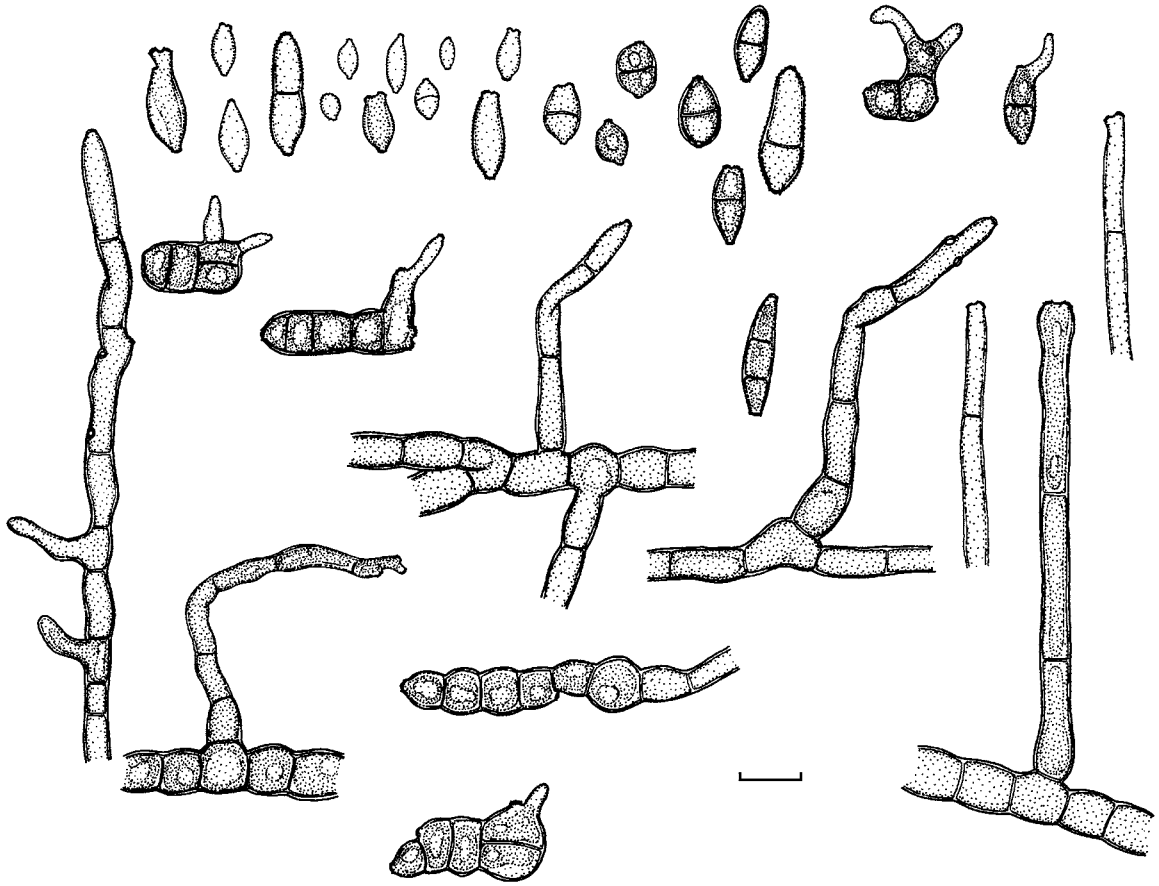


**Fig. 156.** *Cladosporium heliotropii* (BPI 426853). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

wider, pluriseptate, often constricted at septa, sometimes with a single longitudinal septum or a single distoseptum, thick-walled, sometimes even two-layered, smooth to verruculose, sometimes confusable and only barely distinguishable from swollen hyphae, cell structure similar to hyphae and conidiophores, hila protuberant, 1–2 µm diam, thickened, refractive to somewhat darkened; microcyclic conidiogenesis often occurring.

*Substrates and distribution*: On *Heliotropium* spp. (*Boraginaceae*); Europe, North America – *Heliotropium arborescens* (Sweden; USA, AK), *Heliotropium* sp. (USA, AK).

*Additional specimens examined*: **USA**, Alaska, Sitka, on *Heliotropium* sp., 1 Nov. 1914, J.P. Anderson, Alaska Fungi 144 (BPI 426850, BPI 426851) and Alaska Fungi 159 (BPI 426849, BPI 426852).

*Notes*: Some collections on *Heliotropium* sp. from Alaska housed at BPI were examined and proved to be conspecific with *C. heliotropii*. They agree well with the latter species in forming an external mycelium giving rise to solitary conidiophores, having conidiophores and conidia with agreeing morphology and showing the same cell structures as described above. They vary in having longer conidiophores (up to 210 µm long), longer and more frequently septate [0–3(–5) septa] conidia and occasionally somewhat wider conidiogenous loci and hila (up to 3 µm diam). Old, swollen conidia could only occasionally be observed, whereas in the type material they were common. Ferraris (1914) recorded

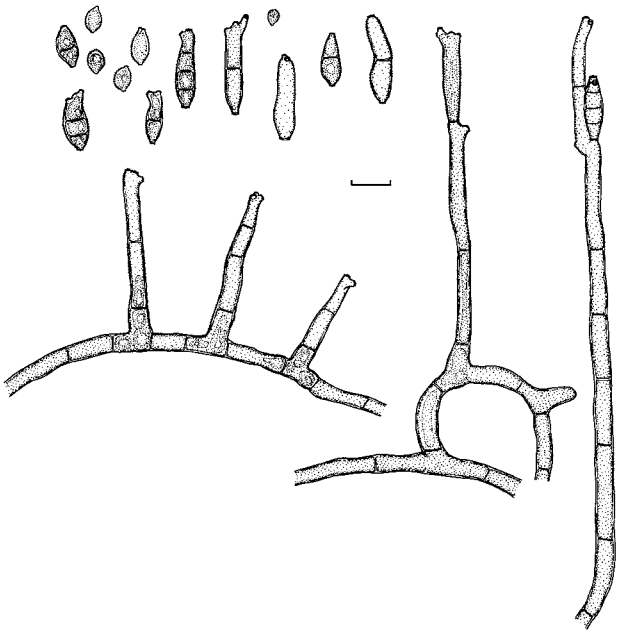


**Fig. 157.** *Cladosporium heliotropii* (BPI 426851). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

and described a single collection from Italy (Italy, near Turin, in a garden, on leaves of *Heliotropium peruvianum*, P. Voglino) indicating that *C. heliotropii* is probably more common and widespread than


**Fig. 158.** *Cladosporium heliotropii* (BPI 426853 and HBG). A, D. Conidiophores with still attached conidia. B. Conidiophore arising from superficially growing hyphae. C, E. Conidiophores and old swollen conidia. F. Small conidia. Scale bars = 10 (A–F) µm.

given under "Substrate and distribution". Furthermore, he stated that the conidia rapidly germinated in water, so that infections of leaves above all occurred under humid conditions. French (1989) reported this species from California, USA.

The phenomenon that conidia are become distinctly swollen, larger and wider, pluriseptate and thick-walled with age, giving rise to secondary conidiophores, is also known from *C. dracaenatum*, but this species differs from *C. heliotropii* in having fasciculate, mildly to distinctly geniculate-sinuous conidiophores arising from true, substomatal to intra-epidermal stromata, and cells with distinct lumina, as described above, were not observed.

**76. *Cladosporium herbaroides*** K. Schub., Zalar, Crous & U. Braun, Stud. Mycol. 58: 120. 2007. Figs 159–161.

*Holotype*: **Israel**, Eilat salterns, isolated from hypersaline water, 2004, N. Gunde-Cimerman, isol. M. Ota (CBS H-19858). *Isotype*: HAL 2025 F. *Ex-type culture*: CBS 121626 = EXF-1733 = CPC 12052.

*Ill.*: Schubert *et al*. (2007b: 121–123, figs 13–15).

*In vitro*: *Mycelium* branched, (1–)2–8 µm wide, septate, often with small swellings and constrictions, subhyaline to pale brown or pale

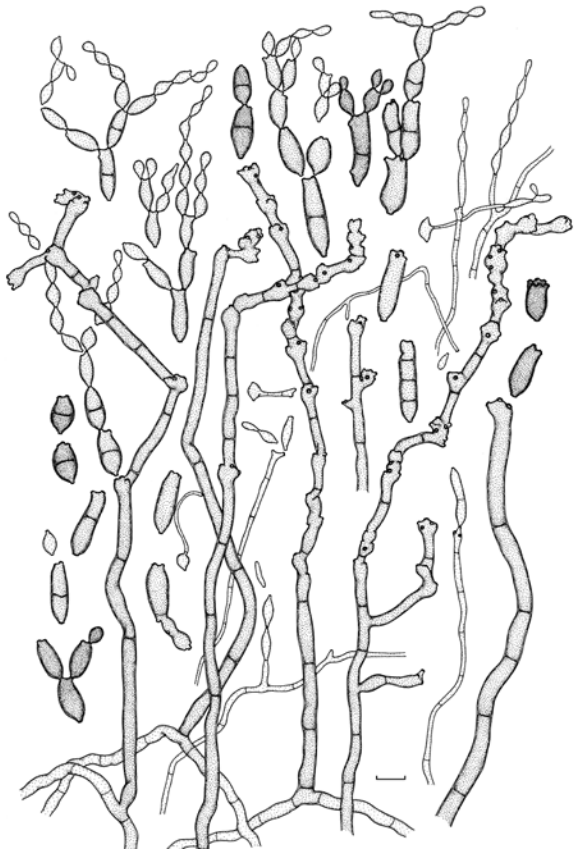


**Fig. 159.** *Cladosporium herbaroides* (CPC 12052). Macro- and micronematous conidiophores and conidia *in vitro*. Scale bar = 10 µm. K. Bensch *del*.

olivaceous-brown, smooth or almost so to somewhat verruculose, walls unthickened or almost so. *Conidiophores* macronematous and micronematous, arising lateral from plagiotropous hyphae or terminally from ascending hyphae. *Macronematous conidiophores* erect, straight to slightly flexuous, often geniculate, nodulose, with unilateral or multilateral swellings, often numerous swellings in short succession giving them a gnarled appearance, often forming somewhat protruding or prolonged lateral swellings or a branch-like prolongation below the terminal swelling (due to sympodial proliferation), unbranched or sometimes branched, 30–230 µm long or even longer, 3–5 µm wide, swellings 5–8 µm wide, septate, not constricted at septa, pale to medium olivaceous-brown, smooth or almost so, walls slightly thickened. *Conidiogenous cells* integrated, terminal or intercalary, cylindrical, usually nodulose to nodose forming distinct swellings, sometimes geniculate, 15–55 µm long, with numerous conidiogenous loci usually confined to swellings or situated on small lateral shoulders, sometimes on the top of short peg-like prolongations or denticles, loci protuberant, 1–2 µm diam, thickened and darkened-refractive. *Micronematous conidiophores* much shorter, narrower, paler, neither nodulose nor geniculate, arising laterally from plagiotropous hyphae, often only as short lateral denticles or branchlets of hyphae, erect, straight, conical to cylindrical, unbranched, 3–65 × 2–3 µm, mostly aseptate,

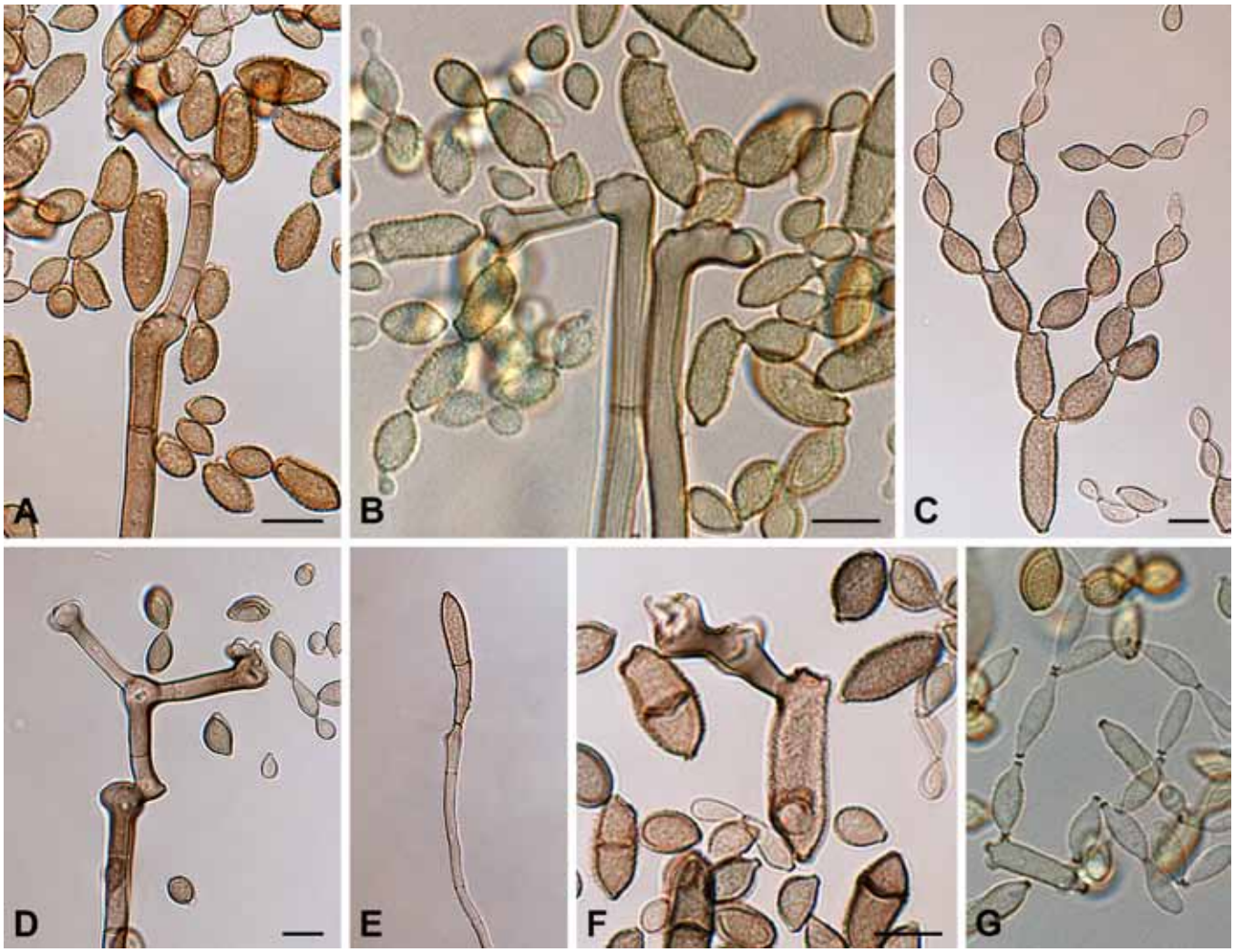



**Fig. 160.** *Cladosporium herbaroides* (CPC 12052). A–B, D. Macronematous conidiophores. C. Conidial chain. E. Micronematous conidiophore. F. Microcyclic conidiogenesis. G. Conidia formed by micronematous conidiophores. Scale bars = 10 µm.

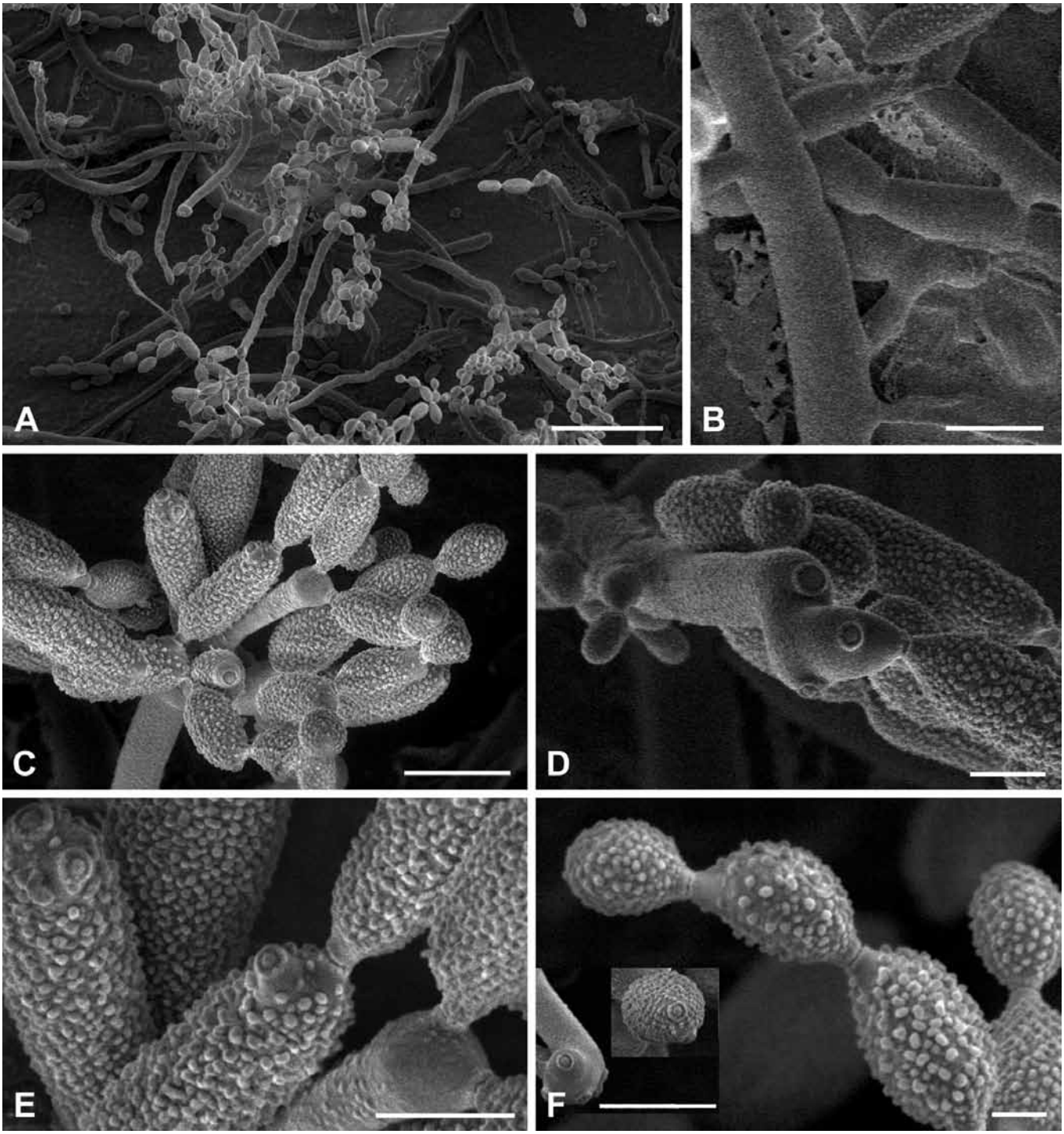



**Fig. 161.** *Cladosporium herbaroides* (CPC 12052). A. Overview of the growth characteristics of this fungus. Broad hyphae run over the surface of the agar, and possibly give rise to conidiophore branches. The conidiophores of this fungus can be rather long, resembling aerial hyphae. Clusters of conidia are clearly visible in this micrograph. B. The very wide surface hyphae can anastomose. C. Conidiophore with secondary ramoconidia and conidia. Note the variation in scar size. D. A very elaborate, complex conidiophore with different scars of variable size, one being more than 2 µm wide! E. Details of secondary ramoconidia and hila. Note the rather strong ornamentation in which smaller "particles" are between larger ones. F. Three conidia in a row. Note the scar formation in the chain and the reduction of the size of the cells throughout the spore-chain. The inset shows the resemblance of the scars on a conidiophore and on a secondary ramoconidium. Scale bars = 2 (F), 5 (D–E), 10 [B–C, F (inset)], 50 (A) µm.

sometimes up to five septa, subhyaline, smooth, walls unthickened. *Conidiogenous cells* integrated, terminal or conidiophores reduced to conidiogenous cells, conidiogenous loci solitary or sometimes as sympodial clusters of pronounced denticles, protuberant, 1–1.5 µm diam, thickened and somewhat darkened-refractive. *Conidia* polymorphous, two main morphological types recognisable, formed by the two different types of conidiophores, conidia formed by macronematous conidiophores catenate, in branched chains, straight to slightly curved, subglobose, obovoid, limoniform, ellipsoid to cylindrical, 3–33 × (2–)3–6(–7) µm [av. ± SD, 14.5 (± 7.9) × 5.2 (± 1.2) µm], 0–2(–3)-septate, sometimes slightly constricted at septa, septa median or somewhat in the lower half, pale to medium olivaceous-brown, verruculose to verrucose (granulate under SEM), walls slightly thickened, with up to three rarely four distal scars, with age becoming medium or even dark brown (chocolate brown), wider and more thick-walled, 5.5–33 × (3.5–)5–9(–11) µm [av. ± SD, 14.4 (± 6.9) × 7.2 (± 1.9) µm], walls up to 1 µm thick, hila protuberant, 0.8–2(–2.5) µm diam, thickened and darkenedrefractive; microcyclic conidiogenesis occurring. *Conidia* formed by micronematous conidiophores paler and narrower,

mostly formed in unbranched chains, sometimes in branched chains with up to three distal hila, straight to slightly curved, limoniform, narrowly fusiform, almost filiform to subcylindrical, 10–26(–35) × 2–3.5 µm [av. ± SD, 15.6 (± 6.2) × 2.9 (± 0.5) µm], 0–1(–3)-septate, subhyaline to pale brown, almost smooth to minutely verruculose, walls unthickened, hila protuberant, 1–1.5 µm diam, thickened and somewhat darkened-refractive.

*Culture characteristics*: Colonies on PDA attaining 23 mm diam after 14 d at 25 ºC, grey-olivaceous to olivaceous, olivaceous-grey reverse, velvety, margin regular, entire edge, narrow, feathery, aerial mycelium abundantly formed, loose, with age covering large parts of the colony, woolly, growth flat with somewhat elevated colony centre, folded, regular, deep into the agar, with few prominent exudates, sporulation profuse. Colonies on MEA attaining 24 mm diam after 14 d at 25 ºC, grey- to greenish olivaceous, olivaceous-grey or iron-grey reverse, velvety to powdery, margin narrow, colourless, entire edge, somewhat feathery, aerial mycelium pale olivaceous-grey, sparse, growth convex, radially furrowed, folded in the colony centre, without prominent exudates, sporulating. Colonies on OA attaining 23 mm diam after 14 d at 25 ºC, grey-olivaceous, margin more or less regular, entire edge, colourless, somewhat feathery, aerial mycelium whitish to smoke grey, at first sparse, later more abundantly formed, growth flat, without exudates, sporulation profuse.

*Substrates and distribution*: Isolated from hypersaline water; Israel, but probably more widespread (see "notes").

*Notes*: *Cladosporium herbaroides* belongs to the *C. herbarum* complex but is distinguished by having somewhat longer conidia becoming wider, darker and even more thick-walled with age [at first conidia 3–33 × (2–)3–6(–7) µm, with age (3.5–)5–9(–11) µm wide] and by forming a second conidial type formed on micronematous conidiophores, giving rise to unbranched conidial chains which are almost filiform, limoniform, narrowly fusiform to subcylindrical, much narrower and paler than the ones formed by macronematous conidiophores, 10–26(–35) × 2–3.5 µm (Schubert *et al.* 2007b).

Two old herbarium collections morphologically well agreeing with *C. herbaroides* have been examined [Germany, Hannover, Nordstemmen, on old leaves of *Populus* sp., 12 Sep. 1883, Eichelbaum (HBG); Germany, Bavaria, Fränkische Schweiz, Jura, Hirschbach, on necrotic leaf spots caused by a coelomycete (*Phyllosticta* or *Septoria*), on *Rhamnus cathartica*, Sep. 1904, Zahn (HBG)].

**77. *Cladosporium herbarum*** (Pers. : Fr.) Link, Ges. Naturf. Freunde Berlin Mag. Neuesten Entdeck. Gesammten Naturk. 7: 37. 1816: Fr., Syst. mycol. 3(2): 370. 1832. Figs 162–165. *Basionym*: *Dematium herbarum* Pers., Ann. Bot. (Usteri) 11: 32. 1794 : Fr., Syst. mycol. 3(2): 370. 1832.

≡ *Acladium herbarum* (Pers.) Link, Ges. Naturf. Freunde Berlin Mag. Neuesten Entdeck. Gesammten Naturk. 3: 12. 1809.
≡ *Byssus herbarum* (Pers.) DC., Fl. franç., Ed. 3, 5: 11. 1815, as "*Bissus*".
≡ *Dematium vulgare* Pers., Mycol. eur. 1: 13. 1822, *nom. superfl.*
≡ *Dematium vulgare* a *herbarum* (Pers.) Pers., Mycol. eur. 1: 13. 1822.

*Lectotype* (selected by Prasil & de Hoog 1988): *Sine loco*, *sine dato*, ex herb. Persoon (L 910.225-733). *Epitype* (designated by Schubert *et al.* 2007b): **Netherlands**, Wageningen, isolated from *Hordeum vulgare* (*Poaceae*), 2005, P.W. Crous (CBS H-19853).

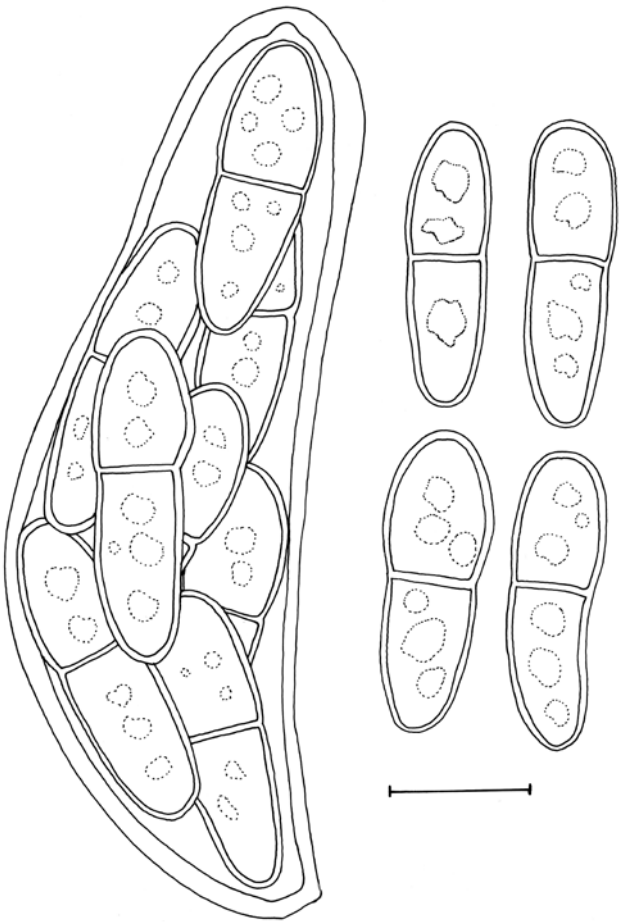


**Fig. 162.** *Cladosporium herbarum* (RO, holotype of the teleomorphic state *Davidiella tassiana*). Ascus and ascospores *in vivo*. Scale bar = 10 µm. P.W. Crous *del*.

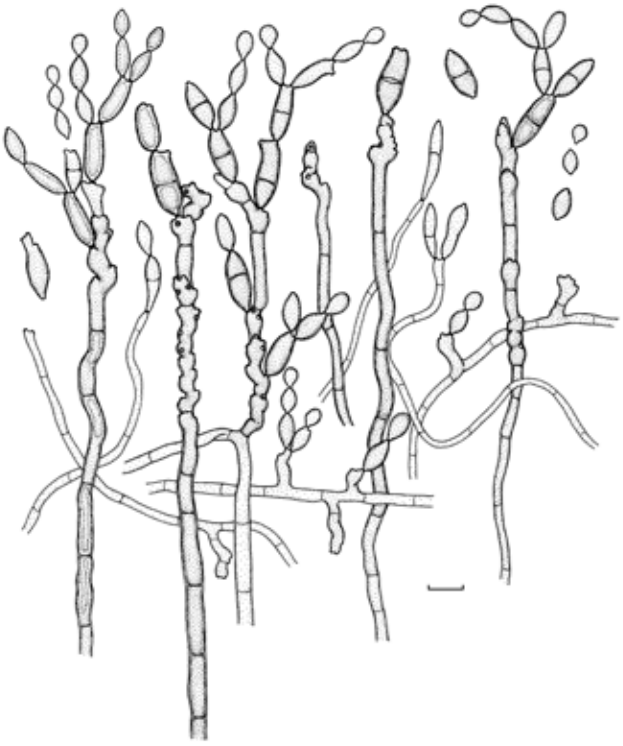


**Fig. 163.** *Cladosporium herbarum* (CPC 11600). Macro- and micronematous conidiophores and conidia *in vitro*. Scale bar = 10 µm. K. Bensch *del*.

*Isoepitype*: HAL 2022 F. *Ex-epitype culture*: CBS 121621 = CPC 12177–12179, 12181, 12183.

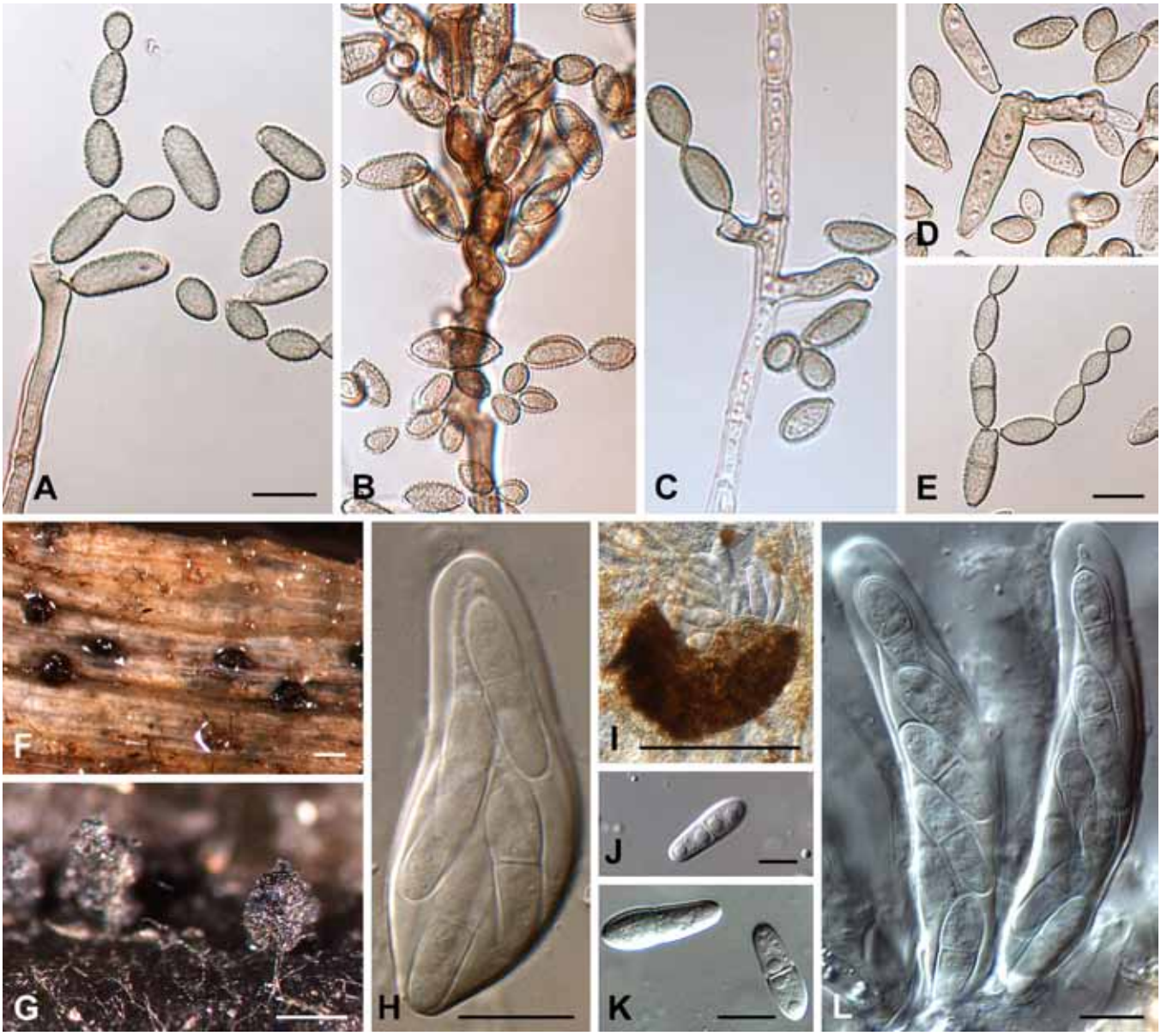



**Fig. 164.** *Cladosporium herbarum* (CPC 11600), anamorphic and teleomorphic states (from the host and CPC 12181). A–B. Macronematous conidiophores. C. Micronematous conidiophore. D. Microcyclic conidiogenesis. E. Conidial chain. F. Ascomata on the leaf. G. Ascomata formed in culture on nettle stems. H–I. Asci on the host. J–K. Ascospores in culture. L. Asci in culture. Scale bars = 10 (A, E, H, J–L), 200 (F–G, I) µm.

= *Dematium epiphyllum* Pers., Syn. meth. fung. 2: 695. 1801 [type: L 910.225-646].

≡ *Cladosporium epiphyllum* (Pers.) Nees, Syst. Pilze 1: 67. 1817.

≡ *Cladosporium epiphyllum* (Pers.) Link, in Willd., Sp. pl. 6(1): 42. 1824.

≡ *Chloridium epiphyllum* (Pers.) Chevall., Fl. gén. env. Paris 1: 35. 1826.

≡ *Cladosporium epiphyllum* (Pers.) Fr., Syst. mycol. 3(2): 370. 1832.

= *Dematium herbarum* γ *fungorum* Pers., Syn. meth. fung. 2: 699. 1801 [type: L 910.225-732].

≡ *Dematium vulgare* γ *fungorum* (Pers.) Pers., Mycol. eur. 1: 14. 1822.

≡ *Cladosporium herbarum* β *fungorum* (Pers.) Chevall., Fl. gén. env. Paris 1: 36. 1826.

≡ *Cladosporium fungorum* (Pers.) Roum., Fungi Sel. Gall. Exs., Cent. 33, No. 3293. 1885, as "Pers.".

= *Dematium epiphyllum* β *chionanthi* Pers., Mycol. eur. 1: 16. 1822 [holotype: L 910.255-872 = L 0115833].

≡ *Cladosporium epiphyllum* β *chionanthi* (Pers.) Link, in Willd., Sp. pl. 6(1): 42. 1824.

= *Dematium fuscum* Pers., Mycol. eur. 1: 16. 1822 [type: L 910.225-720].

≡ *Cladosporium fuscatum* Link, in Willd., Sp. pl. 6(1): 41. 1824, non *C. fuscum* Link, 1824.

= *Botrytis pulvinata* Link, in Willd., Sp. pl. 6(1): 61. 1824 [holotype: B 700006764].

= *Cladosporium typharum* Desm., Pl. Crypt. N. France, Ed. 1, Ser. 2, Fasc. VII, No. 304. 1828 [syntypes: *e.g.*, K, PC].

= *Cladosporium sparsum* Schwein., Trans. Amer. Philos. Soc., N.S., 4(2): 277. 1832 [syntypes: PH 1020413-1020414].

= *Cladosporium typhae* Schwein., Trans. Amer. Philos. Soc., N.S., 4(2): 277. 1832 [type: PH].

= *Helminthosporium* ("*Helmisporium*") *herbarum* Schwein., Trans. Amer. Philos. Soc., N.S. 4(2): 279. 1832 [type: PH].

= *Acladium heterosporum* Wallr., Flora crypt. Germ. 2: 287. 1833 [type: STR].

= *Cladosporium alnicola* Corda, Icon. fung. 1: 14. 1837 [type: PRM].

≡ *Didymotrichum alnicola* (Corda) Bonord., Handb. Mykol.: 89. 1851.

= *Cladosporium caricicola* Corda, Icon. fung. 1: 14. 1837 [type: PRM].

≡ *Didymotrichum caricicola* (Corda) Bonord., Handb. Mykol.: 89. 1851.

= *Cladosporium graminum* Corda, Icon. fung. 1: 14. 1837, *nom. illeg.*, non *C. graminum* (Pers.) Link, 1824.

= *Cladosporium fasciculatum* Corda, Icon. fung. 1: 15. 1837 [type: PRM].

= *Cladosporium lignicola* Corda, Icon. fung. 1: 14. 1837 [type: PRM 155424].

= *Cladosporium nodulosum* Corda, Icon. fung. 1: 15. 1837 [type: PRM].

≡ *Didymotrichum nodulosum* (Corda) Bonord., Handb. Mykol.: 89. 1851.

= *Cladosporium tomentosum* Corda, Icon. fung. 1: 15. 1837 [type: PRM].

= *Helminthosporium* ("*Helmisporium*") *flexuosum* Corda, Icon. fung. 1: 13. 1837 [T: PRM].

≡ *Brachysporium flexuosum* (Corda) Sacc., Syll. fung. 4: 429. 1886.

= *Myxocladium arundinis* Corda, Icon. fung. 1: 12. 1837 [type: PRM 155582].

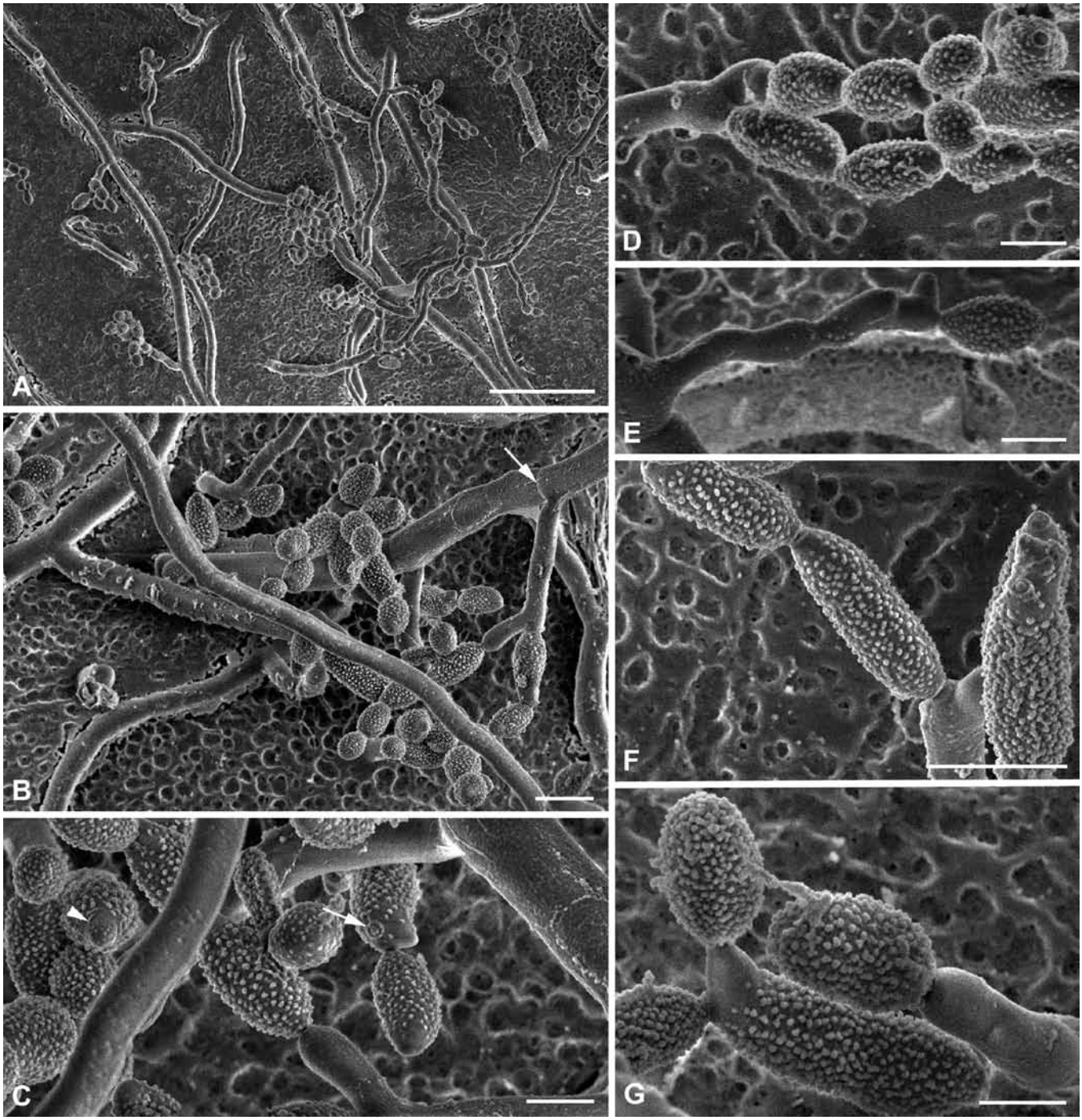



**Fig. 165.** *Cladosporium herbarum* (CPC 11600). A. Overview of hyphal growth and conidiophore formation of a colony on SNA. Conidiophores are often formed on very wide (approx. 10 µm), septate hyphae that often grow near the agar surface. B. A more detailed view on colony organisation reveals the ornamented conidia. Note the septum near the conidiophore (arrow). C. Detail of spore ornamentation and hila on a secondary ramoconidium (arrow). Ornamentation is visible during early stages of spore formation (arrow). D. Structure of the conidiophore, illustrating the complex morphology of the spore-forming apparatus. In addition, secondary ramoconidia, conidia, and a hilum on the conidium are visible. E. Complex structure of the spore-forming apparatus. F. Details of secondary ramoconidia with complex scar-pattern on the right cell. G. Details of a secondary ramoconidium giving rise to conidia. Note the lack of ornamentation at the location of spore formation. Scale bars = 5 (C–E, G), 10 (B, F), 50 (A) µm.

≡ *Cladosporium arundinis* (Corda) Sacc., Syll. fung. 4: 364. 1886.

= ? *Cladosporium herbarum* var. *typharum* Westend. & Van Haes., Catalogue des Cryptogames observes depuis 1835, dans le Brabant et das la Province d'Anvers: 8, no. 173. 1838.

= *Cladosporium amaranticola* Opiz, Lotos 5: 41. 1855, *nom. nud*. [type: PRM].

= *Cladosporium caespiticium* Rabenh., Fungi Eur. Exs., Cent. VI, No. 579. 1863 and Bot. Zeitung (Berlin) 21: 230. 1863, *nom. nud*. [lectotype: M-0057455; isolectotypes: HBG, HAL]

= *Sphaerella tassiana* De Not., Sferiacei Italici 1: 87. 1863.

≡ *Mycosphaerella tassiana* (De Not.) Johanson, Öfvers. Förh. Kongl. Svenska Vetensk.-Akad. 41: 167. 1884.

≡ *Davidiella tassiana* (De Not.) Crous & U. Braun, Mycol. Progr. 2: 8. 2003.

= *Cladosporium fuligineum* Bonord., Abh. Mykol. 1: 92. 1864 [neotype: B, selected by Braun 2001].

= *Cladosporium microporum* Rabenh., in Marcucci, Unio Itin. Crypt., No. 42. 1866, *nom. nud*.

≡ *Cladosporium microporum* Rabenh., in Cooke, Grevillea 17(83): 66. 1889 [syntypes: HBG, M-0057685].

= *Cladosporium herbarum* f. *napi* Thüm., Herb. Mycol. Oecon., Fasc. III, No. 107. 1873 [syntype: M].

= *Cladosporium herbarum* f. *Holci mollis* Thüm., Herb. Mycol. Oecon., Fasc. IV, No. 161. 1874 [syntype: M].

= *Cladosporium herbarum* f. *Tritici vulgaris* Thüm., Herb. Mycol. Oecon., Fasc. IV, No. 204. 1874 [syntype: M].

= *Cladosporium herbarum* var. *torulosum* Berk. & Broome, The Fungi of Ceylon, no. 886. 1870; J. Linn. Soc., Bot. 14: 99. "1873" 1875 [type: K].

= *Cladosporium herbarum* f. *phaseoli* Thüm., Fungi Austr. Exs. 1293. 1875

[syntypes: *e.g.* BPI 427201, HAL].
= *Helminthosporium vesiculosum* Thüm., Mycoth. Univ., Cent. VIII, No. 784. 1877 [syntypes: *e.g.* B, HAL, PAD].
≡ *Brachysporium vesiculosum* (Thüm.) Sacc., Syll. fung. 4: 429. 1886.
= *Cladosporium herbarum* f. *Brassicae Botrytis* Thüm., Herb. Mycol. Oecon., Fasc. XIII, No. 613. 1878 [syntype: M].
= *Cladosporium herbarum* f. *Foeniculi officinalis* Thüm., Mycoth. Univ., Cent. 10, No. 981. 1878 [syntypes: HAL, M].
= *Cladosporium elegans* Penz., in Saccardo, Michelia 2(8): 471. 1882 [neotype: PAD (Saccardo, Mycoth. Ital. 1189)].
= *Cladosporium punctulatum* Sacc. & Ellis, Michelia 2(8): 578. 1882 [lectotype: NY; isolectotypes: BPI 427402, PAD].
= *Cladosporium macrocarpum* f. *fraxini* Roum., Fungi Sel. Gall. Exs., Cent. 22, No. 2158. 1882 [syntype: B].
= *Cladosporium profusum* f. *robustior* Roum., Fungi Sel. Gall. Exs., Cent. 24, No. 2364. 1883 [lectotype (**designated here**): Roumeguère, Fungi Sel. Gall. Exs. 2364 (B 700006687)].
≡ *Cladosporium profusum* var. *robustior* Roum. & Pat., Rev. Mycol. (Toulouse) 5: tab. 35. fig. 6. 1883.
= *Cladosporium brunneum* Cooke & Harkn., Grevillea 12: 96. 1884, *nom. illeg.*, non *C. brunneum* Corda, 1837 [holotype: K 121546; isotype: BPI 426168].
≡ *Cladosporium brunneolum* Sacc., Syll. fung. 4: 358. 1886.
= *Helminthosporium phyllophilum* P. Karst., Hedwigia 23: 41. 1884 [type: H].
= *Heterosporium abroniae* Harkn., Bull. Calif. Acad. Sci. 1: 38. 1884 [type: CAS 2558, now BPI 1108748].
= *Helminthosporium nanum* f. *petiolicola* Roum., Fungi Sel. Gall. Exs., Cent. 34, No. 3391. 1885 [syntypes: G, PC].
= *Heterosporium epimyces* Cooke & Massee, in Cooke, Grevillea 16(79): 80. 1888 [type material not preserved; neotype (**designated here**): UK, Millfield, on *Polyporus squamosus*, 14 Oct. 1864, ex herb. M.C. Cooke, K (M) 121555].
= *Heterosporium laburni* Oudem., Ned. Kruidk. Arch., Ser. 2, 5(2): 174. 1888 [holotype: L].
= *Cladosporium condylonema* Pass., in Briosi & Cavara, Fung. Paras. Piante Colt. Utili Ess., No. 79. 1889 [syntypes: *e.g.*, BPI 426388, HAL].
= *Heterosporium goiranicum* C. Massal., Nuovo Giorn. Bot. Ital. 21: 170. 1889 and Mem. Accad. Agric. Verona, Ser. III, Fasc. 2, 65: 117. 1889 [holotype: VER].
= *Cladosporium velutinum* Ellis & Tracy, J. Mycol. 6: 76. 1890 [holotype: NY].
= *Helminthosporium acuum* P. Karst., Hedwigia 31: 295. 1892 [type: H].
= *Helminthosporium compactum* P. Karst., Hedwigia 31: 295. 1892 [type: H].
= *Heterosporium galii* Fautrey & Roum., Rev. Mycol. (Toulouse) 14: 106. 1892 [lectotype: PC].
= *Heterosporium caulicola* Ellis & Everh., Proc. Acad. Nat. Sci. Philadelphia 46: 381. 1894, as "*caulicolum*" [holotype: NY].
= *Heterosporium cladosporioides* Ellis & Everh., Proc. Acad. Nat. Sci. Philadelphia 46: 382. 1894 [holotype: NY].
= *Heterosporium didymosporum* Clem., Bot. Surv. Nebraska 3, 1893(2): 11. 1894 [holotype: NEB].
= *Cladosporium acutum* Ellis & Dearn., Proc. Canad. Inst., N.S., 3, 1: 91. 1897 [syntypes: DAOM, NYS].
= *Cladosporium fusicladium* Sacc., in Bresadola & Saccardo, Malpighia 11: 321. 1897 [holotype: PAD].
= *Cladosporium herbarum* var. *vincetoxici* Allesch., in P. Sydow, Hedwigia 36(6), Beibl.: 163. 1897 [T: M].
= *Heterosporium avenae* Oudem., Hedwigia 37: 318. 1898 [lectotype (designated by David 1997): L].
= *Heterosporium syringae* Oudem., Hedwigia 37: 183. 1898 [lectotype (designated by David 1997): L].
= ? *Cladosporium fagi* Oudem., Ned. Kruidk. Arch., Ser. 3, 2(3): 768. 1902 and Beih. Bot. Centralbl. 11: 538. 1902.
= *Cladosporium herbarum* f. *dianthi* D. Sacc., Mycoth. Ital. No. 1385. 1904? (syntypes: *e.g.*, BPI 427194, SIENA).
= *Cladosporium laricis* Sacc., Ann. Mycol. 3: 515. 1905 [holotype: PAD].
= *Cladosporium graminum* var. *moliniae-caeruleae* Sacc., Ann. Mycol. 3: 169. 1905 [syntypes: Saccardo, Mycoth. Ital. 1583, *e.g.*, SIENA].
= *Heterosporium ephedrae* Potebnia, Ann. Mycol. 5: 21. 1907 and Trudy Oshch. Isp. Prir. Imp. Khar'kovsk. Univ. (Trudy Oshch. Estest. imp. Khar'kov Univ.) 1907: 43. 1907 [lectotype (designated by David 1997): PAD].
= *Heterosporium fraxini* Ferd. & Winge, Bot. Tidsskr. 28(2): 256. 1907 [holotype: C].
= *Heterosporium opuntiae* Lindau, in Rabenhorst, Krypt.-Fl., ed. 2, 1(9): 84. 1910 [holotype: B].
= *Heterosporium berberidis* Ranoj., Ann. Mycol. 8: 399. 1910 [type: BPI 1108749].
= *Heterosporium cytisi* Ranoj., Ann. Mycol. 8: 398. 1910 [type: BPI 1108761].
= *Cladosporium vincae* Fairm., Ann. Mycol. 9: 148. 1911 [holotype: CUP-F 2873(24-68)].
= *Heterosporium asperatum* Massee ex Sacc., Syll. fung. 22: 1388. 1913.
= *Heterosporium spiraeae* Syd. & P. Syd., Ann. Mycol. 11: 406. 1913 [holotype: S; isotype: IMI 16609].
= *Heterosporium yuccae* Bubák, Ann. Mycol. 12: 214. 1914 [lectotype (designated by David 1997): BPI 802198].
= *Heterosporium sorghi* Ranoj., Ann. Mycol. 12: 418. 1914 [holotype: BPI 1108750].
= *Heterosporium stromatigenum* Bubák & Vleugel, in Bubák, Ann. Mycol. 14: 351. 1916 [type: BPI 802196].
= *Cladosporium herbarum* f. *stellariae* Unamuno, Bol. Soc. Esp. Hist. Nat. 34: 146. 1934 [holotype: MA 06330].
= *Heterosporium atopomerum* Kirschst., Ann. Mycol. 37: 122. 1939 [holotype: B].
= *Cladosporium sarraceniae* Dearn. & House, Circ. New York State Mus. 24: 58. 1940, *nom. inval.*
≡ *Cladosporium punctatum* Dearn. & House, in herb., non *C. punctatum* (Sacc.) Sacc., 1882.
= *Cladosporium moldavicum* Fosteris, Bull. Sect. Sci. Acad. Roumaine 26(7): 494. 1944? and in Săvulescu, Herb. Mycol. Roman., Fasc. 27, No. 1341. 1944, *nom. inval.* [syntypes: BPI 427266, MA-Fungi 8381, *etc.*].
= *Heterosporium equiseti* H.C. Greene, Amer. Midl. Naturalist 44(3): 642. 1950 [holotype: WIS].
= *Cladosporium herbarum* f. *amaranthi* Petrak, Fl. Bohem. Morav. Exs. Pilze, II. Ser., 1. Abt. No. 1216.
= *Cladosporium hederae*, *in herb.* (HBG).
= *Heterosporium caricis* Grove, *in herb.* (K).
= *Heterosporium pseudoplatani* Grove, *in herb.* (K).
= *Cladosporium herbarum* f. *Bambusae arundinaceae* Thüm., *in herb.* (M).

*Lit.*: Saccardo (1886: 350, 1972: 327, 1304), Lindau (1907: 800, 1910: 795), Ferraris (1912: 331), Gonzáles-Fragoso (1927: 194), de Vries (1952: 71), Hughes (1958: 750), Ellis (1971: 313), Domsch *et al*. (1980: 204), Sivanesan (1984: 225), Ellis & Ellis (1985: 290, 468; 1988: 168), Prasil & de Hoog (1988), Wang & Zabel (1990: 202), McKemy & Morgan-Jones (1991c), Dugan & Roberts (1994), David (1997: 59), Ho *et al*. (1999: 129), de Hoog *et al*. (2000: 587), Samson *et al*. (2000: 110, 2001), Zhang *et al*. (2003: 103–108), Heuchert *et al.* (2005: 47–48), Schubert (2005b: 156–159), Schubert *et al.* (2007b: 122–125).
*Ill.*: Ferraris (1912: 327, fig. 101), de Vries (1952: 73, fig. 15), Yamamoto (1959: 2, figs 1–4), Ellis (1971: 314, fig. 217 A), Domsch *et al*. (1980: 206, fig. 83), Arx (1987: 57, fig. 27), Prasil & de Hoog (1988: 51, fig. 3), McKemy & Morgan-Jones (1991c: 311, pl. 1; 313, fig. 1), Dugan & Roberts (1994: 516, figs 4–7), David (1997: 62, fig. 17 F, G, I), Ho *et al*. (1999: 130, figs 21–22), de Hoog *et al*. (2000: 587–588, figs), Samson *et al*. (2000: 110, fig. 49; 111, pl. 47), Zhang *et al*. (2003: 107–108, fig. 66–67), Schubert *et al.* (2007b: 124–126, figs 16–18).
*Exs.*: Baglietto *et al*., Erb. Critt. Ital. 1175, 1396; Bartholomew, Fungi Columb. 2215, 3613, 4407, 4712, 4713; Beck & Zahlbruckner, Krypt. Exs. 220; Briosi & Cavara, Fung. Paras. Piante Colt. Util. Ess. 79; Cooke, Fungi Brit. Exs. 188; Desmazières., Pl. Crypt. N. France 304; Ellis & Everhart, Fungi Columb. 163 p.p., 383, 1082; Ellis & Everhart, Fungi Columb. 383, 789; Ellis & Everhart, N. Amer. Fungi 650, 652, 659, 2968, 2969; Eriksson, Fungi Paras. Scand. Exs. 500; Fl. Hung. Exs. 206; Fuckel, Fungi Rhen. Exs. 113, 114, 1909, 2561; Jaap, Fungi Sel. Exs. 175; Jack, Leiner & Stizenberger, Krypt. Badens 327; Jaczewski, Komarov & Tranzschel, Fungi Ross. Exs. 249, 296; Kabát & Bubák, Fungi Imp. Exs. 241, 242, 344, 443; Kari, Fungi Exs. Fenn. 100; Karsten, Fungi Fenn. Exs. 189; Keissler, Krypt. Exs. 2837 p.p.; Kellerman & Swingle, Ohio Fungi 124; Liro, Mycoth. Fenn. 825–832; Marcucci, Unio Itin. Crypt. 42; Mougeot & Nestler, Stirp. Crypt. Vog.-Rhen. 299; Oudemans, Fungi Neerl. Exs. 298; Petrak, Fl. Bohem. Morav. Exs. Pilze 513 a, 1102, 1216; Petrak, Fungi Eichleriani 48; Rabenhorst, Fungi Eur. Exs. 77, 272, 577, 578, 579, 1271, 1283, 1284, 3895; Rabenhorst, Klotzschii Herb. Viv. Mycol. 333, 765; Roumeguère, Fungi Sel. Gall. Exs. 59, 258, 439, 950, 951, 2157, 2158, 2364, 3293, 3391, 4190;

Saccardo, Mycoth. Ital. 391, 590, 1187, 1189, 1385–1387, 1583; Saccardo, Mycoth. Ven. 588, 1070, 1071; Săvulescu, Herb. Mycol. Roman. 1341; Seymour & Earle, Econ. Fungi 502; Sydow, Mycoth. Germ. 349, 946, 1781, 2044; Sydow, Mycoth. March. 1790, 1795, 4294, 4576, 4577; Thümen, Fungi Austr. Exs. 1293; Thümen, Herb. Mycol. Oecon. 107, 161, 204, 469, 613; Thümen, Mycoth. Univ. 286, 586, 784, 981, 1767, 1963; Triebel, Microfungi Exs. 72; Vill, Fungi Bav. 897.

*Ascomata* pseudothecial, black, globose, erumpent to superficial, up to 200 µm diam, with 1(–3) short, periphysate ostiolar necks; wall consisting of 3–6 layers of medium red-brown *textura angularis*. *Asci* fasciculate, bitunicate, subsessile, obovoid to broadly ellipsoid, straight to slightly curved, 8-spored, 65–85 × 13–17 µm. *Pseudoparaphyses* absent in host material, but remnants observed when studied in culture, hyaline, septate, subcylindrical, anastomosing, 3–4 µm wide. *Ascospores* tri- to multiseriate, overlapping, hyaline, with irregular luminar inclusions, thick-walled, straight to slightly curved, fusoid-ellipsoidal with obtuse ends, widest near middle of apical cell, medianly 1-septate, not to slightly constricted at the septum, tapering towards both ends, but more prominently towards the lower end, (17–)20–23(–25) × (6–)7(–8) µm; becoming brown and verruculose in asci. Ascospores germinating after 24 h on MEA from both ends, with spore body becoming prominently constricted at the septum, but not distorting, up to 7 µm wide, hyaline to pale brown and appearing somewhat verruculose, enclosed in a mucoid sheath, with germ tubes being irregular, somewhat nodular.

*In vivo*: *Mycelium* usually immersed, rarely superficial. *Stromata* lacking or only with small, loose stromatic hyphal aggregations. *Colonies* effuse, caespitose to punctiform-pustulate, velvety, olivaceous-green, olivaceous-grey to olivaceous-brown. *Conidiophores* solitary, loosely aggregated, caespitose or in small to moderately large, loose to moderately dense fascicles, usually arising from immersed hyphae or swollen hyphal cells, occasionally from stromatic hyphal aggregations, erect, straight to somewhat geniculate-sinuous, usually distinctly nodulose, 30–250 × 3–6(–7) µm, usually septate, pale to dark olivaceous, olivaceous-brown, chestnut-brown or brown, wall thin to somewhat thickened, up to 1(–1.5) µm wide, smooth to somewhat rough-walled, swellings up to 9 µm wide. *Conidiogenous cells* integrated, terminal and intercalary, 10–30 µm long, nodulose to nodose, swellings usually multilateral, occasionally more unilateral due to a stronger geniculation, usually with several conidiogenous loci confined to swellings, somewhat protuberant, distinctly coronate, (1–)1.5–2(–2.5) µm diam. *Conidia* catenate, in simple and branched chains, ellipsoid-ovoid, subcylindrical, small terminal and intercalary conidia 5–15 × (3–)4–6(–7) µm, 0–1-septate, secondary ramoconidia 10–25(–30) × (4–)5–7(–9) µm, (0–)1–3-septate, not constricted at the septa, pale to mid olivaceous, olivaceous-brown or brown, thin-walled (≤ 1 µm), verruculose to verrucose, rarely a few intermixed conidia almost smooth, ends obtuse, rounded to slightly attenuated, hila somewhat protuberant, distinctly coronate, (1–)1.5–2(–2.5) µm diam.

*In vitro*: *Mycelium* superficial, loosely branched, (0.5–)1–5 µm wide, septate, sometimes constricted at septa, hyaline, subhyaline to pale brown, smooth or almost so to verruculose or irregularly rough-walled, sometimes appearing irregular in outline due to small swellings and constrictions, walls unthickened to somewhat thickened, cell lumen appearing to be granular. *Conidiophores* both macro- and micronematous, arising laterally from plagiotropous hyphae or terminally from ascending hyphae. *Macronematous conidiophores* erect, straight to flexuous, somewhat geniculate-sinuous, nodulose to nodose with unilateral or multilateral swellings, with a single to numerous swellings in short succession giving the stalk a knotty/gnarled appearance, unbranched or occasionally branched, up to three times, sometimes with a lateral branch-like proliferation below or at the apex, 10–320 × 3.5–5 µm, swellings 5–8(–9) µm wide, pluriseptate, septa sometimes constricted when formed after a node, pale to medium brown, older ones almost dark brown, paler towards the apex, smooth or minutely verruculose, walls thickened, sometimes even two-layered. *Conidiogenous cells* integrated, terminal or intercalary, nodulose to nodose, with a single or up to five swellings per cell, 10–24 µm long, proliferation sympodial, with several conidiogenous loci confined to swellings, mostly situated on small lateral shoulders, more or less protuberant, broadly truncate to slightly convex, 1.5–2.5 µm diam, thickened and somewhat darkened-refractive. *Micronematous conidiophores* hardly distinguishable from hyphae, sometimes only as short lateral outgrowth with a single apical scar, short, conical to almost filiform or narrowly cylindrical, non-nodulose, not geniculate, unbranched, 5–120 × 1.5–3(–4) µm, pluriseptate, not constricted at septa, cells usually very short, 5–15 µm long, subhyaline to pale brown, almost smooth to minutely verruculose or irregularly rough-walled, sometimes forming clavate conidia, up to 33 µm long, 0–2-septate. *Conidiogenous cells* integrated, terminal or conidiophores reduced to conidiogenous cells, narrowly cylindrical or filiform, with a single or two loci. *Conidia* catenate, in unbranched or loosely branched chains with branching mostly occurring in the lower part of the chain, straight to slightly curved, small terminal conidia without distal hilum obovoid, 4–10 × 3–5(–6) µm [av. ± SD, 7.8 (± 1.9) × 4.7 (± 0.9) µm], aseptate, intercalary conidia with a single or sometimes up to three distal hila limoniform, ellipsoid to subcylindrical, 6–16 × 4–6 µm [av. ± SD, 12.4 (± 1.6) × 5.3 (± 0.6) µm], 0–1-septate, *secondary ramoconidia* with up to four distal hila, ellipsoid to cylindrical-oblong, 12–25(–35) × (3–)5–7(–9) µm [av. ± SD, 18.8 (± 4.5) × 6.2 (± 0.9) µm], 0–1(–2)-septate, rarely with up to three septa, sometimes distinctly constricted at the septum, septum median or somewhat in the upper or lower half, pale greyish brown or brown to medium brown or greyish brown, minutely verruculose to verrucose, walls slightly to distinctly thickened, guttulate to somewhat granular, usually only slightly attenuated towards apex and base, apex obtuse or slightly truncate, towards the base sometimes distinctly attenuated with hila situated on short stalk-like prolongations, hila slightly to distinctly protuberant, truncate to slightly convex, (0.8–)1–2.5(–3) µm wide, 0.5–1 µm high, somewhat thickened and darkened-refractive; microcyclic conidiogenesis occurring, conidia forming micro- and macronematous secondary conidiophores.

*Culture characteristics*: Colonies on PDA reaching 19–37 mm diam after 14 d at 25 ºC, grey-olivaceous to olivaceous-grey, whitish to smoke-grey or pale olivaceous-grey due to abundant aerial mycelium, velvety, reverse olivaceous-grey or iron-grey, margin almost colourless, regular, entire edge, glabrous to feathery, aerial mycelium abundant mainly in the colony centre, dense, felty, woolly, sometimes becoming somewhat reddish brown, fawn coloured, growth regular, flat to low convex with an elevated colony centre, sometimes forming few large prominent exudates, sporulation profuse. Colonies on MEA reaching 17–37 mm diam after 14 d at 25 ºC, smoke-grey to pale olivaceous-grey towards margin, olivaceous-grey to iron-grey reverse, velvety, margin white,

entire edge to slightly undulate, aerial mycelium abundant, dense, fluffy to felty, growth low convex or raised, radially furrowed, folded and wrinkled in the colony centre, without prominent exudates but sporulating. Colonies on OA reaching 12–28 mm diam after 14 d at 25 ºC, olivaceous-grey to iron-grey, due to abundant aerial mycelium pale olivaceous-grey, olivaceous-grey reverse, margin narrow, more or less undulate, white, aerial mycelium white, loose to dense, high, fluffy to felty, covering large parts of the colony, growth flat to low convex, without prominent exudates, sporulating.

*Substrate and distribution*: On fading and decaying plant material, on living leaves (phylloplane fungus), as secondary invader, as an endophyte, isolated from air, soil, foodstuffs, paints, textiles and numerous other materials; cosmopolitan.

*Additional specimens examined*: (selection; the complete, large collections deposited at B, HAL, HBG and M have been revised): *Sine loco*, on *Agaricus* sp. (*Agaricales*), Jun. 1924, Prof. Lehmwanger (M-0057570, as *C. fuligineum*); on leaves of *Chionanthus* sp. (*Oleaceae*) (L 910.255-872 = L-0115833, **holotype** of *Dematium epiphyllum* var. (β) *chionanthi*); on *Hypholoma fasciculare*, 21 Jun. 1905, O. Jaap (HBG, as *C. fuligineum*); "ad Gandam", on leaves of *Rhamnus alaterna* (*Rhamnaceae*), winter 1861, E. Coemans, Rabenhorst, Fungi Eur. Exs. 579 (M-0057455, **lectotype** of *C. caespiticium*, **selected here**; HAL, HBG, M-0057454: isolectotypes). *Sine loco et dato*, on leaves of *Hedera* sp. (*Araliaceae*) (HBG, original material of *C. hederae*). **Austria**, Wiener Wald, on bark of *Carpinus betulus* (*Betulaceae*), May 1936, K. Keissler (PRM 657474). **Canada**, Ontario, London, Victoria park, on fallen leaves of *Fraxinus* sp. (*Oleaceae*), Oct./Nov. 1896 (DAOM, NYS, **syntypes** of *C. acutum*). **Czech Republic**, Mähren, in den Eisgruber Weingärten, on leaves of *Sorghum bicolor* (= *Andropogon sorghum, Sorghum vulgare*) (*Poaceae*), 15 Sep. 1907, Hugo Zimmermann (BPI 426832, as *C. graminum* var. *sorghi*); near Reichenberg, on leaves and culms of *Carex* (*Cyperaceae*) (PRM, **type** of *Cladosporium caricicola* Corda). **France**, Lothringen, Forbach, Behrener Wald, on *Russula* sp. (*Russulaceae*), 15 Sep. 1918, A. Ludwig (B 700006386, as *C. fuligineum*). **Germany**, Bavaria, near Wilzhofen, on *Agaricus* sp., 28 Oct. 1925, Schoman (M-0057565, as *C. fuligineum*); Brandenburg, Kreis Nieder-Barnim, forest between Sophienstädt and Ruhlsdorf, on decaying gills of *Boletus bovinus* (= *Suillus bovinus*) (*Boletaceae*), 7 Nov. 1917, P. Sydow, Sydow, Mycoth. Germ. 1781 (M-0057567, as *C. fuligineum*, mixed collection with *C. episclerotiale*); Kreis Prignitz, Triglitz, mould lawn on decaying gills of *Pholiota adiposa* (*Strophariaceae*) on pastures, 27 Dec. 1897, O. Jaap (HBG, as *C. fuligineum*); Triglitz, on *Fraxinus excelsior*, 7 Apr. 1898, O. Jaap (HBG, as *C. elegans* Penz.); 12 Aug. 1897, O. Jaap (HBG, as *C. elegans* Penz.); Hessen, Wiesbaden-Dotzheim, on dead leaves of *Vinca minor* (*Apocynaceae*), 23 Apr. 1963, R. Steppan, No. 1074 (B 700006766, as "*Ramularia vincae* Sacc.", revised by U. Braun as *C. vincae* Moesz); Kreis Siegen, near Gernsdorf, on *Amanita muscaria* (*Amanitaceae*), 22 Sep. 1935, A. Ludwig (B 700006385, as *C. fuligineum*); Kreis Siegen-Wittgenstein, near Wasserburg, Hainchen, on *Boletus subtomentosus*, 16 Jul. 1922, A. Ludwig (B 700006382, **neotype** of *C. fuligineum*); Sachsen, Hirschberg, Schmilka near Schandau, on living leaves of *Prunus domestica* (*Rosaceae*), Jul. 1896, G. Wagner (M-0057518, as *C. condylonema*); Sachsen-Anhalt, Halle, botanical garden, on the surface of living leaves of *Corylus avellana* (*Betulaceae*), 11 Jun. 2004, B. Heuchert, det. K. Schubert (HAL); Harz, Schierke, *ca.* 1.5 km E of town, Königsmoor, on dead leaves attached to stem, sphagnum bog ex *Lycopodium annotinum* (*Lycopodiaceae*), 26 Jul. 2003, F. Klenke (KR-12198). **Hungary**, Gebirgspark, on *Fraxinus excelsior*, Oct. 1886, J.A. Bäumler, Flora Posoniensis (HBG, as *C. elegans* Penz.). **Italy**, on upper and lower surface of dead leaves of *Carex nigra* ["*fusca*"] (*Cyperaceae*), Tassi no. 862, (RO, **holotype** of *Davidiella tassiana*); Apenninen, Giogo di Scarparia (Mugello), on still living leaves of *Larix europaea* (= *Larix decidua*) (*Pinaceae*), Sep. 1905, Prof. V. Perona (PAD, **holotype** of *C. laricis*); Cadine, on fallen leaves of *Fraxinus* sp., Nov. 1922, Roufi (BPI 426449, as *C. desmotrichum*); Padova, botanical garden, on living leaves of *Citrus* medica (C. ×*limonum*) (*Rutaceae*), Aug. 1902, associated with *Epicoccum vulgaris*, Saccardo, Mycoth. Ital. 1189 (HBG, **neotype** of *C. elegans* Penz., **designated here**; Saccardo, Mycoth. Ital. 1189: isoneotypes, *e.g.*, PAD); Parma, on living leaves of *Prunus domestica*, Jun. 1889, Briosi & Cavara, Fung. Paras. Piante Colt. Utili Ess. 79 (*e.g.*, BPI 426388, HAL, **syntypes** of *C. condylonema*); Riva-Valsesia, on leaves of *Salix incana* (*Salicaceae*), 28 Apr. 1891, Carestia, No. 770 (PAD, **holotype** of *C. fusicladium*); Sardinia, Gonnos-Fanadiga, on leaves of *Nerium oleander* (*Apocynaceae*), Dr. Marcucci, Marcucci, Unio Itin. Crypt. 42 (*e.g.*, HBG, M-0057685, **syntypes** of *C. microporum*). **Romania**, Moldova, Neamţ District, Broşteni, Neagră Valley, on *Festuca ovina* (*Poaceae*), 15 Aug. 1943, S. Fosteris, Săvulescu, Herb. Mycol. Roman. 1341 (BPI 427266; MA-Fungi 8381, **syntypes** of *C. moldavicum*). **Russia**, Kaliningrad area, Polesskij District, on dead wood of *Carpinus betulus* (*Betulaceae*), 10 Oct. 2005, D.A. Shabunin, ex SPbFRI 238 (HAL); St. Petersburg, Komarov Botanical Garden, near the building of botanical museum, on fallen leaves of *Ginkgo biloba* (*Ginkgoaceae*), 27 Nov. 2002, V. Mel'nik (HAL). **Sweden**, Prov. Vesterbotten, Umeå, on *Alnus incana* var. *borealis* (*Betulaceae*), Sep. 1911, J. Vleugel (BPI 426104, **holotype** of *C. alnicola* Bubák & Vleugel). **UK**, London, Highgate, Millfield Lane, on *Polyporus squamosus* (*Polyporaceae*), 14 Oct. 1864, ex herb. Cooke (K 121555, **syntype** of *Heterosporium epimyces* Cooke & Massee). **USA**, California, on dead leaves of *Hedera helix*, Dec. 1880, Henkney, No. 1954, mixed infection with a second hyphomycete (K 121546, **holotype** of *C. brunneum* Cooke & Harkn.; BPI 426168: isotype); Colorado, San Juan Co., above Little Molas Lake, isolated from stems of *Delphinium barbeyi* (*Ranunculaceae*), 12 Sep. 2004, A. Ramaley, CBS H-19868 (teleomorph), single ascospore isolates, CBS 121622 = CPC 11600, CPC 11601–11604; Mississippi, Starkville, on leaves of *Phalaris canariensis* (*Poaceae*), 25 Mar. 1890, S.M. Tracy, No. 1323 (NY, **holotype** of *C. velutinum*; BPI 427595, 427596, 427597: topotypes); New Jersey, Newfield, on leaves of *Euonymus japonicas* (*Celastraceae*), 17 Apr. 1881, J.B. Ellis, no. 3585 (NY, **lectotype** of *C. punctulatum*, **selected here**; BPI 427402, PAD: isolectotypes); New York, Buffalo, on rotten wood (ties), *ex herb*. G.W. Clinton (PH); Lyndonville, on dead leaves of *Vinca minor*, 6 May 1910, C.E. Fairman [CUP-F2873(24-68), holotype of *C. vincae* Fairm.]; Saratoga Luke, on *Russula* sp., Apr. 1944, H.D. House (M-0057569, as *C. fuligineum*); Pennsylvania, Bethlehem, on leaves of *Allium cepa* and *Allium* sp. (*Amaryllidaceae*), Schweinitz, No. 2602 (PH 1020413, 1020414, **syntypes** of *C. sparsum*).

*Notes*: *Cladosporium herbarum* is one of the most common and widespread cosmopolitan hyphomycetes, occurring on all kinds of organic debris, as secondary invader, indoor fungus, culture contamination, *etc.* The connection of the anamorph and *Davidiella tassiana*, the sexual stage of this species, was proven by means of molecular sequence analyses (Schubert *et al*. 2007b) and confirmed previously published taxonomic treatments of von Arx (1950) and Barr (1958). The typification of *C. herbarum* proposed in de Vries (1952) with a specimen from Link's herbarium at B was, however, incorrect and had to be refused. Therefore, Prasil & de Hoog (1988) discussed this typification and designated one of Persoon's original specimens as lectotype of *C. herbarum*, which is rather poor, but nevertheless in full accordance with the current concept of this species and an epitype designated by Schubert *et al*. (2007b). The holotype of *Davidiella tassiana* (RO), the sexual stage, is morphologically also in good agreement with ascomata in the epitype.

Type collections of the numerous synonyms of *C. herbarum* were previously revised by Hughes (1958), Prasil & de Hoog (1988) and David (1997). Numerous additional types were re-examined during the course of monographic studies of the genus *Cladosporium* carried out by the authors.

### 78. *Cladosporium heterophragmatis* S.A. Khan & Kamal, Mycopathol. Mycol. Appl. 18(4): 246. 1962. Figs 166, 167.

*Holotype*: **Pakistan**, Tandoja, Campus A.R.I., on leaves of *Haplophragma adenophyllum* (≡ *Heterophragma adenophyllum*) (*Bignoniaceae*), 15 Nov. 1961, Shakil Ahmad Khan (IMI 90787).

*Lit.*: Schubert & Braun (2004: 298–300), Schubert (2005b: 87–89). *Ill.*: Khan & Kamal (1962: 247, fig.), Schubert & Braun (2004: 299, fig. 1), Schubert (2005b: 88, fig. 35, pl. 15, figs D–H).

*In vivo*: On living leaves, forming subcircular, oval-oblong to irregular discolorations on the upper leaf surface, confluent, yellowish brown or ochraceous. *Colonies* hypophyllous, caespitose, effuse, dense, grey-brown to dark brown, blackish, not vein-limited, velvety, confluent, covering large areas of the leaf surface. *Mycelium* external, superficial, hyphae branched, 2.5–6 µm wide, septate, sometimes slightly constricted at the septa, pale olivaceous to olivaceous-brown, smooth, rarely rough-walled to verruculose, walls

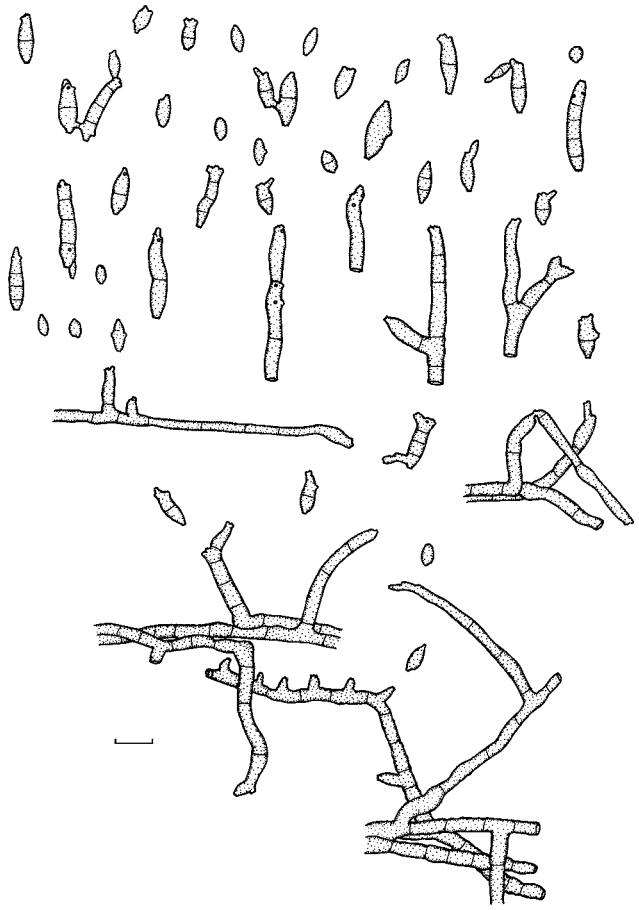


**Fig. 166.** *Cladosporium heterophragmatis* (IMI 90787). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del.*

thickened, hyphae often aggregated, forming horizontal threads, or with swollen hyphal cells, subcircular-ellipsoid, up to 13 µm diam. *Conidiophores* solitary, arising from swollen hyphal cells or creeping hyphae, lateral or terminal, erect or sometimes decumbent, straight to somewhat flexuous, unbranched or branched, 4–113(–190) × 2–5 µm, often slightly attenuated towards apex, continuous or with few septa, not constricted at the septa, pale olivaceous to olivaceous-brown, concolorous with the hyphae, often growing like, hardly distinguishable from and confusable with superficial hyphae, smooth, occasionally verruculose. *Conidiogenous cells* integrated, terminal, rarely intercalary, cylindrical to oblong, 3–14 µm long, proliferation sympodial, with a single to several conidiogenous loci, mostly crowded at the apex, scars protuberant, conspicuous, sometimes subdenticulate, slightly convex, 1–2 µm diam, thickened, more or less darkened-refractive. *Conidia* catenate, frequently in branched chains, straight to slightly curved, variable in shape, small conidia (apex without any hila or with a single apical hilum) subglobose, ellipsoid-ovoid, obovoid, fusiform, 3–14 × 2–4.5 µm, 0–1(–2)-septate, larger conidia with two to several apical hila (secondary ramoconidia) ellipsoid, fusiform, cylindrical to somewhat irregular, 5–23(–27) × 3–5(–6) µm, 0–3(–4)-septate, sometimes slightly constricted at the septa, pale olivaceous, pale brown to olivaceous-brown, smooth, rarely verruculose, walls unthickened or only slightly thickened, apex rounded or attenuated, hila conspicuous, subdenticulate, slightly convex, (0.5–)1–1.5 µm diam, thickened, darkened-refractive; microcyclic conidiogenesis occasionally occurring.

*Substrate and distribution*: On *Haplophragma adenophyllum*; Pakistan.

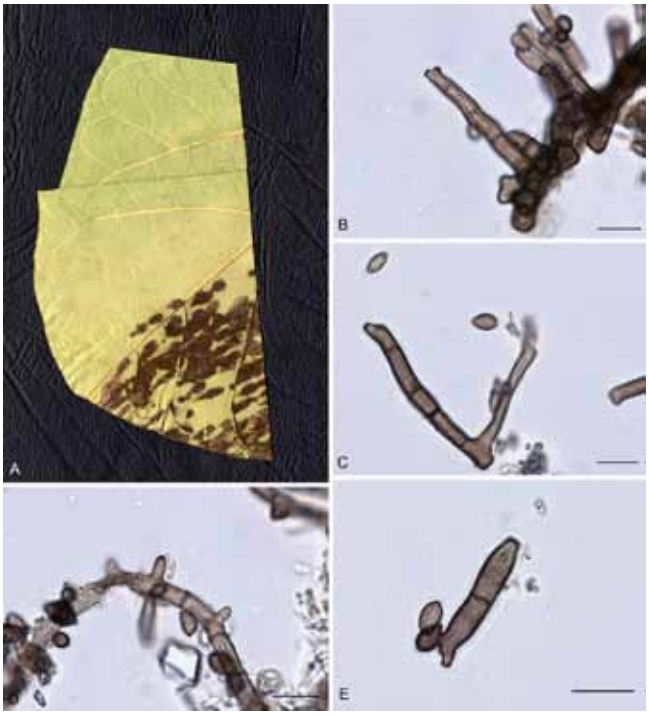



**Fig. 167.** *Cladosporium heterophragmatis* (IMI 90787). A. Symptoms. B. Conidiophores arising from superficial hyphae. C. Branched conidiophore and conidia. D. Small conidiophores arising from plagiotropous hyphae. E. Conidia. Scale bars = 10 (B–E) µm.

*Notes*: This species is morphologically similar to the mycophilic species *C. phyllophilum*, but the latter species is easily distinguishable by having longer and somewhat wider, usually multibranched, pluriseptate conidiophores (20–250 × 3–7 µm) and wider, 0–5(–6)-septate conidia [small conidia 4–13 × 3–6 µm, large conidia 10–30(–35) × 4–10 µm] (Braun 2001, Heuchert *et al*. 2005). *Cladosporium bignoniae*, described on capsules of *Bignonia radicans* from North America, is tentatively considered a *nomen dubium* (Schubert & Braun 2004), and *C. jacarandicola*, known from New Zealand on *Jacaranda mimosifolia*, differs in having usually fasciculate conidiophores arising from substomatal stromata.

### 79. *Cladosporium hillianum* Bensch, Crous & U. Braun, Stud. Mycol. 67: 52. 2010. Figs 168, 169.

*Holotype*: **New Zealand**, Auckland, St. Johns, Auckland University campus, artificial pond, isol. from leaf mold of *Typha orientalis* (*Typhaceae*), 29 May 2008, R. Beever NZ 2008/2765b (CBS H-20436). *Ex-type cultures*: CBS 125988 = CPC 15459, CPC 15458.

*Ill.*: Bensch *et al.* (2010: 54, figs 41−42).

*In vitro: Mycelium* internal and superficial; hyphae branched, 1−4.5 µm wide, becoming swollen with age, up to 6 µm wide, single cells 9 µm wide, pluriseptate, narrower hyphae usually not constricted at septa, but wider ones often slightly to distinctly constricted, due to swellings, branchings and constrictions often irregular in outline, sometimes septa in short succession, pale to medium olivaceous-brown, smooth, sometimes slightly rough-walled, walls unthickened or somewhat thickened, forming subglobose to globose dense conglomerations (teleomorph initials?), pseudoparenchymatous, *textura angularis*, 29−55 µm diam, composed of somewhat swollen

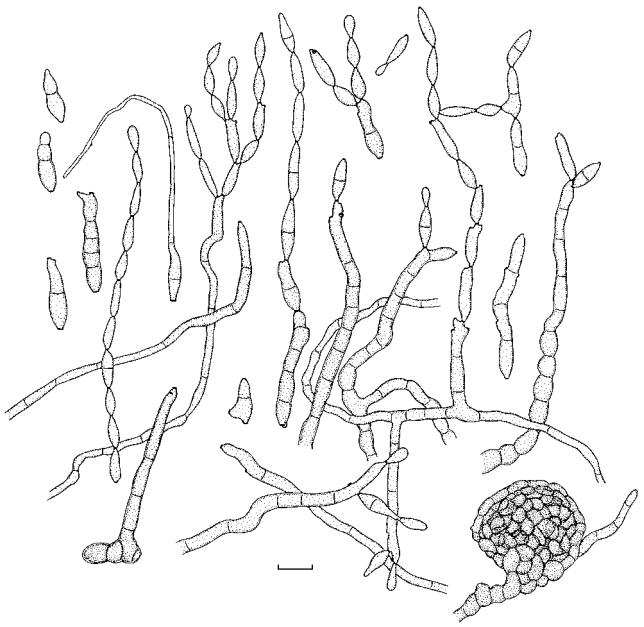


**Fig. 168.** *Cladosporium hillianum* (CBS 125988). Mycelium, hyphal conglomeration, conidiophores and conidia *in vitro*. Scale bar = 10 µm. K. Bensch *del*.

hyphal cells, 3.5−6 µm wide, medium brown or olivaceous-brown, slightly thick-walled. *Conidiophores* solitary, semimacronematous or micronematous, often hardly distinguishable from superficial hyphae, arising terminally and laterally from plagiotropous or ascending hyphae, erect or ascending, straight to slightly flexuous, cylindrical-oblong, sometimes once geniculate-sinuous and subnodulose, (12−)25−100 × (3−)3.5−4.5 µm, pluriseptate, 2−8-septa, sometimes slightly constricted at septa, septa often not very conspicuous, pale olivaceous-brown or pale brown, smooth, walls slightly thickened, cell structure somewhat unusual, guttulate. *Conidiogenous cells* integrated, terminal, occasionally also intercalary, cylindrical, 8−24 µm long, sometimes geniculate-sinuous or subnodulose, with a single locus or often up to four loci at or towards the apex, situated on small lateral shoulders, not very conspicuous, 1−1.5(−2) µm diam, slightly thickened, not darkened but sometimes slightly refractive. *Ramoconidia* occasionally formed. *Conidia* catenate, in long unbranched or basely branched chains, branching often dichotomously, up to 7(−11) conidia in the unbranched terminal part, small terminal conidia obovoid to ellipsoid, (5−)6.5−11 × (2−)2.5−4 µm (av. ± SD: 8.0 ± 1.8 × 3.2 ± 0.7), 0−1-septate, septum median or somewhat in the upper half, intercalary conidia ellipsoid to fusiform or irregular, 7.5−14(−17.5) × 2.5−3.5(−4.5) µm (av. ± SD: 11.0 ± 2.9 × 3.2 ± 0.5), 0−1(−2)-septate, septum median or somewhat in the upper half, secondary ramoconidia fusiform, ellipsoid to subcylindrical or irregular, 10−20(−30) × (2.5)3−4.5(−5) µm (av. ± SD: 16.1 ± 4.8 × 3.7 ± 0.7), 0−3(−4)-septate, sometimes slightly to distinctly constricted at septa and becoming sinuous with age, subhyaline to pale brown or pale to medium olivaceous-brown, smooth, walls unthickened or slightly thickened, with 1−2(−4) distal hila, subconspicuous to

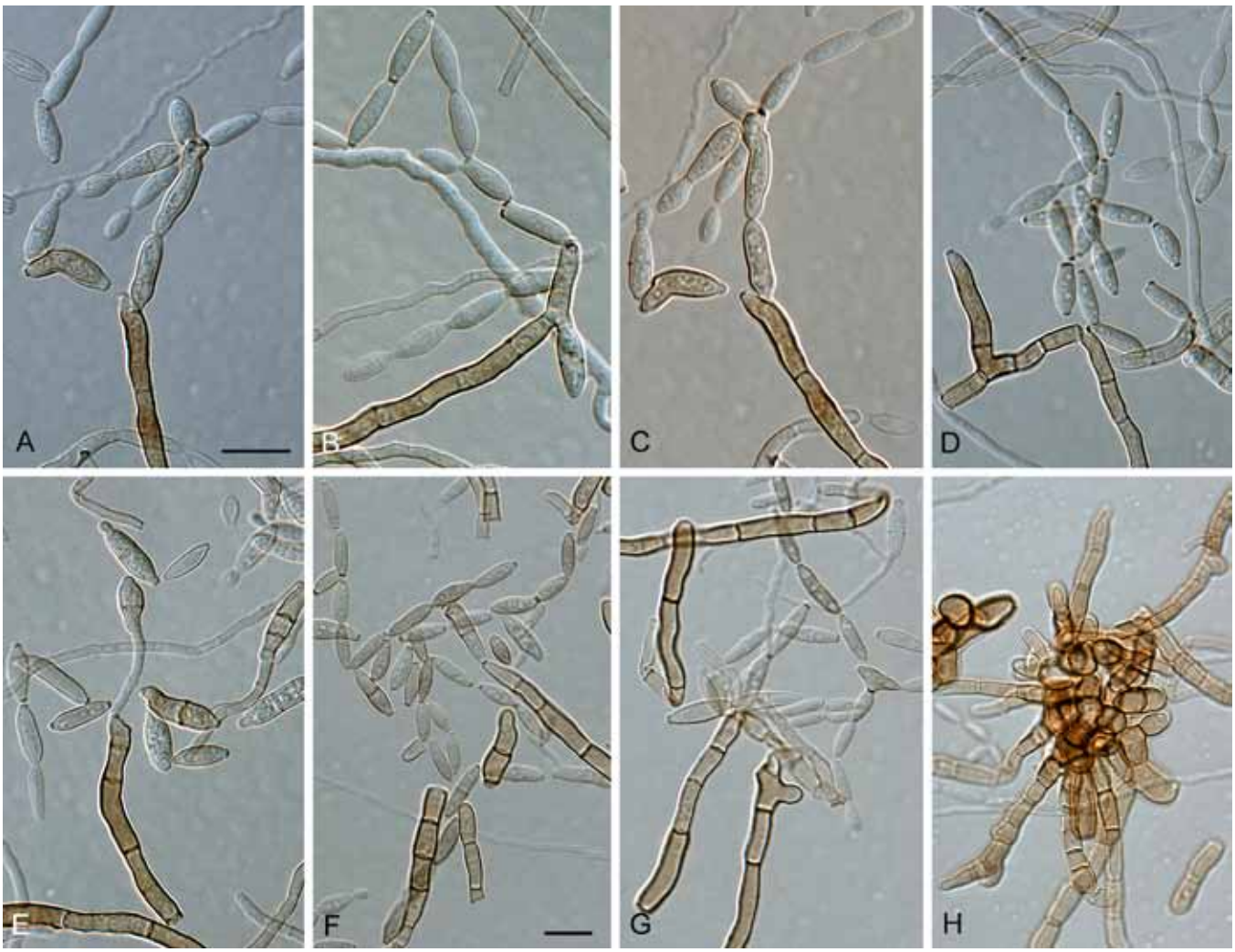



**Fig. 169.** *Cladosporium hillianum* (CBS 125988). A–G. Conidiophores and conidia. H. Hyphal conglomeration. Scale bars = 10 µm.

conspicuous, (0.5−)0.8−1.5 µm diam, slightly thickened, somewhat darkened-refractive; microcyclic conidiogenesis often occurring forming secondary conidiophores and conidia, often germinating.

*Culture characteristics*: Colonies on PDA attaining 13−17 mm diam after 14 d, olivaceous-grey to iron-grey, reverse iron-grey to olivaceous-black, fluffy, margins narrow, colourless to white, somewhat feathery, slightly undulate, aerial mycelium fluffy, loose, high, pale olivaceous-grey, growth low convex. Colonies on MEA reaching 24−25 mm diam after 14 d, olivaceous-grey with patches of white due to aerial mycelium, reverse olivaceous-grey to iron-grey, velvety, margin narrow, white, crenate, radially furrowed, glabrous, aerial mycelium whitish to pale olivaceous-grey, dense, growth low convex to convex with elevated and wrinkled colony centre. Colonies on OA attaining 25−30 mm diam after 14 d, iron-grey with patches of smoke-grey due to aerial mycelium and sporulation, reverse leaden-grey to olivaceous-grey, margins white, regular, glabrous, aerial mycelium loose to dense, fluffy, smoke-grey or whitish, growth flat, sporulating on all media, without prominent exudates.

*Substrate and distribution*: On *Typha*; New Zealand.

*Notes*: *Cladosporium hillianum*, which is unique among other *Cladosporium* spp. due to the formation of globoid pseudoparenchymatic hyphal aggregations on SNA, clustered in phylogenetic analyses close to *C. chalastosporoides* but formed a distinct lineage (Bensch *et al.* 2010, fig. 1). The latter species is easily distinguishable from *C. hillianum* by its distinctly narrower conidiophores, aseptate, narrower conidia and 0−1(−2)-septate secondary ramoconidia. *Cladosporium delicatulum* is another superficially similar species, which differs, however, in forming numerous globose to broadly ellipsoid, shorter and narrower small terminal conidia and some other minor differences. In addition, pseudoparenchymatous conglomerations of *textura angularis* as in *C. hillianum* are not produced.

**80. *Cladosporium hypophyllum*** Fuckel, Jahrb. Nassauischen Vereins Naturk. 23–24: 356. “1869”, 1870. Figs 170, 171.

*Lectotype* (**designated here**): **Germany**, “auf Grünau bei Hattenheim am Rheinufer”, on the lower surface of living leaves of *Ulmus minor* (= *U. campestris*) (*Ulmaceae*), Fuckel, Fungi Rhen. Exs. 1629 (M-0057614). *Isolectotypes*: Fuckel, Fungi Rhen. Exs. 1629 (*e.g.*, B 700006555; BPI 427228, 427229, 427234; HAL).

= *Cladosporium microstictum* Sacc. & D. Sacc., in Saccardo, Ann. Mycol. 3: 169. 1905, **syn. nov.** [lectotype: B 700006625].

*Lit.*: Saccardo (1886: 360), Lindau (1907: 820), Schubert (2005b: 89–91).
*Ill.*: Schubert (2005b: 90, fig. 36, pl. 17, figs A–E).
*Exs.*: Fuckel, Fungi Rhen. Exs. 1629; Saccardo, Mycoth. Ital. 589.

*In vivo*: On living leaves, without distinct leaf spots, hypophyllous as greyish olivaceous coating. *Colonies* hypophyllous, effuse, loosely to densely caespitose, pale to medium olivaceous-brown or brown, sometimes even blackish, sometimes covering large areas of the leaf surface. *Mycelium* external, superficial; hyphae filiform, branched, 1–4 µm wide, septate, sometimes constricted at the septa, subhyaline to pale olivaceous-brown, later distinctly swollen, up to 7 µm wide, constricted at the septa, darker, pale medium to medium olivaceous-brown or brown, walls somewhat thicker, almost smooth or mostly more or less verruculose to irregularly rough-walled, protoplasm of the cells sometimes aggregated at the septa so that walls and, above all, septa appear to be thickened (as in distoseptation), with a somewhat irregular cavity in the centre of the cells, hyphae aggregated, forming loose to dense hyphal ropes or plates and stromatic hyphal aggregations composed of subglobose swollen hyphal cells, brownish to somewhat reddish brown, walls thickened. *Conidiophores* solitary or in loose groups, not fasciculate, arising from external creeping hyphae, lateral or

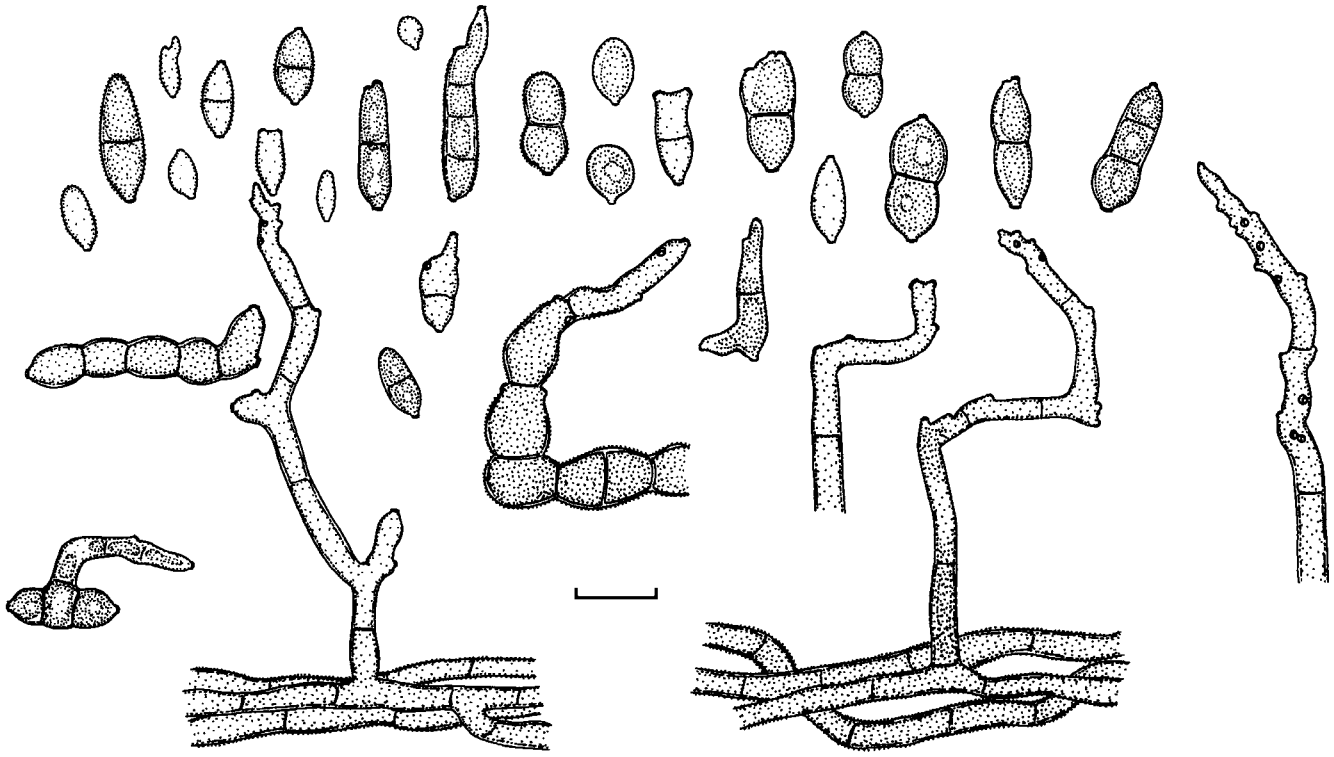


**Fig. 170.** *Cladosporium hypophyllum* (M-0057614). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

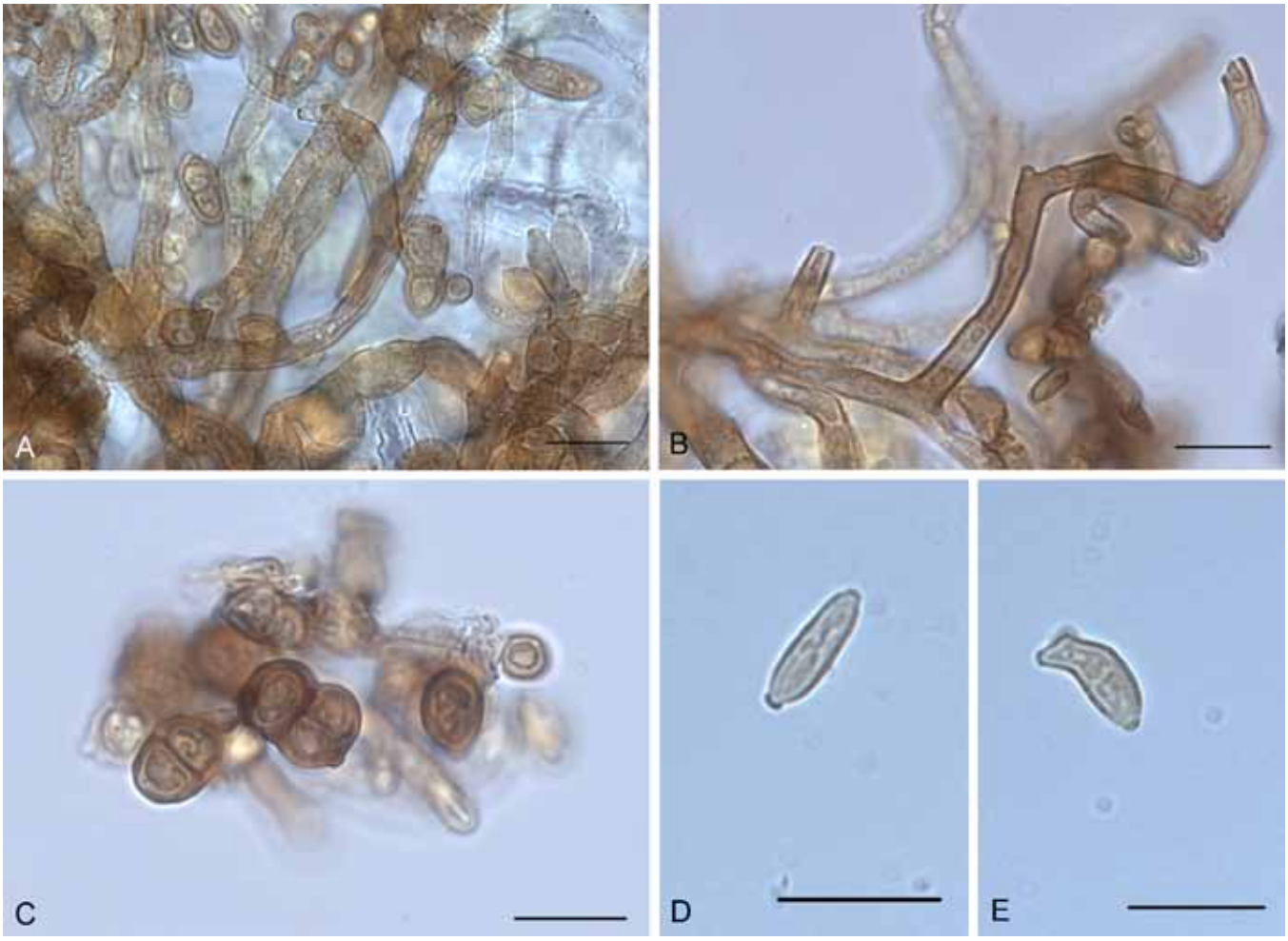



**Fig. 171.** *Cladosporium hypophyllum* (M-0057614). A. Conidiophores, conidia and external mycelium. B. Geniculate conidiophore. C. Old, distinctly swollen conidia showing cell structure, with paler cavity in the centre. D, E. Conidia. Scale bars = 10 (A–E) µm.

terminal, or from stromatic hyphal aggregations, erect, straight to flexuous, often mildly to distinctly geniculate-sinuous, sometimes subnodulose, unbranched or branched, 10–80(–100) × (2–)2.5–4(–5) µm, septate, pale olivaceous-brown, smooth to somewhat verruculose-asperulate, walls thickened, sometimes even two-layered, sometimes growing like and confusable with hyphae, protoplasm of the cells occasionally aggregated at the septa, appearing to be thickened (as in distoseptation). *Conidiogenous cells* integrated, terminal and intercalary, often geniculate to subnodulose, 8–25 µm long, proliferation sympodial, with several conidiogenous loci, often situated on small shoulders or unilateral swellings but not confined to them, subdenticulate, protuberant, obconically truncate or slightly convex, 0.5–1.5 µm diam, thickened, somewhat refractive, but mostly not darkened. *Conidia* catenate, in unbranched or branched chains, straight, ovoid, ellipsoid to fusiform, sometimes subcylindrical, 4–17(–19) × 2–5 µm, 0–1(–3)-septate, subhyaline to pale olivaceous, with age becoming distinctly swollen, longer and wider, 5–7 µm wide, usually constricted at the septa, darker, pale medium olivaceous-brown to somewhat reddish brown, with thicker walls, confusable with swollen hyphal cells of stromatic hyphal aggregations, smooth or almost so to more or less verruculose or irregularly rough-walled, protoplasm often distinct, clearly delineated from the inner wall and sometimes with a conspicuous, small, irregular, paler lumen in the centre of the cells, giving conidia a somewhat zonate appearance, ends rounded or slightly attenuated, hila more or less protuberant, 0.5–1.5 µm diam, thickened, refractive but mostly not darkened; microcyclic conidiogenesis often occurring.

*Substrate and distribution*: On *Ulmus minor* (*Ulmaceae*); Europe (Germany, Italy).

*Additional specimens examined*: **Italy**, Treviso, Vittorio, on leaves of *Ulmus minor* (= *U. campestris*), Oct. 1899, D. Saccardo, Saccardo, Mycoth. Ital. 589 (B 700006625, **lectotype** of *C. microstictum*, **designated here**; isolectotypes: D. Saccardo, Saccardo, Mycoth. Ital. 589, *e.g.* HBG).

*Notes*: De Vries (1952) listed *C. hypophyllum* as synonym of *C. cladosporioides*. A re-examination of type material of *C. hypophyllum* revealed that the latter species is quite distinct in having usually geniculate conidiophores with several conidiogenous loci, shorter conidia and somewhat narrower, mostly not darkened conidiogenous loci and hila; the unusual cell structure as described above does not occur in *C. cladosporioides*. *Cladosporium heliotropii*, which has a similar growth type and cell structure, is easily distinguishable by having usually non-geniculate, somewhat wider conidiophores with only few conidiogenous loci and somewhat wider conidia. A single collection deposited at herbarium M under *C. hypophyllum* (Germany, Bavaria, Fürstenfeldbrück, at the bank of the river Amper towards Schoengasing, on still living leaves of *Ligustrum vulgare*, 31 Aug. 1883, Allescher, M-57613) proved to be *C. herbarum* as secondary invader occurring on leaf spots caused by *Septoria ligustri*.

*Cladosporium microstictum*, also described on leaves of *Ulmus minor*, was introduced in 1899 in D. Saccardo's "Mycotheca italica" without any description. Later, in 1905, Saccardo published a detailed Latin diagnosis. Type material of this species could be re-examined and proved to be synonymous with *C. hypophyllum*.

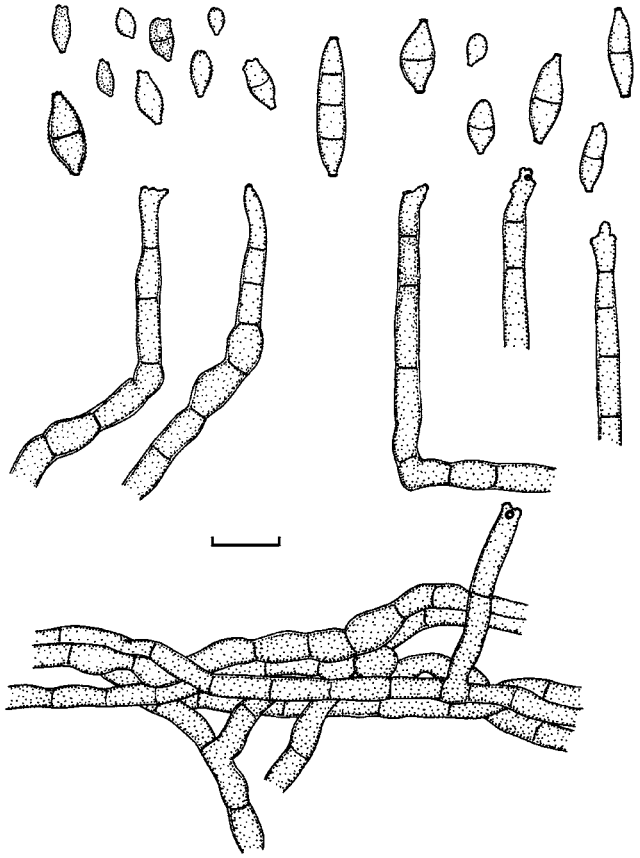


**Fig. 172.** *Cladosporium inconspicuum* (B 700006557). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

**81. *Cladosporium inconspicuum*** Thüm., Contributiones ad florum mycologicam lusitanicam, Ser. 2, No. 193. 1879 and Hedwigia 19: 133. 1880. Figs 172, 173.

*Lectotype* (**designated here**): **Portugal**, Coimbra, botanical garden, on living leaves of *Styrax officinalis* (*Styracaceae*), Oct. 1878, G.A. Moller (B 700006557).

*Lit.*: Saccardo (1886: 359), Oudemans (1923), Schubert (2005b: 91–92).
*Ill.*: Schubert (2005b: 92, fig. 37, pl. 16, figs G–I).

*In vivo*: Leaf spots epiphyllous, small, subcircular to somewhat irregular, 1–5 mm wide, medium to dark brown or somewhat reddish brown, centre mostly paler, pale greyish brown or whitish grey, margin narrow, dark brown, sometimes surrounded by a somewhat reddish brown halo, spots turning fragile with age, on the lower leaf surface almost inconspicuous. *Colonies* hypophyllous, scattered, brownish, only sparingly fruiting. *Mycelium* internal and external, superficial; hyphae branched, (1–)3–6 µm wide, septate, with swellings and constrictions, then up to 9 µm wide, pale to medium smutty brown, rarely subhyaline, smooth, walls somewhat thickened, forming hyphal ropes and plates or loose to somewhat denser stromatic hyphal aggregations composed of swollen hyphal cells, somewhat darker than hyphae, medium dark brown, thick-walled. *Conidiophores* solitary, arising terminally or laterally from superficially growing, creeping hyphae or stromatic hyphal aggregations, erect, straight or somewhat flexuous, narrowly cylindrical, non-geniculate, non-nodulose, unbranched, 19–45 × 3–4(–5) µm, septate, pale brown or yellowish brown, smooth, walls somewhat thickened. *Conidiogenous cells* integrated, usually terminal, 4–10 µm long, proliferation sympodial, with a single or few conidiogenous loci, subdenticulate, obconically truncate, 0.5–1.5(–2) µm diam, thickened, refractive to somewhat darkened. *Conidia* in unbranched or branched chains, obovoid, ovoid-ellipsoid to fusiform, 4–14(–20) × 2.5–5 µm, 0–1(–3)-septate, not constricted at the septa, pale brown, smooth or almost so (verruculose under SEM), walls somewhat thickened, often slightly attenuated towards the base, hila protuberant, obconically truncate, 0.5–1.5(–2) µm diam, central dome usually not higher than the surrounding rim and often not very conspicuous, thickened, refractive to somewhat darkened; microcyclic conidiogenesis not observed.

*Substrate and distribution*: On *Styrax officinalis*; Portugal.

*Notes*: Thümen (1880) described long, sometimes branched and somewhat wider (5 µm) conidiophores which have not been seen during the course of the re-examination of the type material of *C. inconspicuum*. The type is in poor condition and only sparingly fruiting. Only few conidia and conidiophores have been observed. SEM examinations conclusively showed that *C. inconspicuum* belongs in *Cladosporium s. str.* (Fig. 173A), but additional collections need to be examined to determine the morphological variation in this taxon. Urtiaga (1986) recorded this species from Cuba on *Begonia nelumbifolia*, but this could not be confirmed.

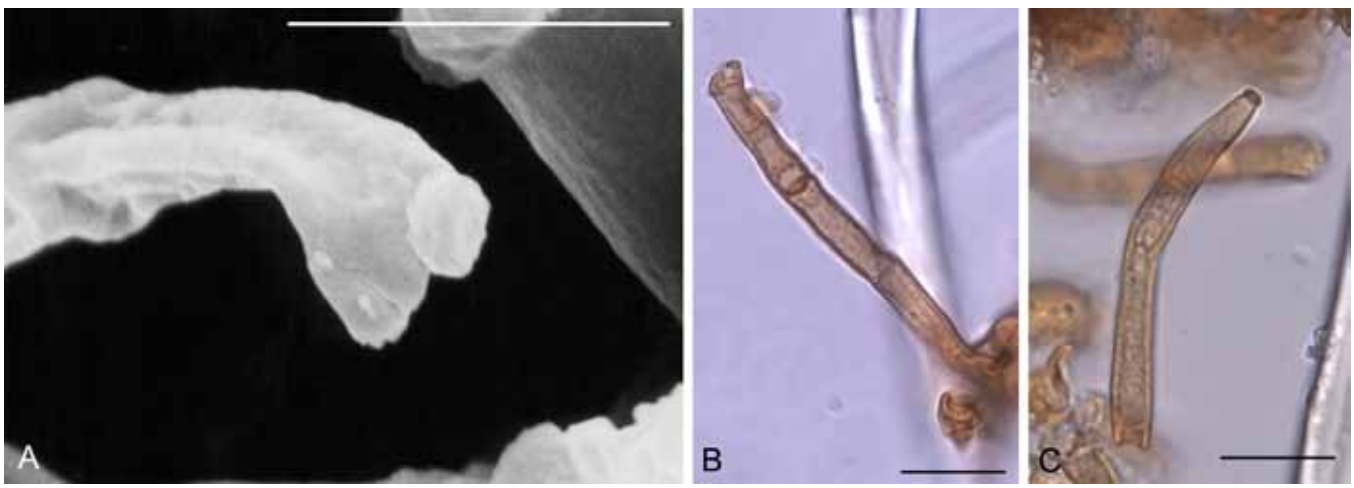



**Fig. 173.** *Cladosporium inconspicuum* (B 700006557). A. Tip of a conidiophore showing the coronate scar structure. B, C. Conidiophores. Scale bars = 5 (A), 10 (B–C) µm.

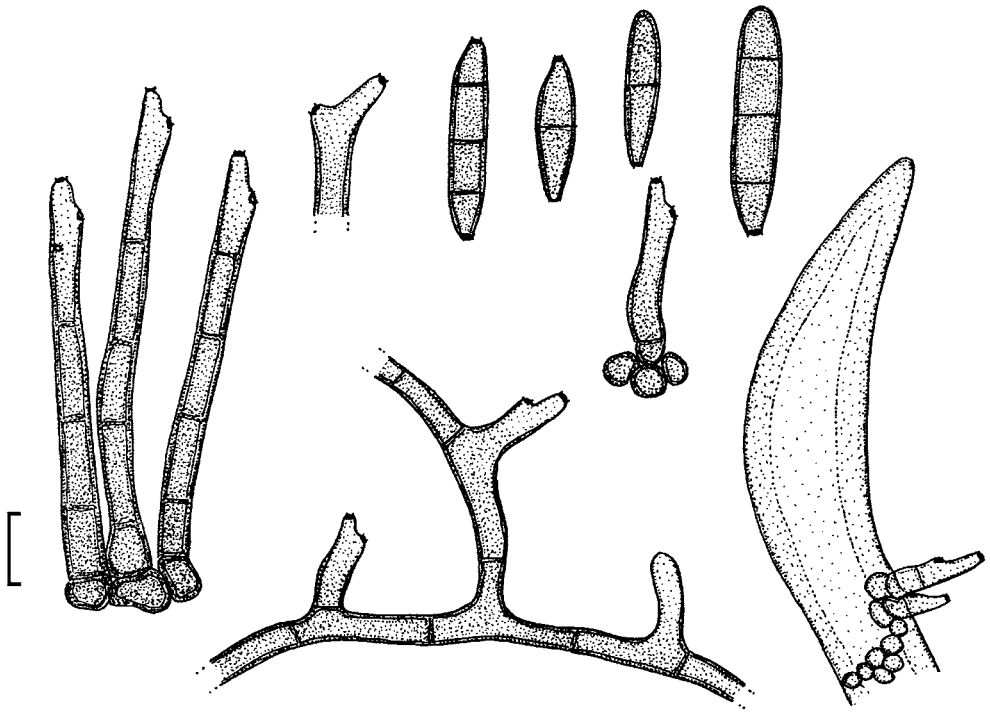


**Fig. 174.** *Cladosporium inopinum* (GZU). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. U. Braun *del*.

**82. *Cladosporium inopinum*** (Petr.) U. Braun, Mycotaxon 55: 224. 1995. Fig. 174.
*Basionym*: *Cercospora inopina* Petr., Sydowia 4: 570. 1950.

*Lectotype* (**designated here**): **Ecuador**, Pichincha, near Quito, on leaves of *Gynoxys hallii* (*Asteraceae*), 20 Sep. 1937, H. Sydow, Poelt & Scheuer, Reliqu. Petrak. 1350 (GZU). *Isolectotypes*: Poelt & Scheuer, Reliqu. Petrak. 1350.

*Lit.*: Chupp (1954: 142), Crous & Braun (2003: 227), Schubert (2005b: 93).
*Ill.*: Braun (1995a: 225, fig. 2), Schubert (2005b 93, fig. 38).
*Exs.*: Poelt & Scheuer, Reliqu. Petrak. 1350.

*In vivo*: Leaf spots indistinct. *Mycelium* mainly external, on trichomes; hyphae branched, 1–5 µm wide, septate, subhyaline-greenish, olivaceous to brown, smooth, rarely faintly rough-walled, forming small stromata. *Stromata* composed of brown swollen cells, 4–9 µm wide, fairly thick-walled. *Conidiophores* solitary to fasciculate, arising from small stromata or plagiotropous hyphae, erect or horizontal, straight to geniculate-sinuous, subcylindrical, unbranched, occasionally branched, 10–120 × 3–7 µm, continuous or septate, sometimes with constrictions and swollen segments, olivaceous-brown, smooth, walls only slightly thickened. *Conidiogenous cells* integrated, terminal or conidiophores reduced to conidiogenous cells, cylindrical, often geniculate, with a single or few conidiogenous loci, somewhat protuberant, about 1–2 µm diam, thickened and darkened. *Conidia* catenate, occasionally in branched chains, ellipsoid-ovoid, subcylindrical, (8–)10–30(–35) × 2.5–6 µm, 0–3(–4)-septate, olivaceous to brown, smooth to faintly rough-walled, hila somewhat protuberant, about 1.5–2 µm diam, thickened and darkened.

*Substrate and distribution*: On *Gynoxys hallii*; Ecuador.

*Notes*: Based on the cladosporioid structure of the conidiogenous loci and hila, *Cercospora inopina* was transferred to *Cladosporium s. str.* (Braun 1995a). *Cladosporium gynoxidicola*, also known from Ecuador on leaves of *Gynoxys* sp., has been excluded from the latter genus and re-allocated to *Passalora* (Schubert & Braun 2005b).

**83. *Cladosporium inversicolor*** Bensch, Crous & U. Braun, Stud. Mycol. 67: 55. 2010. Figs 175, 176.

*Holotype*: **Netherlands**, isol. from a leaf of *Triticum aestivum* (*Poaceae*), deposited Jul. 1980 as *C. cladosporioides*, isol. by N.J. Fokkema, ident. by G.A. de Vries (CBS H-20437). *Ex-type culture*: CBS 401.80 = ATCC 200941.

*Ill.*: Bensch *et al.* (2010: 55−56, figs 43−44).

*In vitro: Mycelium* immersed and sparingly superficial; hyphae mainly unbranched, 1.5−3(−4.5) µm wide, septate, not constricted at septa, without swellings, pale olivaceous to pale olivaceous-brown, smooth to often minutely verruculose, walls unthickened. *Conidiophores* macronematous, solitary, arising terminally and laterally from hyphae, erect, straight to somewhat flexuous, cladosporioides-like, cylindrical-oblong, somewhat geniculate-sinuous towards or at the apex, non-nodulose, unbranched or once branched, 15−225 × 2.5−4(−5) µm, aseptate or with few septa, not constricted at septa, subhyaline to very pale olivaceous-brown, smooth, sometimes rough-walled at the base; occasionally also micronematous, about 1.5 µm wide. *Conidiogenous cells* integrated, mainly terminal, cylindrical-oblong, non-nodulose, sometimes geniculate at or towards the apex due to sympodial proliferation, 15−66 µm long, with (1−)2−3 loci, conspicuous, subdenticulate, 1−2 µm diam, somewhat thickened and darkened-refractive. *Ramoconidia* occasionally formed, cylindrical-oblong, 17−42 × 3−3.5 µm, aseptate, occasionally with up to three septa, base (1.8−)2−3 µm wide, unthickened. *Conidia* numerous, catenate, in branched chains, often dichotomously branched, sometimes in more directions, terminal unbranched parts of the chains often very long, up to eight conidia, sometimes even up to 17 conidia, small terminal conidia obovoid to ellipsoid, sometimes subglobose,

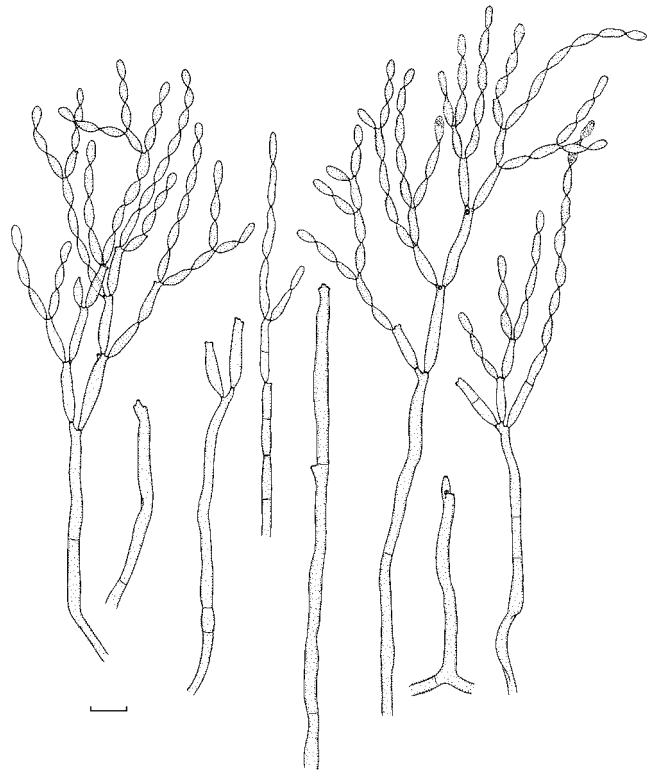


**Fig. 175.** *Cladosporium inversicolor* (CBS 401.80). Conidiophores and conidial chains *in vitro* with intercalary conidia and small terminal conidia sometimes verruculose or irregularly rough-walled, rugose. Scale bar = 10 µm. K. Bensch *del*.

(3−)5−8.5 × 2−3(−3.5) µm (av. ± SD: 5.9 ± 1.6 × 2.6 ± 0.4), aseptate, apex rounded, attenuated towards the base, intercalary conidia ovoid, fusiform to ellipsoid, (5−)7−20 × (2−)2.5−3.5(−4) µm (av. ± SD: 10.3 ± 3.5 × 2.9 ± 0.4), aseptate, attenuated towards apex and base, with 1−3(−4) distal hila, secondary ramoconidia subcylindrical, 10.5−24(−29) × (2.2−)2.8−4(−4.2) µm (av. ± SD: 16.9 ± 4.0 × 3.3 ± 0.5), 0−1(−2)-septate, but mainly aseptate, not constricted at septa, pale to olivaceous-brown, small terminal conidia and intercalary conidia slightly darker than ramoconidia, secondary ramoconidia and conidiophores, smooth to loosely minutely verruculose or irregularly rough-walled, rugose, verruculose-rugose surface ornamentation especially in small terminal and intercalary conidia, conidia slightly attenuated towards apex and base, with (1−)2−4(−6) distal hila, walls unthickened or almost so, hila conspicuous, subdenticulate, 0.5−2 µm diam, thickened and darkened-refractive; microcyclic conidiogenesis not observed.

*Culture characteristics*: Colonies on PDA attaining 60−75 mm diam after 14 d, olivaceous-grey, grey-olivaceous towards margins, leaden-grey to olivaceous-black reverse with grey-olivaceous margins, floccose, margins regular, white or colourless, feathery, aerial mycelium sparse to abundant, diffuse to floccose, loose to dense, growth effuse, without prominent exudates, sporulation profuse. Colonies on MEA 62−65 mm diam after 14 d, grey-olivaceous to olivaceous-grey or olivaceous, reverse iron-grey to black, velvety, floccose to felty, margins colourless or white, glabrous to feathery, regular, aerial mycelium whitish to smoke-grey, felty-floccose, growth effuse, sometimes radially furrowed in colony centre, without exudates, sporulation profuse. Colonies on OA 50−65 mm diam after 14 d, grey-olivaceous to greenish olivaceous, olivaceous, olivaceous-grey or olivaceous-buff, reverse pale greenish grey to olivaceous-grey, leaden-grey or iron-grey,

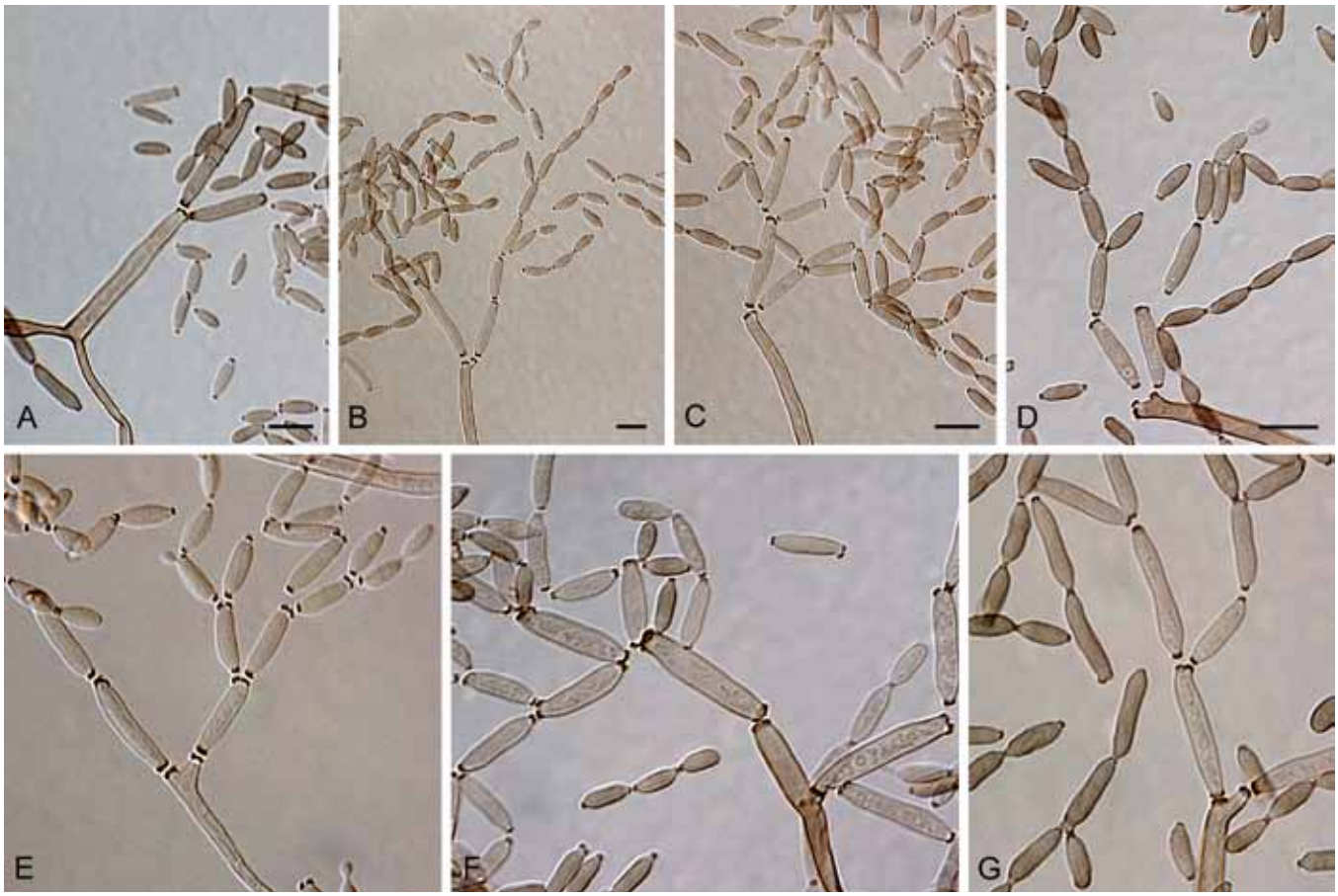



**Fig. 176.** *Cladosporium inversicolor* (CBS 401.80). A–G. Conidiophores and conidial chains with intercalary conidia and small terminal conidia somewhat darker than ramoconidia and secondary ramoconidia. Scale bars = 10 µm.

velvety to floccose, margins glabrous, olivaceous-grey, narrow, aerial mycelium smoke-grey to pale olivaceous-grey, felty, growth flat, without exudates, sporulation profuse.

*Substrates and distribution*: On plant material, isol. from air and food, also mycophilic; Europe (Denmark, Germany, Netherlands), North America (USA), South America (Colombia).

*Additional specimens examined*: *Sine loco*, isol. from *Triticum aestivum* (*Poaceae*) by F.T. Bennett, 1929, deposited as *C. cladosporioides*, CBS 131.29 = ATCC 200942 = ATCC 11275 = IMI 049623 = LCP 52.404. **Colombia**, isol. from *Cortaderia* sp. (*Poaceae*), CBS 484.80. **Denmark**, Usseroed, isol. from school dust, 2000, B. Andersen, BA 1735 = CPC 14368. **Germany**, Bayern, München, park of castle Nymphenburg, isol. from *Puccinia bromina* ssp. *symphyti-bromarum* var. *paucispora*, Jul. 2006, K. Schubert, CPC 13150. **Netherlands**, isol. from a leaf of *Tilia* sp. (*Tiliaceae*), deposited Jan. 1965 as *C. cladosporioides*, isol. by A.A. Verhorst, ident. by G.A. de Vries, CBS 143.65; Baarn, de Vuursche, isol. from seeds of *Alnus* sp. (*Betulaceae*), 14 Mar. 1982, G.S. de Vries, No. 4110, CBS H-1604, CBS 464.82 = ATCC 200945, deposited as *C. laxicapitulatum*; Millingerwaard, isol. from a fruit of *Sambucus nigra* (*Adoxaceae*), 29 Aug. 2007, P.W. Crous, CPC 14241; Zwolle, isol. from outside air, 7 Jan. 2007, M. Meijer, CPC 14190, 14191. **USA**, Seattle, University of Washington campus, 47.6263, 122.3331, isol. from chasmothecia of *Phyllactinia guttata* (*Erysiphales*) on leaves of *Corylus avellana* (*Betulaceae*), 16 Sep. 2004, D. Glawe, CPC 11818.

*Notes*: *Cladosporium inversicolor* belongs to the *C. cladosporioides* complex. The name of this species is derived from the unusual pigmentation of conidia with intercalary conidia being usually darker than ramoconidia, secondary ramoconidia and conidiophores, which is unique and distinctive amoung *Cladosporium* species of this complex and in general. Phylogenetically *C. inversicolor* is close to *C. delicatulum* (Bensch *et al.* 2010, fig. 1, part a), which is, however, morphologically well distinguished by having often dichotomously branched, very long conidial chains and various other characters of the conidia.

**84. *Cladosporium iranicum*** Bensch, Crous & U. Braun, Stud. Mycol. 67: 56. 2010. Figs 177, 178.

*Holotype*: **Iran**, isol. from a leaf of *Citrus* ×*aurantium* (= *C.* ×*sinensis*) (*Rutaceae*), on scale insect, 2004, W. Gams (CBS H-20438). *Ex-type culture*: CBS 126346 = CPC 11554.

*Ill.*: Bensch *et al.* (2010: 56–57, figs 45–46).

*In vitro: Mycelium* mainly immersed; hyphae sparingly branched, 1–5 µm wide, septate, sometimes with swellings and constrictions, therefore irregular in outline, almost hyaline to pale or medium olivaceous-brown, smooth to minutely verruculose, walls unthickened to slightly thickened, forming ropes. *Conidiophores* macro- and micronematous, solitary, arising terminally and laterally from plagiotropous or ascending hyphae, erect or ascending, straight to slightly flexuous, filiform to cylindrical-oblong, neither nodulose nor geniculate, unbranched or once branched, branches mostly only as short lateral prolongations just below a septum, 40–180(–325) × (2–)2.5–4(–5) µm, pluriseptate, mostly 2–5-septate, not constricted at septa, few septa darkened (viz. those septa at the base of potential ramoconidia), subhyaline to pale, sometimes medium olivaceous-brown, smooth or almost so at the apex and finely asperulate towards the base, walls unthickened to slightly thickened. *Conidiogenous cells* integrated, mainly terminal, cylindrical-oblong, neither geniculate nor nodulose, 6–44 µm long, smooth, with up to three apical loci, sometimes one or two loci at a lower level, denticulate, protuberant, 1–2 µm diam, thickened and darkened-refractive. *Ramoconidia* sometimes formed, cylindrical-oblong, 31–42 × 3.5–5 µm, often 1-septate, base broadly truncate, 2.2–3 µm wide, not thickened, somewhat refractive. *Conidia* catenate, in long unbranched and branched chains, chains often dichotomously branched, up to 10 conidia in the unbranched terminal part, straight to slightly curved, small terminal conidia and intercalary conidia in long unbranched chains, obovoid, limoniform to narrowly fusiform or ellipsoid, 4–10 × (1–)1.5–3 µm (av. ± SD: 6.2 ± 1.7 × 2.3 ± 0.6), aseptate, often subrostrate to rostrate, secondary ramoconidia ellipsoid to subcylindrical or cylindrical-oblong, 10–33 × (2–)3–4 µm (av. ± SD: 21.0 ± 6.8 × 3.4 ± 0.5), 0–1(–2)-septate, not constricted at septa, septum median, sometimes in the lower third, often not very conspicuous, almost hyaline to pale olivaceous-brown, smooth or almost so, walls unthickened or slightly thickened, slightly to distinctly attenuated towards apex and base, cell structure 1–2 guttulate, with up to three distal hila, hila protuberant, denticulate, 0.5–2 µm diam, thickened and darkened-refractive; conidia often germinating especially terminal ones, germ tubes up to 30 µm long; no microcyclic conidiogenesis.

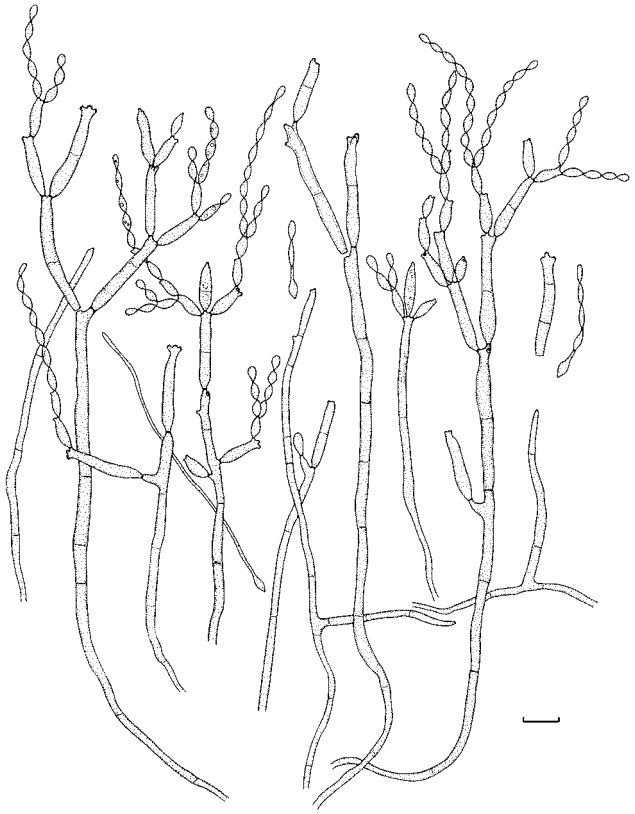


**Fig. 177.** *Cladosporium iranicum* (CBS 126346). Macro- and micronematous conidiophores, ramoconidia and conidial chains *in vitro* with intercalary conidia sometimes subrostrate. Scale bar = 10 µm. K. Bensch *del.*

*Culture characteristics*: Colonies on PDA attaining 53–60 mm diam after 1 mo, olivaceous-grey to grey-olivaceous towards the margins, reverse iron-grey to leaden-grey, powdery to fluffy, margin regular, white, broad, glabrous, aerial mycelium abundantly formed, fluffy, especially in the colony centre, no exudates formed, sporulation profuse. Colonies on MEA reaching 47 mm diam after 1 mo, smoke-grey or whitish due to aerial mycelium, pale olivaceous-grey towards margins, reverse olivaceous-grey to buff, fluffy-felty, margin regular, white, glabrous, radially furrowed, aerial mycelium abundant, fluffy, covering the whole surface, no exudates, sporulation profuse.

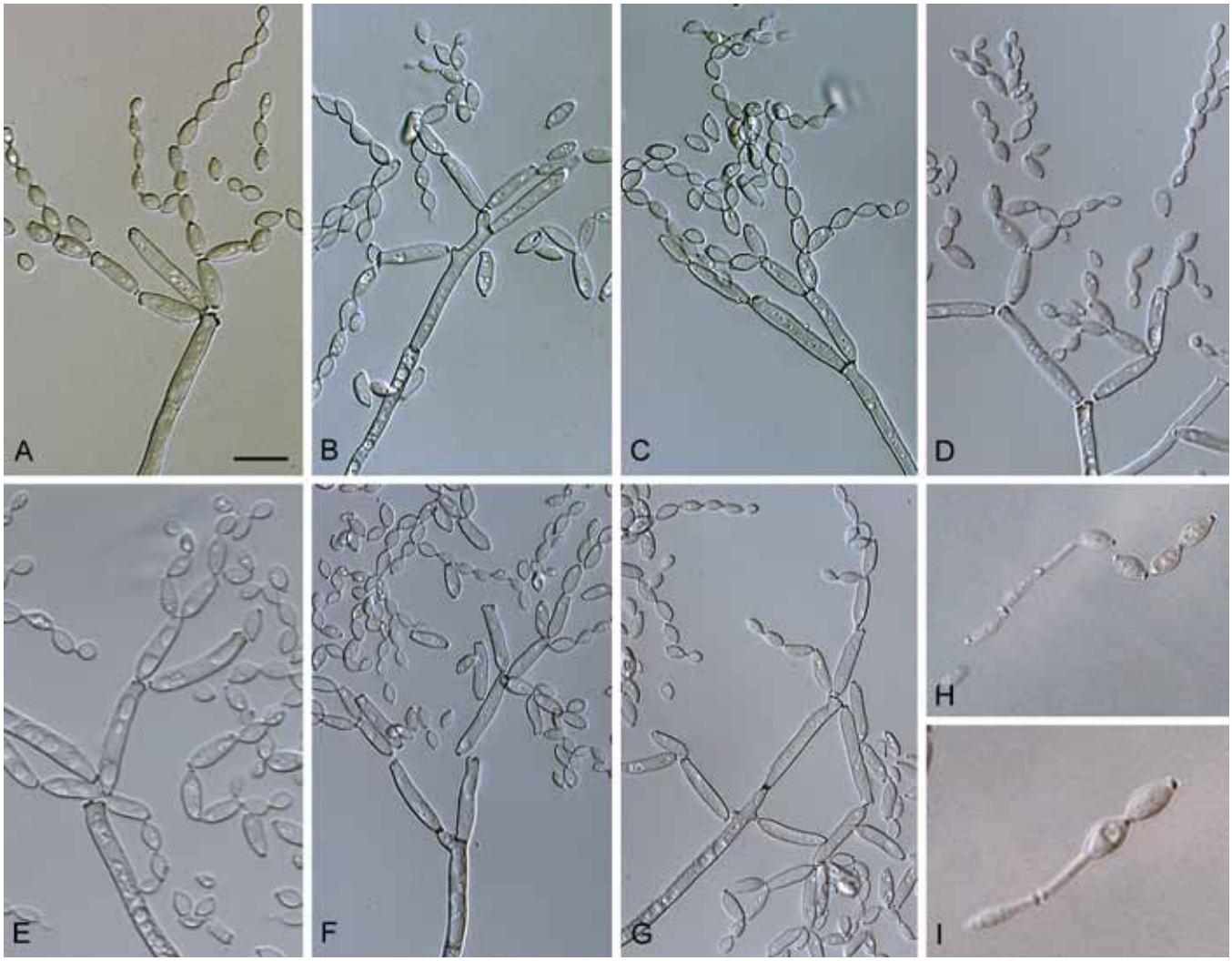



**Fig. 178.** *Cladosporium iranicum* (CBS 126346). A–D, F–G. Macronematous conidiophores and conidial chains. E. Conidia and conidiophore showing the often guttulate cell structure. H–I. Subrostrate intercalary conidia. Scale bar = 10 µm.

*Substrate and distribution*: On *Citrus*; Iran.

*Notes*: *Cladosporium iranicum* belongs to the *C. cladosporioides* complex and is morphologically very close to the latter species *s. str.*, but somewhat distinct by its 1(−2)-septate secondary ramoconidia, often ± beaked intercalary conidia and slow-growing cultures. Phylogenetically *C. iranicum* is, however, quite unrelated to *C. cladosporioides* (Bensch *et al.* 2010, fig. 1, part a *vs.* c). There are some other *Cladosporium* species described from *Citrus* spp., which are, however, quite distinct.

**85. *Cladosporium iridis*** (Fautrey & Roum.) G.A. de Vries, Contr. Knowl. Genus *Cladosporium*: 49. 1952. Figs 179, 180.
*Basionym*: *Scolecotrichum iridis* Fautrey & Roum., Rev. Mycol. (Toulouse) 13: 82. 1891.

≡ *Heterosporium iridis* (Fautrey & Roum.) J.E. Jacques, Contr. Inst. Bot. Univ. Montréal 39: 18. 1941.

*Lectotype*: **France**, Cote d'Or, Jardin de Noidan, on leaves of *Iris germanica* (*Iridaceae*), Jul. 1880, F. Fautrey, Roumeguère, Fungi Sel. Gall. Exs. 5689 (PC, designated by David 1997). *Isolectotypes*: Roumeguère, Fungi Sel. Gall. Exs. 5689, *e.g.* K.

*Epitype*: **Netherlands**, Boterenbrood, isolated from *Iris* sp., Aug. 1940 (CBS H-19859). *Ex-epitype culture*: CBS 138.40.

= *Heterosporium gracile* Sacc., Syll. fung. 4: 480. 1886, as "(Wallr. ?) Sacc." [lectotype: PAD].
= *Heterosporium montenegrinum* Bubák, Sitzungsber. Königl. Böhm. Ges. Wiss. Prag, Math.-Nat. Classe, 1903(12): 21. 1903 [lectotype: BPI 802189].
= *Scolecotrichum cladosporioideum* Maire, Ann. Mycol. 4: 329. 1906, as "*sp. prov. nov*." [holotype: MPU; isotypes: PC, K].
= *Didymellina macrospora* Kleb., Ber. Deutsch. Bot. Ges. 42: 60. "1924" 1925.
≡ *Mycosphaerella macrospora* (Kleb.) Jørst., Meld. Statens Plantepatol. Inst. 1: 20. 1945.
≡ *Davidiella macrospora* (Kleb.) Crous & U. Braun, Mycol. Progr. 2(1): 10. 2003.
= ? *Heterosporium pruneti* Nicolas & Aggéry, Rev. Pathol. Vég. Entomol. Agric. France 15: 66. 1928.
= *Heterosporium iridis-pumilae* Săvul. & Sandu, Hedwigia 75: 222. 1935 [syntypes: K, IMI 10047, M-0057611].

*Lit.*: Saccardo (1886: 480, 1892: 600), Ellis (1971: 312), Ellis & Waller (1974), Sivanesan (1984: 222, as *Cladosporium* state of *Mycosphaerella macrospora*), McKemy & Morgan-Jones (1990), David (1997: 43), Shin *et al*. (1999), Zhang *et al*. (2003: 111), Schubert *et al*. (2007b: 125–129).
*Ill.*: Ellis (1971: 311, fig. 215 B), Sivanesan (1984: 224, fig. 120), McKemy & Morgan-Jones (1990: 427, fig. 1; 429, pl. 1; 431, fig. 2; 433, fig. 3; 437, pl. 2), David (1997: 45, fig. 11), Shin *et al.* (1999: fig. 1), Zhang *et al.* (2003: 111, fig. 71), Schubert *et al.* (2007b: 128, figs 20–21).

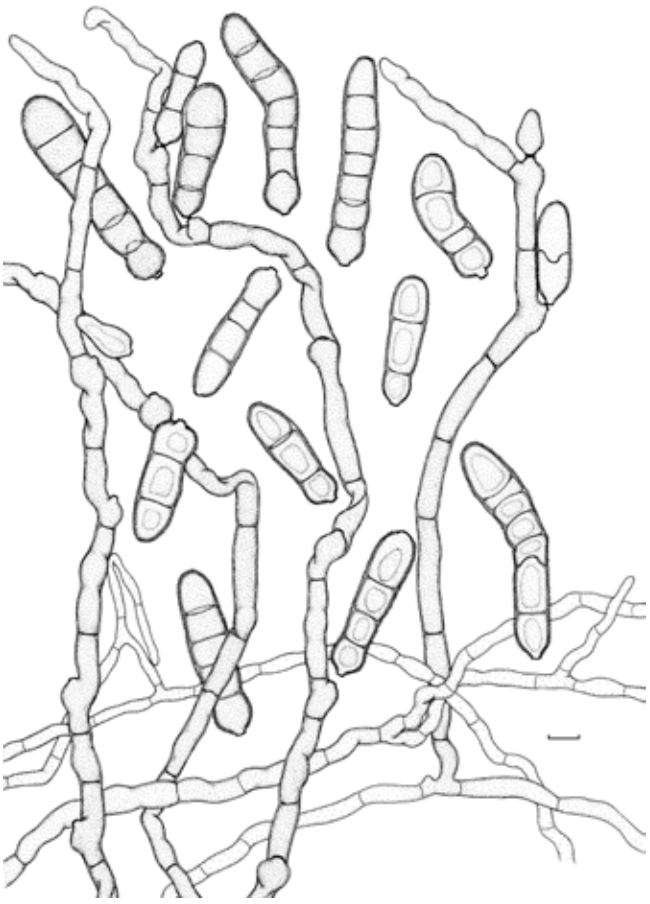


**Fig. 179.** *Cladosporium iridis* (CBS 138.40). Conidiophores and conidia *in vitro*. Scale bar = 10 µm. K. Bensch *del*.

*Exs*.: Anonymous, Fl. Olten. Exs. 151; Baglietto, Cesati & Notaris, Erb. Critt. Ital. Ser. II, 1299; Briosi & Cavara, Fungi Paras. Piante Colt. Utili Ess. 115; Ellis & Everhart, N. Amer. Fungi. Ser. II, 2189; Kabát & Bubák, Fungi Imperf. Exs. 295, 595, 796; Krieger, Fungi Saxon. Exs. 2448; Newodowski, Griby Ross. Herb. 194; Petrak, Fl. Bohem. Morav. Exs. Pilze 521, 2210, 2479; Săvulescu, Herb. Mycol. Roman. 187, 648; Scheuer & Poelt, Mycoth. Graec. 54; Sydow, Mycoth. Germ. 1396; Sydow, Mycoth. March. 1683, 4398; Triebel, Microf. Exs. 535; Vestergren, Micromyc. Rar. Sel. Praec. Scand. 241; Vill, Fungi Bav. 790; Weese, Eumyc. Sel. Exs. 611; Zahlbruckner, Krypt. Exs. 1836b.

*In vivo*: *Leaf spots* amphigenous, necrotic, oval-ellipsoid to oblong, sometimes subcircular, 1−8 mm long, 0.5−2 mm wide, scattered, with a pale yellowish, greyish to pale brown centre, surrounded by a narrow to broad reddish brown to brown or even dark margin and a somewhat wider olivaceous-green halo, later often confluent. *Colonies* amphigenous, in small tufts, punctiform to effuse, caespitose, dark olivaceous-brown to brown, villose, fruiting on the pale centre of the spots, often distinctly visible (even without using a stereomicroscope). *Mycelium* internal, subcuticular to intraepidermal; hyphae sparingly branched, 3–12 µm wide, septate, not constricted at the septa, subhyaline to pale olivaceous, smooth, walls unthickened or almost so. *Stromata* small to extended, 40−150 × 30−80 µm or confluent and larger, several layers deep, substomatal to intraepidermal, medium to almost dark brown, composed of swollen hyphal cells, subglobose to angular, 10−16(−22) µm wide, pale olivaceous, smooth, walls only slightly thickened. *Conidiophores* solitary or usually fasciculate, in small to moderately large loose fascicles, caespitose, arising from stromata, emerging through stomata or erumpent through the cuticle, erect, straight to substraight or flexuous, often slightly to distinctly geniculate, subnodulose to torulose, unbranched, later occasionally branched, (12–)25–120(–250) × (6–)9–15(–17) µm, swellings up to 17 µm wide, continuous to septate, pale to medium olivaceous-brown or brown, somewhat paler at the apices, smooth or occasionally minutely roughened with age, walls almost unthickened, becoming more thick-walled with age, base often swollen, up to 27 µm wide. *Conidiogenous cells* integrated, terminal or intercalary, 10–94 µm long, subnodulose, geniculate, proliferation sympodial, with a single or few conidiogenous loci situated on small lateral shoulders or swellings, loci protuberant, coronate with a distinct periclinal rim, 2−4 µm wide, thickened, somewhat darkened-refractive. *Conidia* solitary or in short unbranched chains, straight to slightly curved, oblong-cylindrical, becoming soleiform with age, (13–)30–60(–75) × (11–)15–23(–28) µm, (0–)2–4(–7)-septate, often slightly constricted at the septa, septa becoming sinuous with age, pale to medium brown or olivaceous-brown, distinctly and densely spinulose echinulate, at first thin-walled (young conidia) becoming thick-walled, up to 2–3(–5) µm thick including ornamentation, rounded at both ends, rarely somewhat pointed, with a distinctly bulbous base, hila often not very prominent, often only visible as thickened and somewhat darkened plate just below the outer echinulate wall layer, in younger conidia protuberant, 2.5–4 µm wide, thickened; microcyclic conidiogenesis not observed.

*In vitro*: *Mycelium* branched, 2–8 µm wide, septate, not constricted at the septa, hyaline to pale brown, smooth, walls slightly thickened, sometimes guttulate. *Conidiophores* very long, usually terminally arising from ascending hyphae, erect to subdecumbent, slightly to distinctly flexuous, geniculate-sinuous, usually several times, subnodulose due to geniculate, sympodial proliferation forming swollen lateral shoulders, unbranched, rarely branched, up to 720 µm long, 6–11 µm wide, swellings 8–11(–14) µm wide, pluriseptate, often very regularly septate, not constricted at the septa, pale to medium olivaceous-brown, somewhat paler towards the apex, smooth to minutely verruculose, walls only slightly thickened. *Conidiogenous cells* integrated, terminal as well as intercalary, cylindrical-oblong, 15–55 µm long, proliferation percurrent to sympodial, usually with a single geniculation forming laterally swollen shoulders often below a septum, conidiogenous loci confined to swellings, usually one locus per swelling, rarely two, protuberant, (2–)2.5–4 µm diam, somewhat thickened and darkened-refractive. *Conidia* solitary, sometimes in short, unbranched chains, straight to curved, young conidia pyriform to subcylindrical, connection between conidiophore and conidium being rather broad, subhyaline to pale olivaceous-brown, walls slightly thickened, then enlarging and becoming more thick-walled, cylindrical-oblong, soleiform with age, both ends rounded, usually with a slightly to distinctly bulbous base, visible from a very early stage, but broadest part often towards the apex not at the base, (18–)30–75(–87) × (7–)10–16(–18) µm [av. ± SD, 53.3 (± 17.8) × 12.6 (± 2.2) µm], (0–)2–6(–7)-septate, usually not constricted at the septa, rarely slightly constricted, septa often becoming sinuous with age, pale to medium olivaceous-brown, sometimes darker, verrucose to echinulate, walls thickened, especially in older conidia, up to 1 µm thick, hila protuberant, often stalk-like or conically prolonged, up to 2 µm long, (2–)2.5–3.5(–4) µm diam, with age becoming more sessile, sometimes just visible as a thickened plate just below the outer wall layer, especially in distal scars of branched conidia, periclinal rim often distinctly visible, hila somewhat thickened and darkened-refractive; microcyclic conidiogenesis not observed.

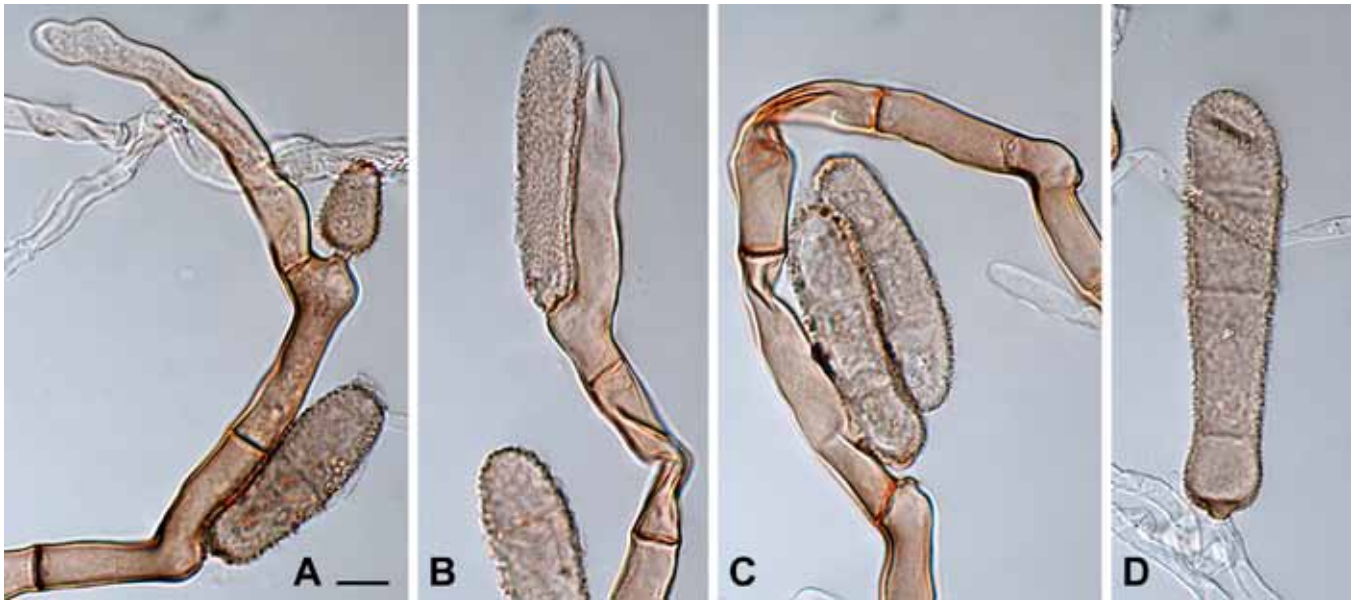



**Fig. 180.** *Cladosporium iridis* (CBS 138.40). A–C. Conidiophores with conidia. D. Conidium. Scale bar = 10 µm.

*Culture characteristics*: Colonies on PDA reaching 19–23 mm iam after 14 d at 25 ºC, pale greenish olivaceous, smoke-grey to olivaceous-grey due to abundant aerial mycelium, greenish olivaceous to olivaceous reverse, margin broad, regular, entire edge to slightly undulate, feathery, aerial mycelium abundantly formed, felty, fluffy, covering large parts of the colony, mainly in the central parts, high, growth low convex with a somewhat raised colony centre. Colonies on MEA reaching 9–23 mm diam after 14 d at 25 ºC, pale olivaceous-grey to olivaceous-grey, olivaceous-grey reverse, felty, margin slightly undulate, white, somewhat raised, aerial mycelium abundant, loose, diffuse, high, growth low convex, radially furrowed, slightly folded. Colonies on OA reaching 10–19 mm diam after 14 d at 25 ºC, olivaceous, margin broad, undulate, white, aerial mycelium white, very high, loose, diffuse, hairy, growth flat, due to the mycelium low convex, without prominent exudates and sporulating on all media. Cultures on SNA without sporulation.

*Substrates and distribution*: Leaf spot and blotch of *Belamcanda*, *Gladiolus*, *Iris, Juno* and *Pardanthopsis* spp. (*Iridaceae*), *Hemerocallis* (*Xanthorrhoeaceae*), Africa (Algeria, Morocco, South Africa, Zambia, Zimbabwe), Asia (Armenia, Azerbaijan, China, Georgia, India, Iran, Israel, Japan, Kazakhstan, Kyrgyzstan, Korea, Russia, Turkey, Turkmenistan, Uzbekistan), Australasia (Australia, New Zealand), Caucasus, Europe (Austria, Belgium, Belorussia, Cyprus, Czech Republic, Denmark, Estonia, France, Germany, Great Britain, Greece, Italy, Latvia, Lithuania, Malta, Moldavia, Montenegro, Netherlands, Norway, Poland, Romania, Russia, Serbia, Spain, Sweden, Ukraine), North America (Canada, USA), Central and South America (Argentina, Chile, Jamaica, Panama, Uruguay) – *Belamcanda chinensis* (= *Gemmingia chinensis*) (China, Jilin; USA, CA, FL, IA, KS, NY, OK, VA, VT, WI), *Gladiolus* ×*gandavensis* (Czech Republic), *Gladiolus* spp. (Denmark, Iran, Romania), *Hemerocallis fulva* (USA, NJ), *Iris alberti* (Kazakhstan), *I. anguifuga* (China, Zhejiang), *I. aphylla* (= *I. furcata*) (Armenia, Romania), *I. bismarkiana* (Romania), *I. crocea* (Germany), *I. elegantissima* (Armenia), *I. ensata* (China, Gansu), *I.* ×*florentina* (Romania), *I. foetida* (= *I. gueldenstaedtiana*) (Czech Republic, Serbia, Sweden), *I. foetidissima* (France, Germany, Italy, New Zealand), *I. germanica* (Armenia, Australia, Austria; Canada, BC, NS, Ont.; Czech Republic, Denmark, Estonia, France, Germany, Hungary, Israel, Italy, Korea, New Zealand, Poland, Romania, Serbia, South Africa, Spain; USA, WA), *I. glaucescens* (= *I. scariosa* auct.) (Kazakhstan), *I. halophila* (Armenia, Germany, Kazakhstan, Romania), *I. humilis* (= *I. flavissima*, *I. mandshurica* (Kazakhstan, Romania), *I. hungarica* (Romania), *I. iberica* (Romania), *I. japonica* (China, Xinjiang; Romania), *I. kamaonensis* (Germany, Romania), *I. latifolia* (Germany), *I. monnieri* (Romania), *I. musulmanica* (Armenia), *I. nepalensis* (Germany), *I. pallida* (Latvia, Romania), *I. paradoxa* (Armenia), *I. plicata* (= *I. swertii* Hort.) (Denmark), *I. prilipkoana* (= *I. demetrii*) (Armenia), *I. pseudocyperus* (Greece, Romania), *I. pumila* (Armenia, Romania), *I. sibirica* (Armenia), *I. sogdiana* (Armenia, Kazakhstan), *I. songarica* (Romania), *I. spuria* (Denmark, Romania), *I. spuria* subsp. *halophila* (Germany), *I. tectorum* (China, Anhui, Jiangsu, Liaoning, Shandong), *I. tingitana* (New Zealand), *I. tuberosa* (Romania), *I. variegata* (Romania), *I. versicolor* (Armenia, Romania, USA, MA, OK), *I. xiphium* (Canada, BC; New Zealand), *Iris* spp. (Armenia; Australia, Tasmania; Austria; Canada, BC, Man., NB, NS, Ont., Que.; China, Jilin; Czech Republic, Denmark, Germany, Greece, Iran, the Netherlands, New Zealand, Poland, Central and South America, South Africa; USA, AL, FL, HI, NC, WY; Sweden, Ukraine), *Juno bucharica* (≡ *Iris bucharica*) (Romania), *J. caucasica* (≡ *I. caucasia*) (Romania), *Pardanthopsis dichotoma* (≡ *Iris dichotoma*) (China, Jilin).

*Additional specimens examined*: *Sine loco et sine dato*, isolated from *Iris* sp., CBS 107.20. **Austria**, Steiermark, Graz, Bezirk Liebenau, Murfeld, GF 8958/4, 47°01'N/15°27'E, 340 m alt., in einem Hausgarten, on *Iris* sp., 18 Jun., 9 Aug., 20 Aug. 1996, P. Zwetko, Scheuer & Poelt, Mycoth. Graec. 54 (M-0057610); Wien, botanical garden, on *I. germanica*, Jul. 1915, Kupka (M). **Czech Republic**, Böhmen, Turnau, on *I. gueldenstaedtiana*, 16 Jul. 1909, J.E. Kabát, Kabát & Bubák, Fungi Imperf. Exs. 796 (M); Brünn in Mähren, on *Gladiolus* ×*gandavensis*, Sep. 1925, Dr. J. Hruby, Petrak, Fl. Bohem. Morav. Exs. Pilze 2210 (M); on *Iris* sp., Aug. 1929, Dr. J. Hruby, Petrak, Fl. Bohem. Morav. Exs. Pilze, 2479 (M); Eisgrub I Mähren, Fürst Lichtenstein Hofgarten, on *I. germanica*, 28 Aug. 1912, H. Zimmermann, Petrak, Fl. Bohem. Morav. Exs. Pilze 521 (M); Sternberg, Park der Irrenanstalt, on *I. germanica*, Dec. 1925, J. Piskoř, Flora moravica. **France**, Iles de Chausey, on *I. foetidissima*, 11 Jul. 1929, W.J. Lütjeharms, Fungi gallici (M). **Germany**, Bayern, Freising, on *I. germanica*, 1897, Prof. J.E. Weiss (M); Murnau, on *I. germanica*, Sep. 1875, Allescher (M); Mittelfranken, Kreis Hersbruck, on *I. germanica*, 27 Aug. 1946, K. Starcs, No. 2495 (M); Oberfranken, Bamberg, on *I. germanica*, Aug. 1902, A. Vill, Vill, Fungi Bav. 790 (M); Berlin, botanical garden, on *Iris* sp., Aug. 1890, P. Magnus, (M); Späth'sche Baumschule, on *I. germanica*, 1895, P. Sydow, No. 79 (M); Sachsen, Rathen, in a garden, on *Iris* sp., Jul. 1916, W. Krieger, Krieger, Fungi Saxon. Exs. 2448 (M); Sachsen-Anhalt, Halle, botanical garden, on *Iris crocea*,

11 Jun. 2004, K. Schubert (HAL); on *I. foetidissima*, 22 Jun. 2004, K. Schubert (HAL); on *I. kamaonensis*, 11 Jun. 2004, K. Schubert (HAL); on *I. latifolia*, 22 Jun. 2004, K. Schubert (HAL); on *I. nepalensis*, 11 Jun. 2004, K. Schubert (HAL); on *I. spuria* ssp. *halophila*, 18 Sep. 2003, K. Schubert (HAL); 25 Sep. 2003, K. Schubert (HAL); Thüringen, Weimar, in a garden, on *I. germanica*, Oct., J. Bornmüller, Zahlbruckner, Krypt. Exs. 1836b (M). **Greece**, Athen, on *I. pseudacorus*, Apr., F. von Höhnel, Zahlbruckner, Krypt. Exs. 1836b (M; same exsiccatae number as above but different dates). **Israel**, Jerusalem-Catamon, on *I. germanica*, 2 Mar. 1938, Dr. T. Rayss, Flora Cryptog. Palaestinae. **Italy**, Pavia, botanical garden, on *I. germanica*, 1889, Briosi & Cavara, Fung. Paras. Piante Colt. Utili Ess. 115 (M); Pozzuolo nel Lucchese, on *I. foetidissima*, Apr. 1882, G. Arcangeli, Baglietto, Cesati & Notaris, Erb. Critt. Ital., Ser. II, 1299 (B). **Latvia**, Prov. Vidzeme, Riga, on *I. pallida*, 6 Jul. 1932, K. Starcs, No. 342 (M). New Zealand, Otago, Dunedin, on *Lilium* sp. (? *Iris* sp.), Oct. 1948, J.M. Dingley (PDD 6292). **Poland**, "Tamsel", Schlossgarten, on *I. germanica*, 16 Jul. 1913, P. Vogel, Sydow, Mycoth. Germ. 1396; Schlesien, Freudenthal, am Sudetinum des neuen Parkes, on *I. germanica*, Sep. 1933, Dr. J. Weese, Weese, Eumyc. Se. Exs. 611 (M). **Romania**, Muntenia, distr. Ilfov, Bucureşti, on *I. germanica*, 27 Jul. 1927, T. Săvulescu & C. Sandu, Săvulescu, Herb. Mycol. Roman. 187 (M); Bururești, Grădina Botanica, on *I. florentina*, 12 Jul. 1958, Eliade (M); Mănăstirea, on *I. germanica*, 1 Aug. 1932, T. Săvulescu & C. Sandu, Săvulescu, Herb. Mycol. Roman. (M); distr. Oltenia, Gura-Văii, on *I. pumila*, 13 Jul. 1961, Eliade (M); Oltenia, distr. Craiova, Horto Bot. Craiovense, on *I. germanica*, alt. *ca.* 95 m, 5 Oct. 1963, J. Comes, I. Ene, M. Costescu & I. Terbea, Anonymous, Fl. Olten. Exs. 151 (M). **Serbia**, Topčider near Belgrad, on *I. gueldenstaedtiana*, 14 Jul. 1909, N. Ranojevič, Kabát & Bubák, Fungi Imperf. Exs. 595 (M). **Sweden**, Uppsala, botanical garden, on *I. gueldenstaedtiana*, 18 Sep. 1895, A.G. Eliasson (M); on *Iris* sp., 15 Sep. 1896, T. Vestergren, Vestergren, Micromyc. Rar. Se. Praec. Scand. 241 (M). **Ukraine**, province Kiev, distr. Tscherkasy, Smiela, on *Iris* sp., 6 Dec. 1915, G. Newodowski, Newodowski, Griby Ross. Herb. 194 (M). **USA**, New Jersey, Newfield, on *Hemerocallis fulva*, Jul. 1888, Ellis & Everhart, N. Amer. Fungi. Ser. II, 2189 (M); Wyoming, Laramie, on *Iris* sp., Oct. 1940, W.I. Solheim (M).

*Notes*: *Cladosporium iridis* is one of the *Heterosporium*-like species with very large conidia formed singly or only in very short chains. Records of this species on *Narcissus* sp. (*Amaryllidaceae*) from Armenia, *Allium canadense* (*Amaryllidaceae*), *Chlorogalum* sp. (*Asparagaceae*), *Pandanus* sp. (*Pandanaceae*) and *Freesia* hybrid (*Iridaceae*) from from the USA (Farr *et al*. 1989) are very doubtful and possibly based on confusions with *C. macrocarpum* or other species. Schubert *et al*. (2007b) examined collections on *Hemerocallis fulva* from the USA as well as *Gladiolus* ×*gandavensis* from the Czech Republic and confirmed their correct determinations. Another collection on the latter host from Germany, deposited at K (Kew), proved to be misidentified and belonging to *Drechslera* (David 1997).

**86. *Cladosporium jacarandicola*** K. Schub., U. Braun & C.F. Hill, Sydowia 56(2): 300. 2004. Figs 181, 182.

*Holotype*: **New Zealand**, Mt. Albert, Ruarangi Road, on living leaves of *Jacaranda mimosifolia* (*Bignoniaceae*), 6 Aug. 2002, C.F. Hill 693 (HAL 1812 F).

*Lit.*: Schubert (2005b: 94–95).
*Ill.*: Schubert & Braun (2004: 300, fig. 2), Schubert (2005b: 94, fig. 39, pl. 17, figs F–I).

*In vivo*: On living leaves, causing small, subcircular, brownish spots. *Colonies* punctiform, scattered, brownish. *Mycelium* internal; hyphae 3–4(–5) µm wide, septate, pale olivaceous. *Stromata* absent to well-developed, substomatal, composed of subglobose, more or less thick-walled cells, 5–7 µm wide, olivaceous to olivaceous-brown. *Conidiophores* solitary or in loose to dense fascicles, arising from stromata, emerging through stomata, erect, straight to somewhat flexuous, somewhat geniculate-sinuous, unbranched, occasionally branched, 10–58 × 3.5–5 µm, continuous to sparsely septate, olivaceous, olivaceous-brown, apex often paler, subhyaline, smooth, walls slightly thickened, somewhat swollen at the base. *Conidiogenous cells* integrated, terminal, rarely intercalary, cylindrical-oblong, 10–30 µm long, proliferation sympodial, with several conidiogenous loci, often crowded at the apex, loci protuberant, 1–1.5(–2) µm diam, thickened, darkened-refractive. *Conidia* in unbranched or branched chains, subglobose, obovoid, fusiform, ellipsoid, 4–18 × 3–5(–6.5) µm, 0–3-septate, pale olivaceous, smooth to verruculose, walls not to slightly thickened, apex rounded, somewhat attenuated or truncate, base truncate to slightly convex, hila (0.5–)1–1.5(–2) µm diam, thickened, darkened-refractive; microcyclic conidiogenesis occasionally occurring.

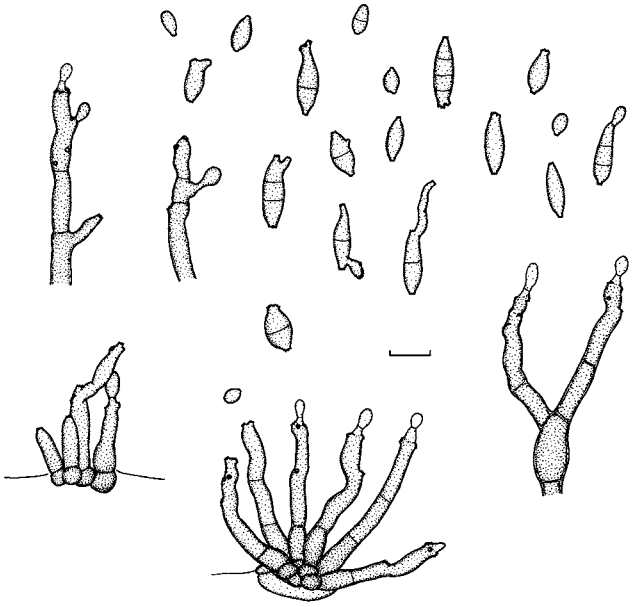


**Fig. 181.** *Cladosporium jacarandicola* (HAL 1812 F). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

*Substrate and distribution*: On *Jacaranda mimosifolia*; New Zealand.

*Notes*: There are some morphologically similar species with consistently short conidiophores, which are, however, quite distinct from *C. jacarandicola* in forming wider conidiophores [(3–)4–10(–13) wide in *C. agoseridis*; 3–8 µm in *C. lupiniphilum*], larger, above all wider conidia with different surface ornamentations [(6.5–)12–26(–31) × 4–8 µm, faintly to conspicuously verruculose-echinulate in *C. praecox*; (10–)12–40(–50) × (5–)6–13(–15) µm, loosely to densely verruculose or verrucose in *C. agoseridis*; 6–28 × 4–8 µm, smooth or almost so in *C. lupiniphilum*] and wider loci, respectively [1.5–2.5 µm diam in *C. orchidearum*; (1.5–)2–3.5(–4.5) µm diam. in *C. agoseridis*] (Braun & Rogerson 1995, Braun 1998, 2000, Ellis 1976). In addition to the species of *Cladosporium*, this collection (no. 693) also contained rich fructification of *Cercospora apii* Fresen. *s. lat*.

**87. *Cladosporium lacroixii*** Desm., Pl. Crypt. N. France, Ed. 3, Fasc. 15–16, No. 755. 1860. Fig. 183.

*Lectotype* (designated by David 1997): **France**, Vienne, on *Narcissus jonquilla* (*Amaryllidaceae*), L.-S.V. Lacroix, Desmazières, Pl. Crypt. N. France 755 (PC). *Isolectotypes*: Desmazières, Pl. Crypt. N. France 755, *e.g.*, BR, K, IMI 118411.

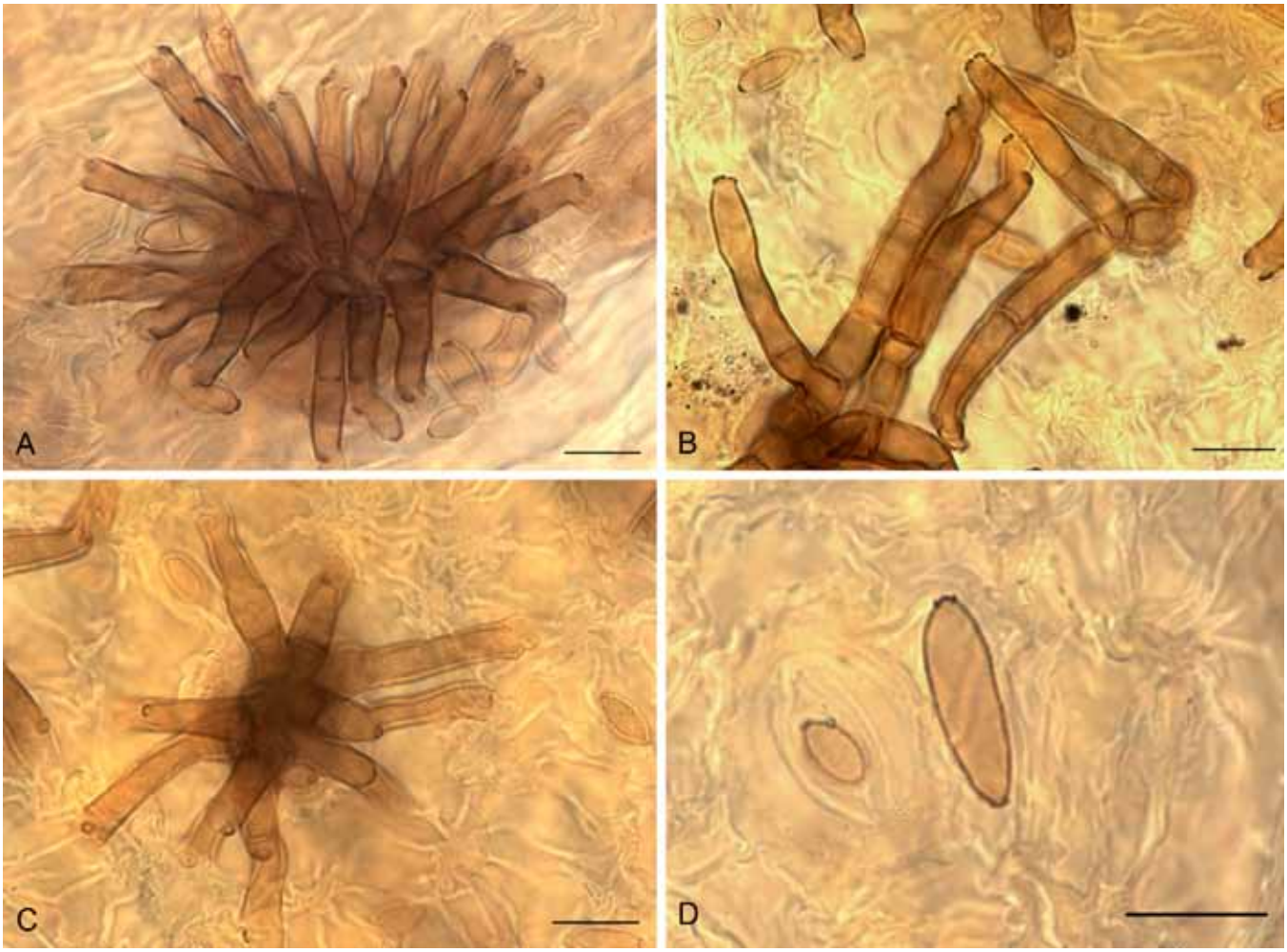



**Fig. 182.** *Cladosporium jacarandicola* (HAL 1812 F). A, C. Fascicles of conidiophores emerging through stomata. B. Unbranched and branched conidiophores. D. Conidia. Scale bars = 10 (A–D) µm.

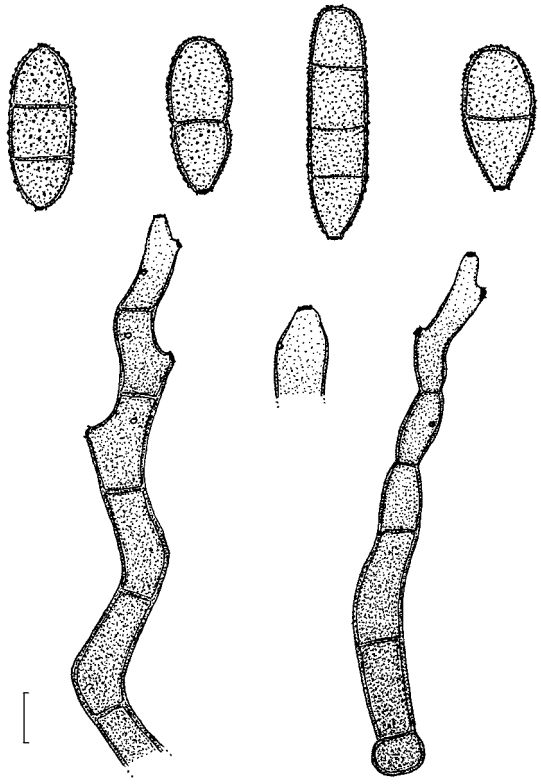


**Fig. 183.** *Cladosporium lacroixii* (IMI 118411). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. U. Braun *del.*

*Lit.*: Saccardo (1886: 370), Ellis (1976: 333), David (1997: 50).
*Ill.*: Ellis (1976: 335, fig. 253), David (1997: 51, fig. 13, 53, fig. 14 G–I).

*In vivo*: *Colonies* on necrotic leaves, effuse, olivaceous to blackish brown, loose to dense, velvety. *Mycelium* immersed. *Stromata* lacking, but solitary swollen hyphal cells or small to moderately large aggregations of such cells formed, cells up to 15 µm diam., brown. *Conidiophores* solitary to caespitose, arising from swollen hyphal cells, erect, usually moderately to strongly geniculate-sinuous, torulose, usually unbranched, 50–100 × 5–13 µm, pluriseptate throughout, pale to medium brown, tips sometimes paler, thin-walled, ≤ 1 µm, smooth or almost so. *Conidiogenous cells* integrated, terminal and intercalary, proliferation distinctly sympodial, 10–35 µm long, conidiogenous loci distinctly coronate, 1–5 per cell, 1.5–3.5 µm wide and about 1 µm high, somewhat darkened-refractive. *Conidia* usually solitary, ellipsoid-ovoid, obovoid, short cylindrical, (15–)20–50(–60) × 9–15(–17) µm, (0–)1–3(–4)-septate, occasionally somewhat constricted at the septa, but usually non-constricted, septa often becoming sinuous with age, very pale to medium brown, wall thin, < 1 µm, densely to occasionally more loosely verrucose, ends rounded, hila conspicuously coronate, 1.5–3.5 µm wide, up to 1 µm high.

*Substrate and distribution*: On *Narcissus jonquilla*; France.

*Notes*: This species is morphologically close to *Cladosporium macrocarpum*, but differs by much larger conidia, almost

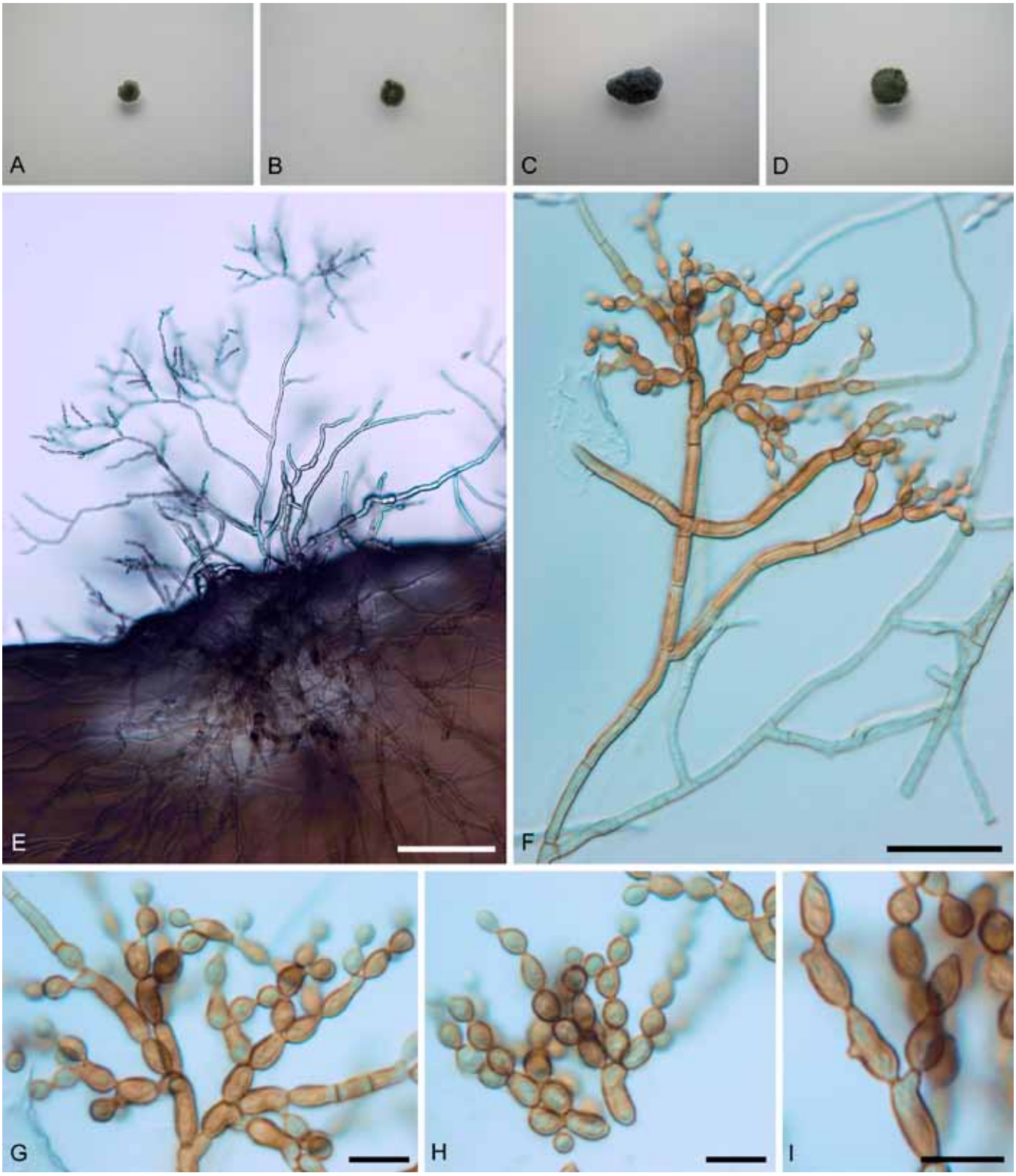



**Fig. 184.** *Cladosporium langeronii* (CBS 189.54) (from Zalar *et al.* 2007). A–D. Colony surface grown on PDA (A), OA (B), MEA (C) and MEA plus 5 % NaCl (D) of strains incubated for 14 d at 25 ºC in darkness. E–F. Habit of conidiophores. G–I. Ramoconidia and conidia. E–I. All from 7-d-old SNA slide cultures. A–D, from CBS 189.54 (ex-type strain); E, from CBS 109868; F–I, from EXF-999. Scale bars = 10 (G–I), 30 (F), 100 (E) µm.

consistently formed singly, with septa becoming sinuous with age. The ecology of this species, which is only known from the type collection, is unclear. The type material consists of necrotic leaves. If this fungus is biotrophic or saprobic, remains unclear and requires new collections. In the type material, several much narrower conidiophores, up to 100 × 3–5 µm, with much smaller, *Cladosporium herbarum*-like conidia have been observed. If they belong to *C. lacroixii*, representing a second type of a dimorphic fruiting is also unclear and could only be proven in culture.

**88. *Cladosporium langeronii*** (Fonseca, Leão & Nogueira) Vuillemin, Champ. Paras. Myc. Homme: 78. 1931. Fig. 184.
*Basionym*: *Hormodendrum langeronii* Fonseca, Leão & Nogueira, Sciencia Med. 5: 563. 1927.

≡ *Cladosporium langeronii* (Fonseca, Leão & Nogueira) Cif., Manuale di Micologia Medica, Ed. 2: 488. 1960, *comb. superfl.*

*Neotype*: **Brazil**, isolated from man ulcero-nodular mycosis of hand and arm, 1927, coll. & isol. by da Fonseca (CBS H-19737). *Ex-type culture*: CBS 189.54.

*Lit*.: Zalar *et al*. (2007: 173–174).
*Ill*.: Zalar *et al*. (2007: 174, fig. 9).

*In vitro: Mycelium* partly immersed, partly superficial; hyphae branched, 1–3 µm wide, septate, without swellings and constrictions, subhyaline to pale brown, smooth or almost so, sometimes enveloped in polysaccharide-like material, sometimes forming few swollen hyphal cells, up to 7 µm diam, arranged like a starting stroma giving rise to several conidiophores appearing loosely fasciculate. *Conidiophores* macro- and micronematous, arising terminally and laterally from submerged and superficial hyphae, erect or ascending, straight to slightly flexuous. *Macronematous conidiophores* cylindrical-oblong, sometimes geniculate-sinuous, non-nodulose, (20–)50–210(–290) × 2.5–4.5(–6) µm, unbranched or often branched, once or several times, branches not only as short peg-like prolongations but longer, distinct, one branching often below the apex, pluriseptate, cell length 9–22 µm, not constricted at septa, medium to dark brown, somewhat paler at the apex, smooth to verruculose or irregularly rough-walled, walls slightly thickened, about 0.5 µm wide, protoplasm granular. *Conidiogenous cells* integrated, terminal, sometimes also intercalary, cylindrical, 9–25 µm long, slightly attenuated at the apex, sometimes seceding and forming ramoconidia, usually with a single apical scar, protuberant, 0.8–1.5(–2) µm diam, thickened and darkened-refractive. *Micronematous conidiophores* filiform, mostly unbranched, rarely branched, 6–120 µm long or longer, 1–2 µm wide, pale brown, septate, smooth or almost so, walls unthickened. Conidiogenous cells integrated, terminal or sometimes discrete, with a single apical scar, protuberant, 0.5–1 µm diam, thickened and darkened-refractive. *Ramoconidia* cylindrical, 0–1-septate, (10–)11–22(–42) × (3–)3.5–4.5(–5) µm, base broadly truncate, 2–3.5 µm wide, slightly thickened and somewhat darkened. *Conidia* catenate, formed in dichotomously branched chains, with up to six conidia in the unbranched parts, straight, small terminal conidia subglobose or ovoid, (3–)4–5.5(–8) × (2–)3–4(–5) µm (av. ± SD: 5.1 ± 1.6 × 3.1 ± 0.5 µm), aseptate, rarely 1-septate, hila 0.5–0.8 µm diam, apex rounded, intercalary conidia broadly ovoid to ellipsoid, 5–11 × 3–4 µm (av. ± SD: 7.5 ± 1.7 × 3.3 ± 0.3 µm), 0(–1)-septate, not constricted, attenuated towards apex and base, with a single apical hilum, 0.5–1 µm diam, secondary ramoconidia ellipsoid to cylindrical, (5.5–)9–20(–35.5) × (2.5–)3–4.5(–5.5) µm (av. 10.7 ± 4.7 × 3.6 ± 0.8 µm), 0–1(–2)-septate, not constricted at septa, pale to medium or dark brown, irregularly verruculose to sometimes loosely verrucose, walls slightly or more distinctly thickened, with 1–2(–3) distal hila, hila protuberant, peg-like, denticulate, 0.8–1.5(–2) µm diam, thickened and darkened-refractive; microcyclic conidiogenesis occasionally occurring. Conidia formed by micronematous conidiophores paler, narrower, usually only in unbranched chains, filiform, ellipsoid to obclavate, 3–12 × 1.5–2.5 µm, 0(–1)-septate.

*Culture characteristics*: *Colonies on PDA, OA and MEA* with restricted growth, attaining 2.5–4.5, 1.5–7.0 and 1.0–5.5 mm diam., respectively. Colonies flat or heaped (up to 3 mm), dark green, with black reverse and slightly undulate margin with immersed mycelium. Sporulating on PDA and OA, sterile on MEA. On MEA + 5 % NaCl growth is faster, colonies attaining 8.5–12 mm diam, sporulating and growing deeply into the agar. *Maximum tolerated salt concentration*: All strains develop colonies at 17 % NaCl after 14 d. *Cardinal temperatures*: No growth at 4 °C, optimum / maximum at 25 °C (1–5.5 mm diam.), no growth at 30 °C (from Zalar *et al.* 2007).

*Substrate and distribution*: Polar ice and biomats, conifer wood and window frame in Europe, humans; strains originating from nasal mucus (Buzina *et al*. 2003) have 100 % sequence homology with studied strains, as well as a clone from mycorrhizal roots (Menkis *et al.* 2005).

*Additional specimens examined*: **Antarctics**, isol. from biomat in a lake (dH 11736). **Arctics**, isol. from ice (dH 13833 = EXF-1933). **Belgium**, Lichtervoorde, isol. from a moist aluminium school window frame (CBS 101880). **Brazil**, isol. from orig. face lesions (dH 12459 = EXF-999). **Germany**, Göttingen, isol. from wood of *Picea abies* (CBS 601.84). **Italy**, Parma, isol. from mortar of Muro Farnesiano, coll. by C. Urzi, Dpt. Sci. Microbiol. Gen. Mol., Univ. of Messina, Italy, No. MC 783 (CBS 109868).

*Notes*: *Cladosporium langeronii* is a saprobic species belonging to the *C. sphaerospermum* complex. This species, which is probably much more widespread than indicated by the present collections, is morphologically and genetically allied to the latter species (*s. str.*), but clearly distinct (see Zalar *et al*. 2007). De Vries (1952) synonymised the isolate identified as *Hormodendron langeronii* with *C. sphaerospermum*. Other authors confused strains of this species with *C. cladosporioides* (Buzina *et al.* 2003, Menkis *et al*. 2005), although it has slightly longer conidia. According to Zalar *et al.* (2007) it most likely represents a complex of at least two species with strains from the Arctic and the Antarctic probably being distinguished from *C. langeronii* on species level.

*Cladosporium langeronii* failed to grow at 30 °C and has been isolated from various saprobic substrates. Therefore, clinical strains of this species could have been secondary colonisers being able to dwell on surfaces poor in nutrients or more likely, could be air-borne contaminations of lesions (Summerbell *et al.* 2005, Zalar *et al.* 2007).

**89. *Cladosporium leguminicola*** U. Braun & K. Schub., Schlechtendalia 16: 65. 2007. Fig. 185.

*Holotype*: **Spain**, Churriana (Málaga), C. Blívar et E. Rijoa, on pods of *Phaseolus vulgaris* (*Fabaceae*), 18 Jun. 1917, Gonz. Fragoso 2906 (MA 06450-52), as "*C. pisi*".

*Ill*.: Braun & Schubert (2007: 66, fig. 3).

*In vivo*: On necrotic pods, lesions lacking. *Colonies* dark brown to blackish, effuse to dense, forming subcircular to irregular speckles. *Mycelium* immersed. *Stromata* small to well-developed, 10–60 µm diam., later enlarged or confluent, up to 150 µm diam., yellowish brown, pale to medium brown or medium to dark olivaceous-brown, cells circular to somewhat angular-irregular in outline, 3–7 µm diam. *Conidiophores* in small to large, loose to dense fascicles, arising from stromata, erect, straight to somewhat curved or slightly sinuous, but usually non-geniculate, unbranched, 10–70 × 3–7 µm, 0–3-septate, wall thin to slightly thickened, ≤ 1 µm, pale olivaceous to medium olivaceous-brown, smooth or almost so to verruculose. *Conidiogenous cells* integrated, terminal or conidiophores reduced to conidiogenous cells, 10–30 µm long, coronate conidiogenous loci 1.5–2.5 µm wide and 1 µm high. *Conidia* solitary or in unbranched chains,

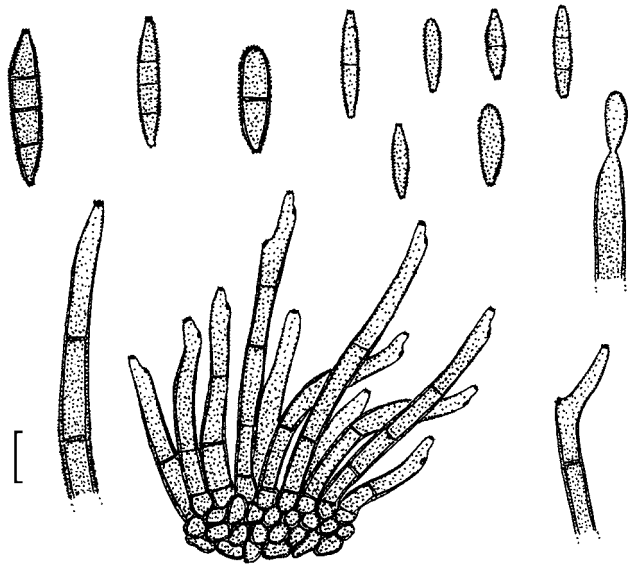


**Fig. 185.** *Cladosporium leguminicola* (MA 06450-52). Conidiophores, conidiogenous cells and conidia *in vivo*. Scale bar = 10 µm. U. Braun *del*.

ellipsoid-ovoid, subcylindrical, ramoconidia not seen, 5–26 × 3–5.5 µm, 0–3-septate, subhyaline to pale olivaceous or olivaceous-brown, thin-walled, verruculose, ends obtuse, rounded to somewhat attenuated, hila distinct, slightly protuberant, 1.5–2 µm diam; microcyclic conidiogenesis lacking.

*Substrate and distribution*: On *Phaseolus vulgaris*; Spain.

*Notes*: The type collection of this species was deposited at MA as *Cladosporium pisi* Cugini & Macch. The latter species was described to have small, subhyaline conidia, 4.5–5.5 × 4–4.5 (terminal) and 7–9 × 2.5–4.5 µm (lateral), respectively (Saccardo 1892: 601). These measurements rather agree with those of *C. cladosporioides*, which is common on pea. Gonzáles-Fragoso (1927) recorded the collection on *Phaseolus vulgaris* as *C. pisi*, but simply copied the original description of the latter species, which is not in full agreement with the fungus on bean. *Cladosporium cladosporioides* is quite distinct from *C. leguminicola* by lacking stromata, usually much longer, filiform, non-fasciculate conidiophores with terminal, non-geniculate conidiogenous cells and, above all, usually smooth-walled, 0–1-septate conidia. The true *C. pisicola*, often confused with the common *C. cladosporioides*, is a leaf-spotting fungus, characterised by having integrated, often intercalary, distinctly geniculate conidiogenous cells and 0–3-septate conidia. It is distinct from *C. leguminicola* by its geniculate conidiophores with intercalary conidiogenous cells, smooth conidia and lacking stromata.

**90. *Cladosporium licheniphilum*** Heuchert & U. Braun, Herzogia 19: 12. 2006. Figs 186, 187.

*Holotype*: **Russia**, Altai, Zmeinogorsk Region, Belaya River near Mt. Stanovaya, 51°00'N, 82°44'N, alt. 600 m, Taiga forest, on apothecia of *Pertusaria alpina*, 12 Jun. 1999, E. A. Davydov (LE). *Epitype* (designated in Bensch *et al.* 2010): **Germany**, Bavaria, Unterfranken, Kreis Aschaffenburg, parking area at the motorway Würzburg-Frankfurt, south-east of Waldaschaff, isol. from the lichen *Phaeophyscia orbicularis* and *Physcia* sp. on stems and bark of

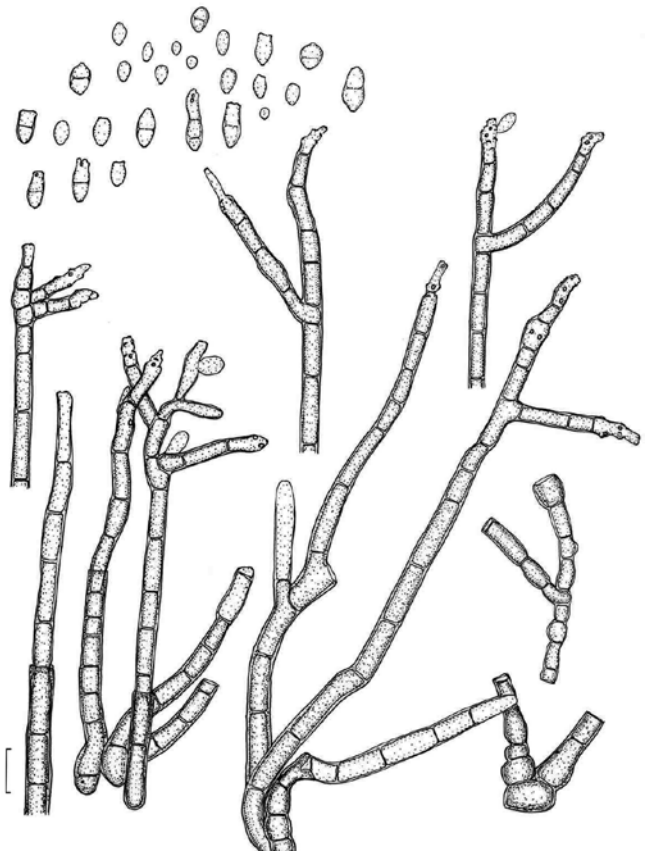


**Fig. 186.** *Cladosporium licheniphilum* (LE). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. B. Heuchert *del*.

*Acer platanoides* (*Aceraceae*), 31 May 2006, W. von Brackel, No. 3808 (CBS H-20439). *Ex-type culture*: CBS 125990 = CPC 13224.

*Lit.*: von Brackel (2007: 8, 2008: 64, 2009), Bensch *et al.* (2010: 58).
*Ill.*: Heuchert & Braun (2006: 13, fig. 1; 18, fig. 5 A–F), Bensch *et al.* (2010: 59, fig. 47).

*In vivo*: *Colonies* on the thallus and on apothecia of the host lichens, caespitose, reddish brown to dark brown or blackish, somewhat shiny. Mycelium immersed; hyphae branched, sinuous, 5–8 µm wide, brown, septate, with constrictions, thick-walled, smooth, hyphal cells around the conidiophores swollen, subglobose to polygonal, about 12 µm diam. or 7–17 × 4–10 µm, thick-walled, dark brown, smooth. *Stroma* lacking. *Conidiophores* solitary or in small, loose tufts, arising from internal swollen hyphal cells, erect, straight to slightly curved, subcylindrical to slightly geniculate-sinuous, unbranched to 1–3 times branched, ramification usually terminal, divergent, branchlets short to moderately long, 10–55 × 4–6.5 µm (occurrence and percentage of branches variable, almost lacking to abundant), conidiophores (65–)90–190 × 5–8 µm, somewhat wider at the base and gradually narrowed towards the apex, 5–14-septate, usually not constricted at the septa, dark brown, paler towards the apex, thick-walled (up to 2 µm), but wall of the terminal conidiogenous cells thinner, smooth, often with a single or few distant enteroblastic-percurrent proliferations. *Conidiogenous cells* integrated, terminal, occasionally intercalary, (7–)9–20 µm long, subcylindrical-conic to slightly geniculate-sinous, proliferation sympodial, with a single or usually numerous, up to 12, coronate conidiogenous loci, 1–2 µm diam. *Ramoconidia* lacking or very

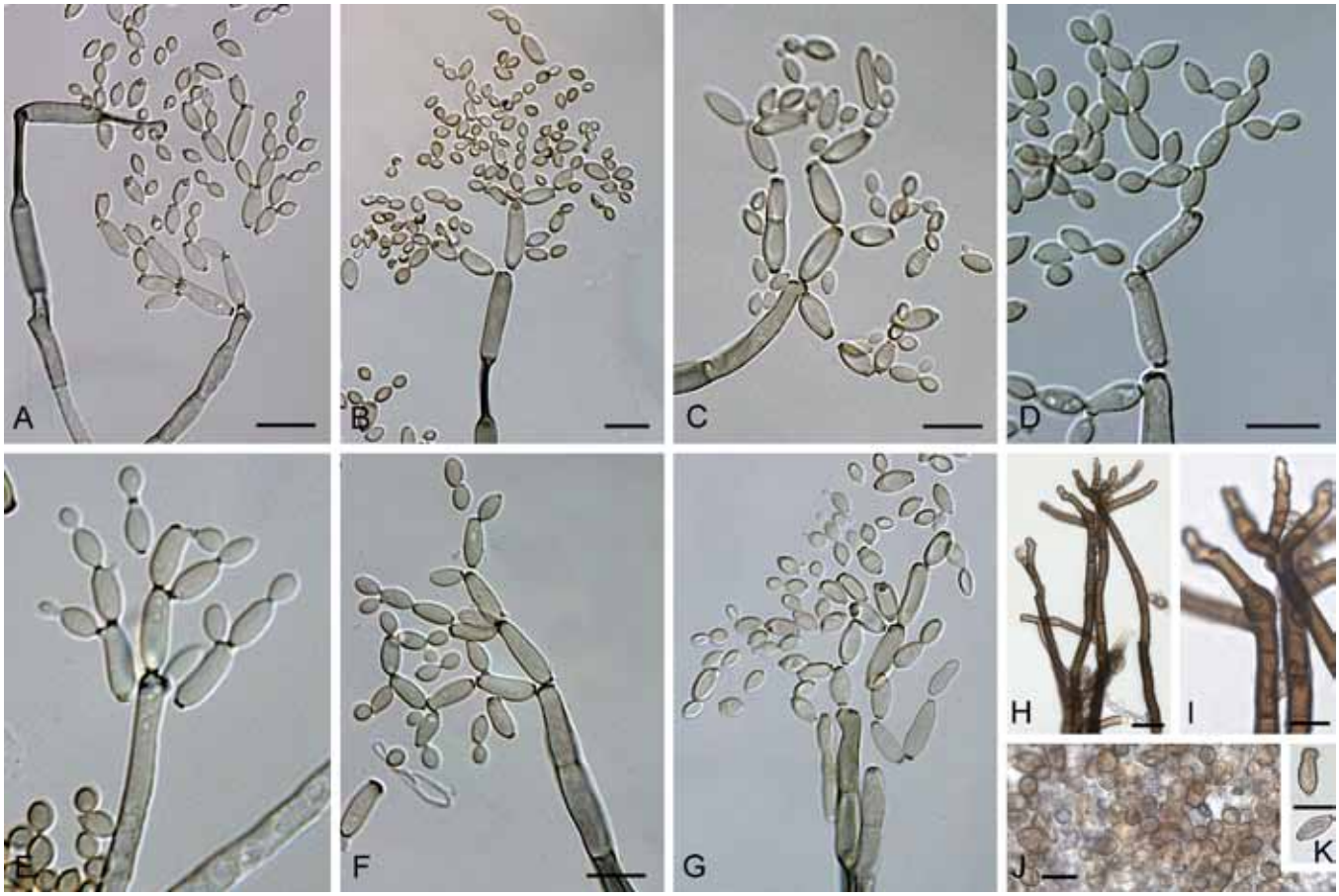



**Fig. 187.** *Cladosporium licheniphilum in vivo* (LE) and *in vitro* (CBS 125990). A–G. Macronematous conidiophores and conidial chains *in vitro*. H. Conidiophores *in vivo*. I. Apically branched tips of conidiophores. J–K. Conidia. Scale bars = 10 (A–G, I–K), 20 (H) µm.

rare. *Conidia* catenate, usually in branched acropetal chains, subglobose, limoniform to ellipsoid-subcylindrical, 0–2(–3)-septate, ramoconidia lacking, only with secondary ramoconidia, aseptate conidia 3.5–8 × 3–5 µm, secondary ramoconidia and septate conidia 7–20 × 4–7 µm, usually not constricted at the septa, pale brown or yellowish brown, wall thin to slightly thickened, smooth or almost so, ends more or less rounded or slightly attenuated, with a single basal and 1–4 distal hila, coronate, 0.5–2 µm diam; occasionally with microcyclic conidiogenesis.

*In vitro*: *Mycelium* immersed and superficial, dimorphic, sparingly branched, 2−5 µm wide, septate, not constricted at septa, hyaline to subhyaline or olivaceous-brown, sterile hyphae smooth, fertile hyphae giving rise to conidiophores irregularly rough-walled, *Zasmidium*(*Stenella*)-like, often irregular in outline, walls unthickened to somewhat thickened. *Conidiophores* macronematous, sometimes also micronematous, arising laterally or terminally from plagiotropous or ascending hyphae, solitary, sometimes in loose groups of two or three, erect, straight to slightly flexuous, cylindrical-oblong, unbranched or once, sometimes twice branched, lateral branches as short outgrowth just below a septum or relatively long, in an angle of 45−90°, 28−90(−145) × 3−4 µm, pluriseptate, not constricted at septa, pale olivaceous to olivaceous-brown, paler towards apices, smooth to somewhat irregularly rough-walled, similar as hyphae, walls thickened, up to 1 µm wide; micronematous conidiophores shorter, narrower and paler, 14−65 × 2−3 µm, septate. *Conidiogenous cells* integrated, terminal and intercalary, cylindrical-oblong, 5−35 µm long, with 1−5 protuberant, denticle-like loci, often aggregated or sitting on small lateral prolongations, broadly truncate, 1.2−2 µm diam, thickened and distinctly darkened, secondary ramoconidia sitting like a whirl at the tip of conidiophores. *Ramoconidia* occasionally formed, with a broadly truncate base, not darkened but slightly refractive. *Conidia* numerous, catenate, in branched chains, often dichotomously branched, especially in the terminal part, small terminal conidia ovoid to obovoid, sometimes subglobose or globose, 3−5 × 2−3 µm (av. ± SD: 4.3 ± 0.8 × 2.6 ± 0.4), aseptate, rounded at the apex, attenuated towards the base, smooth, thin-walled, intercalary conidia ovoid-ellipsoid, 5−8(−12) × 3−4 µm (av. ± SD: 7.6 ± 1.7 × 3.6 ± 0.4), aseptate, distinctly attenuated towards the base, with 1−3 distal hila, sometimes situated on short lateral prolongations at the distal end, secondary ramoconidia ellipsoid to fusiform or subcylindrical, with (1−)2−3(−4) distal hila, 7−18(−23) × (2.5−)3−5(−6) µm (av. ± SD: 12.8 ± 3.9 × 3.9 ± 0.7), 0−1(−2)-septate, not constricted at septa, only very slightly attenuated towards apex and base, base broadly truncate, pale brown or pale olivaceous-brown, smooth, walls unthickened or almost so, hila protuberant, denticulate, 0.5−2 µm diam, thickened, distinctly darkened-refractive; microcyclic conidiogenesis not observed.

*Culture characteristics*: Colonies on PDA attaining 8−18 mm diam after 1 mo, pale olivaceous-grey to olivaceous-grey, sometimes olivaceous due to abundant sporulation, reverse olivaceous-grey, velvety to fluffy, margin feathery to glabrous, regular, slow growing, aerial mycelium loose to dense, more abundant at few areas, fluffy, few prominent exudates formed, sporulation profuse. Colonies on MEA reaching 8−18 mm diam after 1 mo, grey-olivaceous to olivaceous-grey, whitish to smoke-grey due to aerial mycelium, reverse olivaceous-grey to iron-grey, velvety to woolly, margin

very narrow, white feathery, aerial mycelium dense, high, covering some parts of the colony, abundant, without conspicuous exudates, sporulation profuse.

*Substrate and distribution*: On thalli and apothecia of lichens (*Ascomycota*); Asia (Russia, Altai and Taimyr Peninsula), Europe (Germany, Italy, Norway, Russia) – *Cetraria islandica* (Germany), *Glypholecia scabra* (Norway), *Hypogymnia physodes* (Germany), *Lecanora chlarotera* (Germany), *L. carpinea* (Germany), *Parmelia sulcata* (Germany), *Peltigera rufescens* (Germany), *Pertusaria alpina* (Russia, Altai), *Phaeophyscia orbicularis* (Germany), *Physcia aipolia* (Germany), *P. tenella* (Germany), *Physconia distorta* (Germany), *Thamnolia vermicularis* [(Russia, Taimyr Peninsula (Zhurbenko 2012)], *Xanthoria parietina* (Germany, Italy), *X. polycarpa* (Germany).

*Additional specimens examined*: **Germany**, Bavaria, Mittelfranken, Kreis Erlangen-Höchstadt, car park, BAB Münden-Würzburg behind Nbg. Nord, 49°31'36"N, 10°04'03"E, 310 m NN, on *Parmelia sulcata*, on *Acer platanoides*, 23 Jun. 2006, W. v. Brackel x077; Kreis Kitzingen, Gerentholz, NE Willanzheim, 245 m NN, 49°41'31,8"N, 10°14'09"E, on *Physcia tenella*, on a fallen twig of *Quercus robur*, 21 Dec. 2006, W. v. Brackel x117. **Italy**, Tuscany, Prov. Siena, Siena, between Belvedere and Tognazza, 335m, on apithecia of *Xanthoria parietina*, on *Fraxinus ornus*, 14 Sep. 2007. W. v. Brackel, IVL 4281 (all collections deposited in the moss and lichen herbarium of the "Institut für Vegetationskunde und Landschaftsökologie (IVL)" Hemhofen, Germany). **Russia**, Taimyr Peninsula, Byrranga Mts., N of Levinson-Lessinga Lake, 250 m alt., on *Thamnolia vermicularis*, 20 Aug. 1995, M. Zhurbenko 95581 (HAL 2444 F, LE 260309).

*Notes*: *Cladosporium licheniphilum*, which is a true lichenicolous species on thalli and apothecia of living lichens, clustered as a sister to *C. phyllophilum* (Bensch *et al.* 2010, fig. 1, part a) and formed a distinct lineage. *Cladosporium antarticum* is another genuine lichenicolous *Cladosporium* species, but belongs to the *C. herbarum* complex. *Cladosporium lichenicola* is an invalid, doubtful name, and *C. lichenum* has been excluded and assigned to *Pseudocercospora* (Hawksworth 1979, Heuchert *et al.* 2005). *Cladosporium licheniphilum* is morphologically well distinguishable from most other species of *Cladosporium* by having conidiophores with numerous characteristic terminal branches. Comparable ramifications are only known in a few other species, *e.g.* the uredinicolous North American *C. gallicola*, and the biotrophic, leaf-spotting species *C. populicola* on *Populus tremula*, *C. syringicola* on *Syringa* ×*chinensis* and *C. ushuwaiensis*, known from Argentina on *Berberis ilicifolia*, which are, however, easily distinguishable by various differences in the characters of conidiophores and conidia (see Schubert 2005b, Schubert & Braun 2006).

**91. *Cladosporium lineolatum*** Sacc., Ann. Mycol. 12: 313. 1914. Figs 188, 189.

*Lectotype* (**designated here**): **Philippines**, Prov. Rizal, Alabang, on leaves of *Capparis micracantha* (*Capparaceae*), Mar. 1912, P.W. Graff, No. 16748 (PAD). *Isolectotype*: BPI 427242.

*Lit.*: Saccardo (1931: 789), Schubert (2005b: 95–96).
*Ill.*: Schubert (2005b: 96, fig. 40, pl. 18, figs A–D).
*In vivo*: On still living leaves, causing leaf spots or discolorations, amphigenous, minute, often short striate, blackish, under stereomicroscope visible as minute spots with pale centre and distinct, blackish brown margin. *Colonies* hypophyllous, scattered, subeffuse, dense, dark brown. *Mycelium* at first internal, subcuticular to intraepidermal, later also external, growing superficially; hyphae

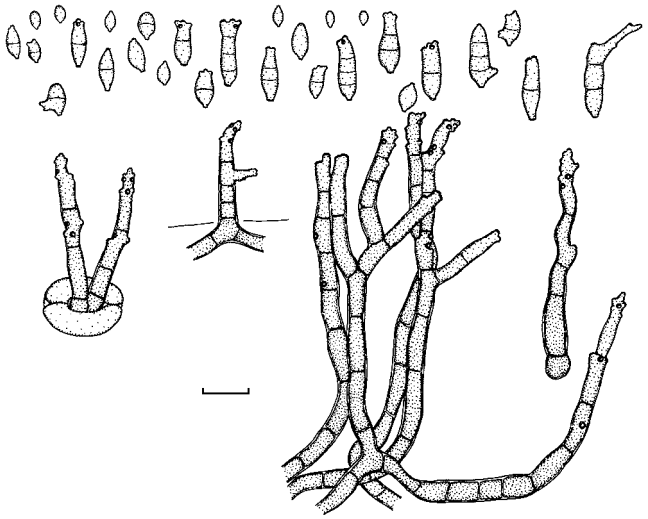


**Fig. 188.** *Cladosporium lineolatum* (PAD). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

branched, 2–5 µm wide, sometimes swollen, then up to 8 µm wide, septate, often slightly constricted at the septa, subhyaline or almost hyaline to pale olivaceous-brown, smooth, walls slightly thickened. *Stromata* lacking. *Conidiophores* solitary or in small, loose fascicles, arising from internal hyphae, mostly emerging through stomata, sometimes erumpent through the cuticle, or in loose to somewhat denser groups, arising from superficial hyphae as lateral or terminal branches, confusable with hyphae, more or less erect to subdecumbent, more or less flexuous, filiform, often mildly geniculate-sinuous, unbranched or branched, sometimes slightly furcate, 8–70(–90) × 2.5–5(–6) µm, septate, often slightly constricted at the septa, then cells appearing to be somewhat swollen, pale to medium olivaceous-brown, somewhat paler towards the apex, smooth, with age somewhat asperulate, walls thickened, often two-layered, up to 1 µm wide, sometimes slightly swollen at the base. *Conidiogenous cells* integrated, terminal and intercalary, often somewhat geniculate, 6–15 µm long, proliferation sympodial, cicatrised, with numerous subdenticulate, protuberant conidiogenous loci, obconically truncate to slightly convex, 0.5–1.5(–2) µm diam, thickened, refractive to somewhat darkened. *Ramoconidia* sporadically occurring, base broadly truncate, unthickened and only very slightly attenuated. *Conidia* in branched chains, subglobose, ovoid, limoniform, ellipsoid to subcylindrical, 2–14(–16) × 2–4.5 µm, 0–3-septate, mostly not constricted at the septa, subhyaline to pale olivaceous-brown, smooth or almost so to somewhat irregularly rough-walled, walls more or less thickened, occasionally apparently two-layered, apex and base rounded or attenuated, hila protuberant, obconically truncate to somewhat convex, 0.5–1.5(–2) µm diam, dome and rim often not very conspicuous, thickened, refractive to somewhat darkened; microcyclic conidiogenesis occurring.

*Substrate and distribution*: On *Capparis micracantha*; Philippines.

*Notes*: *Cladosporium lineolatum* is morphologically comparable with *C. myrtacearum*, *C. cassiae-surathensis* and *C. chamaeropis*. However, the latter species differs from *C. lineolatum* in having somewhat longer and wider conidia, 3–20 × 2–5(–6.5) µm, wider conidiophores, 4–6.5 µm, usually arranged in moderately large fascicles and somewhat wider conidiogenous loci and hila, (0.5–)1–2(–2.5) µm; in *C. myrtacearum* the conidiophores are wider, 3–7 µm, and the conidia are longer, above all wider, 3–22 × 2–7 µm, often constricted at the septa; and *C. cassiae-*

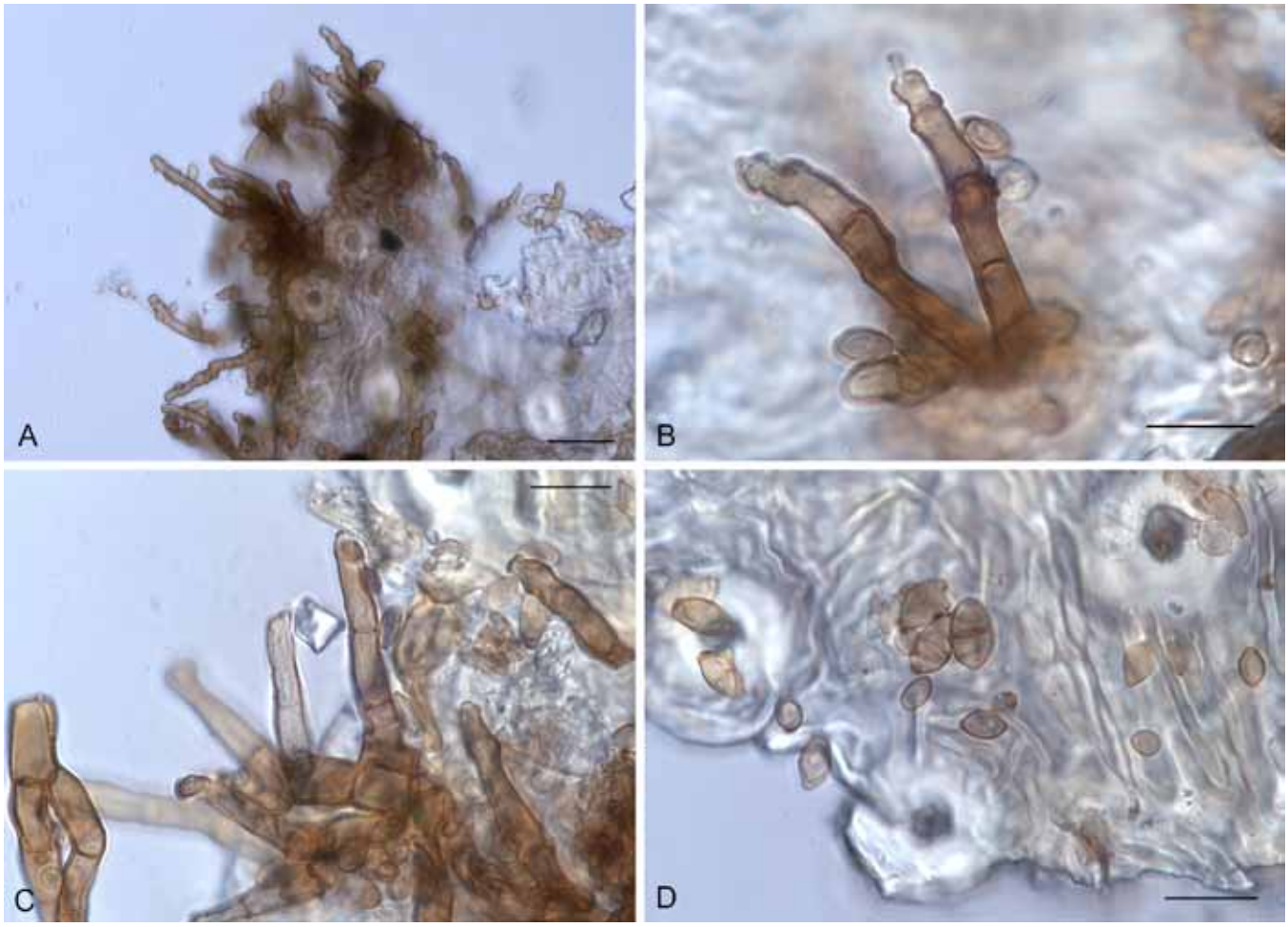



**Fig. 189.** *Cladosporium lineolatum* (PAD). A. Overview. B. Small fascicle of conidiophores emerging through stomata. C. Conidiophores arising from superficial hyphae. D. Conidia. Scale bars = 10 (B–D), 20 (A) µm.

*surathensis* possesses 0–1-septate conidia and non-geniculate conidiophores. *Cladosporium bosciae* described on leaves of *Boscia senegalensis*, a host belonging to the *Capparidaceae*, is quite distinct by forming much longer and wider, 0–6(–8)-septate conidia, wider conidiophores and wider conidiogenous loci and hila.

**92. *Cladosporium liriodendri*** K. Schub. & U. Braun, Schlechtendalia 14: 71. 2007. Figs 190,191.

*Holotype*: **USA**, New York, Tomkins Co., Six Mile Ravine, on *Liriodendron tulipifera* (*Magnoliaceae*), 11 Sep. 1949, C.T. Rogerson, as "*Cercospora* or *Cladosporium*" (NY).

*Lit.*: Schubert (2005b: 96–98).
*Ill.*: Schubert (2005b: 97, fig. 41, pl. 18, figs E–I), Schubert & Braun (2006: 72, fig. 8, pl. 2, figs A–C).

*In vivo*: On living leaves, leaf spots amphigenous, subcircular, but more or less irregular in outline, 2–10 mm wide, sometimes somewhat extended, up to 14 mm long, medium to dark brown or yellowish brown, ochraceous, sometimes greyish brown in the centre, surrounded by a narrow, medium to dark brown, irregular margin, on the lower leaf surface somewhat paler, affected areas finally dropping out, forming shot holes symptoms. *Colonies*

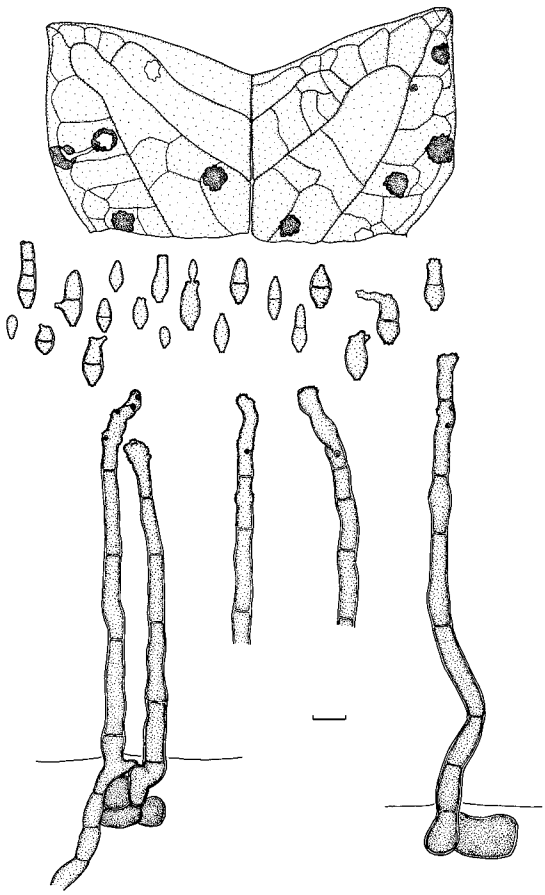


**Fig. 190.** *Cladosporium liriodendri* (NY). Symptoms, conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

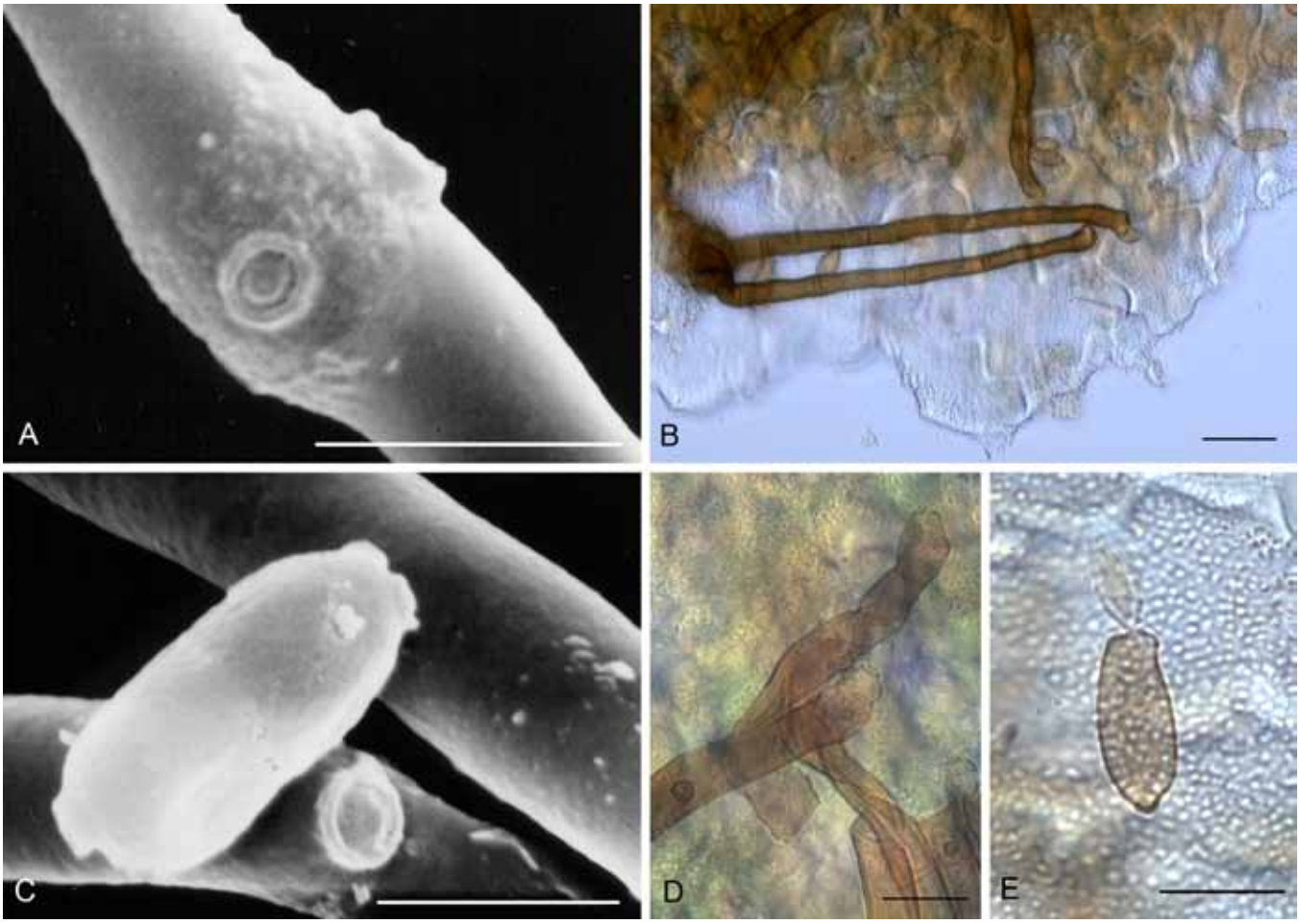



**Fig. 191.** *Cladosporium liriodendri* (NY). A. Conidiophore with coronate scars. B. Overview. C. Conidium showing coronate scar structure. D. Tips of conidiophores with several conspicuous, somewhat darkened conidiogenous loci. E. Conidia. Scale bars = 5 (A, C), 10 (D–E), 20 (B) µm.

amphigenous, loosely scattered, villose, not caespitose, brown. *Mycelium* internal, subcuticular to intraepidermal, hyphae sparingly branched, 4.5–6 µm wide, septate, pale to mostly medium brown, smooth, walls slightly thickened, often swollen. *Stromata* or stromatic hyphal aggregations usually small, subglobose to somewhat oval, 15–40 µm diam., sometimes larger, composed of large, swollen hyphal cells, subglobose to angular-oblong, 8–13(–20) µm wide, dark brown, thick-walled. *Conidiophores* solitary or in small loose groups, mostly in pairs or up to three, arising from swollen hyphal cells or stromatic hyphal aggregations, erumpent through the cuticle, erect, straight to slightly flexuous, not to only somewhat geniculate-sinuous, unbranched, rarely branched, 45–200 × 4–7(–8) µm, pluriseptate, medium to dark brown, smooth, walls distinctly thickened, sometimes two-layered, up to 1 µm wide, often swollen at the base and somewhat attenuated towards the apex, sporadically subnodulose, swellings sometimes with conidiogenous loci, but loci not restricted to them. *Conidiogenous cells* integrated, terminal and intercalary, 8–39 µm long, proliferation sympodial, with few protuberant conidiogenous loci, 1–2.5(–3) µm diam, conspicuously differentiated in a central dome and a raised periclinal rim, thickened, only somewhat darkened-refractive. *Conidia* in unbranched or branched chains, straight, obovoid, ellipsoid to subcylindrical, 5–15(–20) × (2.5–)3.5–6(–7) µm, 0–1(–3)-septate, not constricted at the septa, in 1-septate conidia the septum more or less median, pale to medium brown, smooth, walls more or less thickened, apex rounded, slightly attenuated or truncate, hila protuberant, 1–2.5 µm diam, thickened, only somewhat darkened-refractive; occasionally microcyclic conidiogenesis occurring.

*Substrate and distribution*: On *Liriodendron tulipifera*; USA.

*Notes*: This species is similar to *C. cladosporioides*, which differs, however, in having narrower conidiophores, 2.5–5 µm wide, with usually one-layered walls and longer, somewhat narrower conidia, 5–30 × 3–4(–5) µm. *Cladosporium galii* is also morphologically close to *C. liriodendri*, but the conidia are longer, 6–30(–40) µm, and, above all, minutely verruculose (Mułenko *et al*. 2004). Farr *et al*. (1989) recorded *C. cladosporioides* on *Liriodendron* in the USA, which possibly refers to *C. liriodendri*.

**93. *Cladosporium lupiniphilum*** U. Braun, A monograph of *Cercosporella*, *Ramularia* and allied genera (phytopathogenic hyphomycetes) 2: 410. 1998. Fig. 192.

*Holotype*: **Byelorussia**, Minsk area, on *Lupinus luteus* (*Fabaceae*), 1959, (?) Chenashskaya (LEP, as "*Ramularia lupini*").

*Lit*.: Schubert (2005b: 98–99).
*Ill*.: Braun (1998: 411, fig. 664), Schubert (2005b: 99, fig. 42).

*In vivo*: Leaf spots amphigenous, subcircular to irregular, 1–3 mm wide, pale yellowish ochraceous to greyish white, margin indefinite or with a narrow darker marginal line. *Colonies* amphigenous, mostly hypophyllous, subeffuse, pale brownish. *Mycelium* internal; hyphae branched, 1.5–5 µm wide, septate, hyaline, subhyaline to pale yellowish olivaceous or olivaceous-brown, forming small stromatic

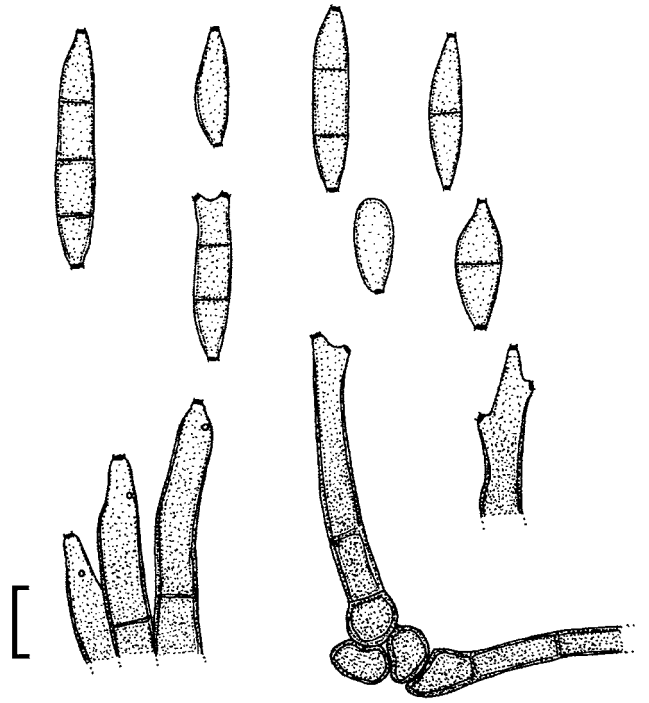


**Fig. 192.** *Cladosporium lupiniphilum* (LEP). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. U. Braun *del*.

hyphal aggregations, up to 10 µm wide, subglobose, subcuticular to intraepidermal, rarely substomatal, often confluent, sometimes almost crustose. *Conidiophores* solitary or in small, loose fascicles, arising from internal cells or stromatic hyphal aggregations, erumpent through the cuticle, rarely emerging through stomata, erect, subcylindrical, hardly geniculate-sinuous, non-nodulose, unbranched, 20–80 × 3–8 µm, continuous or sparingly septate, subhyaline, pale olivaceous to yellowish brown, smooth, walls only slightly thickened. *Conidiogenous cells* integrated, terminal, with few conidiogenous loci, prominent, 1–2 µm diam, thickened and darkened. *Conidia* catenate, usually in branched chains, ellipsoid-ovoid (-subglobose), subcylindrical-fusiform, 6–28 × 4–8 µm, 0–3-septate, subhyaline, pale olivaceous to yellowish brown, smooth or almost so, ends somewhat attenuated, hila prominent, 1.5–2.5 µm diam, thickened and darkened.

*Substrate and distribution*: On *Lupinus luteus*; Byelorussia.

*Notes*: *Cladosporium lupiniphilum* is easily distinguishable from morphologically similar *Cladosporium* species with relatively short, loosely fasciculate conidiophores by having smooth conidia [faintly to conspicuously verruculose-echinulate in *C. praecox*], wider, 0–3-septate conidia [2–5 µm wide, 0–1-septate in *C. cheonis*; 2–5(–6.5) µm wide, 0–1(–3)-septate in *C. chamaeropis*], and wider conidiogenous loci and hila [1–1.5 µm diam in *C. cheonis*], respectively.

**94. *Cladosporium lycoperdinum*** Cooke, Grevillea 12(61): 32. 1883. Figs 193–195.

*Lectotype* (designated in Heuchert *et al*. 2005): **USA**, South Carolina, Aiken, on *Lycoperdon* sp. (*Agaricales*), Ravenel & Cooke, Fungi Amer. Exs. 595 (K 121561). *Isolectotypes*: Ravenel & Cooke, Fungi Amer. Exs. 595 (*e.g.*, BPI 427244, NY).

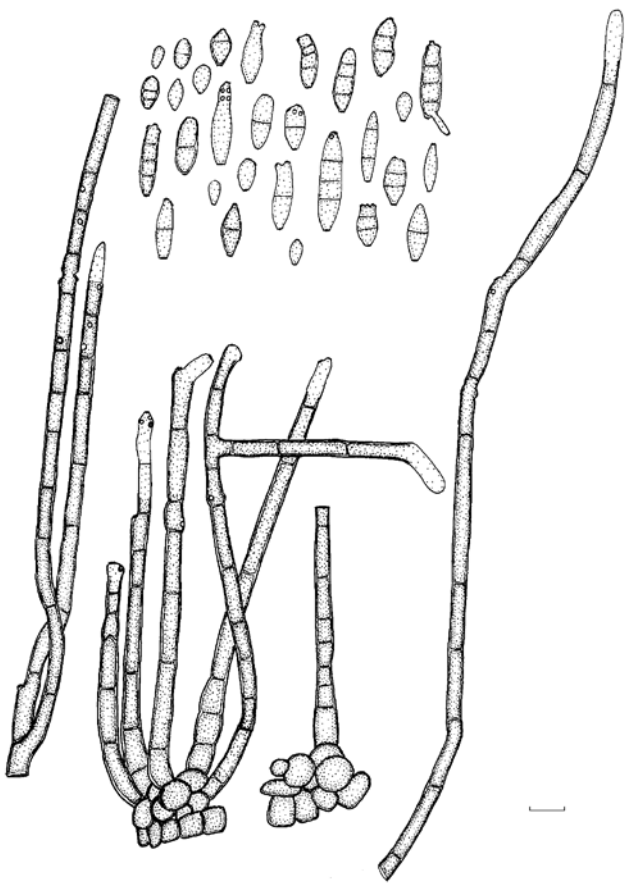


**Fig. 193.** *Cladosporium lycoperdinum* (K 121561). Conidiophores in loose fascicles arising from stromata and conidia *in vivo*. Scale bar = 10 µm. B. Heuchert *del*.

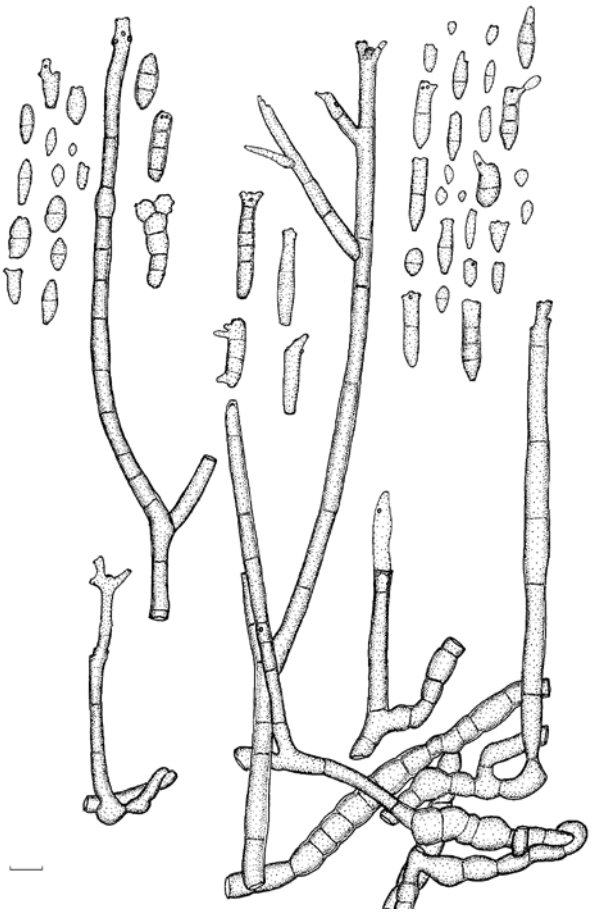


**Fig. 194.** *Cladosporium lycoperdinum* (from B 700006387 and a collection from PH). Conidiophores arising from swollen hyphal cells, ramoconidia and conidia *in vivo*. Scale bar = 10 µm. B. Heuchert *del*.

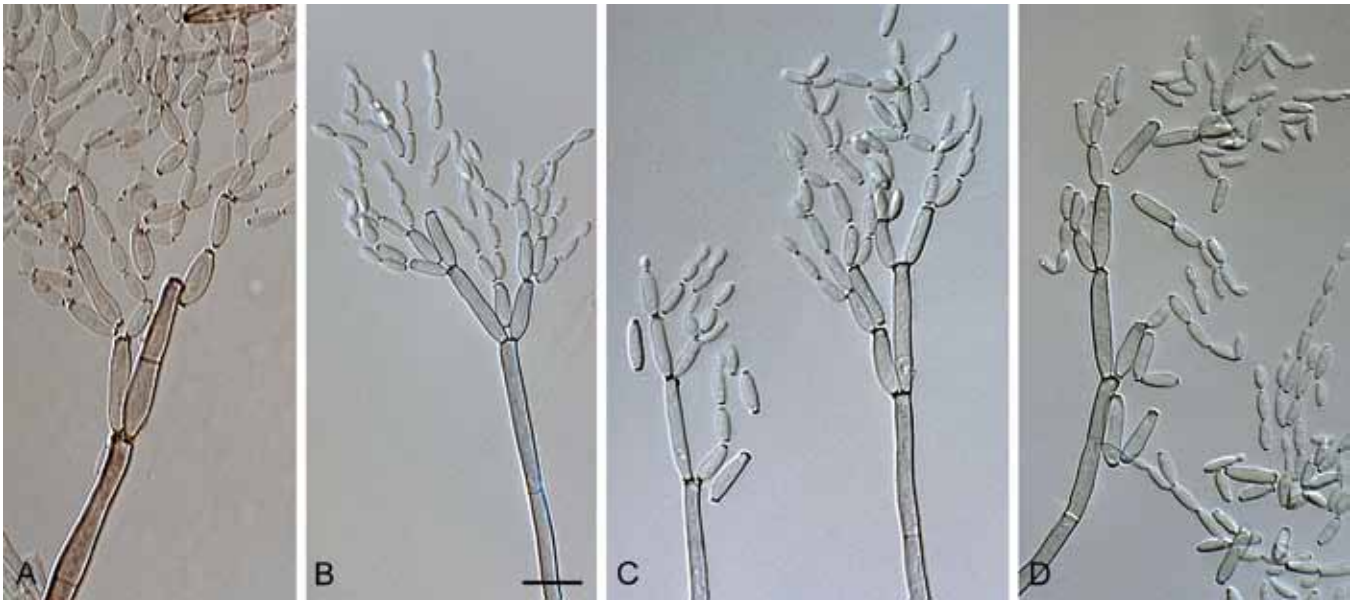



**Fig. 195.** *Cladosporium lycoperdinum* (CBS 574.78c). A–D. Macronematous conidiophores and conidial chains *in vitro*. Scale bar = 10 µm.

*Lit.*: Saccardo (1886: 368), Heuchert *et al*. (2005: 33–36), Bensch *et al.* (2010: 58–60).
*Ill.*: Heuchert *et al*. (2005: 34–35, figs 11–12), Bensch *et al.* (2010: 59, fig. 48).
*Exs.*: Herter, Plantae Urug. Exs. 1452; Sydow, Mycoth. Germ. 1781.

*In vivo*: *Colonies* olivaceous to dark brown, effuse, loose to dense, caespitose, velvety. *Mycelium* external, superficial; hyphae branched, 3–12 µm wide, cells 5–10 µm long, often subglobose, angular to irregularly swollen by constrictions at the septa, swollen cells sometimes aggregated, pale olivaceous to olivaceous-brown, occasionally subhyaline, smooth. *Stromata* effuse, composed of swollen hyphal cells, 5–12 µm diam., dark olivaceous-brown or medium brown, smooth, walls thickened. *Conidiophores* solitary, arising from swollen hyphal cells, or in loose to dense fascicles, arising from stromata, erect to decumbent, straight to curved, subcylindrical, slightly geniculate-sinuous, unbranched to branched, 39–265 × 3–6(–8) µm, 6–9 µm wide at the base, occasionally somewhat attenuated towards the apex (up to 3.5 µm), 4–12-septate, at the base septa often closely spaced, occasionally slightly constricted at the septa, pale to medium olivaceous, sometimes paler towards the tips, occasionally subhyaline, smooth or almost so, walls slightly thickened, thin-walled towards the apex, rarely enteroblastically proliferating, monopodial. *Conidiogenous cells* integrated, terminal or intercalary, cylindrical, 8–53 µm long, polyblastic, proliferation sympodial, with up to four not or only slightly protuberant conidiogenous loci, only occasionally denticle-like or situated on small lateral shoulders, thickened and darkened-refractive, 1–2(–3) µm diam, intercalary conidiogenous cells sometimes somewhat swollen. *Ramoconidia* occasionally formed, subcylindrical to ampulliform, 21–32 × 4.5–5.5 µm, 0–5-septate, usually not constricted at the septa, smooth or rarely irregularly minutely verruculose, walls thickened, base convex without a cladosporioid hilum, 2–3 µm wide, apex with up to five hila. *Conidia* usually in branched chains, straight, rarely curved, variable in shape and size, fusiform, obovoid, limoniform, narrowly to broadly ellipsoid, (2–)6–28 × 2.5–7(–10) µm, 0–3-septate, without any constrictions, pale olivaceous, occasionally subhyaline, smooth, walls unthickened or almost so, apex rounded, with up to four hila, base truncate to convex, sometimes attenuated, hila slightly protuberant, denticle-like, thickened, darkened-refractive, (0.5–)1–2(–2.5) µm diam; microcyclic conidiogenesis observed.

*In vitro*: *Mycelium* unbranched or loosely branched, filiform to cylindrical-oblong, (0.5−)1−5 µm wide, not constricted at septa, subhyaline to pale or medium olivaceous-brown, smooth or almost so to often minutely verruculose or loosely verrucose, walls unthickened or almost so, occasionally forming ropes. *Conidiophores* macro- and micronematous, solitary, arising terminally and laterally from hyphae, erect, straight or slightly flexuous, macronematous conidiophores cylindrical-oblong or filiform, non-nodulose, usually not geniculate, occasionally slightly geniculate at or towards the apex due to sympodial proliferation, unbranched or once, rarely twice branched, branches often only as short lateral peg-like prolongations just below a septum, 20−250 × (2.5−)3−6(−6.5) µm, pluriseptate, with septa occasionally in short succession, not constricted at septa, few septa sometimes darkened just below potential ramoconidia or where conidiophores disarticulate into shorter pieces, pale olivaceous to medium olivaceous-brown, smooth to somewhat irregularly rough-walled or minutely verruculose, especially at or towards the base, walls unthickened or almost so, about 0.5 µm wide, sometimes slightly attenuated towards the apex or intercalary somewhat wider; micronematous conidiophores narrower, shorter and paler, 9−105 × 1.5−2.5 µm, filiform, not geniculate, unbranched or once branched, 0−5-septate, subhyaline to pale olivaceous, conidiogenous cells 6.5−50 µm long, loci 0.5−1.2 µm diam. *Conidiogenous cells* integrated, terminal, intercalary or sometimes pleurogenous, often seceding and forming ramoconidia, cylindrical-oblong, sometimes slightly geniculate due to sympodial proliferation, 10−57 µm long, with (1−)2−4 loci at or towards the apex, sometimes with additional loci situated on a lower level, in intercalary conidiogenous cells loci usually situated on small peg-like lateral outgrowths, loci conspicuous, subdenticulate to denticulate, 1−2 µm diam, thickened and darkened-refractive. *Ramoconidia* often formed, cylindrical-oblong, 13.5−55 × 3−5(−5.5) µm, 0−3(−6)-septate, not constricted at septa, with 2−4 distal hila, base broadly truncate, 2.2−3(−3.5) µm wide, unthickened or slightly thickened, often somewhat darkened or refractive, without dome and rim. *Conidia* catenate, in branched chains branching in all directions, up to 5(−7) conidia in the terminal unbranched part of the conidial chains, straight, small terminal conidia subglobose to obovoid or narrowly ellipsoid, (2−)3.5−5 × (1.5−)2−2.5(−3) µm (av. ± SD: 4.2 ± 0.7 × 2.0 ± 0.3), aseptate, intercalary conidia limoniform, ovoid to ellipsoid, 4−14(−16.5) × (2−)2.5−3(−4) µm (av.

± SD: 8.6 ± 3.0 × 2.8 ± 0.5), 0(−1)-septate, with 1−3(−4) distal hila, secondary ramoconidia ellipsoid to cylindrical, sometimes almost doliiform, 8−32(−38) × (2.5−)3−4(−5) µm (av. ± SD: 15.6 ± 6.3 × 3.5 ± 0.5), 0−1(−3)-septate, not constricted at septa, pale olivaceous to pale olivaceous-brown, smooth or almost so, walls unthickened or almost so, with 2−5 distal hila, intercalary conidia and secondary ramoconidia sometimes formed in dense whirls at the conidiogenous cells or secondary ramoconidia, hila conspicuous, subdenticulate, 0.5−2(−2.5) µm diam, thickened and darkened-refractive; microcyclic conidiogenesis occasionally occurring.

*Culture characteristics*: Colonies on PDA attaining 50−68 mm diam after 14 d, olivaceous-grey, grey-olivaceous towards margins, reverse leaden-grey to olivaceous-black, floccose to fluffy, margins white to grey-olivaceous, feathery, regular, aerial mycelium abundant, covering the whole colony surface, floccose to fluffy, growth flat to low convex, without prominent exudates, sporulation profuse. Colonies on MEA reaching 50−62 mm diam after 14 d, olivaceous-grey to pale olivaceous-grey, sometimes smoke-grey or white, reverse olivaceous-grey to iron-grey, floccose to felty, margins white, narrow, feathery, regular, aerial mycelium abundant, covering the whole colony surface, growth flat to low convex, sometimes radially furrowed, without prominent exudates, sporulation profuse. Colonies on OA attaining 58−70 mm diam after 14 d, olivaceous to greenish olivaceous, olivaceous-grey at margins, reverse leaden-grey to olivaceous-grey, floccose to felty, margins glabrous, aerial mycelium abundant covering almost the whole colony surface, loose to dense, low to rarely high, growth flat, without prominent exudates, sporulation profuse.

*Substrates and distribution*: On ascomycetes and fruiting bodies of different basidiomycetous fungi; Europe (Germany, Russia), North America (Canada, USA) and South America (Colombia, Uruguay) – *Apiosporina morbosa* (Canada), *Aureobasidium caulivorum* (Russia), *Gomphidius viscidus* (Germany), *Lactarius volemus* (USA, NY), *Lepiota procera* (Germany), *Lycoperdon* sp. (USA, SC), *Phyllactinia guttata* (USA, WA), *Piptoporus betulinus* (Germany), *Polyporus* sp. (USA, DE, NY), *Scleroderma tuberoideum* (South America, Uruguay), on *Suillus bovinus* (Germany), unknown ascomycete (USA, WA).

*Additional specimens examined*: **Canada**, Ontario, isol. from galls of *Apiosporina morbosa* (*Venturiaceae*) on *Prunus* sp. (*Rosaceae*), 2005, coll. K.A. Seifert, isol. P.W. Crous (CBS 126347 = CPC 12102). **Colombia**, near Cogna, bosque andino, *ca.* 3000 m alt., isol. from *Puya* sp. (*Bromeliaceae*), W. Gams, depos. May 1980, isol. by W. Gams (CBS 274.80C). **Germany**, Brandenburg, (probably Triglitz), on *Lepiota procera*, 4 Oct. 1905, O. Jaap, Fl. Prov. Br. 102 (B 700006246), as *C. fuligineum* [later revised by Braun (2001) as *C. diaphanum*, mixed infection together with *C. herbarum*]; Kreis Nieder-Barnim, forest between Sophienstädt and Ruhlsdorf, on decaying gills of *Boletus bovinus* (= *Suillus bovinus*), 7 Nov. 1917, P. Sydow, Sydow, Mycoth. Germ. 1781 (HBG), as *C. fuligineum* [mixed collection with *C. episclerotiale* and *C. herbarum*]; Kreis Prignitz, Triglitz, on *Gomphidius viscidus*, 5 Oct. 1905, O. Jaap, Fl. Prig. 74 (B 700006245), as *C. fuligineum* [later re-identified by Braun (2001) as *C. diaphanum* Thüm.; mixed collection with *C. herbarum*]; Nordrhein-Westfalen, Kreis Olpe, near Silberg, Sellenbruch, on *Polyporus betulinus* (≡ *Piptoporus betulinus*), 20 Jun. 1947, A. Ludwig (B 700006387), as *C. fuligineum*. **Russia**, Moscow region, isol. from *Aureobasidium caulivorum* (*Dothioraceae*), ident. by W. Gams, stored as "*C. epichloës*" (CBS 574.78C = VKM F-2759). **Uruguay**, Dep. de San José, on *Scleroderma tuberoideum*, 5 Oct. 1939, W.G. Herter, Herter, Plantae Urug. Exs. 1452 (NY), as *C. epimyces*. **USA**, Delaware, on *Polyporus* sp., without date, A. Commons (PH); Wilmington, on *Polyporus* sp., 26 Oct. 1891, herb. A. Commons Nr. 1879 (PH), as *C. epimyces*; Illinous, Lake Forest, on an old *Polyporus* sp., 16 Oct. 1892, R.A. Harper (NY); New York, Newfield, on *Lactarius volemus*, Sep. 1897 (NY), as *C. epimyces*; Washington, Metalline Falls, on an unknown ascomycete on *Abies grandis*, 31 Aug. 1930, G.G. Hedgcock (BPI 427384), as *C. peridermiicola in herb.*; Seattle, University of Washington campus, isol. from chasmothecia of *Phyllactinia guttata* (*Erysiphales*) on leaves of *Corylus avellana* (*Betulaceae*), 12 Feb. 2004, D. Glawe (CBS 126348 = CPC 11833).

*Notes*: This species can be classified as fungicolous hyphomycete being confined to fruiting bodies of ascomycetes and basidiomycetes. Based on the collections examined it can be suggested that this species, which was until the treatment in Heuchert *et al.* (2005) only known from the type collections, is probably widespread and common. An epitype has not yet been designated since type material was collected on a basidiomycete, but the available cultures, which morphologically coincide with *C. lycoperdinum* (Heuchert *et al.* 2005), are isolated from ascomycetes (Bensch *et al.* 2010). A collection of "*Cladosporium epimyces*" on *Scleroderma tuberoideum* (NY), overgrowing basidiospores, is tentatively assigned to *C. lycoperdinum*, although a few conidiophores with swellings (up to 10 µm) have been observed. "*Peridermium columnare*" (BPI 427384) [deposited under "*C. peridermiicola*" *in herb.*], inhabiting stromata of an unknown ascomycete, is morphologically also indistinguishable from *C. lycoperdinum*. In a specimen on *Lactarius volemus* (NY), some broadly ellipsoid to subcylindrical, darker conidia, 13–20 × 5.5–8.5 µm, 1–3-septate, with constrictions at the septa, have been seen, but it is not clear if they belonged to *C. lycoperdinum* or if a mixed infection was involved. *Cladosporium epimyces*, also occurring on fungal fruiting bodies, possesses much larger, subcylindrical ramoconidia, 33–53 × 4.5–6 µm, 0–6-septate. The conidiophores are, in comparison with *C. lycoperdinum*, frequently dichotomously to irregularly branched (Heuchert *et al.* 2005).

**95. *Cladosporium macrocarpum*** Preuss, in Sturm, Deutsch. Fl. 3(26): 27. 1848, *nom. cons. prop*. Figs 196–199.

≡ *Cladosporium herbarum* var. *macrocarpum* (Preuss) M.H.M. Ho & Dugan, Mycotaxon 72: 131. 1999.

*Neotype* (designated by Schubert *et al*. 2007b): **USA**, Washington, isolated from *Spinacia oleracea* (*Chenopodiaceae*), 1 Jan. 2003, L. DuToit (CBS H-19855). *Isoneotype*: HAL 2020 F. *Ex-neotype culture*: CBS 121623 = CPC 12755.

= *Dematium herbarum* var. (β) *brassicae* Pers., Syn. meth. fung. 2: 699. 1801 [holotype: L 910.255-736 = L-0115836].

= *Dematium graminum* Pers., Mycol. eur. 1: 16. 1822 [lectotype: L 910.255-723 = L-0115836].

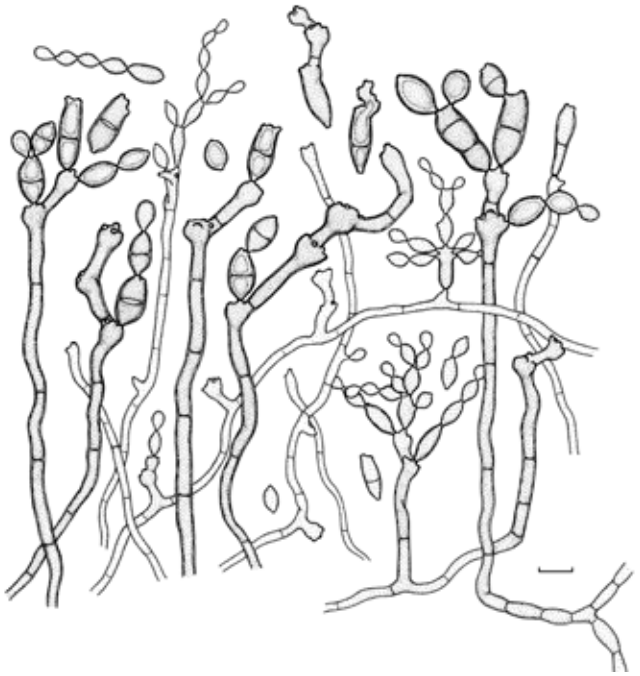


**Fig. 196.** *Cladosporium macrocarpum* (CBS 299.67). Macro- and micronematous conidiophores and conidia *in vitro*. Scale bar = 10 µm. K. Bensch *del*.

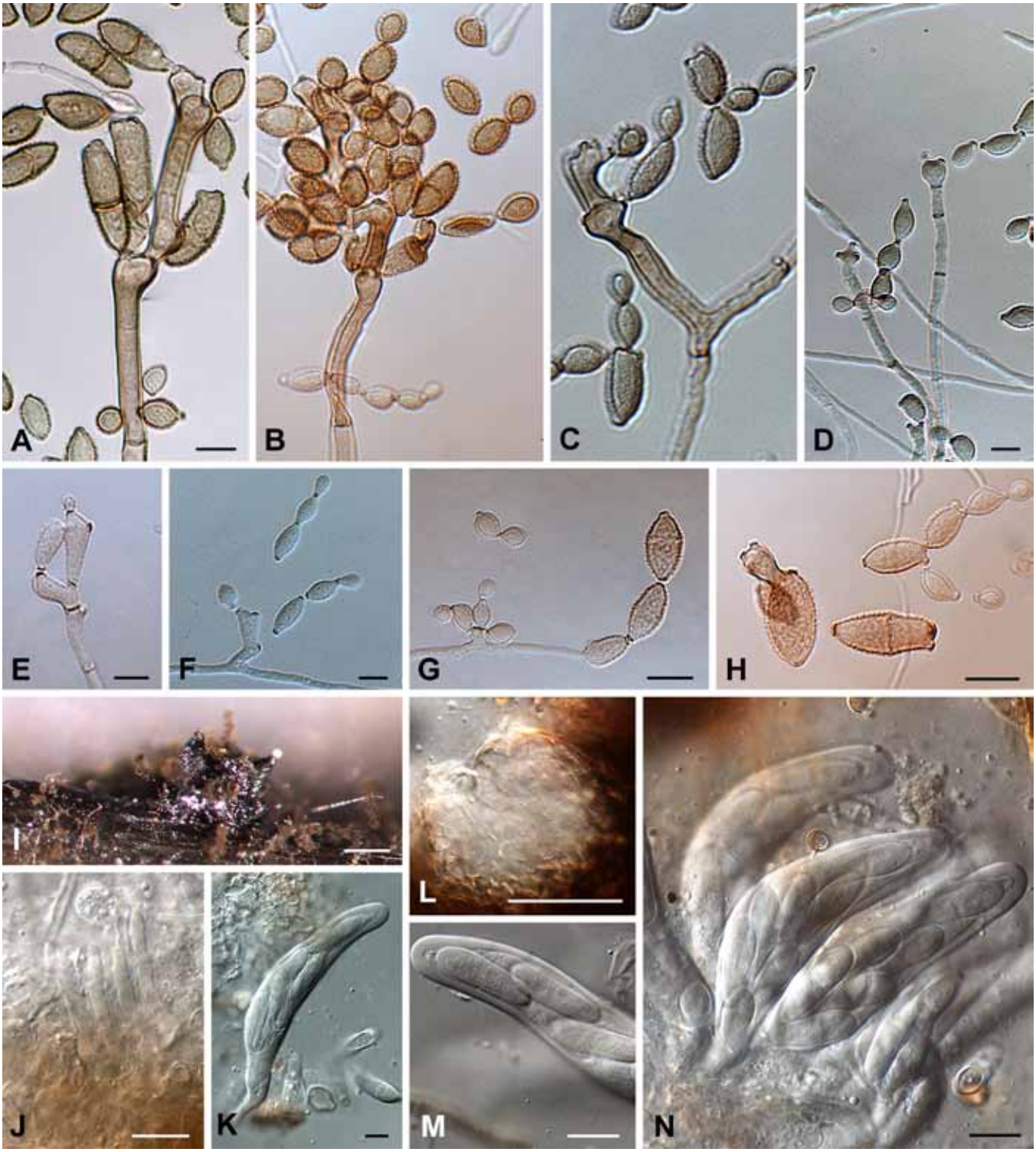



**Fig. 197.** *Cladosporium macrocarpum* (CBS 299.67), anamorphic and teleomorphic state (CPC 12755). A–C. Macronematous conidiophores and conidia. D–G. Micronematous conidiophores. H. Microcyclic conidiogenesis. I. Ascomata formed on nettle stems in culture. J. Periphyses. K, M–N. Asci. L. Ostiole. Scale bars = 10 (A, D–H, J–N), 200 (I) µm.

≡ *Cladosporium graminum* (Pers.) Link, in Willd., Sp. pl. 6(1): 42. 1824.
≡ *Chloridium graminum* (Pers.) Chevall., Fl. gén. env. Paris 1: 36. 1826.
= *Dematium vulgare* var. (β) *foliorum* Pers., Mycol. eur. 1: 14. 1822 [holotype: L 910.255-736 = L-0115871].
≡ *Cladosporium herbarum* α *foliorum* (Pers.) Chevall., Fl. gén. env. Paris 1: 36. 1826.
= *Dematium vulgare* var. (δ) *typharum* Pers., Mycol. eur. 1: 14. 1822 [lectotype: L 910.255-698 = L-0115852].
= *Cladosporium brunneum* Corda, Icon. fung. 1: 15. 1837 [holotype: PRM 657440].
= *Cladosporium gracile* Corda, Icon. fung. 1: 15. 1837 [holotype: PRM 155423].
≡ *Didymotrichum gracile* (Corda) Bonord., Handb. Mykol.: 89. 1851.
= *Cladosporium lanciforme* Ces., Flora 36: 204. 1853 [syntypes: Rabenh., Herb. Viv. Mycol. 1788, *e.g.* B; HAL; HBG; LE 160383, 160385].
≡ *Cladosporium typharum* f. *lanciforme* (Ces.) Ferraris, Flora Ital. Crypt., Pars I, Fungi, Fasc. 8: 337. 1912.
= *Cladosporium cardariae* Opiz, Lotos 5: 41. 1855 [syntypes: PRM 657446, 657447].
= *Cladosporium herbarum* f. *lignicola* Thüm., Fungi Austr. Exs., Fasc. 9, No. 891. 1874 [syntypes: Thümen, Fungi Austr. Exs., e.g., BPI, HAL].
= *Cladosporium kniphofiae* Cooke, Grevillea 14(70): 40. 1885 [holotype: K 121560].
= *Heterosporium minutulum* Cooke & Massee, Grevillea 16(77): 11. 1887 [holotype: K].
= *Cladosporium algarum* Cooke & Massee, Grevillea 16(79): 80. 1888 [lectotype: K, isolectotype: NY, designated by Kohlmeyer].
≡ *Heterosporium algarum* (Cooke & Massee) Cooke & Massee, in Cooke, Grevillea 18(88): 74. 1890.
= *Heterosporium typharum* Cooke & Massee, Grevillea 16(79): 80. 1888

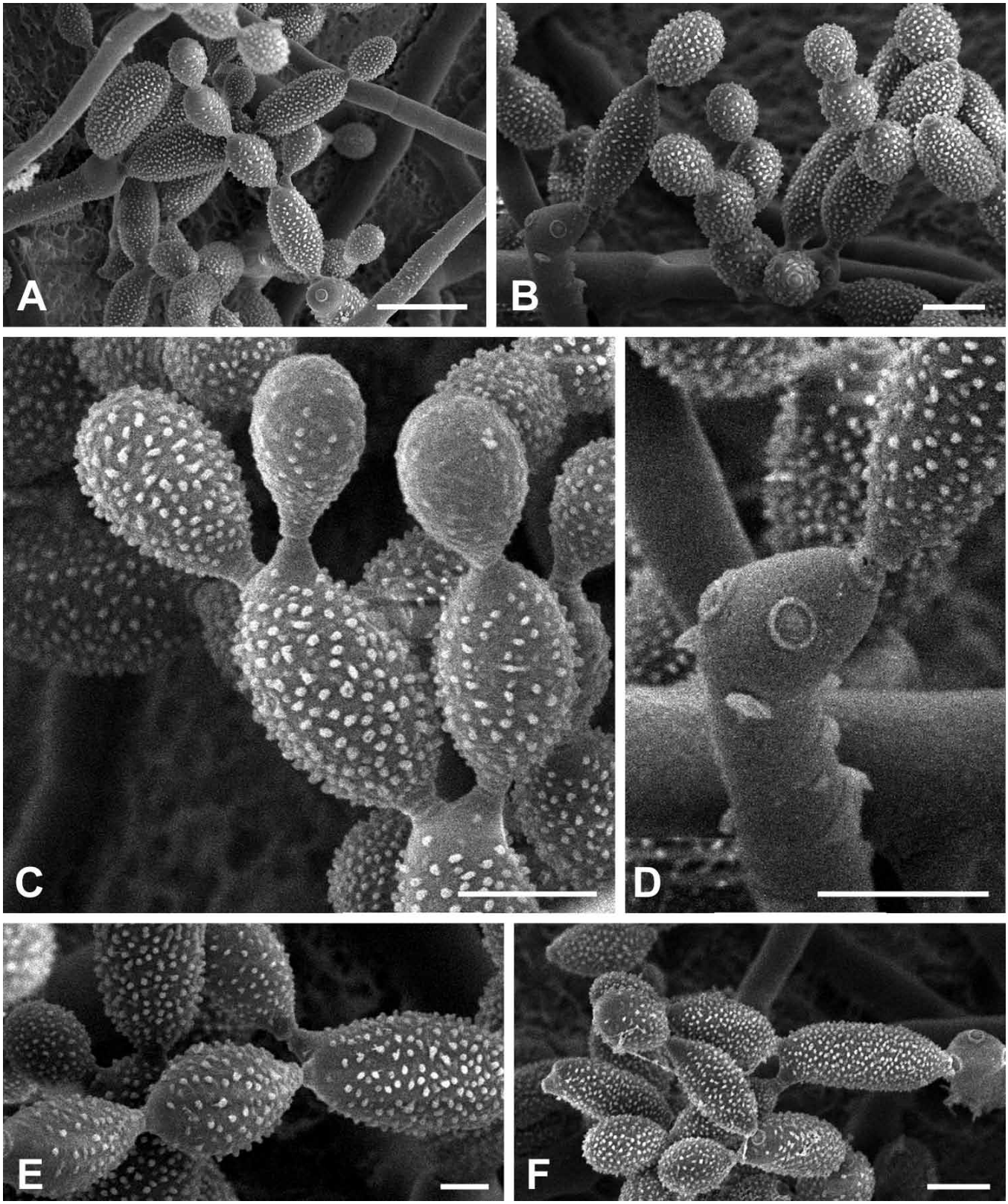



**Fig. 198.** *Cladosporium macrocarpum* (CBS 299.67). A. Survey of a conidiophore that forms several secondary ramoconidia and conidia. Several aerial hyphae are also visible in this picture. B. Conidiophore with broadly ellipsoid secondary ramoconidia and obovoid conidia. Note the different scars on the conidiophore at the lower left. C. Ellipsoid or obovoid conidia with notable areas of scar formation. The ornamentation is relatively widely distributed over the body of the cell and similar to *C. variabile*. D. Detail of a conidiophore (see B) with scars. Note the relatively shallow rings of the scars. E. Details of conidia and a secondary ramoconidium. F. Conidiophore with a secondary ramoconidium and conidia. Note the hila on several spores and the lack of ornamentation at the site where spores are formed. Scale bars = 2 (E), 5 (D, F), 10 (A–C) µm.

[lectotype: NY, designated by J. David].
= *Heterosporium phragmitis* var. *typharum* Cooke, Grevillea 16(80): 109. 1888, *nom. inval*. [type: K].
= *Heterosporium maculatum* Klotzsch ex Cooke, Grevillea 17(83): 65. 1888 [lectotype: K, designated by J. David].
= *Heterosporium fungicola* Ellis & Everh., J. Mycol. 5: 70. 1889, as "*fungicolum*" [type not preserved; neotype (**designated here**): USA, Nebrasca, on *Polyporus pricipes*, Lincoln, 1888, R. Pound, NY].
= *Heterosporium hybridum* Ellis & Everh., J. Mycol. 5: 70. 1889 [holotype: NY].
= *Heterosporium cleomis* Ellis & Everh., in Kelsey, J. Mycol. 5: 82. 1889, *nom. inval*.
= *Fusicladium destruens* Peck, Rep. (Annual) New York State Mus. Nat. Hist. 43: 30. 1890 [holotype: NYS].
= *Cladosporium phoenicis* Roum., Fungi Sel. Gall. Exs. , Cent. 58, No. 5798.

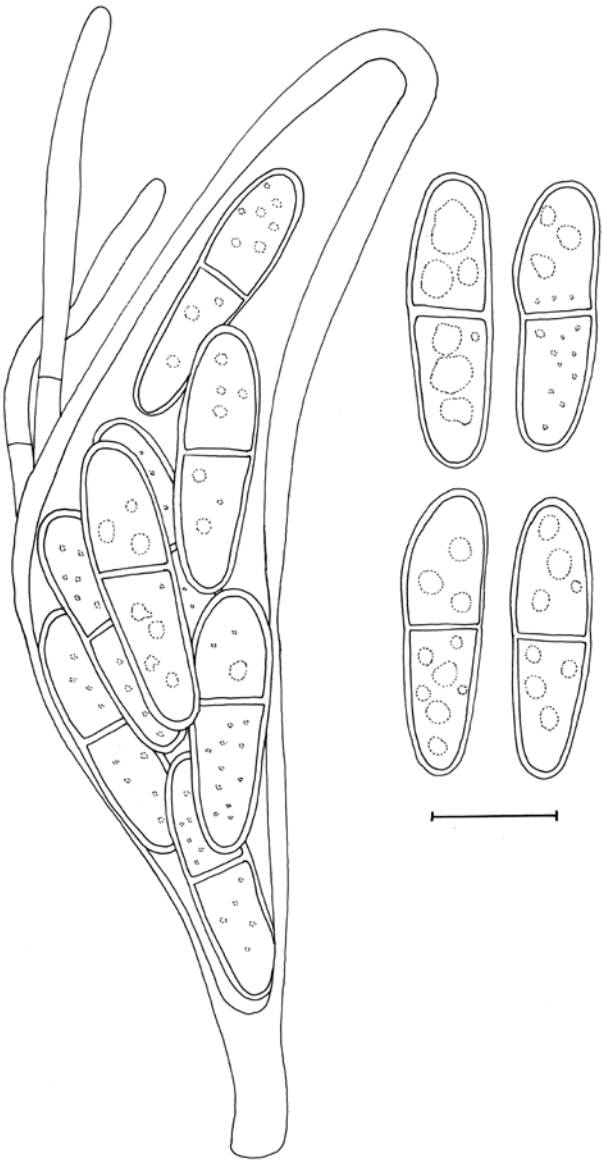


**Fig. 199.** *Cladosporium macrocarpum* (CPC 12755, neotype). Ascus and ascospores. Scale bar = 10 µm. P.W. Crous *del*.

1891 and Rev. Mycol. (Toulouse) 13: 133. 1891 [lectotype (**designated here**): B 700006677. Isolectotypes: Roumeguère, Fungi Sel. Gall. Exs. 5798, *e.g.* FH, *etc*.].
= *Cladosporium myriosporum* Ellis & Dearn., Proc. Canad. Inst., N.S., 3, 1: 90. 1897 [syntypes: DAOM, NYS].
= *Heterosporium tuberculans* Ellis & Everh., Erythea 1: 203. 1893 [syntypes: Ellis & Everhart, N. Amer. Fungi 3295, *e.g.*, NY, K].
= *Heterosporium sphaeriiforme* Ellis & Everh., Proc. Acad. Nat. Sci. Philadelphia 46: 381. 1894, as "*sphaeriaeforme*" [holotype: NY].
= *Cladosporium menispermi* Allesch., Hedwigia 34: 220. 1895 [holotype: M-0057686].
= *Heterosporium proteus* Starbäck, Bot. Centralbl. 64: 382. 1895 [syntypes: Eriksson, Fungi Paras. Scand. Exs. 500, *e.g.* K].
= *Cladosporium idesiae* Bres., Hedwigia 35(1), Beih.: 62. 1896 [type: B 70000655].
= *Heterosporium oxybaphi* F. Patt., Bull. Torrey Bot. Club 27: 285. 1900 [type: BPI].
= *Heterosporium calandriniae* Massee, Bull. Misc. Inform. 175–177: 168. 1901 [holotype: K].
= *Heterosporium chamaeropis* Oudem., Beih. Bot. Centralbl. 11: 539. 1902 [holotype: L].
= *Heterosporium hordei* Bubák, Sber. K. böhm. Ges. Wiss., Math.-Nat. Kl. 1903(12): 20. 1903 [holotype: BPI].
= *Cladosporium magnoliae* Lindau, Verh. Bot. Vereins Prov. Brandenburg 47: 74. 1905 [holotype: B].
= *Heterosporium amsoniae* Kabát & Bubák, Hedwigia 47: 362. 1908 [holotype: BPI].
= *Heterosporium tortuoso-inflatum* Bubák, Bot. Közlem. 15(3–4): 82. 1915 [holotype: BPI].
= *Cladosporium alnicola* Bubák & Vleugel, Svensk Bot. Tidskr. 11: 322. 1917, *nom. illeg.*, non *C. alnicola* Corda, 1837 [holotype: BPI 426104].
= *Cladosporium epiphyllum* var. *acerinum* Sacc., Nuovo Giorn. Bot. Ital., N.S., 27: 86. 1920 [holotype: PAD].
= *Heterosporium laricinum* Dearn., Mycologia 21: 328. 1929 [holotype: DAOM 6812].
= *Heterosporium maydis* Lobik, Trudy Severo-Kavkazsk. Inst. Zashch. Rast. 1(2): 42. 1933 [neotype (**designated here**): Russia, Leningrad Oblast, Siverskaya, on *Zea mays*, 8 Sep. 1955, *E.g.* Potatosova (LEP)].
= *Heterosporium thapsiae* Petr., Denkschr. Akad. Wiss. Wien 105(2): 26. 1943 [holotype: W 08842].
= *Heterosporium petuniae* R. Sprague, Mycologia 57: 658. 1965 [holotype: WSP 46160].
= *Davidiella macrocarpa* Crous, K. Schub. & U. Braun, Stud. Mycol. 58: 129. 2007.
= *Cladosporium equiseti* Pass., *in herb*. [B 700006324].
= *Heterosporium cerastis* Jacz., *in herb*. [LEP].
= *Heterosporium trichostematis* Jacz., *in herb*. [LE 41142].

*Lit*.: Saccardo (1886: 352), Lindau (1907: 805), Ferraris (1912: 335), Gonzáles-Fragoso (1927: 200), de Vries (1952: 76), Ellis (1971: 315), Shvartsman *et al.* (1975: 97–111), Domsch *et al*. (1980: 208), Ellis & Ellis (1985: 290, 468), Matsushima (1985: 5), McKemy & Morgan-Jones (1991c), Dugan & Roberts (1994), David (1997: 71), Samson *et al*. (2000: 112), Schubert *et al*. (2007b: 129–133).
*Ill*.: Preuss (1848: Tab. 14), Gonzáles-Fragoso (1927: 200, Fig. 44), de Vries (1952: 77–78, Figs 16–17), Ellis (1971: 314, Fig. 217 C), Shvartsman *et al.* (1975: 98–99, Figs 57–58), Domsch *et al*. (1980: 209, Fig. 84), Matsushima (1985: 58, Fig. 311), Dugan & Roberts (1994: 516, Figs 1–3), David (1997: 62, Fig. 17 H–I; 89, Fig. 22 G–H), Samson *et al*. (2000: 112, Fig. 50; 113, Pl. 48), Schubert *et al.* (2007b: 129–132, Figs 22–25).
*Exs*.: Allescher & Schnabl, Fungi Bav. 592, 593; Ellis, N. Amer. Fungi 650; Fl. Hung. Exs. 206; Fuckel, Fung. Rhen. Exs. 109; Kabát & Bubák, Fungi Imp. Exs. 795; Krieger, Fungi Saxon. Exs. 2091 p.p.; Liro, Mycoth. Fenn. 829; Petrak, Fl. Bohem. Morav. Exs. Pilze 513 b, 557; Petrak, Mycoth. Gen. 215; Roumeguère, Fungi Sel. Gall. Exs. 948, 1060, 1159, 1365, 3294, 3594, 5798; Smarods, Fungi Lat. Exs. 650; Sydow, Mycoth. Germ. 2044; Sydow, Mycoth. March. 485, 899, 4498; Thümen, Fungi Austr. Exs. 535; Vestergren, Micromyc. Rar. Sel. Praec. Scand. 1798.

*Ascomata* superficial on a small stroma, black, up to 200 µm diam, globose, separate, but developing with 1–3 necks with age; ostioles consisting of pale brown to subhyaline cells, periphysate, with periphysoids growing into the cavity; wall consisting of 3–6 layers of medium brown *textura angularis*. *Pseudoparaphyses* present, hyaline, subcylindrical, septate, anastomosing, 3–4 µm diam; hamathecial cells persistent in cavity. *Asci* fasciculate, bitunicate, subsessile, broadly ellipsoid with a long tapered stalk, straight to curved, 8-spored, 70–110 × 15–20 µm. *Ascospores* tri- to multiseriate, overlapping, hyaline, guttulate, irregular lumina rarely observed, thick-walled, straight to slightly curved, fusoidellipsoidal with obtuse ends, widest in the middle of the apical cell, medianly 1-septate, not to slightly constricted at the septum, tapering towards both ends, but more prominently towards lower end, (22–) 23–26(–28) × (6–)6.5–7(–8) µm; mucoid sheath rarely observed, mostly absent.

*In vivo*: *Colonies* on dead leaves, stems and other organic substrates rather inconspicuous to conspicuous, caespitose, effuse, punctiform to almost pustulate, dark to blackish olivaceous or olivaceous-brown, velvety. *Mycelium* usually immersed, rarely with few superficial

hyphae. *Stromata* usually lacking, occasionally with loose stromatic hyphal aggregations. *Conidiophores* solitary or in small to large facicles, loose to moderately dense, large fascicles occasionally in almost pustulate aggregations, arising from internal hyphae or swollen hyphal cells, erect, usually distinctly nodulose-nodose to geniculate-nodulose, up to 8(–10) µm wide (otherwise agreeing with the conidiophores formed *in vitro*, see below). *Conidia* often distinctly dimorphic, with smaller conidia formed in simple or branched chains, 8–20 × 5–9 µm, and some larger, above all broader conidia, 15–25(–30) × (6–)7–12(–15) µm, formed singly or in short simple to branched chains, micronematous conidiophores not formed *in vivo* (otherwise agreeing with conidia formed *in vitro*, see below).

*In vitro*: *Mycelium* unbranched or loosely branched, 1–4.5(–5) µm wide, septate, sometimes slightly constricted at septa, hyaline to pale brown, smooth to minutely verruculose, walls unthickened or slightly thickened. *Conidiophores* micronematous and macronematous, solitary, arising terminally from plagiotropous hyphae or terminally from ascending hyphae. *Macronematous conidiophores* erect, straight to somewhat flexuous, cylindrical-oblong, nodulose to nodose, with a single apical or usually several swellings either somewhat distinct from each other or often in short succession giving conidiophores a knotty appearance, swellings sometimes laterally elongated or formed at the top of a branch-like outgrowth below the apical swelling, sometimes distinctly geniculate, unbranched, sometimes branched, 12–260 × (3–)4–6 µm, swellings 5–10 µm wide, pluriseptate, sometimes slightly constricted at septa, pale to medium brown or olivaceous-brown, somewhat paler at apices, smooth to minutely verruculose or verruculose, walls somewhat thickened, sometimes even two-layered. *Conidiogenous cells* integrated, terminal or intercalary, cylindrical, nodulose with lateral shoulders or nodose with swellings round about the stalk, with conidiogenous loci confined to swellings, 12–37 µm long, with up to 12 loci per cell, usually with up to six, loci conspicuous, protuberant, (1–)1.5–2 µm diam, somewhat thickened and darkened-refractive. *Micronematus conidiophores* almost indistinguishable from hyphae, straight, narrowly filiform, non-nodulose or with a single or few swellings, mostly with small head-like swollen apices, usually only few micrometer long, 1.5–3 µm wide, aseptate or with only few septa, subhyaline, smooth or almost so, walls unthickened, with a single or only few conidiogenous loci, narrow, 0.8–1.2 µm diam, thickened and somewhat darkened-refractive. *Conidia* catenate, in branched chains, small terminal conidia subglobose, obovoid, oval, limoniform, 4–11 × (3–)4–6 µm [av. ± SD, 7.6 (± 1.9) × 5.0 (± 0.8) µm], aseptate, intercalary conidia broadly ovoid-ellipsoid, 10–17 × (4.5–)5–9 µm [av. ± SD, 12.7 (± 2.1) × 6.8 (± 0.8) µm], 0–1-septate; secondary ramoconidia broadly ellipsoid to subcylindrical, 14–25(–30) × (5–)6–9(–10) µm [av. ± SD, 19.4 (± 3.5) × 7.6 (± 1.0) µm], 0–2(–3)-septate, sometimes slightly constricted at the septa, septa somewhat sinuous with age, pale brown to medium olivaceous-brown or brown, sometimes even dark brown, verruculose to echinulate (muricate under SEM), walls thickened, up to 1 µm thick, mostly broadly rounded at apex and base, sometimes attenuated, sometimes guttulate by oil drops, with up to three apical hila, mostly 1–2, hila sessile (apparently somewhat immersed) to somewhat protuberant, 1–2(–2.5) µm diam, thickened and darkened-refractive; microcyclic conidiogenesis occurring with conidia forming secondary micro- and macronematous conidiophores, conidia often germinating with long hyphae. *Conidia* formed by micronematous conidiophores usually smaller, narrower and paler, catenate, in short unbranched or branched chains, subglobose, obovoid to limoniform, ellipsoid or fusiform, 2.5–16 × 1.5–5 µm, 0(–1)-septate, few longer conidia subcylindrical to clavate, up to 37(–43) µm long, 0–2(–3)-septate, occasionally with up to four septa, sometimes slightly constricted at the septa, subhyaline to pale brown, almost smooth to minutely verruculose, walls unthickened, hila 0.8–1.2 µm diam, thickened and darkened-refractive.

*Culture characteristics*: Colonies on PDA reaching 30–43 mm in diam after 14 d at 25 ºC, dark dull green to olivaceous-grey, olivaceous-grey, dark olivaceous- to iron-grey reverse, pulvinate, velvety, sometimes somewhat zonate, paler zones towards the margin, margin regular, entire edge, almost colourless to white, glabrous to feathery, aerial mycelium sparse to more abundant in the colony centre or covering large areas of the colony, hairy, fluffy or felty, whitish to smoke-grey, sometimes becoming reddish, livid red to vinaceous, growth flat, regular, sometimes forming few prominent exudates, exudates sometimes slightly purplish, sporulation profuse with two kinds of conidiophores, low and high. Colonies on MEA reaching 31–50 mm in diam after 14 d at 25 ºC, grey-olivaceous to olivaceous-grey or iron-grey, sometimes pale olivaceous-grey to whitish due to abundant aerial mycelium, olivaceous-grey or iron-grey reverse, velvety or powdery, margin narrow, entire edge, colourless to white, glabrous, aerial mycelium sparse to abundant, hairy or felty, growth regular, flat to low convex, radially furrowed, without prominent exudates, sporulation profuse. Colonies on OA reaching 29–40 mm in diam after 14 d at 25 ºC, grey-olivaceous, olivaceous-grey to dark smoke-grey, olivaceous-black or iron grey reverse, margin entire edge, narrow, colourless or white, glabrous, aerial mycelium sparse, mainly in the colony centre, felty, white to smoke-grey or grey-olivaceous, felty, growth flat, regular, without exudates, sporulating.

*Substrate and distribution*: Decaying plant material (on leaves, stems and other parts of dead herbaceous and woody plants), on dead fruit bodies of other fungi, occasionally as secondary invader on lesions caused by other fungi, isolated from human and water, incl. hypersaline water; widespread, almost cosmopolitan.

*Additional specimens examined*: *Sine loco et dato* (L 910.255-723 = L-0115836, **lectotype** of *Dematium graminum*). *Sine loco*, on dead stems of *Brassica* sp. (*Brassicaceae*), No. 601 [L 910.255-716 = L-0115849, **holotype** of *D. herbarum* var. (β) *brassicae*]. *Sine loco*, on leaves of *Iris* (*Iridaceae*), *Quercus* (*Fagaceae*), *Brassica etc.* [L 910.255-736 = L-0115871, **holotype** of *D. vulgare* var. (β) *foliorum*, isotype L 910.255-718 = L-0115872]. *Sine loco et dato* [L 910.255-698 = L-0115852, **lectotype** of *D. vulgare* var. (δ) *typharum*]. Isolated from "*Mycosphaerella tulasnei*" (CBS 223.32 = ATCC 11287 = IMI 049635). **Czech Republic**, Prague, on rotten leaves of *Populus* sp. (*Salicaceae*), 1847, E.D. Hofmann (PRM 657440, **neotype** of *C. brunneum* Corda, **designated here**). **Denmark**, Viborg, on dead leaves of *Hordeum vulgare* (= *H. hexastichum*) (*Poaceae*), 3 Aug. 1903, J. Lind (HBG). **France**, Toulouse, on leaves of *Phoenix canariensis* (= *P. tenuis*), 1891, G. Machado, Roumeguère, Fungi Sel. Gall. Exs. 5798 (**syntypes** of *C. phoenicis e.g.*, B, FH). **Germany**, on dead leaves of *Althaea officinalis* (*Malvaceae*), 8 Sep. 1902, Zahn, herb. Magnus 1453 (HBG); on petioles of *Brassica oleracea* (*Brassicaceae*), without date, J. Becker (FR); Bavaria, Munich, botanical garden, on fading leaves of *Menispermum canadense* (*Menispermaceae*), Sep. 1894, Allescher (M-0057686, holotype of *C. menisperm*i); Berlin, Späth'sche Baumschule, on leaves of *Idesia* sp. (*Salicaceae*), Oct. 1895, P. Sydow (B 700006556, **holotype** of *C. idesiae*; Sydow, Mycoth. March. 4498: isotypes, *e.g.*, HBG); Brandenburg, Triglitz, on old fruit bodies of *Hypholoma fasciculata*, 2 Oct. 1904, O. Jaap (B). **Italy**, Emilia Romagna, Parma, on *Equisetum ramosum* (*Equisetaceae*), 1873, G. Passerini (B 700006324, original material of *C. equiseti*). **Poland**, "Tamsel", on leaves of *Yulanea* ×*soulangeana* (= *Magnolia* ×*soulangeana*), Dec. 1904, Vogel (B 700006614, holotype of *C. magnoliae*). **Romania**, isolated from water (CBS 175.82). **Russia**, Novgorod Region, Borovichi District, lake Peleno, on dead leaves of *Eriophorum vaginatum* (*Cyperaceae*), 9 Aug. 2007, V.A. Mel'nik (HAL). **Slovenia**, Sečovlje, isolated from hypersaline water from salterns (precrystalisation pond), 2004, P. Zalar (EXF-2287 = CPC 12054). **Turkey**, Ankara, Tekeli, isolated from *Triticum aestivum* (*Poaceae*), isol. S. Tahsin, ident. A.C. Stolk (CBS 299.67). **UK**, Surrey, Kew, Royal Botanic

Gardens, on leaves of *Kniphofia uvaria* (= *K. aloides*) (*Xanthorrhoeaceae*), Aug. 1885, M.C. Cooke (K 121560, **holotype** of *C. kniphofiae*). **USA**, Idaho, Coeur d' Alene, on leaves, partly becoming dry, of *Acer platanoides* (*Aceraceae*), Sep. 1918, N.W. Scherer, No. 10027 (PAD, **type** of *C. epiphyllum* var. *acerinum*); Montana, Huntley, on dead leaves of *Hordeum* sp., 7 Jul. 1928, P.A. Young 238 (BPI 423224); Seattle, University of Washington Campus, 47.6263530, -122.3331440, isolated from cleistothecia of *Phyllactinia guttata* (*Erysiphaceae*) on leaves of *Corylus* sp. (*Corylaceae*), 16 Sep. 2004, D. Glawe (CPC 11817).

*Notes*: *Cladosporium macrocarpum* is closely allied and morphologically very similar to *C. herbarum*. The two species are very common and widespread saprobic species, which have often been confused previously, depending on the species concept of *C. herbarum s. lat.* (McKemy & Morgan-Jones 1991c, Dugan & Robert 1994, Ho *et al.* 1999), but based on molecular and morphological re-examinations Schubert *et al*. (2007b) have clearly shown that two distinct species are involved. *Cladosporium macrocarpum* is well differentiated from *C. herbarum s. str.* by the wider swellings of its nodulose conidiophores, 5–10 µm, broader and more frequently septate conidia [small terminal conidia 4–11 × (3–)4–6 µm, intercalary conidia 10–17 × (4.5–)5–9 µm, secondary ramoconidia 14–25(–30) × (5–)6–9(–10) µm] and by being connected with a distinct teleomorph, described as *Davidiella macrocarpa*. The teleomorphic state is characterized by having smaller, globose pseudothecia, asci with longer stalks, prominent pseudoparaphyses, and rather inconspicuous luminar ascospore inclusions.

On natural substrates the conidiophores are usually somewhat wider than in culture, 4–8(–10) µm wide, and also the conidia can be somewhat wider, sometimes up to 13(–15) µm.

Type material of *C. macrocarpum* is not preserved. Therefore, de Vries (1952) "lectotypified" *C. macrocarpum* by a specimen in Saccardo's herbarum (Herb. Myc. P.A. Saccardo no. 419, PAD), but this material, later distributed in Mycotheca Italica no. 1396, has to be regarded as neotype as already pointed out by David (1997). A single collection of Saccardo's Mycotheca Italica no. 1396 from herb. HBG, which can be considered as isoneotype material, was re-examined and proved to rather agree with the species concept of *C. herbarum s. str*. The conidia were formed in simple, rarely branched chains, 6–26 × (4–)5.5–8(–9) µm, 0–3-septate, almost smooth or minutely to densely verruculose or verrucose. However, since de Vries' "lectotypification" was incorrect according to the code (ICBN, Art. 9.2, 9.17), a neotype was designated in Schubert (2005b).

*Cladosporium graminum*, described by Persoon (1822), as well as *C. brunneum* and *C. gracile*, introduced by Corda (1837), are older synonyms of *C. macrocarpum* and, according to the code, would have priority. However, since *C. macrocarpum* is a well established, currently used name with numerous records in literature, a proposal to conserve the name against these older names is in preparation for formal publication in *Taxon*.

"Purplish" exudates in *Cladosporium* (examined strain probably belonging to the *C. herbarum* complex) have been correlated with *in vivo* (in knapweed seed) biological activity against *Botrytis* (Ragavendra 2012).

**96. *Cladosporium maracuja*** Viégas, Bragantia 6: 367. 1947. Figs 200, 201.

*Holotype*: **Brazil**, Prov. St. Pauli, Pindorama, Est. Exp. de Pindorama, on *Passiflora* sp. (*Passifloraceae*), 19 Jul. 1935, A.S. Costa (IACM).

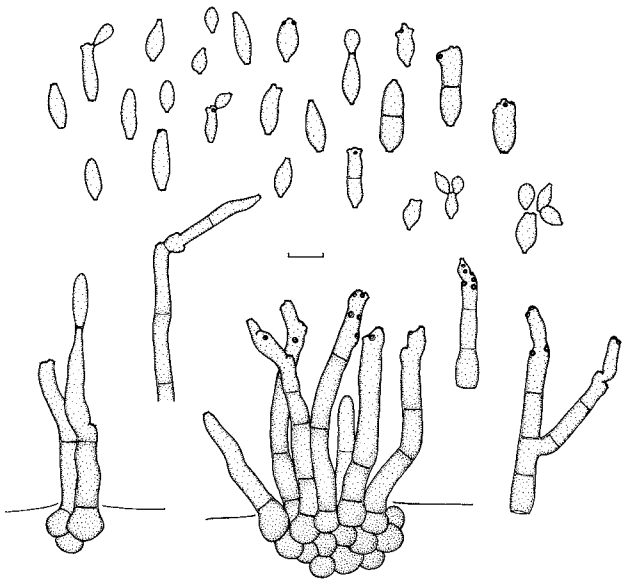


**Fig. 200.** *Cladosporium maracuja* (IACM). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

*Lit.*: Schubert (2005b: 99–101).
*Ill.*: Viégas (1947: 368, fig. 5), Schubert (2005b: 100, fig. 43, pl. 19, figs A–C).

*In vivo*: Leaf spots amphigenous, solitary, scattered, subcircular, 1–6 mm wide, paler in the centre, margin reddish brown, surrounded by a subcircular, yellowish halo. *Colonies* amphigenous. *Mycelium* immersed, intercellular, intraepidermal; hyphae sparingly branched, 4–5.5 µm wide, septate, not constricted at the septa, hyaline to subhyaline, smooth, walls slightly thickened. *Stromata* small, substomatal to intraepidermal, 10–50 µm diam, composed of swollen hyphal cells, subglobose, 6–10(–14) µm diam, pale brown, smooth, thick-walled. *Conidiophores* solitary or in small groups, arising from swollen hyphal cells or from stromata, erumpent through the cuticle or emerging through stomata, erect, straight to somewhat flexuous, sometimes geniculate-sinuous, non-nodulose, unbranched, rarely branched, 25–85 × 4–7 µm, often slightly attenuated towards the apex, septate, occasionally somewhat constricted at the septa, pale brown, smooth, walls only slightly thickened, often swollen at the base, up to 10 µm wide, protoplasm of the cells sometimes aggregated at the septa which then appear to be thickened, similar to distoseptation. *Conidiogenous cells* integrated, terminal or intercalary, cylindrical, 10–32 µm long, with a single to several conidiogenous loci, situated on small lateral shoulders, protuberant, truncate to slightly convex, 1–2(–2.5) µm diam, dome and raised rim conspicuous, thickened, darkened-refractive. *Conidia* catenate, in branched chains, straight, variable, obovoid, ellipsoid, fusiform to subcylindrical, 5–25 × (3–)4–6.5 µm, 0–1(–2)-septate, sometimes slightly constricted at the septum, subhyaline to pale brown, smooth, walls not to only slightly thickened, apex rounded or with a single to several apical hila, truncate to slightly convex at the base, hila conspicuous, 1–2 µm diam, thickened, darkened-refractive; microcyclic conidiogenesis not observed.

*Substrate and distribution*: On *Passiflora* sp.; Brazil.

*Notes*: A stained preparation of the holotype of this species, which has been examined by F. Freire (Fortaleza, Brazil), showed several

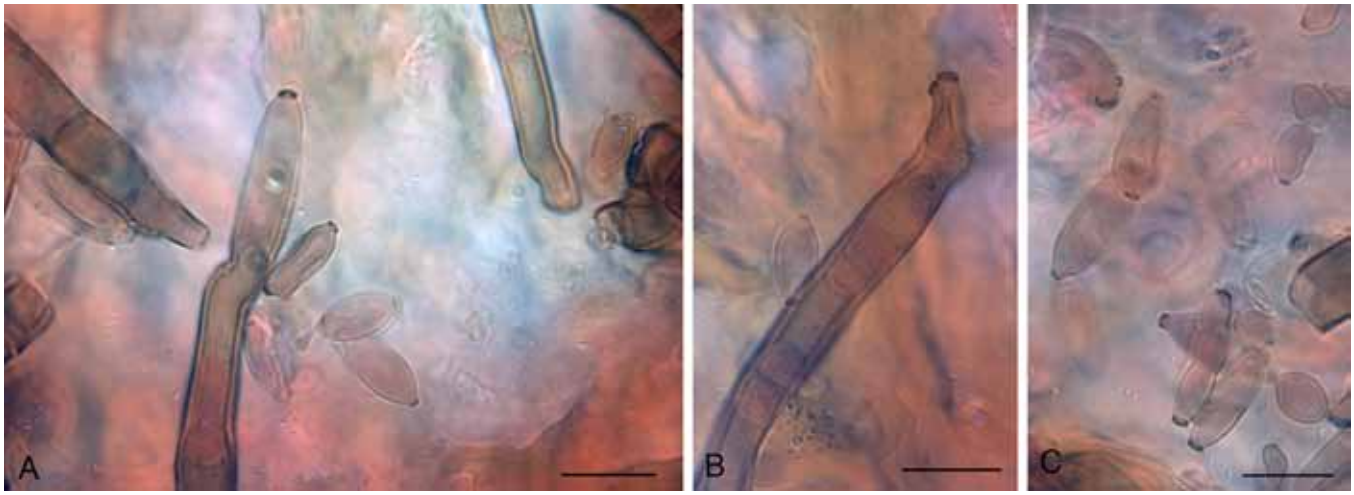



**Fig. 201.** *Cladosporium maracuja* (IACM). A. Conidiophores and conidia. B. Tip of a conidiophore. C. Conidia. Scale bars = 10 (A–C) µm.

fascicles of conidiophores and numerous conidia with conspicuous cladosporioid conidiogenous loci and hila, well differentiated in a convex central dome and a raised periclinal rim. *Cladosporium maracuja* is the only species in this genus known to attack a member of *Passifloraceae*. It is morphologically comparable with *C. praecox*, *C. orchidearum* and *C. gentianae*, but distinct in having smooth conidia [faintly to conspicuously verruculose-echinulate in *C. praecox*; smooth or almost so to verruculose or irregularly rough-walled in *C. gentianae*; verruculose in *C. orchidearum*], narrower conidiophores [(4–)5–10 µm wide in *C. gentianae*], and usually 0–1-septate conidia (0–3-septate in *C. orchidearum*).
*Cladosporium oxysporum*, originally described on dead leaves of *Passiflora edulis* from Cuba, is a common saprobic species and easily distinguishable from *C. maracuja* by having nodulose or even nodose, much longer conidiophores with conidiogenous loci confined to swellings.

**97. *Cladosporium melospermae*** K. Schub. & U. Braun, Schlechtendalia 16: 67. 2007. Fig. 202.

*Holotype*: **Argentina**, Mendoza, San Rafael, entre Calmu-co y Barrancas, on leaves of *Melosperma andicola* (*Plantaginaceae*), 15 Feb. 1942, Covas, No. 462, ex herb. A. Ruiz Leal, Nr. 10797, Flora de la Prov. Mendoza (LPS 14053).

*Ill.*: Braun & Schubert (2007: 68, fig. 4).

*In vivo*: On leaves and inflorescences (sepals), without conspicuous leaf spots, but sometimes with pale brownish discolorations, somewhat faded. *Colonies* amphigenous, punctiform, scattered to effuse, brownish, sometimes velvety. *Mycelium* internal, subcuticular to intraepidermal; hyphae branched, (3–)5–10 µm wide, septate, not constricted at the septa, pale brown to pale medium brown or somewhat olivaceous-brown, sometimes subhyaline, smooth or almost so, walls more or less thickened, forming aggregations. *Stromata* small, substomatal to intraepidermal, 15–60 µm diam, few layers deep, composed of swollen hyphal cells or hyphal aggregations, cells 8–15 µm diam, medium brown, smooth, thick-walled. *Conidiophores* solitary or usually in small loose fascicles, arising from hyphae aggregations or stromata, emerging through stomata or erumpent through the cuticle, erect, straight to flexuous, cylindrical, geniculate-sinuous towards the apex and often coralloid

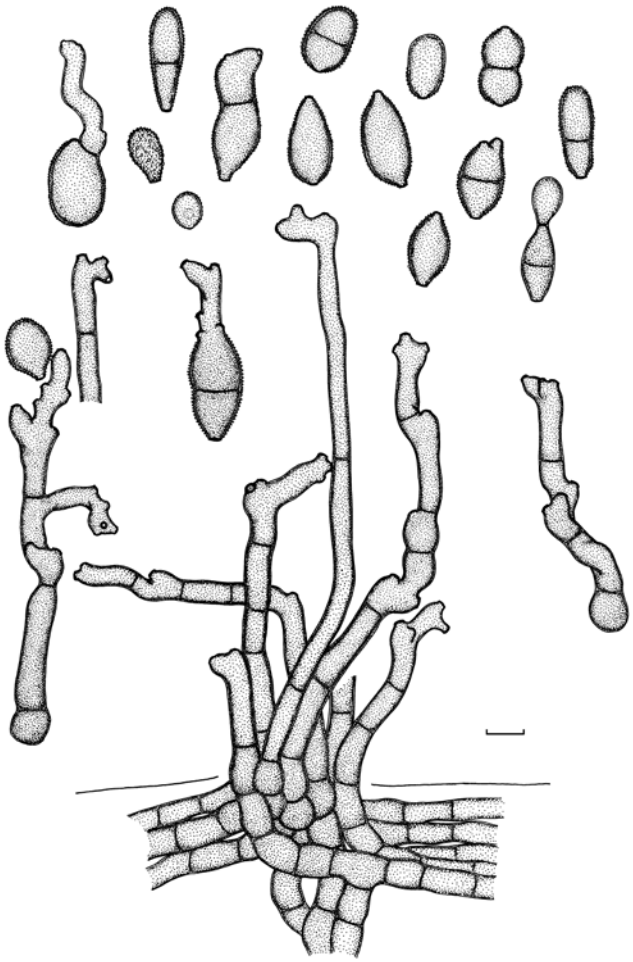


**Fig. 202.** *Cladosporium melospermae* (LPS 14053). Fascicle of conidiophores arising from stromata and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

at the apex, non-nodulose, unbranched, occasionally branched, 20–145 × 4.5–8 µm, 0–5-septate, not constricted at the septa, medium brown, somewhat paler towards the apex, smooth to verruculose, walls thickened, up to 1(–1.5) µm thick, often distinctly two-layered, base often somewhat swollen. *Conidiogenous cells* integrated, terminal or intercalary, 10–30 µm long, cylindrical, often geniculate-sinuous, coralloid, proliferation distinctly sympodial, with a single or few conidiogenous loci situated on small shoulders or small lateral projections, protuberant, coronate but dome

and rim often flat and not distinctly differentiated, 2–3 µm wide, thickened and somewhat darkened-refractive. *Conidia* solitary or in short unbranched, rarely branched chains, straight, obovoid, broadly ellipsoid to subcylindrical or somewhat irregular, 9–35 × (8.5–)10–15 µm, 0–1(–2)-septate, septum somewhat in the upper or lower half, sometimes slightly constricted, medium brown, coarsely verrucose, ornamentation up to 1 µm high, thick-walled, apiculate, base sometimes attenuated, stalk-like, cells sometimes with large oil drops, hila more or less protuberant, truncate, dome and rim flat, dome often not higher than the surrounding rim, 2–3 µm wide, thickened, somewhat darkened-refractive; microcyclic conidiogenesis occurring.

*Substrate and distribution*: On *Melosperma andicola*; Argentina.

*Notes*: *Cladosporium melospermae*, occurring on living leaves and inflorescences of the endemic host species *Melosperma andicola*, is morphologically close to *C. variabile*, but the later species, which causes distinct leaf spots on spinach, is easily distinguishable by having longer, (6.5–)10–45(–55) µm, 0–4(–5)-septate conidia. *Cladosporium mimulicola*, known from North America on *Mimulus* sp., is quite distinct by having shorter and narrower conidiophores arising from superficial hyphae, smooth and narrower conidia, (2.5–)3–5(–6.5) µm, and narrower conidiogenous loci and hila. Type material of *C. digitalicola*, a species also recorded from a member of the *Scrophulariaceae*, was not available for a re-examination. Therefore, its status remains still uncertain, but conidia were described to be shorter, 0–4-septate, and conidiophores longer and narrower, 45–502 × 4.0–7.9 µm (Zhang *et al*. 1998e).

**98. *Cladosporium mimulicola*** U. Braun, Nova Hedwigia 58(1–2): 196. 1994. Fig. 203.

*Holotype*: **USA**, California, on *Mimulus* sp. (*Phrymaceae*), 18 Jul. 1895, J.J. Davis (NY).

*Lit.*: Schubert (2005b: 101).
*Ill.*: Braun (1994: 193, pl. 1, fig. 7), Schubert (2005b: 101, fig. 44).

*In vivo*: Leaf spots almost absent or diffuse, leaves with brownish discolorations. *Colonies* usually hypophyllous, diffuse, brownish. *Mycelium* internal and external, superficial; hyphae branched, 2–5 µm wide, septate, brown, smooth, thin-walled. *Stromata* absent. *Conidiophores* solitary, arising from superficial hyphae, lateral and terminal, straight and subcylindrical to slightly geniculate-sinuous, unbranched, 10–80 × 3–5 µm, 0–3-septate, brown, walls thin to slightly thickened. *Conidiogenous cells* integrated, terminal or conidiophores reduced to conidiogenous cell, proliferation sympodial, conidiogenous loci conspicuous, protuberant, (0.5–) 1–2(–2.5) µm diam, thickened and darkened. *Conidia* catenate, often in branched chains, ellipsoid-ovoid, subcylindrical, 10–30 × (2.5–)3–5(–6.5) µm, 0–2-septate, brown, smooth, hila coronate, somewhat protuberant, 0.5–2.5 µm diam, thickened and darkened.

*Substrate and distribution*: On *Mimulus* sp.; USA.

*Notes*: This species, only known from the type collection, is a leaf-spotting hyphomycete easily distinguishable from other biotrophic *Cladosporium* spp. by its solitary conidiophores arising from superficial hyphae and rather large, smooth conidia.

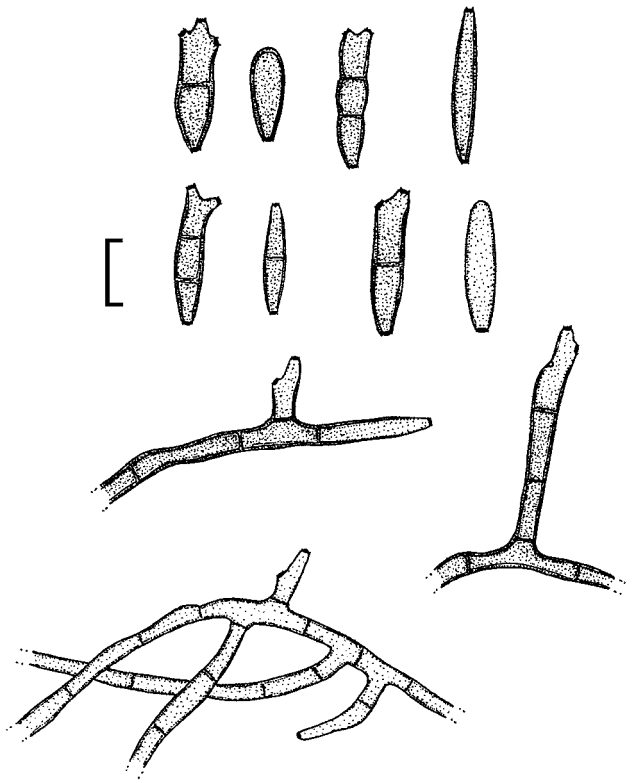


**Fig. 203.** *Cladosporium mimulicola* (NY). Conidiophores arising from superficial hyphae and conidia *in vivo*. Scale bar = 10 µm. U. Braun *del*.

**99. *Cladosporium minusculum*** Sacc., Ann. Mycol. 11: 20. 1913. Figs 204, 205.

*Holotype*: **Malta**, Ghain el Gbira, on *Salix alba* (*Salicaceae*), Oct. 1911, Caruana Gatto (PAD). *Isotype*: IMI 70294.

*Lit.*: Ferraris (1914: 886), Saccardo (1931: 798), Braun (2000: 34), Schubert (2005b: 102–103).
*Ill.*: Braun (2000: 37, fig. 5), Schubert (2005b: 102, fig. 45, pl. 19, figs D–F).

*In vivo*: On living leaves without conspicuous lesions or associated with distinct leaf spots, together with *Alternaria* sp., spots amphigenous, subcircular to irregular, 1–3 mm wide, brownish to greyish white, with a diffuse brownish margin or marginal line. *Colonies* amphigenous, usually epiphyllous, scattered to subeffuse, dull greyish brown, not very conspicuous. *Mycelium* internal, mostly intraepidermal; hyphae sparingly branched, 3–6 µm wide, septate, later often swollen and slightly constricted at the septa, up to 10 µm wide, subhyaline to pale brown, smooth, walls somewhat thickened. *Stromata* absent or developed, small, usually substomatal, 10–20 mm diam., composed of only few swollen hyphal cells, somewhat angular, 4–8 µm wide, pale to medium brown, thick-walled, smooth. *Conidiophores* solitary or in small loose fascicles, arising from swollen hyphal cells or stromata, often emerging through stomata, sometimes erumpent through the cuticle, erect, straight to often somewhat flexuous, strongly and frequently geniculate-sinuous, non-nodulose, mostly unbranched, 15–100 × 2–5(–7) µm, pluriseptate, not constricted at the septa, pale to medium dark brown throughout or tips paler, smooth, with age somewhat asperulate, walls somewhat thickened, sometimes

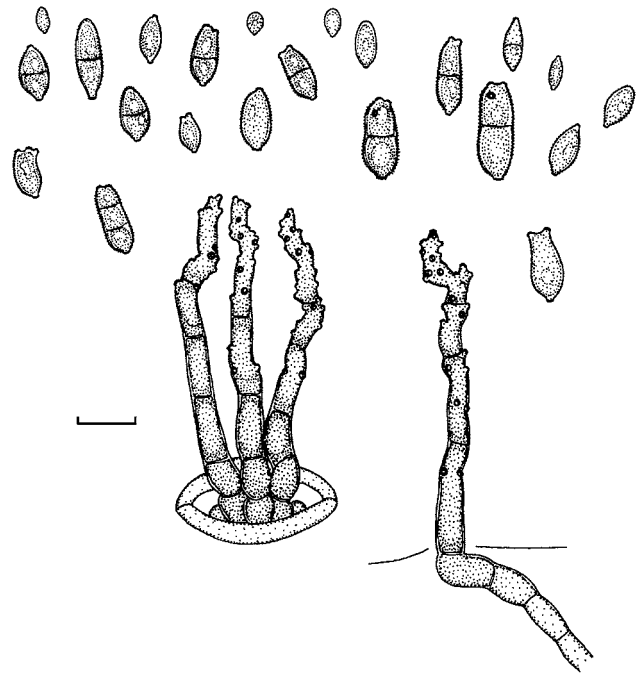


**Fig. 204.** *Cladosporium minusculum* (PAD). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del.*

two-layered, protoplasm of the cells somewhat aggregated at the septa which then appear to be thickened (as in distoseptation). *Conidiogenous cells* integrated, terminal and intercalary, 7–35 µm long, proliferation sympodial, with numerous conidiogenous loci, often aggregated near the apex, protuberant, often situated on small lateral shoulders, subdenticulate, (0.5–)1–1.5 µm diam, thickened, refractive to somewhat darkened. *Conidia* catenate, in unbranched or branched chains, subglobose, ellipsoid-ovoid, fusiform to subcylindrical, 3–16 × (2–)3–5(–6) µm, 0–1(–3)-septate, sometimes slightly constricted at the septa, subhyaline to pale yellowish, olivaceous or brownish, almost smooth or mostly faintly to distinctly verruculose, walls somewhat thickened, thicker with age, protoplasm of the cells mostly with a small, oval to somewhat irregular, paler cavity in the centre, ends rounded or slightly attenuated, hila protuberant, truncate to slightly convex, 0.5–1.5 µm diam, thickened, refractive to somewhat darkened; microcyclic conidiogenesis sporadically occurring.

*Substrate and distribution*: On *Salix alba*; Malta.

*Notes*: In the original diagnosis, Saccardo (1913b) described this species to occur on minute excrements of insects on the lower leaf surface of living leaves of *Salix alba*, which could not be observed neither by Braun (2000) nor during the course of the recent re-examination of the type material. *Cladosporium minusculum* is morphologically allied to *C. cladosporioides*, but differs in having strongly geniculate-sinuous conidiophores and consistently verruculose conidia (Braun 2000). *Cladosporium lineolatum*, which is also close to *C. minusculum*, deviates in having an internal mycelium as well as superficially growing hyphae giving raise to often branched conidiophores, and usually smooth 0–3-septate conidia; occasionally ramoconidia are formed.

**100. *Cladosporium myrtacearum*** K. Schub., U. Braun & R.G. Shivas, Australas. Pl. Pathol. 34: 513. 2005. Figs 206, 207.

*Holotype*: **Australia**, Northern Territory, Millingimbi, Townsite, on *Corymbia polycarpa* (*Myrtaceae*), 17 Aug. 1999, A.A. Mitchel (BRIP 26527). *Isotype*: DNAP 26527. *Epitype* (designated in Bensch *et al.* 2010): **Australia**, Northern Territory, Emerald Springs, S13°37'23, E131°36'40, isol. from *Corymbia foelscheana*, 22 Sep. 2007, coll. B.A. Summerell, isol. P.W. Crous (CBS H-20440). *Ex-type culture*: CBS 126350 = CPC 14567.

*Lit.*: Schubert (2005b: 103–105), Bensch *et al.* (2010: 60–61).
*Ill.*: Braun *et al*. (2005: 513, fig. 5), Schubert (2005b: 104, fig. 46, pl. 19, figs G–I), Bensch *et al.* (2010: 61, fig. 49).

*In vivo*: Leaf spots amphigenous, subcircular to oval-oblong, 3–12 mm wide, medium to reddish brown, centre paler, occasionally with a small hole in the centre, margin irregular, inconspicuous or narrow, somewhat raised, occasionally with a narrow, brown or purplish halo, finally leaf spots dropping out, leaving shot-hole symptoms. *Colonies* amphigenous, mostly in the centre, densely caespitose, olivaceous-brown. *Mycelium* immersed, subcuticular to intraepidermal; hyphae sparingly branched, septate, subhyaline to pale olivaceous, smooth, thin-walled. *Stromata* lacking or only with small hyphal aggregations, composed of swollen hyphal cells, subglobose to somewhat angular, 5–10(–13) µm diam, pale olivaceous to medium brown. *Conidiophores* solitary or in small, loose to dense fascicles, arising from swollen hyphal cells, emerging through stomata or erumpent through the cuticle,

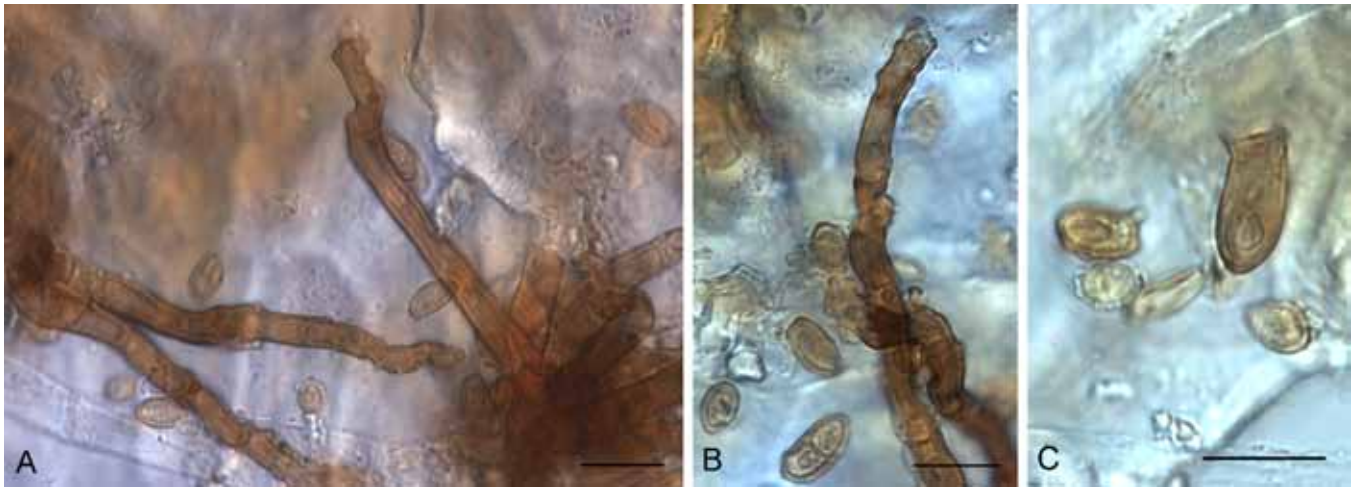



**Fig. 205.** *Cladosporium minusculum* (PAD). A. Fascicles of conidiophores. B. Frequently geniculate-sinuous conidiophores and conidia. C. Conidia. Scale bars = 10 (A–C) µm.

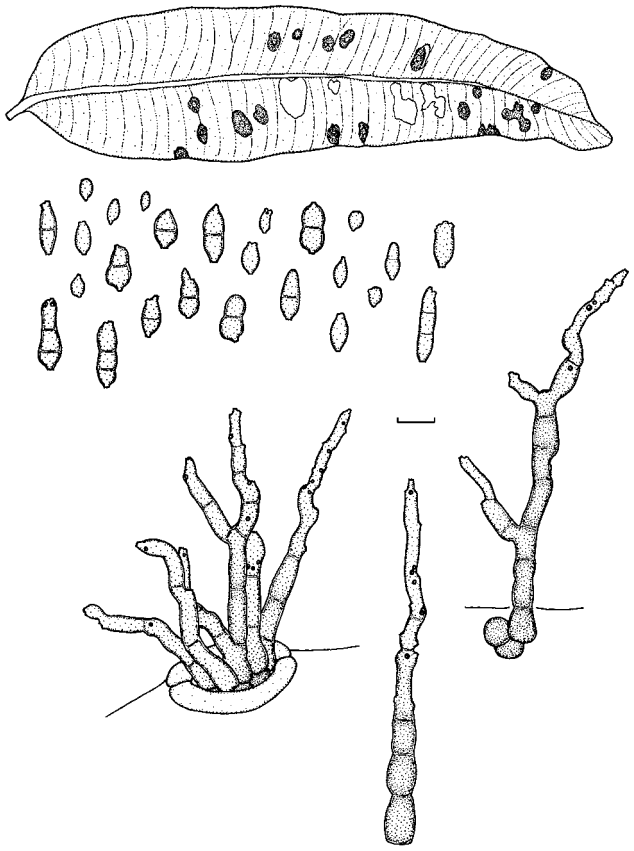


**Fig. 206.** *Cladosporium myrtacearum* (BRIP 26527). Symptoms, conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

straight to flexuous, unbranched or branched, geniculate-sinuous, subnodulose, often somewhat attenuated towards the apex and swollen at the base, 14–96 × 3–7(–9.5) µm, pluriseptate, often constricted at the septa, pale olivaceous to medium brown, somewhat paler towards the apex, walls somewhat thickened, protoplasm of the cells sometimes aggregated at the septa which then appear to be thickened (as in distoseptation). *Conidiogenous cells* integrated, terminal and intercalary, cylindrical-oblong, 10–43 µm long, proliferation sympodial, with numerous, scattered conidiogenous loci, not confined to swellings, somewhat protuberant, 1–2 µm diam, somewhat thickened and darkened-refractive. *Conidia* in unbranched or branched chains, straight, subglobose, ovoid, obovoid, broadly ellipsoid-fusiform, subcylindrical, 3–22 × 2–7 µm, 0–1(–2)-septate, not to distinctly constricted at the septa, pale olivaceous to olivaceous, smooth, wall unthickened to somewhat thickened, apex rounded or with 1–5 hila, base rounded to somewhat attenuated, hila somewhat protuberant, 1–2 µm diam, somewhat thickened and darkened-refractive; microcyclic conidiogenesis occasionally occurring.

*In vitro: Mycelium* branched, branches often only as short lateral outgrowths, rhizoid, 1−6 µm wide, septate, with swellings and constrictions, therefore often irregular in outline, subhyaline to medium olivaceous-brown or dingy brown, smooth to often appearing rough-walled, minutely verruculose to irregularly rough-walled, walls unthickened or somewhat thickened, sometimes forming ropes or hyphae twisted. *Conidiophores* macronematous, sometimes also micronematous, solitary or in loose groups, arising terminally and laterally from ascending, erect and plagiotropous hyphae, erect, straight to flexuous, cylindrical-oblong, geniculate towards the apex, sometimes subnodulose towards the tip, but also intercalary, with unilateral swellings giving conidiophores a gnarled, knotty appearance, unbranched, occasionally once branched, 9−85(−120) × (2−)3−4.5(−5) µm, (0−)1−3(−5)-septate, not constricted at septa, septa sometimes not very conspicuous, pale to medium olivaceous-brown or dingy brown, sometimes paler towards the apex, smooth or almost so, walls thickened, up to 1 µm wide. *Conidiogenous cells* integrated, terminal, cylindrical-oblong, geniculate, once or sometimes several times, subnodulose with unilateral swellings due to geniculations, occasionally nodulose, 12−45 µm long, with up to six loci, crowded towards the apex, situated on small lateral shoulders but not confined to swellings, loci conspicuous, subdenticulate to denticulate, 1−1.8 µm diam, thickened and darkened-refractive. *Ramoconidia* occasionally formed, 17−30 µm long, about 4 µm wide. *Conidia* catenate, in branched chains, branching in all directions, up to seven conidia in the unbranched terminal part of the chain, smooth to sometimes verruculose, small terminal and intercalary conidia obovoid to narrowly ellipsoid, mostly fusiform, 5−10(−12) × 2−4 µm (av. ± SD: 8.1 ± 1.8 × 2.9 ± 0.6), aseptate, rarely with a single septum, distinctly attenuated towards apex and base, secondary ramoconidia fusiform, ellipsoid to subcylindrical, (9−)10−20(−25) × 3−4(−4.5) µm (av. ± SD: 14 ± 3.4 × 3.5 ± 0.5), 0−1(−2)-septate, not constricted at septa, septa not very conspicuous, median or somewhat in the upper half, pale or sometimes medium brown or dingy brown, smooth to finely verruculose or somewhat irregularly rough-walled, attenuated towards apex and base, walls unthickened or slightly thickened, with up to five distal hila, sometimes also laterally, hila protuberant, subdenticulate, 0.8−1.8(−2) µm diam, somewhat thickened and darkened-refractive; microcyclic conidiogenesis occasionally occurring.

*Culture characteristics*: Colonies on PDA attaining 40−57 mm diam after 1 mo, olivaceous-grey, grey-olivaceous towards margins or iron-grey both surface and reverse, buff due to aerial mycelium, towards the margins becoming slimy, not sporulating, appearing zonate, mycelium often aggregated, forming “dread locks”, margin white, regular, glabrous, growth flat with elevated colony centre, aerial mycelium formed, often aggregated, without prominent exudates, sporulating. Colonies on MEA reaching 44−70 mm diam after 1 mo, iron-grey to smoke-grey due to sporulation, whitish towards margins, olivaceous-grey reverse, white to buff towards margins, fluffy, hairy, margin white, glabrous, radially furrowed, aerial mycelium abundantly formed, covering the whole surface, dense, hairy to fluffy, colonies wrinkled, without prominent exudates, sporulation sparse.

*Substrate and distribution*: On *Myrtaceae* (*Corymbia*, *Eucalyptus*); Australia.

*Additional specimen examined*: **Australia**, New South Wales, Bimbadeen Lookout, *ca.* 10 km of Cessnock, North Coast, isol. from *Eucalyptus placita* (*Myrtaceae*), 14 Oct. 2006, coll. B.A. Summerell, isol. P.W. Crous (NSM 734672, CBS 126349 = CPC 13689).

*Notes*: *Cladosporium myrtacearum* seems to be confined to hosts or substrates of the *Myrtaceae* and seems to cause lesions, suggesting a biotrophic fungus. However, the ecology of this species is not yet clear, *i.e.* it is uncertain if the observed leaf spots have been actually caused by *C. myrtacearum*. It was described from Australia on *Corymbia polycarpa* based on a collection *in vivo*. Later it was possible to prepare a culture isolated from an additional collection on the type host, which has been designated as epitype (Bensch *et al.* 2010). A second, morphologically well agreeing

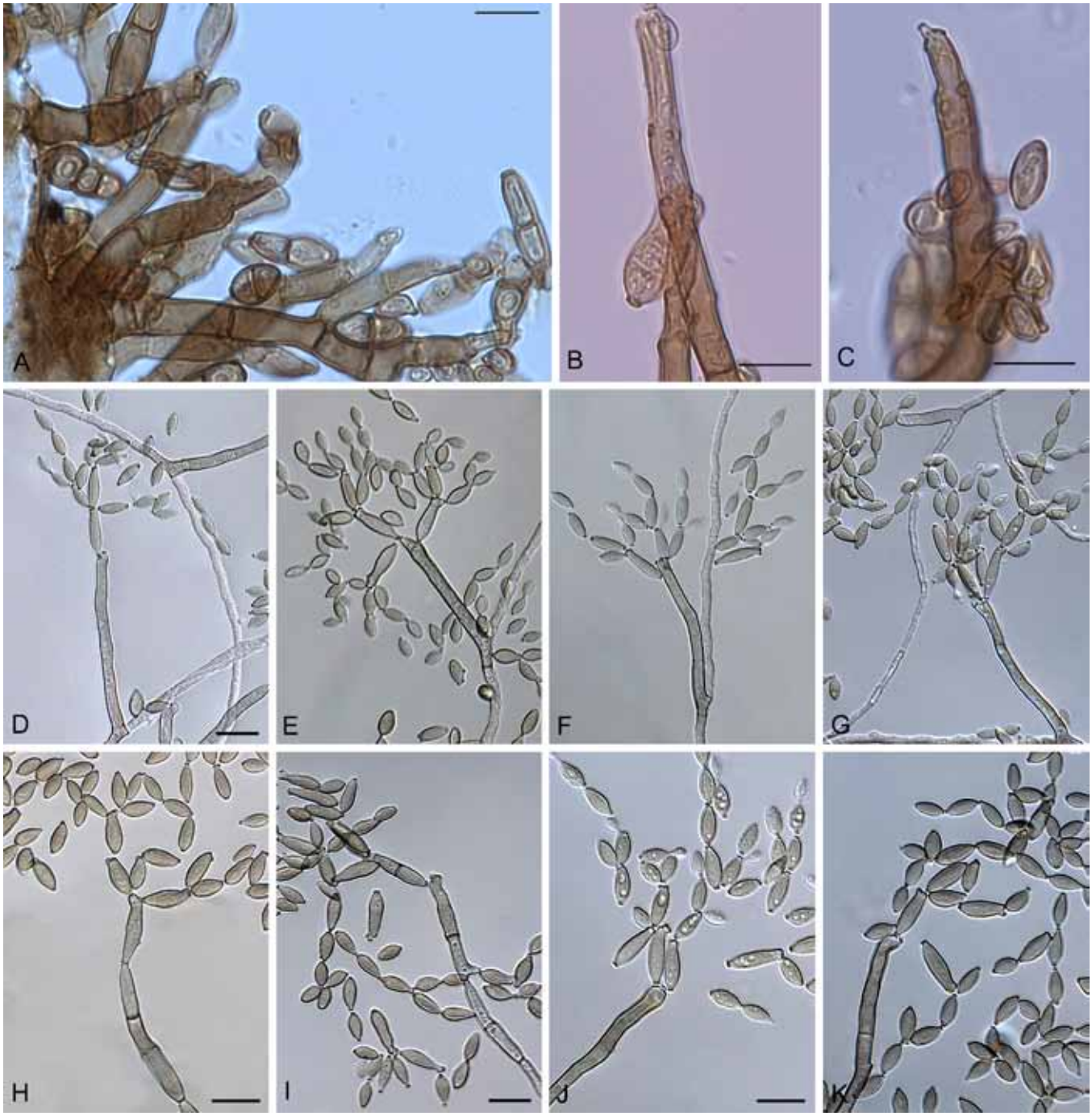



**Fig. 207.** *Cladosporium myrtacearum in vivo* (BRIP 26527) and *in vitro* (CBS 126350). A. Fascicle of conidiophores. B–C. Tips of conidiophores and conidia. D–K. Macronematous conidiophores and conidial chains *in vitro*. Scale bars = 10 µm.

strain isolated from *Eucalyptus placita* from New South Wales (CPC 13689) clustered with the epitype strain of *C. myrtacearum* and formed a highly supported subclade (see Bensch *et al.* 2010, fig. 1, part a). Cultures of *C. antarcticum* resemble those of *C. myrtacearum*, but they are distinct by forming dimorphic mycelium, longer and wider, minutely verruculose or verrucose conidia and secondary ramoconidia (Schubert *et al.* 2007b). *Cladosporium jacarandicola* (Schubert & Braun 2004), described from New Zealand on *Jacaranda mimosifolia*, and *C. praecox* (Braun 2000) on *Tragopogon orientalis* in Europe are two somewhat similar species, but they differ in having shorter and somewhat narrower, sparsely septate conidiophores and conidia with different surface ornamentations (smooth to verruculose in *C. jacarandicola* and faintly to conspicuously verruculose-echinulate in *C. praecox*).

**101. *Cladosporium neriicola*** S.A. Khan & M.A. Kamal, Mycopathol. Mycol. Appl. 52(1): 33. 1974. Figs 208, 209.

*Holotype*: **Pakistan**, Tando Mohd Khan, Faugi Sugarcane Farm, on leaves of *Nerium oleander* (= *N. indicum*) (*Apocynaceae*), 11 Oct. 1966, S.A. Khan (IMI 123901).

*Lit.*: Schubert (2005b: 105–107).
*Ill.*: Khan & Kamal (1974: 34, fig. 4), Schubert (2005b: 106, fig. 47, pl. 20, figs A–D).

*In vivo*: On living leaves, tips and margins of the leaves, faded, turning pale greyish brown, delimited from green parts of the leaves by a small, 2 mm wide, medium to reddish brown margin, on the lower leaf surface somewhat darker. *Colonies* hypophyllous, punctiform, scattered, in

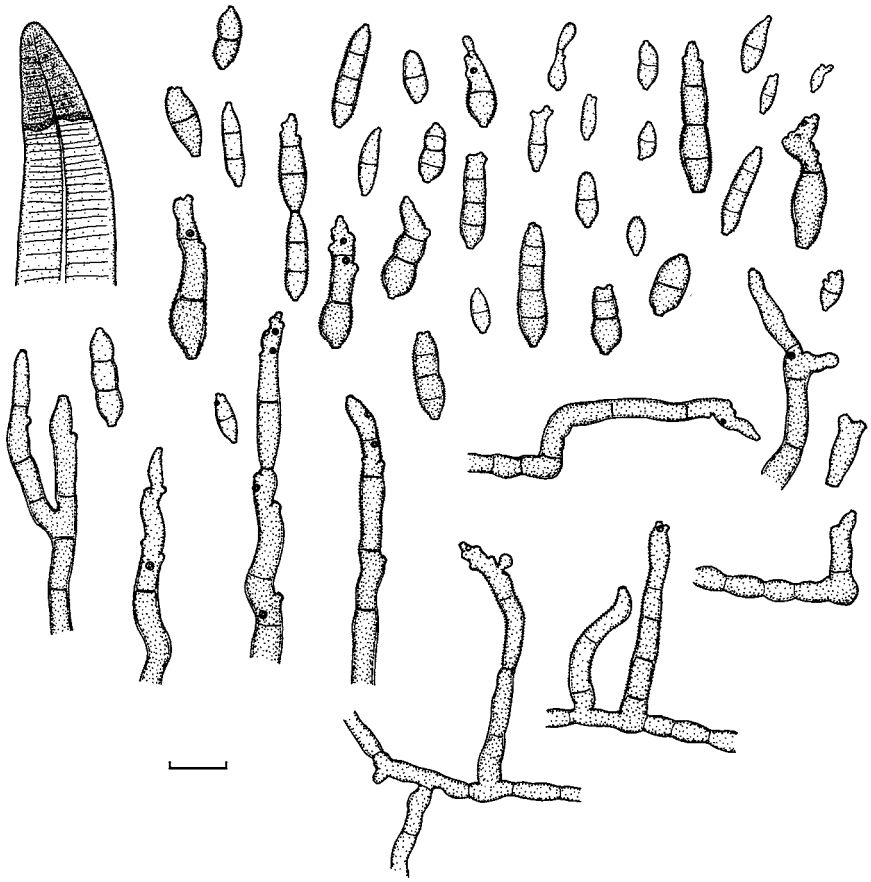


**Fig. 208.** *Cladosporium neriicola* (IMI 123901). Symptoms, conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.


**Fig. 209.** *Cladosporium neriicola* (IMI 123901). A. Symptoms. B. Geniculate conidiophore showing coronate scar structure. C. Conidiophores. D. Conidia. Scale bars = 5 (B), 10 (C–D) µm.

small tufts, dark brown to blackish. *Mycelium* internal, immersed, subcuticular, or external, superficial; hyphae plagiotropic, branched, 2.5–4 µm wide, septate, often constricted at the septa, pale olivaceous-brown, smooth to verruculose, walls slightly thickened. *Stromata* dense, 15–50 µm diam, only few layers deep, composed of subcircular to somewhat angular cells, 3–6 µm diam, pale to reddish brown, smooth, walls slightly thickened. *Conidiophores* solitary, arising from external, creeping hyphae, lateral or terminal, or in loose groups arising from stromata, erect to subdecumbent, straight to slightly flexuous, one to several times mildly to distinctly geniculate-sinuous, unbranched, rarely branched, 13–100 × 2.5–4.5(–5) µm, 1–11-septate, pale to medium brown throughout or somewhat paler towards the apex, smooth or

faintly to distinctly verruculose, especially at the apex, walls slightly thickened. *Conidiogenous cells* integrated, terminal or intercalary, cylindrical, 6–25 µm long, with a single or several subdenticulate conidiogenous loci, truncate to slightly convex, 1–2(–2.5) µm diam, dome and rim often not very conspicuous, somewhat thickened, more or less darkened-refractive. *Conidia* catenate, in branched chains, straight to slightly curved, small conidia subglobose, obovoid, ellipsoid, 3.5–14 × 2.5–4.5(–5) µm, 0–1(–3)-septate, larger conidia cylindrical-oblong, 15–30 × 4–5(–6) µm, 1–4(–5)-septate, sometimes constricted at the septa, mostly at the median septum, subhyaline, pale to medium brown, smooth to faintly or distinctly verruculose, walls thickened, apex rounded or attenuated with a single to several apical hila, hila conspicuous, subdenticulate, truncate to slightly convex, 1–2(–2.5) µm diam, dome and rim often almost inconspicuous, somewhat thickened, darkened-refractive; microcyclic conidiogenesis not observed.

*Substrate and distribution*: On *Nerium oleander*; Pakistan.

*Notes*: With its superficially growing, smooth to verruculose secondary mycelium and its sometimes verruculose conidiophores and conidia, *C. neriicola* resembles species of the genus *Stenella*, but SEM examinations conclusively showed that *C. neriicola* is a genuine member of *Cladosporium s. str*. (Schubert 2005b, pl. 20, fig. B).

*Cladosporium microporum*, described on leaves of *Nerium oleander* from Italy, proved to be synonymous with *C. herbarum*. Type material of *C. nerii*, recorded on faded and dried leaves of *Nerium oleander* from Spain, could not be located in herb. MA and is probably not preserved. However, the latter species seems to be quite distinct from *C. neriicola*, since it was described to have longer and wider, 130 × 7 µm, irregularly pluriseptate conidiophores and wider, oval, cylindrical to subclavate conidia, up to 30 × 8 µm (Gonzáles-Fragoso 1920). Zhang *et al.* (2003) reported *C. nerii* on *Nerium indicum* from China, but this record possibly refers to *C. neriicola*.

**102. *Cladosporium nigrelloides*** U. Braun & Mouch., New Zealand J. Bot. 37(2): 302. 1999. Fig. 210.

*Holotype*: **French Polynesia**, Isles Gambier, Mangareva, Rikitaea, on leaves of *Manihot utilissima* (*Euphorbiaceae*), 2 Apr. 1966, Huguenin (PS 66.684, PC, as "*Cercospora henningsii*").

*Lit.*: Schubert (2005b: 107).
*Ill.*: Braun *et al*. (1999: 300, fig. 2), Schubert (2005b: 107, fig. 48).

*In vivo*: Leaf spots amphigenous, subcircular to irregular, 2–40 mm wide, sometimes oblong, up to 70 mm in length, ochraceous to pale brown, later greyish to greyish brown, margin indefinite or with a narrow somewhat darker marginal line, occasionally somewhat raised. *Colonies* amphigenous, punctiform, sometimes dense, dark greyish brown. *Mycelium* internal, occasionally with a few superficial hyphae; hyphae branched, septate, brown, smooth, thin-walled. *Stromata* intraepidermal, occasionally substomatal, 15–50 µm diam, brown, composed of swollen hyphal cells, 2.5–8 µm diam, walls somewhat thickened. *Conidiophores* solitary or in small to fairly large fascicles, loose to dense, arising from stromata, erumpent through the cuticle, occasionally emerging through stomata, erect to decumbent, unbranched or branched, straight, subcylindrical to slightly geniculate-sinuous, 10–90 × 2.5–6 µm, olivaceous to medium brown throughout or paler towards the apex, smooth, walls thin to somewhat thickened. *Conidiogenous cells*

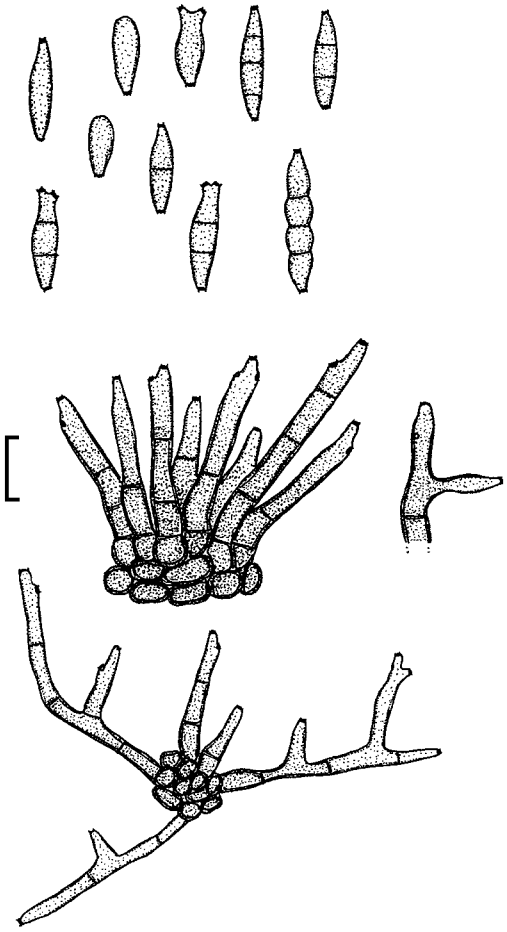


**Fig. 210.** *Cladosporium nigrelloides* (PS 66.684, PC). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. U. Braun *del*.

integrated, terminal, conidiogenous loci protuberant, about 1–2 µm diam, thickened and darkened. *Conidia* catenate, often in branched chains, ellipsoid-ovoid, fusiform, subcylindrical, 4–18 × 4–6 µm, 0–3-septate, pale olivaceous to olivaceous-brown, smooth or almost so, ends obtuse, rounded or attenuated, subacute, hila protuberant, about 1.5–2 µm diam, thickened and darkened.

*Substrate and distribution*: On *Manihot utilissima*; French Polynesia.

*Notes*: *Cladosporium nigrelloides* belongs to a group of plant-inhabiting, leaf-spotting species within *Cladosporium*, well characterised by its relatively large intraepidermal stromata, mostly fasciculate conidiophores and relatively small conidia which are more or less smooth.

**103. *Cladosporium nigrellum*** Ellis & Everh., Proc. Acad. Nat. Sci. Philadelphia 1893: 463. 1894. Fig. 211.

*Lectotype* (**designated here**): **USA**, West Virginia, Fayette Co., Nuttallburg, on inner bark of railroad ties, 20 Oct. 1893, L.W. Nutall, Fl. Fayette County, No. 172 (NY). *Isolectotypes*: Ellis & Everhart, N. Amer. Fungi. Ser. II, 3086 (*e.g.*, HBG, N, NY, PH, WIS) and Ellis & Everhart, Fungi Columb. 382 (*e.g.*, NY, PH).

= *Cladosporium herbarum* f. *epixylon* Sacc., Mycoth. Ven., Fasc. 3, No. 286. 1875 [syntypes: *e.g.*, BPI 427093, HAL].

= *Cladosporium aspericoccum* Oudem., in Roumeguère, Fungi Sel. Gall. Exs., Cent. 46, No. 4592. 1888, *nom. nud*. [syntypes: FH].

*Lit.*: Saccardo (1895: 620), Ellis (1976: 329), Morgan-Jones (1977: 5), Zhang *et al.* (2003: 86–87, 133–134).
*Ill.*: Ellis (1976: 328, fig. 246), Morgan-Jones (1977: 4, fig. 2), Zhang *et al.* (2003: 86: fig. 50; 133, fig. 89).
*Exs.*: Clements & Clements, Crypt. Format. Colorad. 271; Ellis & Everhart, N. Amer. Fungi. Ser. II 3086; Ellis & Everhart, Fungi Columb. 382; Roumeguère, Fungi Sel. Gall. Exs. 4592; Saccardo, Mycoth. Ital. 591; Saccardo, Mycoth. Ven. 286.

*In vivo*: Saprobic, occurring on wood. *Colonies* extended, dense, caespitose, grey-brown to dark brown or blackish olivaceous, velvety, often forming expanded layers. *Mycelium* immersed or superficial; hyphae branched, 3–6 µm wide, septate, sometimes slightly constricted at septa, pale brown to pale yellowish-brown, sometimes almost hyaline, smooth, walls slightly thickened, often with small swellings and constrictions, forming stromatic hyphal aggregations, cells subcircular to somewhat angular-irregular, 5–10(–14) µm wide, medium to dark brown, walls thickened. *Conidiophores* macronematous, solitary or in small loose groups, arising from swollen hyphal cells or stromatic hyphal aggregations, erect, straight to somewhat flexuous, cylindrical, sometimes slightly geniculate-sinuous and with small intercalar swellings, up to 8 µm wide, unbranched, rarely branched, 14–290 × 4–7(–9) µm, sometimes slightly attenuated towards apex and swollen at the base, pluriseptate, not constricted at septa, medium to dark brown, paler towards the apex, pale brown at the apex, smooth, occasionally minutely verruculose towards the apex, walls thickened, sometimes distinctly two-layered, protoplasm sometimes aggregated at septa and walls. *Conidiogenous cells* integrated, terminal or intercalary, cylindrical, sometimes with small intercalar swellings, proliferation sympodial, polyblastic, with up to four conidiogenous loci, sometimes occurring at small swellings but not confined to them, truncate to slightly convex, 1–2(–2.5) µm diam, somewhat thickened and darkened-refractive. *Conidia* catenate, in unbranched or branched chains, straight or slightly curved, subglobose, obovoid, limoniform, ellipsoid to subcylindrical, 3.5–22(–31) × 3–8(–10) µm, 0–3(–4)-septate, sometimes slightly to distinctly constricted at septa, subhyaline, pale brown to medium brown, smooth, sometimes verruculose, walls unthickened or slightly thickened, protoplasm aggregated at walls and septa, apex and base rounded or slightly attenuated, with up to three apical scars, slightly to distinctly protuberant, base truncate to slightly convex, 1–2(–2.5) µm diam, not distinctly differentiated in dome and surrounding rim in light microscopy, thickened and somewhat darkened-refractive; microcyclic conidiogenesis occasionally occurring.

*Substrates and distribution*: On wood and herbaceous stems; Asia (China), Europe (France, Italy, Russia), North America (USA).

*Additional specimens examined*: **Italy**, Bologna, botanical garden, on dead stems of *Ricinus communis* (*Euphorbiaceae*), Feb. 1899, Saccardo, Mycoth. Ital. 591 (SIEN, as *C. stromatum*); Selva (Treviso), on decorticated branches of *Robinia pseudoacacia* (*Fabaceae*), Sep. 1874, Saccardo, Mycoth. Ven. 286 (*e.g.*, BPI 427093, HAL, **syntypes** of *C. herbarum* f. *epixylon*). **Latvia**, Vidzeme, Vestiena, on dead wood of *Picea abies* (*Pinaceae*), 20 Jul. 1933, K. Starcs (M-0057726). **Netherlands**, La Haye, on dead stems of *Sambucus nigra* (*Adoxaceae*), May 1888, C. Destrée, Roumeguère, Fungi Sel. Gall. Exs. 4592 (FH, **syntype** of *C. aspericoccum*). **Russia**, Leningradskaya Oblast', Vyborgskij Rajon, settlement Roshchino, on dead wood of *Betula pendula* (*Betulaceae*), 21 Sep. 2006, D.A. Shabunin (HAL 2402 F); Novgorodskaya Oblast', Okulovskij Rajon, in the vicinity of village Zarechnaya, on dead wood of *Betula pendula*, 20 May 2001, D.A. Shabunin (HAL 2403 F), contains *Cladosporium herbarum* and traces of *C. nigrellum.* **USA**, Colorado, Bottomless Pit, on dead cones of *Pinus flexilis* (*Pinaceae*), 13 Jul. 1906, Clements & Clements, Crypt. Format. Colorad. 271 (BPI 426469, as *C. entoxylinum*).

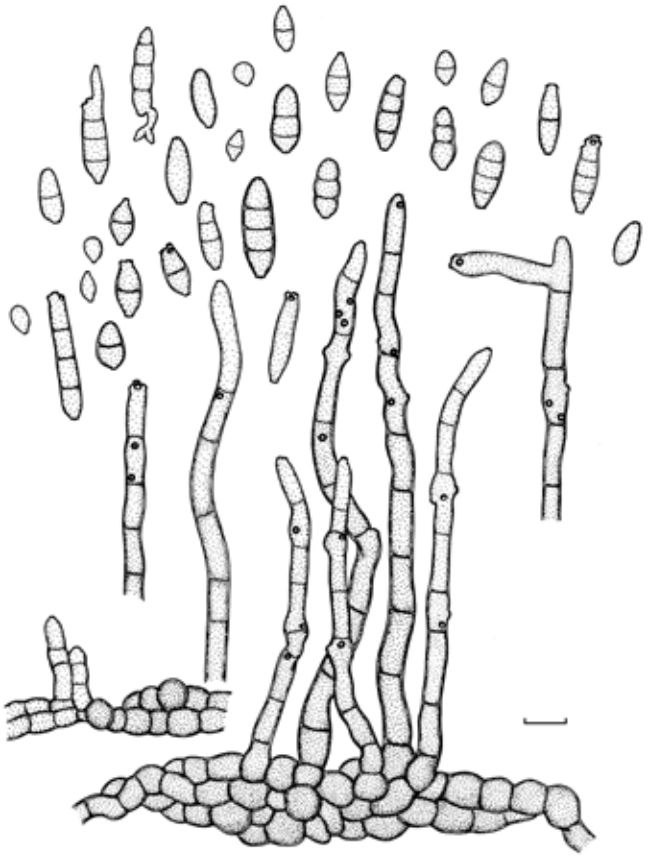


**Fig. 211.** *Cladosporium nigrellum* (NY). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

*Notes*: The colonies, conidiophores and conidia of this wood-inhabiting species resemble those of the saprobic *C. delicatulum* but the conidia in *C. nigrellum* are somewhat wider [3–8(–10) µm in *C. nigrellum* versus 3–6(–7) µm in *C. delicatulum*]. Besides this the biology of *C. nigrellum* seems to be different from *C. delicatulum* in mainly occurring on wood. Therefore, we prefer to treat it as a distinct species. Additional collections and phylogenetic studies are necessary to clarify the status of this species as well as of the morphologically very similar species *C. sarmentorum* also occurring on wood. Since the conidiophores of the latter species are frequently branched in the upper portion with short lateral branchlets or long branches, it is tentatively maintained as a species separate from *C. nigrellum* until additional collections, cultures and phylogenetic data are available.

*Cladosporium xylophilum*, a species also occurring on wood, deviates from *C. nigrellum* in having shorter and narrower conidiophores, 0–1(–3)-septate, narrower conidia, true ramoconidia and in forming numerous subglobose or ovoid small terminal conidia which are often irregularly rough-walled (Bensch *et al.* 2010).
The description and illustration of "*C. nigrellum*" in Ho *et al.* (1999: 137 and 138, fig. 38) was based on a strain isolated from *Fagus sylvatica* leaf litter in the Netherlands and does not agree with true *C. nigrellum* but was re-identified as *Fusicladium fagi* (Crous *et al.* 2007d).

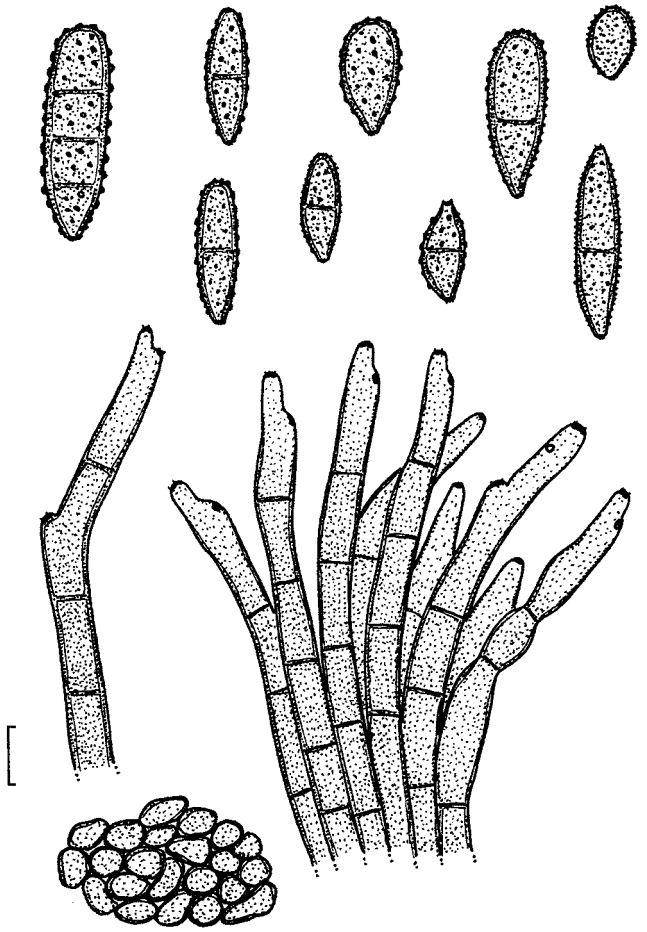


**Fig. 212.** *Cladosporium oblongum* (BPI 427289). Stromata, fascicle of conidiophores and conidia *in vivo*. Scale bar = 10 µm. U. Braun *del*.

**104. *Cladosporium oblongum*** Bres., Stud. Trent. 7: 74. 1926. Fig. 212.

*Holotype*: **Italy**, Trento, on dead stems of *Zinnia elegans* (*Asteraceae*), 1923, G. Bresadola (BPI 427289).

*In vivo*: Saprobic on dead stems, colonies punctiform or pustulate, up to 5 mm diam, dark olivaceous-brown to brown. *Mycelium* internal. *Stromata* well-developed, at first small to medium-sized, punctiform, 20–100 µm diam, composed of swollen hyphal cells, 3–10 µm diam, thick-walled, stromata later enlarged or confluent, up to 500 µm diam, pustulate, subcircular in outline to somewhat irregular or oblong, at first immersed, later erumpent, brown. *Conidiophores* arising from stromata, erumpent, in large, loose to dense fascicles, erect, straight, subcylindrical to moderately geniculate-sinuous, subnodulose, swellings usually connected with geniculation, often unilateral, *i.e.* not as nodulose as in *C. herbarum*, unbranched, 100–250 × 3–7 µm, pluriseptate throughout, olivaceous-brown, wall up to 1 µm wide, almost smooth to distinctly asperulate. *Conidiogenous cells* integrated, terminal, occasionally intercalary, 10–30 µm long, conidiogenous loci 1.5–2 µm diam, slightly protuberant. *Conidia* solitary or catenate, usually in simple chains, broadly ellipsoid-ovoid, subcylindrical, rarely subglobose, 8–25 × 5–10 µm, rather pale, very pale yellowish to greenish, pale olivaceous or olivaceous-brown, wall up to 1 µm thick, very coarsely verrucose-rugose, verrucae up to 1 µm wide, distant from each other (up to 2.5 µm), ends usually broadly rounded, hila 1.5–2 µm wide and 1 µm high; microcyclic conidiogenesis not observed.

*Substrate and distribution*: On *Zinnia elegans*; Italy.

*Notes*: *Cladosporium oblongum* resembles *C. herbarum* and *C. macrocarpum*, but the conidiophores of *C. oblongum* are less nodulose, the conidiogenous loci are not confined to swellings and, above all, the conidia are characteristically coarsely verrucose, with rather large, distant verrucae. On account of conidia often formed singly or only in simple chains and the very coarse sculpture of the conidial surface, this species is close to various former *Heterosporium* species.

**105. *Cladosporium obtectum*** Rabenh. ex Cooke, Grevillea 17(83): 66. 1889. Figs 213, 214.

≡ *Cladosporium obtectum* Rabenh., in Marcucci, Unio Itin. Crypt., No. 36. 1866, *nom. nud*.

*Lectotype* (**designated here**): **Italy**, Sardinia, Alghero, on fading leaves of *Artemisia maritima* (*Asteraceae*), Marcucci, Unio Itin. Crypt. 36 (HBG). *Isolectotypes*: Marcucci, Unio Itin. Crypt. 36; Rabenhorst, Fungi Eur. Exs. 2783 (*e.g.*, B, HAL, HBG, M).

*Lit.*: Saccardo (1892: 602, 1895: 619), Ferraris (1912: 348), Ellis (1976: 342), Schubert (2005b 108–109).
*Ill.*: Ellis (1976: 341, fig. 259 C), Schubert (2005b: 108, fig. 49, pl. 19, figs J–L).
*Exs.*: Marcucci, Unio Itin. Crypt. 36; Rabenhorst, Fungi Eur. Exs. 2783.

*In vivo*: On leaves, without distinct leaf spots or discolorations. *Colonies* hypophyllous, sometimes also epiphyllous, punctiform to subeffuse, pale olivaceous-brown, thin, mostly not very conspicuous, between leaf hairs. *Mycelium* external, superficial; hyphae branched, 3–11 µm wide, with swellings and constrictions, pluriseptate, closely septate, cells narrow, 3–10 µm long, pale to medium olivaceous-brown, smooth, walls thickened, forming loose to dense, small to extended stromatic hyphal aggregations. *Conidiophores* solitary or in loose to somewhat denser groups, but not fasciculate, sometimes forming large, expanded, sporodochium-like layers, arising from external hyphae or stromatic hyphal aggregations, more or less erect and flexuous, non-nodulose, sometimes slightly geniculate-sinuous, unbranched or branched, 5–60 µm long, but usually much shorter, 3–5(–7) µm wide, 0–2(–3)-septate, sometimes slightly constricted at the

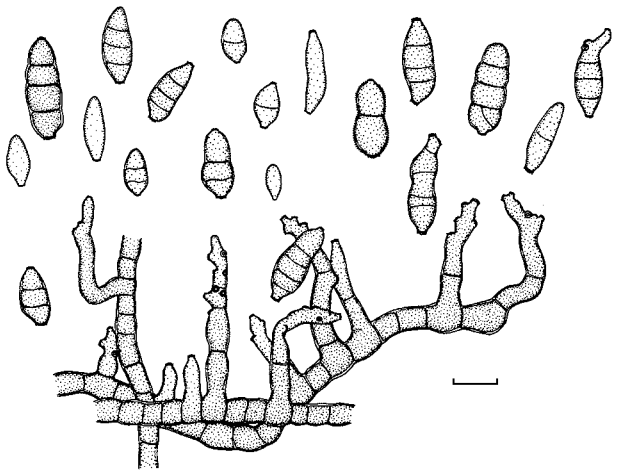


**Fig. 213.** *Cladosporium obtectum* (HBG). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

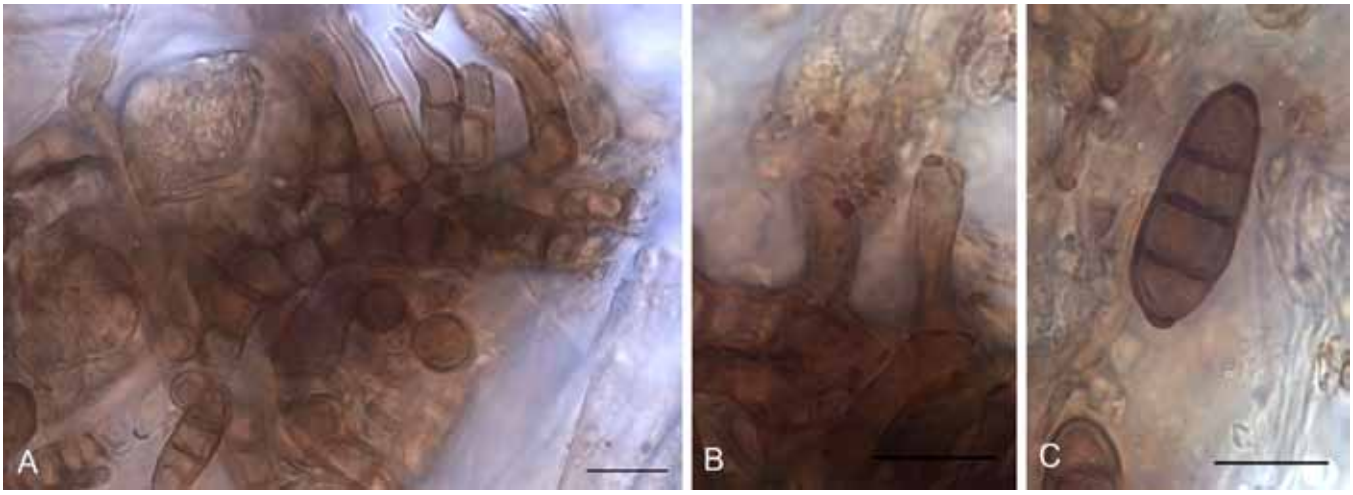



**Fig. 214.** *Cladosporium obtectum* (HBG). A. External pluriseptate mycelium. B. Conidiophores. C. Conidium. Scale bars = 10 µm.

septa, pale to medium olivaceous-brown, smooth, walls more or less thickened. *Conidiogenous cells* terminal or conidiophores often reduced to conidiogenous cells, later becoming also intercalary, 5–25 µm long, sometimes slightly geniculate-sinuous towards the apex, proliferation sympodial, with a single or several protuberant conidiogenous loci, often situated on small shoulders, subdenticulate, short cylindrical, obconically truncate, 1.5–2.5 µm diam, thickened and darkened-refractive. *Conidia* catenate, usually in short unbranched chains, occasionally in branched chains, straight or somewhat curved, broadly ellipsoid to cylindrical, 8–25(–34) × (3–)5–8 µm, 0–5-septate, often 3-septate, sometimes slightly constricted at the septa, occasionally with a single longitudinal septum, septa becoming somewhat sinuous with age, pale to medium olivaceous-brown, smooth or sometimes verruculose, walls more or less thickened, slightly attenuated towards apex and base, hila protuberant, obconically truncate, 1.5–2.5 µm diam, thickened and darkened-refractive; microcyclic conidiogenesis occasionally occurring.

*Substrate and distribution*: On *Artemisia maritima*; Italy.

*Notes*: Unio Itin. Crypt. (1866) is a selection of species made by Marcucci and determinated by Rabenhorst. Since a description was not given, *C. obtectum* was not validly published, but in Cooke's "Omitted Diagnoses" (1889) a brief Latin diagnosis of this species was provided. Ellis (1976) described longer conidia, up to 34 µm, and somewhat wider conidiophores, which could not be observed. Zhang *et al*. (2003) reported this species from China on *Artemisia hedinii* and *Solanum melongena*. These records are very probably not identical with *C. obtectum* since the authors described and illustrated much longer conidiophores, 51–102 µm, and 0–2-septate, shorter and narrower conidia.

Several other *Cladosporium* species occur on hosts belonging to the *Asteraceae*. *Cladosporium agoseridis* on *Agoseris glauca* in North America and *C. praecox*, known from the Czech Republic on *Tragopogon orientalis*, are easily distinguishable by internal mycelium, usually fasciculate conidiophores and 0–1(–3)-septate conidia with different surface ornamentations (loosely to densely verruculose or verrucose in *C. agoseridis*; faintly to distinctly verrucose-echinulate in *C. praecox*). *Cladosporium inopinum*, known from South America on *Gynoxys hallii*, differs in forming small stromata, often fasciculate, longer conidiophores, up to 120 µm, and narrower conidia, 2.5–6 µm wide.

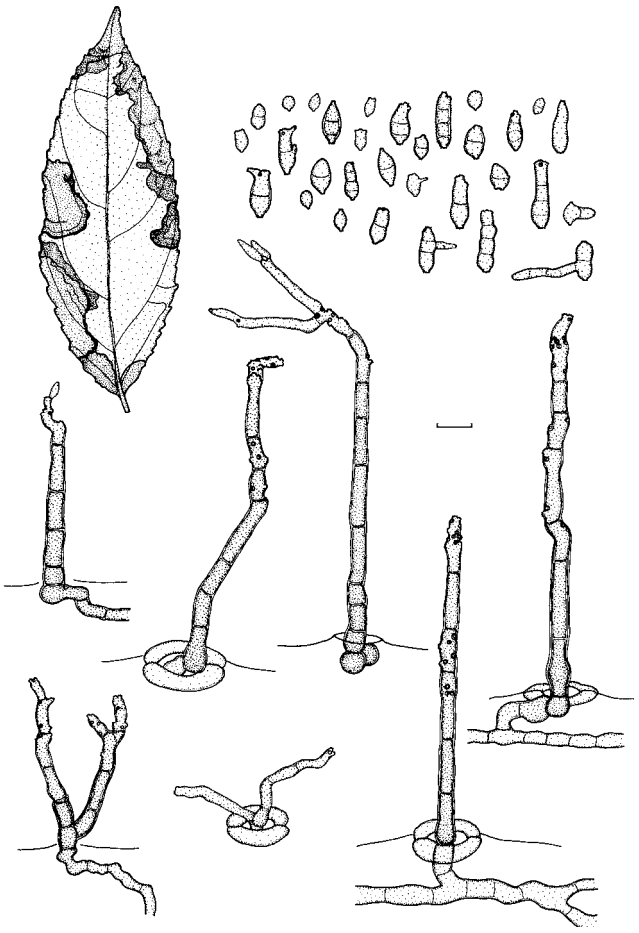


**Fig. 215.** *Cladosporium oncobae* (HAL 1832 F). Symptoms, conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

**106. *Cladosporium oncobae*** K. Schub. & C.F. Hill, Fungal Diversity 22: 18. 2006. Figs 215, 216.

*Holotype*: **New Zealand**, Auckland, Princes Street, Auckland University Campus, on *Oncoba spinosa* (*Salicaceae*), 19 Sep. 2004, C. F. Hill, No. 1076 (HAL 1832 F).

*Lit*.: Schubert (2005b: 109–111).
*Ill*.: Schubert (2005b: 110, fig. 50, pl. 21, figs A–G), Braun *et al*. (2006: 19–20, fig. 2, pl. 2).

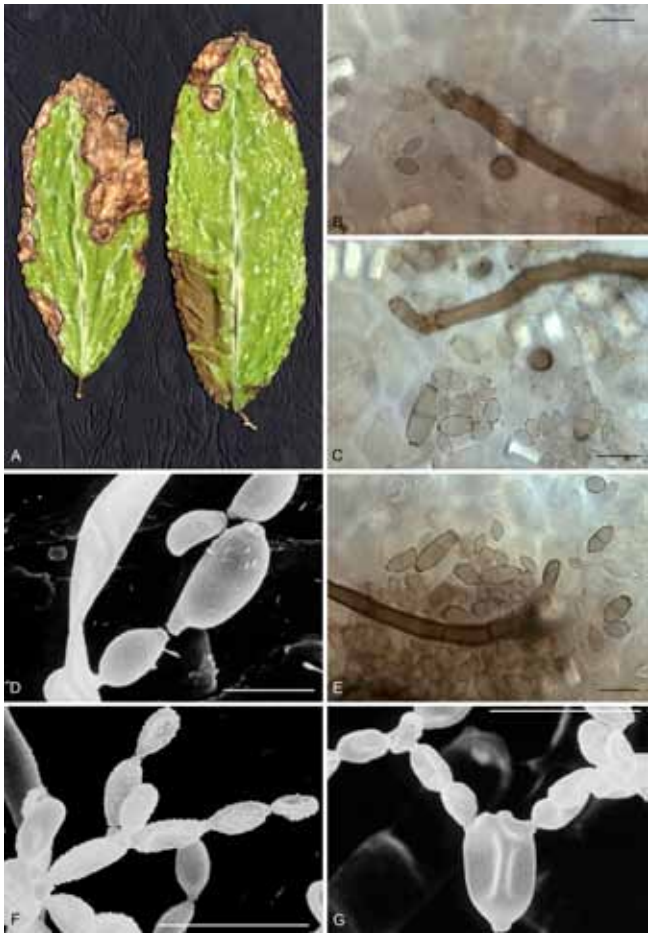


**Fig. 216.** *Cladosporium oncobae* (HAL 1832 F). A. Symptoms. B, C. Tips of conidiophores with numerous, conspicuous, somewhat crowded conidiogenous loci and conidia. D. Conidiophore and conidia. E. Numerous conidia and base of a conidiophore with percurrent, enteroblastic proliferation and thickened, two-layered walls. F. Conidial chains. G. Conidial chain. Scale bars = 5 (D, G), 10 (B–C, E–F) µm.

*In vivo*: On living leaves, causing necrotic leaf margins, leaf spots amphigenous, small to extended, irregular in shape, infections mostly starting at leaf margins, later enlarging and covering large areas of the leaf surface, pale to dark brown, sometimes somewhat zonate, at first without definite border, later with a distinct, small to wide, irregular, dark brown to purple-brown margin, often turning fragile at the leaf margins. *Colonies* amphigenous, scattered, loosely caespitose, pale olivaceous-grey to dark olivaceous-brown. *Mycelium* internal, subcuticular, rarely external; hyphae emerging through stomata and growing superficially, creeping, loosely branched, 2–6 µm wide, septate, sometimes slightly constricted at the septa, often with small swellings, pale olivaceous, smooth, walls slightly thickened, forming a loose network, at the base of the conidiophores often somewhat swollen and darker, pale to medium olivaceous-brown. *Stromata* mostly absent to rarely well-developed, substomatal, 15–40 µm diam, forming dense stromatic aggregations composed of swollen hyphal cells, subglobose, 6–13 µm diam, pale to medium or dark olivaceous-brown, thick-walled. *Conidiophores* mostly solitary, rarely in pairs or in small groups, arising from swollen hyphal cells or from internal, rarely superficial hyphae, usually emerging through stomata, erect, straight to flexuous, often somewhat geniculate-sinuous, subnodulose, with small lateral shoulders or one-sided swellings, sometimes with somewhat head-like, swollen tips, unbranched or rarely branched, 15–162 × (2.5–)3–6(–7) µm, pluriseptate, pale olivaceous to medium or dark olivaceous-brown, often somewhat paler at the apex, smooth, walls thickened, often distinctly two-layered, (0.5–)1–2 µm thick, sometimes enteroblastically proliferating, often somewhat swollen at the base. *Conidiogenous cells* integrated, terminal and intercalary, 8–36 µm long, proliferation sympodial, somewhat geniculate-sinuous, with few to numerous conidiogenous loci, often crowded and situated on small lateral shoulders, protuberant, 0.5–2(–2.5) µm diam, thickened, more or less darkened-refractive. *Conidia* in branched chains, numerous, variable in shape, subglobose, obovoid, limoniform, narrowly to broadly ellipsoid to subcylindrical or somewhat irregular, 3–20(–25) × 2.5–6(–7) µm, 0–3-septate, occasionally constricted at the septa, pale olivaceous, smooth, very rarely somewhat rough-walled, walls thickened, often rounded at the ends, usually with a single or few apical protuberant hila, 0.5–2(–2.5) µm diam, thickened, more or less darkened-refractive; microcyclic conidiogenesis occurring.

*Substrate and distribution*: On *Oncoba spinosa*; New Zealand.

*Notes*: *Cladosporium idesiae*, the only species of the genus *Cladosporium* hitherto described on a host belonging to the *Flacourtiaceae*, has to be reduced to synonymy with *C. macrocarpum*.

*Cladosporium oncobae* is morphologically comparable with *C. cladosporioides*, *C. myrtacearum* and *C. uredinicola*. However, *C. cladosporioides* differs from the new species in having somewhat longer and narrower, 0–1-septate conidia, usually terminal conidiogenous cells only with a single or few conidiogenous loci and conidiophores with only somewhat thickened and usually one-layered walls; in *C. myrtacearum* the conidiophores are often arranged in loose to somewhat dense fascicles, crowded conidiogenous loci are lacking, and the conidia are 0–1(–2)-septate; and in the hyperparasitic *C. uredinicola* the walls of the conidiophores are only slightly thickened, not two-layered and the conidia are longer, 3–39 µm, 0–2(–3)-septate, without any constrictions (Heuchert *et al*. 2005). *Cladosporium alneum* is also morphologically closely allied to *C. oncobae*, but differs in its occurrence on an unrelated host (on *Alnus* spp.), distinct lesions and conidiophores with thinner walls [0.5–1 µm wide in *C. alneum*, versus (0.5–)1–2 µm wide in *C. oncobae*]. Based on these differences, and since leaf-spotting *Cladosporium* species are generally confined to related hosts of a single plant family, *C. oncobae* is considered a separate species.

Two strains isolated from type material and stored in the CPC collection (CPC 11663 and CPC 11664) at the CBS were included in the phylogenetic studies within the *C. cladosporioides* complex. CPC 11664 represents one of the *C. cladosporioides s. lat.* lineages and CPC 11663 is conspecific with *C. perangustum* (see Bensch *et al.* 2010). *Cladosporium perangustum* differs from *C. oncobae* in having narrower conidiophores, conidiogenous cells and conidia and probably co-occured with the latter species on the same leaf spots. Since *C. oncobae* is morphologically close to *C. cladosporioides* it is possible that CPC 11664 is ex-type culture of *C. oncobae*. However, additional isolates from *Oncoba* leaves are necessary to clarify the status of the isolate and the species.

**107. *Cladosporium orchidearum*** Cooke & Massee, Grevillea 16(79): 80. 1888. Figs 217, 218.

*Holotype*: **Great Britain**, Surrey, Kew, Kew Gardens, H. Low's nursery, Borough of Richmond, on leaves of *Oncidium crispum* (*Orchidaceae*) (NY 72454).

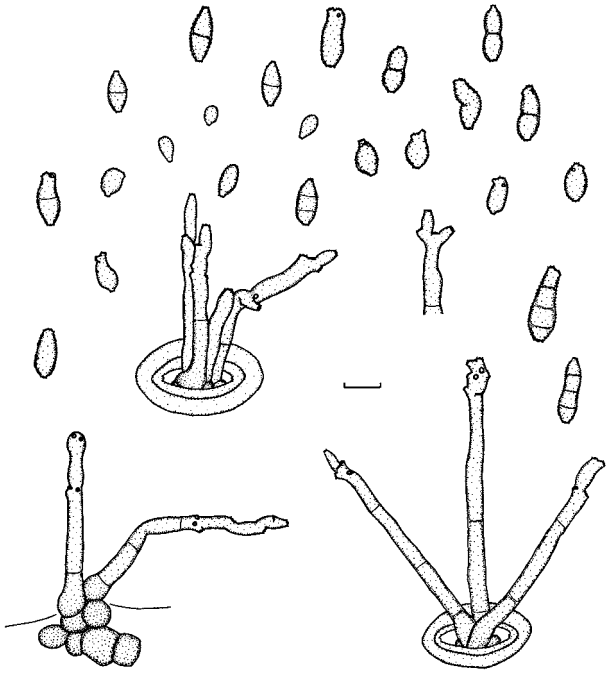


**Fig. 217.** *Cladosporium orchidearum* (NY 72454). Conidiophores emerging through stomata or erumpent through the cuticle and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

*Lit.*: Saccardo (1892: 605), Ellis (1976: 339), Schubert & Braun (2004: 305), Schubert (2005b: 111–113).
*Ill.*: Ellis (1976: 339, fig. 257 B), Schubert & Braun (2004: 306, fig. 4), Schubert (2005b: 112, fig. 51, pl. 20, figs E–G).

*In vivo*: On living leaves, distinct leaf spots lacking. *Colonies* hypophyllous, punctiform, in small tufts, scattered to dense, dark olivaceous-brown. *Mycelium* immersed, subcuticular; hyphae sparingly branched, 2–4.5 µm wide, septate, not to slightly constricted at the septa, sometimes with small swellings, up to 7 µm wide, subhyaline, pale olivaceous to pale brown, smooth, walls not or only slightly thickened. *Stromata* 25–65 µm diam, composed of subcircular to somewhat angular or oblong cells, 5–11 µm wide, pale to medium brown, walls slightly thickened. *Conidiophores* solitary or in small fascicles, arising from stromata, mostly emerging through stomata, or erumpent through the cuticle, erect, straight to slightly flexuous, sometimes somewhat geniculate-sinuous, unbranched, occasionally branched, 20–75 × (3–)4–6 µm, 0–3-septate, pale to medium olivaceous-brown, smooth, walls not or only very slightly thickened, not or somewhat swollen at the base, up to 7 µm wide. *Conidiophores* reduced to conidiogenous cells or conidiogenous cells integrated, terminal, 20–45 µm long, proliferation sympodial, with one to several conidiogenous loci, often crowded at the apex, loci protuberant, subdenticulate to denticulate, truncate to slightly convex, 1.5–2.5 µm diam, slightly thickened, darkened-refractive. *Conidia* catenate, usually in branched chains, ellipsoid, ovoid, subcylindrical, 5–20 × 4–7 µm, 0–3-septate, sometimes slightly constricted at the septa, pale olivaceous, almost smooth to usually verruculose, walls only slightly thickened, somewhat attenuated towards apex and base, with up to three scars at the apex, hila truncate to slightly convex, 1–2(–2.5) µm diam, thickened, darkened-refractive; microcyclic conidiogenesis not observed.

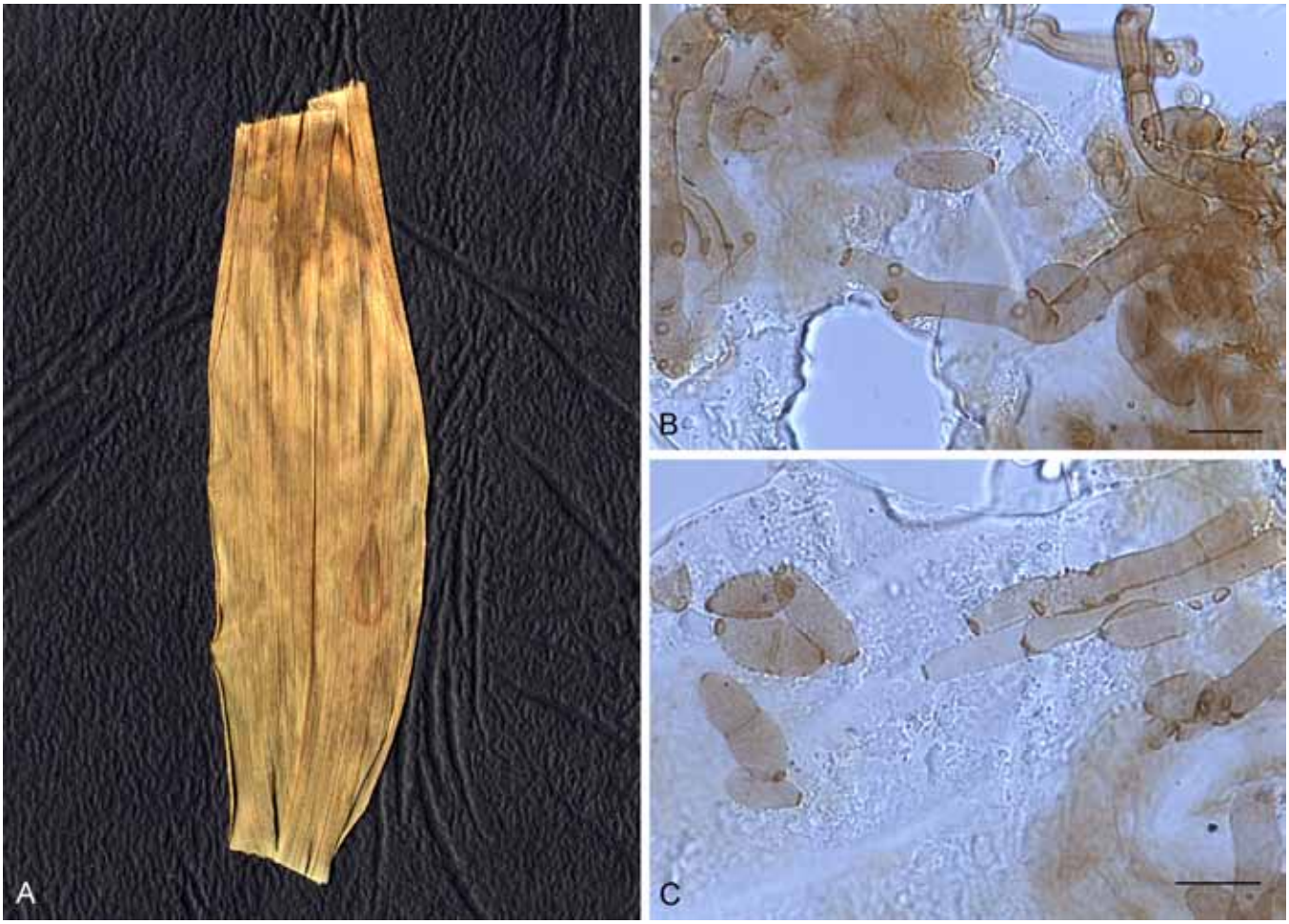



**Fig. 218.** *Cladosporium orchidearum* (NY 72454). A. Symptoms. B, C. Conidiophores and conidia with conspicuous, darkened-refractive conidiogenous loci. Scale bars = 10 (B–C) µm.

*Substrate and distribution*: On *Oncidium crispum*; Great Britain.

*Notes*: *Cladosporium orchidearum* is only known from the type material; several collections from BPI identified as "*C. orchidearum*" proved to be misidentified and had to be referred to other taxa or they had to be described as new species. *Cladosporium orchidearum* belongs into a complex of foliicolous *Cladosporium* species with consistently short conidiophores, but differs in having narrower conidiophores [(3–)4–10(–13) wide in *C. agoseridis*; 3–8 µm in *C. lupiniphilum*] and smaller, above all narrower conidia, respectively [(6.5–)12–26(–31) × 4–8 µm in *C. praecox*; (10–)12–40(–50) × (5–)6–13(–15) µm in *C. agoseridis*; 6–28 × 4–8 µm in *C. lupiniphilum*].

*Cladosporium orchidis*, described on *Dactylorhiza majalis* ssp. *praetermissa* from Great Britain, was excluded and re-allocated to *Fusicladium* and *C. cattleyae*, known from Belgium on dead leaves of *Cattleya mossia*, proved to be a synonym of *Dendryphiella vinosa* (Schubert & Braun 2004).

**108. *Cladosporium orchidiphilum*** K. Schub. & U. Braun, Sydowia 56(2): 306. 2004. Figs 219, 220.

*Holotype*: **Australia**, Canterbury, on leaves of *Cypripedium* sp. (*Orchidaceae*), 19 Aug. 1914 (VPRI 2488, as "*C. orchidearum*").

*Lit*.: Schubert (2005b: 113–115).
*Ill*.: Schubert & Braun (2004: 307, fig. 5), Schubert (2005b: 114, fig. 52, pl. 22, figs A–C).

*In vivo*: On living leaves, causing leaf spots, irregular in shape, on the upper leaf surface with a greyish centre, surrounded by a dark reddish brown margin, on the lower leaf surface more or less zonate, with a pale greyish brown centre, surrounded by dark red-brown and pale reddish brown segments, partly surrounded by a narrow dark red-brown margin and a pale to dark reddish brown halo. *Colonies* hypophyllous, punctiform, in small tufts, scattered, blackish brown. *Mycelium* internal; hyphae sparingly branched, 2–4 µm wide, septate, often slightly constricted at the septa, cells sometimes slightly swollen, pale olivaceous to pale olivaceous-brown, smooth, walls slightly thickened. *Stromata* dense, small to large, substomatal, subcuticular to intraepidermal, 35–75(–100) µm diam, composed of subglobose to somewhat angular or irregular, thick-walled cells, up to 13 µm wide, medium to dark brown, smooth. *Conidiophores* mostly densely fasciculate, arising from stromata, emerging through

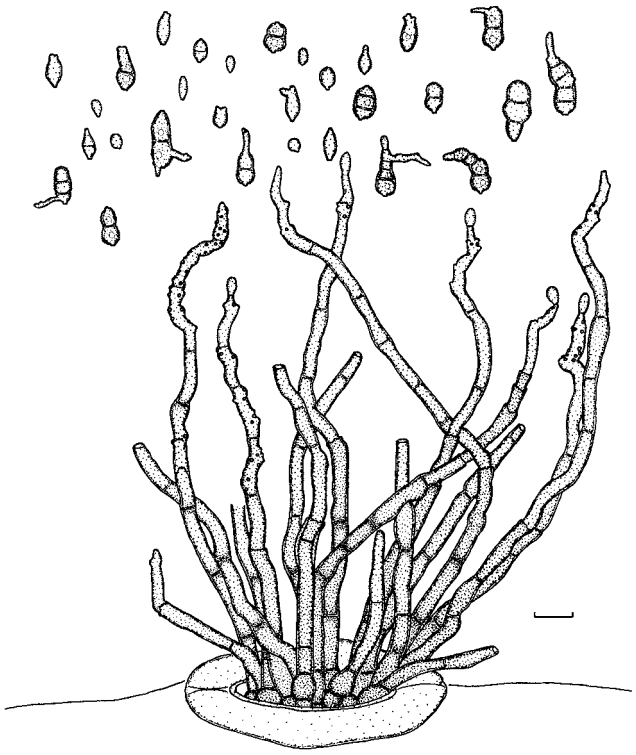


**Fig. 219.** *Cladosporium orchidiphilum* (VPRI 2488). Fascicle of conidiophores emerging through stomata and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

stomata or erumpent through the cuticle, more or less erect, straight to flexuous, often somewhat geniculate-sinuous, nodulose, but swellings not connected with any conidiogenous loci, mostly unbranched, rarely branched, 50–175 × (2.5–)3–6 µm, pluriseptate, medium brown, paler towards the apex, smooth, thick-walled, sometimes two-layered, 0.5–1 µm wide, somewhat attenuated towards the apex, often enteroblastically proliferating, visible as discontinuity in pigmentation and thickness of the wall, protoplasm sometimes aggregated at the septa, so that the walls and septa appear to be thickened, similar to distoseptation. *Conidiogenous cells* integrated, terminal or intercalary, 12–35 µm long, with numerous, often crowded conidiogenous loci, sometimes situated on small lateral shoulders, more or less protuberant, subdenticulate, 0.5–1.5 µm diam, slightly thickened, darkened-refractive. *Conidia* catenate, in unbranched or branched chains, straight to curved, subglobose, ovoid, ellipsoid to somewhat irregular in shape, 3–15(–19) × 2–5(–7)

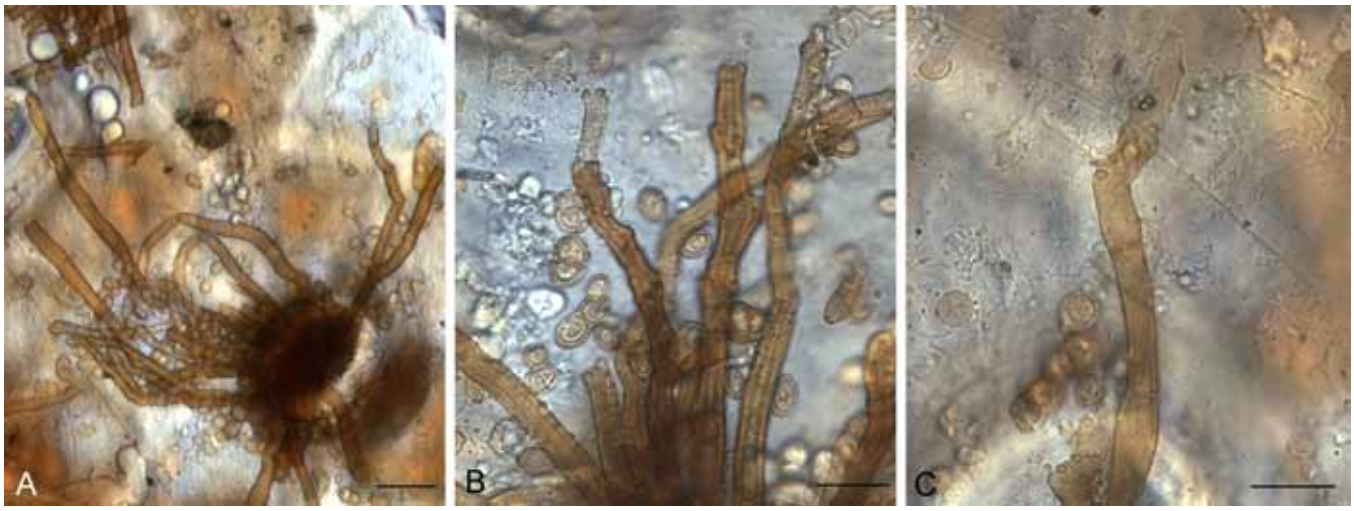



**Fig. 220.** *Cladosporium orchidiphilum* (VPRI 2488). A. Fascicle of conidiophores emerging through stomata. B, C. Conidiophores and conidia. Scale bars = 10 (B–C), 20 (A) µm.

µm, 0–3(–4)-septate, sometimes constricted at the septa, usually very pale to pale brown, rarely somewhat darker, pale medium brown, smooth to minutely verruculose, thick-walled, sometimes with distinct, pale, irregular lumen in the centre of the cell, surrounded by the somewhat darker protoplasm, apex rounded or attenuated, often with one or several apical hila, hila protuberant, truncate to slightly convex, 0.5–1.5 µm diam, slightly thickened, somewhat darkened-refractive; microcyclic conidiogenesis often occurring.

*Substrate and distribution*: On *Cypripedium*; Australia.

*Notes*: *Cladosporium orchidearum* is a similar species, but easily distinguishable by having shorter, 0–3-septate conidiophores, without swellings and enteroblastic proliferations, and wider conidiogenous loci and hila, (1–)1.5–2.5 µm diam; microcyclic conidiogenesis does not occur. The identity of the host plant is not quite clear. *Cypripedium* spp. are not native in Australia, and they are not commercially grown. The cultivation of these orchids is very difficult, and they are generally only found in specialist hobby orchid collections. Confusion with commercially grown *Paphiopedilium* or *Phragmipedium* spp. is possible (according to a previous information from C.F. Hill †).

**109. *Cladosporium oreodaphnes*** Allesch. ex K. Schub., Schlechtendalia 14: 73. 2006. Figs 221, 222.

≡ *Cladosporium oreodaphnes* Allesch., *in herb.*

*Holotype*: **Germany**, Berlin, botanical garden, on a leaf of *Oreodaphne foetens* [= *Ocotea foetens*] (*Lauraceae*), Apr. 1894, P. Hennings (M-0057756).

*Lit.*: Schubert (2005b: 115–117).
*Ill.*: Schubert (2005b: 116, fig. 53, pl. 23, figs A–G), Schubert *et al*. (2006: 74, fig. 9, pl. 1, fig. G).

*In vivo*: Leaf spots amphigenous, effuse, covering large areas of the leaf surface, faded, turning pale brownish-grey or somewhat ochraceous, membranous, caused by the detaching cuticle, margin or marginal line mostly small, irregular, dark brown or olivaceous-brown, sometimes with a small olivaceous-greyish halo. *Colonies* amphigenous, scattered, punctiform, dense, in tufts, greyish brown to somewhat blackish, appearing darker on the upper leaf surface, somewhat floccose or sometimes villose. *Mycelium* internal, subcuticular to intraepidermal; hyphae branched, 2–5 µm wide, septate, sometimes with swellings and constrictions, very pale, subhyaline or almost hyaline to pale olivaceous, smooth or almost so, walls only slightly thickened. *Stromata* small to moderately large, 25–65 µm wide, sometimes wider, up to 110 µm wide, several layers deep, composed of swollen hyphal cells, subglobose to somewhat angular, polygonal, 5–11 µm wide, medium to dark olivaceous-brown or brown, smooth, thick-walled. *Conidiophores* in small to moderately large loose fascicles, arising from stromata, erumpent through the cuticle, more or less erect, straight to more or less flexuous, cylindrical-oblong to filiform, sometimes mildly geniculate-sinuous, often subnodulose to nodulose, intercalar swellings up to 7 µm diam, unbranched to often branched, usually once branched, sometimes several times branched, 40–230 × 3.5–7 µm, pluriseptate, sometimes slightly constricted at the septa, pale to medium olivaceous-brown, smooth or almost so to faintly asperulate or irregularly rough-walled with age, walls somewhat thickened, up to 1 µm thick, sometimes even two-layered, occasionally swollen

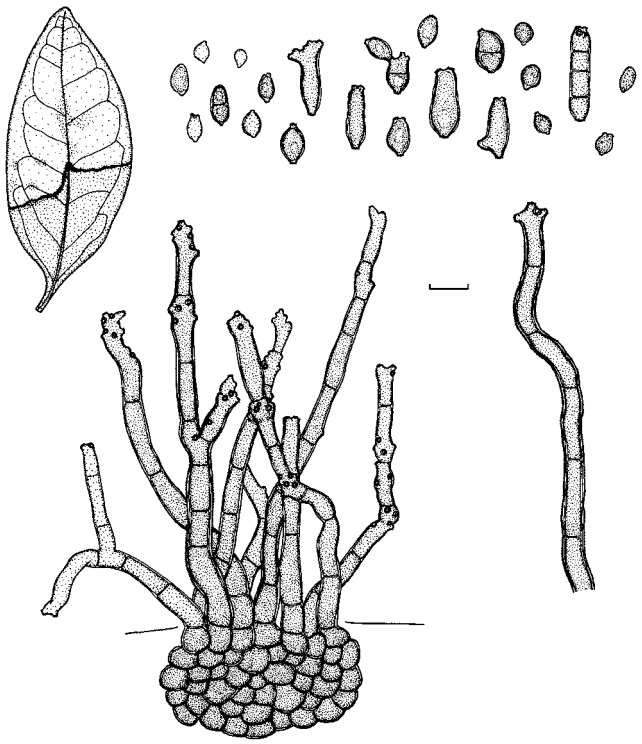


**Fig. 221.** *Cladosporium oreodaphnes* (M-0057756). Symptoms, fascicle of conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del.*

at the base, up to 8 µm wide, protoplasm of the cells sometimes aggregated at the septa appearing to be thickened, similar to distoseptation. *Conidiogenous cells* integrated, terminal and intercalary, 10–21 µm long, proliferation sympodial, occasionally mildly geniculate-sinuous, often subnodulose or nodulose, usually with numerous, crowded conidiogenous loci at the swellings, but loci not confined to them, protuberant, subdenticulate, 1–2.5 µm diam, thickened and darkened-refractive. *Conidia* catenate, in branched chains, more or less straight, almost globose to subglobose, obovoid, limoniform, somewhat fusiform, ellipsoid to subcylindrical, 2.5–19(–24) × 2–7(–8) µm, 0–1(–3)-septate, pale to medium olivaceous-brown, almost smooth to minutely asperulate or irregularly rough-walled, walls more or less thickened, sometimes even two-layered, up to 1 µm wide, with distinct lumen in the centre of the cells, surrounded by the somewhat darker protoplasm, apex and base somewhat rounded or attenuated, hila protuberant, truncate to obconically truncate, short cylindrical, 0.5–2(–2.5) µm diam, thickened, darkened-refractive; microcyclic conidiogenesis occurring.

*Substrate and distribution*: On *Oreodaphne foetens*; Germany.

*Notes*: Several *Cladosporium* species have been described from hosts belonging to the *Lauraceae*, but almost all of them have to be excluded from the genus. *Cladosporium cinnamomeum* (≡ *Scolecotrichum cinnamomeum*) was assigned to *Stenella* (Braun 2002) and now belongs to the genus *Zasmidium* (see excluded species). *Cladosporium congestum* proved to be conspecific with *Spiropes scopiformis* (Ellis 1968). *Cladosporium ferrugineum*, known from Cuba on *Nectandra coriacea*, was placed in the new genus *Penidiella* (Crous *et al*. 2007b). *Cladosporium machili* (*nom. inval*.), described from Taiwan on *Machilus* (= *Persea*) *thunbergii*, and *C. superficiale* on *Cinnamomum ovalifolium* from India have to be excluded from *Cladosporium s. str*. since the conidiogenous

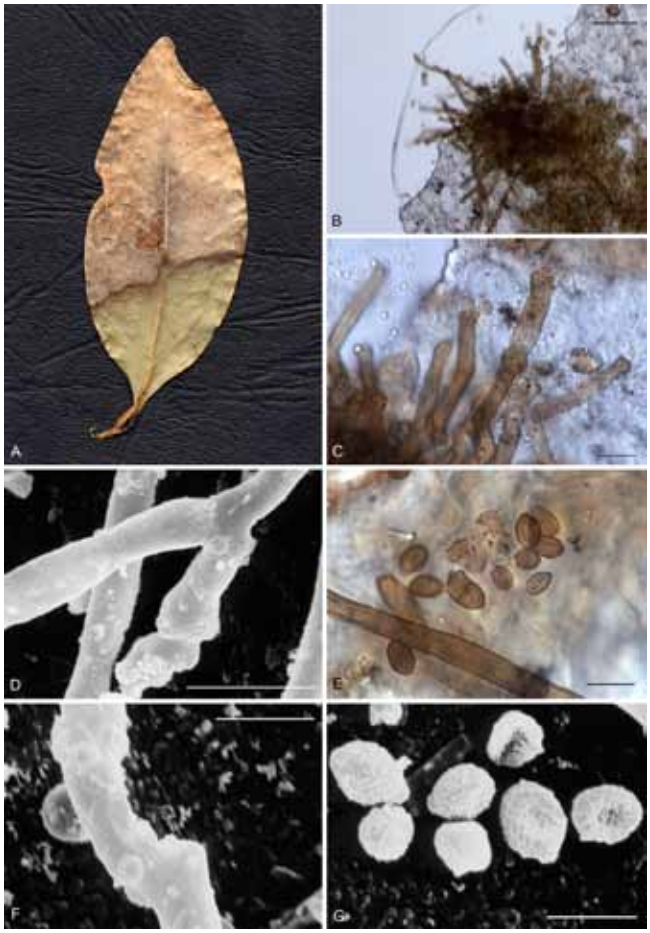


**Fig. 222.** *Cladosporium oreodaphnes* (M-0057756). A. Symptoms. B. Overview. C. Conidiophores with numerous, conspicuous, somewhat crowded conidiogenous loci. D. Branched conidiophore with several conidiogenous loci. E. Conidia showing cell structure, with paler cavity in the centre of the cells. F. Conidiophore with several coronate scars. G. Conidia. Scale bars = 5 (F–G), 10 (C–E), 50 (B) µm.

loci and hila are non-cladosporioid, but their taxonomic affinities are not yet clear. *Cladosporium lauri* was described to form leaf spots on leaves of *Laurus nobilis* which were damaged by insects. Type material of the latter species could not be traced, but Raybaud (1923) stated that the conidia are similar to those of the genus *Torula* with the central cells swollen and voluminous.

Among leaf-spotting *Cladosporium* species on hosts of other plant families, *Cladosporium oreodaphnes* is morphologically comparable with *C. apicale*, *C. dracaenatum* and *C. fusicladiiformis*; however, the latter species is easily distinguishable by its dimorphic conidiophores and somewhat shorter and narrower conidia, which are usually smooth or almost so. *Cladosporium apicale* possesses much longer and distinctly attenuated conidiophores with thicker walls, 0.75–3 µm wide, and in *C. dracaenatum* the conidiophores and conidia are narrower, intercalar swellings with crowded conidiogenous loci are lacking and, above all, the conidia become longer, wider, more frequently septate and more thick-walled with age.

**110. *Cladosporium ornithogali*** (Klotzsch ex Cooke) G.A. de Vries, Contr. Knowl. Genus *Cladosporium*: 49. 1952. Fig. 223.

*Basionym*: *Heterosporium ornithogali* Klotzsch ex Cooke, Grevillea 5(35): 123. 1877.

≡ *Heterosporium ornithogali* Klotzsch, Herb. Viv. Mycol., Cent. I, No. 69. 1832, *nom. inval*.

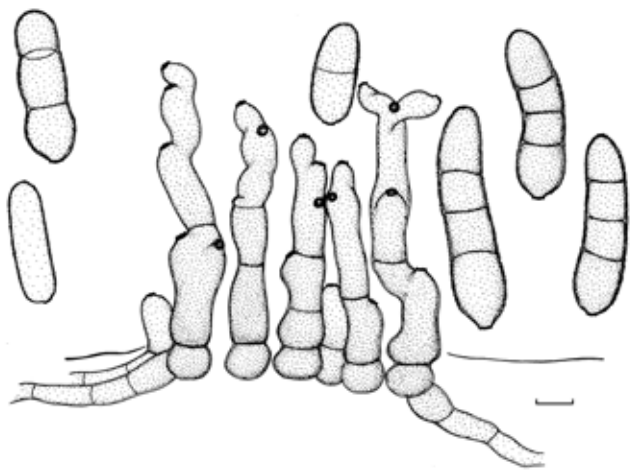


**Fig. 223.** *Cladosporium ornithogali* (M). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

*Lectotype*: **Germany**, on leaves of *Ornithogalum umbellatum* (*Asparagaceae*), spring, Klotzsch, Herb.Viv. Mycol. 69 (M, selected by David 1997). *Isolectotypes*: Klotzsch, Herb.Viv. Mycol. 69 (*e.g.* HAL, K).

= *Heterosporium ornithogali* var. *minus* Bäumler, Ann. K.K. Naturhist. Hofmus. 12(2): 81. 1897, as "f. *minus*" [syntypes: Krypt. Exs. 219 (*e.g.*, K)].

= *Didymellina ornithogali* J.E. Jacques, Contr. Inst. Bot. Montréal 39: 35. 1941.

≡ *Davidiella ornithogali* (J.E. Jacques) Crous & U. Braun, Mycol. Progr. 2(1): 10. 2003.

*Lit*.: Ellis (1976: 338), David (1995b; 1997: 52), IMI Descriptions of Fungi and Bacteria, No. 123, Sheet 1228.

*Ill*.: Ellis (1976: 337, fig. 256 B), David (1995b: 1, fig.; 1997: 53–54, figs 14 A–F, 15).

*Exs*.: Beck & Zahlbruckner, Krypt. Exs. 219; Ellis & Everhart, Fungi Columb. 1366; Ellis & Everhart, N. Amer. Fungi Ser. II. 2187; Klotzsch, Herb. Viv. Mycol. 69; Saccardo, Mycoth. Ital. 1588; Săvulescu, Herb. Mycol. Roman. 646; Scheuer, Dupla Graec. Fung. 6; Tranzschel & Serebrianikow, Mycoth. Ross. 248; Vestergren, Micromyc. Rar. Sel. Praec. Scand. 1445; Vize, Micro-Fung. Brit. 70.

*In vivo*: *Leaf spots* amphigenous, elongated ellipsoid patches, 5–20 × 2–5 mm, the long axis parallel to that of the leaves, pale to dark brown, becoming confluent, somtimes covering the entire leaf surface. *Colonies* effuse, caespitose, loose to dense, pale to dark brown, velvety. *Mycelium* internal, subcuticular to intraepidermal; hyphae branched, 2–7 µm wide, septate, not constricted at the septa, hyaline, subhyaline to very pale olivaceous, smooth, walls unthickened or almost so, forming swollen hyphal cells. *Stromata* absent (only formed in culture, black, prosenchymatous). *Conidiophores* solitary, in loose groups or caespitose, arising from hyphae or swollen hyphal cells, emerging through stomata or erumpent through the cuticle, erect, more or less straight, geniculate-sinuous, often somewhat twisted, subnodulose to nodulose, swellings up to 15 µm wide, unbranched or apically once branched, (12–)25–120(–200) × (7–)8–12 µm, septate, younger conidiophores often only with a single or few basal septa, not or only slightly constricted at septa, pale olivaceous-brown to red-brown, paler at the apices, subhyaline, smooth or minutely roughened, walls thin, base often somewhat wider or swollen, up to 15 µm. *Conidiogenous cells* integrated, usually terminal, also intercalary, geniculate, once or several times, proliferation sympodial with conidiogenous loci situated on lateral shoulders or

swellings, distinctly protuberant, (2–)3(–4) µm wide, *ca.* 1 µm high, the periclinal rim generally lower than the central dome, thickened and somewhat darkened-refractive. *Conidia* solitary or in short unbranched chains, young conidia oblong-ovate, 0–1-septate, later oblong-cylindrical, straight to slightly curved, (12–)20–60(–75) × (7–)9–15(–16) µm, (0–)2–6(–7)-septate, usually not constricted at the septa, becoming sinuous with age, very pale to pale brown, verrucose to coarsely verrucose, walls almost thin-walled, with age more thickened, up to 1 µm, apex rounded, but somewhat attenuated towards the base, base truncate, hila protuberant, *ca.* 3 µm diam, thickened and darkened-refractive; microcyclic conidiogenesis not observed.

*Substrates and distribution*: On *Ornithogalum* spp. and *Gagea* spp. (*Liliaceae*); Africa (Kenya, South Africa), Europe (Austria, Czech Republic, France, Germany, Hungary, Italy, Montenegro, Netherlands, Poland, Romania, Russia, Serbia, Slovakia, UK), North America (USA) – *Gagaea lutea* (Germany), *G. pratensis* (Czech Republic, Germany), *G. pusilla* (Austria, Russia), *Ornithogalum arabicum* (Kenya), *O. narbonense* (France, Montenegro, Serbia), *O. nutans* (Hungary, N. Ireland, Slovakia), *O. umbellatum* (Austria, France, Germany, Italy, Poland, Romania; USA, IL, PA, WA), *Ornithogalum* sp. (Netherlands, South Africa, UK).

*Additional specimens examined*: **Czech Republic**, Bohemia, Tábor, on *Gagea pratensis*, 25 Mar. 1905, F. Bubák, Vestergren, Micromyc. Rar. Sel. Praec. Scand. 1445 (M). **Germany**, Sachsen-Anhalt, Altmark, Altkreis Osterburg, Gollensdorf, Friedhof, MTB 3035/1, on *Gagea pratensis*, 22 Apr. 2003, H. Jage, Jage Herb. No. 167/03 (HAL); Börde, Kreis Köthen, Gröbzig, Friedhof, on *Gagea pratensis*, 23 Mar. 2003, H. Jage, Jage Herb. No. 61/03 (HAL); Hügelland, Kreis Hettstedt, Ober-Wiederstedten, Kirch(Fried)hof, MTB 4335/1.3, on *Gagea pratensis*, 12 Apr. 2003, H. Jage, Jage Herb. No. 100/03 (HAL); on *Ornithogalum umbellatum*, 12 Apr. 2003, H. Jage, Jage Herb. No. 99/03 (HAL). **Hungary**, Posonia, in a garden, on *Ornithogalum nutans*, May, J.A. Bäumler, Beck & Zahlbruckner, Krypt. Exs. 219 (M, **syntype** of *Heterosporium ornithogali* f. *minus*). **Romania**, Muntenia, distr. Ilfov, Jilava, on *Ornithogalum umbellatum*, 8 May 1933, T. Săvulescu & C. Sandu, Săvulescu, Herb. Mycol. Roman. 646 (M). **Russia**, Prov. Tambow, Zna, on *Gagea pusilla*, 22 Apr. 1910, Schirajewsky, Tranzschel & Serebrianikow, Mycoth. Ross. 248 (M). **USA**, Pennsylvania, Philadelphia, on *Ornithogalum umbellatum*, Dr. G.A. Rex, Ellis & Everhart, N. Amer. Fungi. Ser. II. 2187 (M).

*Notes*: Ranojević (1910) reported this species on leaves of *Ornithogalum narbonense*, *Muscari comosum* and *M. neglectum* from Montenegro and Serbia. Material on *Muscari* could not be traced and examined.

**111. *Cladosporium ossifragi*** (Rostr.) U. Braun & K. Schub., Stud. Mycol. 58: 133. 2007. Figs 224–227.

*Basionym*: *Napicladium ossifragi* Rostr., Bot. Færöes 1: 316. 1901.
≡ *Heterosporium ossifragi* (Rostr.) Lind, Dan. fung.: 531. 1913.

*Neotype* (selected in Schubert *et al*. 2007b): **Denmark**, Undallslund, on *Narthecium ossifragum* (*Nartheciaceae*), 13 Sep. 1885, E. Rostrup (CP). *Epitype*: **Norway**, Bjerkreim County, isolated from *Narthecium ossifragum*, M. di Menna (CBS H-19860). *Ex-epitype culture*: CBS 842.91 = ATCC 200946.

= *Heterosporium magnusianum* Jaap, Schriften Naturwiss. Vereins Schleswig-Holstein 12: 346. 1902 [lectotype: HBG].
≡ *Cladosporium magnusianum* (Jaap) M.B. Ellis, More Dematiaceous Hyphomycetes: 337. 1976.

*Lit*.: Ellis & Ellis (1985: 390), David (1995a, 1997: 85), IMI Descriptions of Fungi and Bacteria, No. 123, Sheet 1227 (1995), Ho *et al*. (1999: 132).

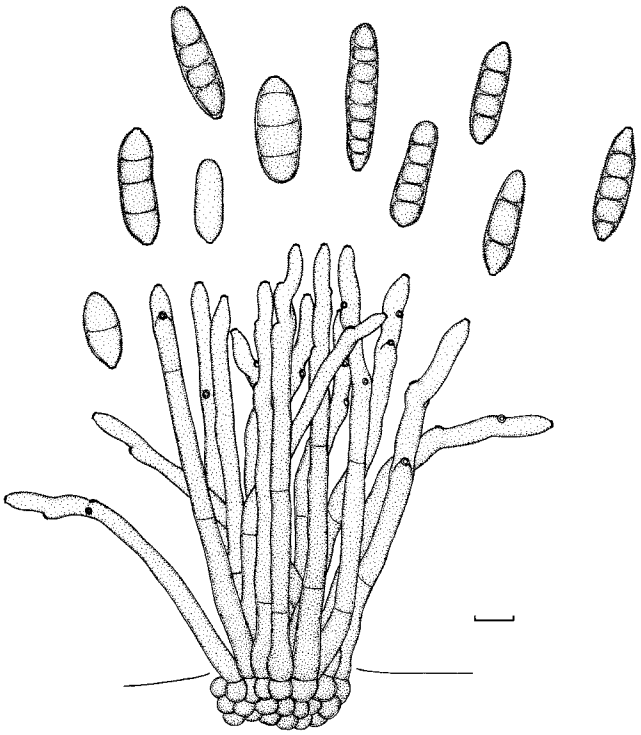


**Fig. 224.** *Cladosporium ossifragi* (M). Fascicle of conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

**Fig. 225.** *Cladosporium ossifragi* (CBS 842.91). Conidiophores and conidia *in vitro*. Scale bar = 10 µm. K. Bensch *del*.

*Ill*.: David (1995a: 1, fig.; 1997: 88–89, figs 21, 22 A–B), Ho *et al*. (1999: 133, figs 28–29), Schubert *et al.* (2007b: 133–134, figs. 26–28).

*Exs*.: Jaap, Fungi Sel. Exs. 49; Petrak, Mycoth. Gen. 146; Sydow, Mycoth. Germ. 1047.

*In vivo*: On living or fading leaves without causing distinct leaf spots, but sometimes with discolorations. *Colonies* amphigenous, scattered to effuse, caespitose, dense, pale to medium or even dark olivaceous-brown, with dense fructification velvety. *Mycelium* internal, subcuticular to intraepidermal; hyphae sparingly branched, septate, subhyaline to pale olivaceous, smooth. *Stromata* small to usually extended, dense, compact, 25–100 µm wide or even larger, later confluent, substomatal

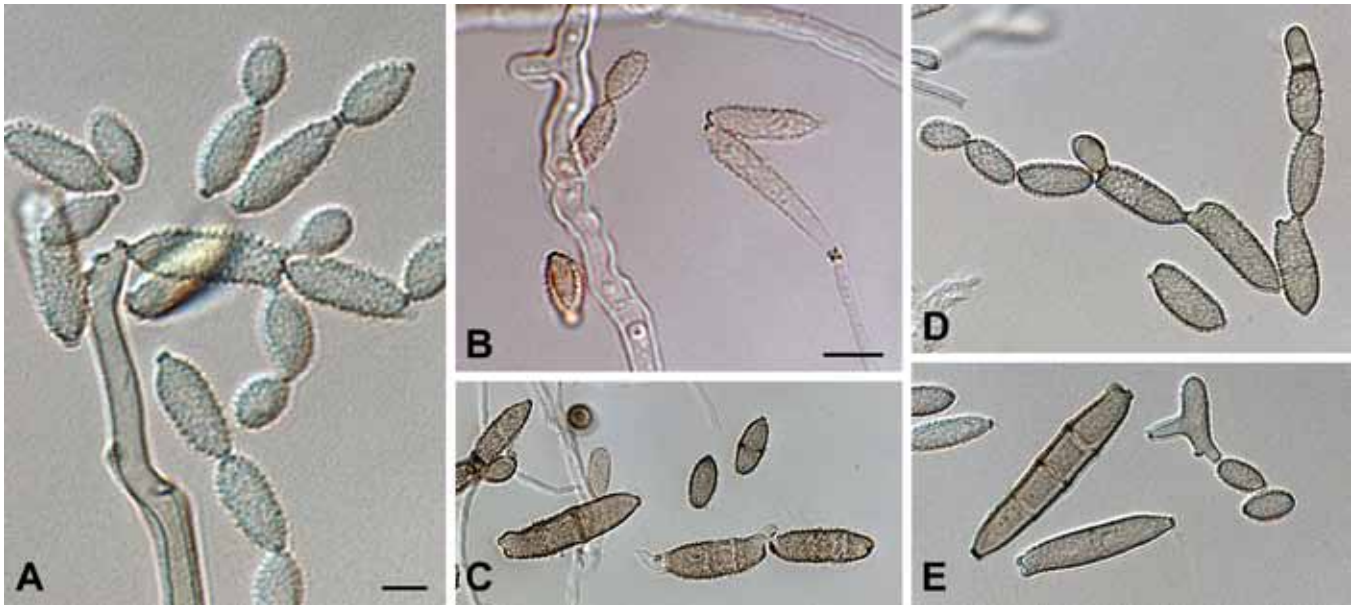



**Fig. 226.** *Cladosporium ossifragi* (CBS 842.91). A. Macronematous conidiophore. B. Micronematous conidiophore. C–D. Conidia. E. Conidia and microcyclic conidiogenesis. Scale bars = 10 µm.

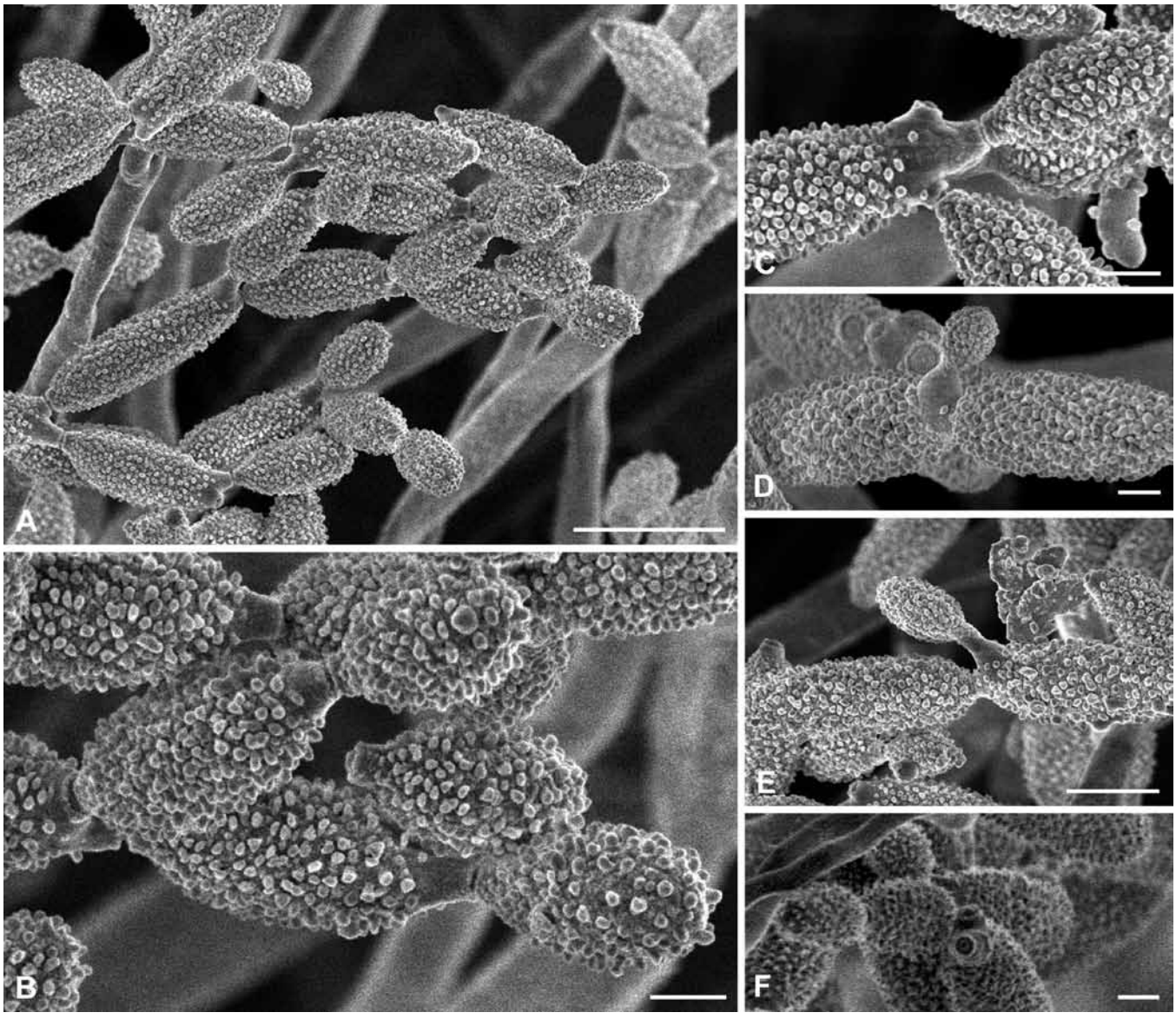



**Fig. 227.** *Cladosporium ossifragi* (CBS 842.91). A. Survey on different secondary ramoconidia and conidia. B. Details of conidia and hila. Note the very pronounced ornamentation and the absence of ornamentation near the site of spore formation. C. Detail of the end of a secondary ramoconidium with pronounced hila. D. Formation of a new conidium. Note the broad scar behind it (> 1 µm). E. Formation of a new conidium from a smooth-walled stalk. F. Hila on a secondary ramoconidium. This micrograph is from the sample before coating with gold-palladium and shows similar features as the sample after sputter coating. Scale bars = 2 (B–D, F), 5 (E), 10 (A) µm.

to intraepidermal, composed of slightly swollen hyphal cells, 4–7 µm wide, pale to medium olivaceous or olivaceous-brown, smooth, walls slightly thickened. *Conidiophores* in small to usually large, loose to somewhat denser fascicles, emerging through stomata or erumpent through the cuticle, arising from stromata, erect, straight to flexuous, non-nodulose but often slightly geniculate, unbranched, up to 250 µm long, (3–)5–7 µm wide, sometimes attenuated towards the apex, 2 µm wide, septate, not constricted at septa, pale to medium olivaceous, golden brown with age, paler towards the apex, subhyaline, walls almost smooth to usually minutely verruculose, walls unthickened or almost so, with age becoming thickened, two distinct wall layers visible, 1–1.5 µm thick. *Conidiogenous cells* terminal or intercalary, cylindrical, often slightly geniculate, proliferation sympodial with several small conidiogenous loci often situated on small lateral shoulders, protuberant, 1–2 µm diam, thickened, refractive or slightly darkened. *Conidia* solitary or catenate, in unbranched chains, straight, cylindrical to subfusiform, ellipsoid, rounded at the ends, (10–)16–32(–37) × (5–)7–10(–12) µm, (0–)1–5(–7)-septate, mostly 2–4-septate, occasionally constricted at septa, pale to medium brown, closely verruculose to echinulate, more or less thick-walled, hila protuberant, 1–2 µm diam, thickened, somewhat refractive or darkened; microcyclic conidiogenesis not observed.

*In vitro*: *Mycelium* abundantly formed, twisted, often somewhat aggregated, forming ropes, branched, 1–5 µm wide, septate, often irregularly swollen and constricted, hyaline or subhyaline to pale brown, smooth, walls unthickened or only slightly thickened. *Conidiophores* macronematous and micronematous, arising from plagiotropous hyphae, terminally or laterally, erect to subdecumbent, more or less straight to flexuous, cylindrical, sometimes geniculate, subnodulose with loci often situated on small lateral shoulders, unbranched, sometimes branched, often very long, up to 350 µm long, 3–4.5(–5) µm wide, pluriseptate, shorter ones aseptate, not constricted at septa, pale to pale medium brown, paler towards apices, sometimes subhyaline, smooth to minutely verruculose, especially towards apices, walls somewhat thickened, up to 0.5 µm, sometimes appearing two-layered. *Conidiogenous cells* integrated, terminal as well as intercalary, cylindrical, sometimes geniculate, subnodulose, 5–31 µm long, proliferation sympodial, with few loci (1–3) per cell, loci usually confined to small lateral shoulders, protuberant, conspicuous, short cylindrical, 1–2 µm wide, up to 1 µm high, somewhat thickened, darkened-refractive. *Conidia* catenate, in short, unbranched or branched chains, straight, small terminal and intercalary conidia subglobose, obovoid to ellipsoid, 4–15 × 3–5 µm [av. ± SD, 9.3 (± 3.7) × 4.0 (± 0.7) µm], 0–1-septate, not constricted at the septa, pale brown, hila 0.8–1 µm diam, secondary ramoconidia cylindrical, sometimes ellipsoid or subfusiform, 16–36(–40) × (4–)5–8 µm [av. ± SD, 26.6 (± 7.4) × 6.0 (± 1.2) µm], (0–)1–3(–4)-septate, not constricted at the septa, septa sometimes slightly sinuous, pale brown to pale medium brown, densely verruculose, verrucose to echinulate (densely muricate under SEM), walls unthickened to somewhat thickened, rounded or somewhat attenuated at apex and base, hila protuberant, conspicuous, sometimes situated on short, small prolongations, 1–2.5 µm diam, somewhat thickened and darkened-refractive; microcyclic conidiogenesis occasionally occurring.

*Culture characteristics*: Colonies on PDA reaching 53 mm diam after 14 d at 25 ºC, greenish olivaceous, grey-olivaceous to olivaceous-grey or iron-grey, appearing somewhat zonate, dull green to olivaceous-black reverse, margin colourless, regular, entire edge, aerial mycelium abundantly formed, covering at first the colony centre later most of the surface, dense, high, growth flat with elevated colony centre, somewhat folded. Colonies on MEA reaching 54 mm diam after 14 d at 25 ºC, pale olivaceous-grey to olivaceous-grey in the centre, iron-grey reverse, velvety, margin colourless to white, entire edge, radially furrowed, aerial mycelium abundantly formed, fluffy to felty, growth flat with somewhat raised, folded colony centre. Colonies on OA attaining 52 mm diam after 14 d at 25 ºC, olivaceous-grey to iron-grey, iron-grey to greenish black reverse, margin white, entire edge, aerial mycelium diffuse, loose, growth flat, prominent exudates absent, sporulation profuse on all media.

*Substrate and distribution*: Causing leaf spots on *Narthecium ossifragum*; Europe (Austria, Denmark, Germany, Great Britain, Ireland, Norway).

*Additional specimens examined*: **Denmark**, Tønder, Rømø, Twismark (formerly belonging to Germany, on the label: Germany, Schleswig-Holstein), on *Narthecium ossifragum*, 19 Aug. 1911, H. Sydow, Sydow, Mycoth. Germ. 1047 (M, PDD 51942). **Germany**, Hamburg, Eppendorfer Moor, on *N. ossifragum*, 12 Sep. 1897, O. Jaap [HBG, as "*Heterosporium ossifragi*", **lectotype** of *C. magnusianum* (desingated by Schubert *et al*. 2007b)]; 4 Sep. 1903, O. Jaap, Jaap, Fungi Sel. Exs. 49 (M); Hamburg, Wernerwald near Cuxhaven, on *N. ossifragum*, Aug. 1927, A. Ludwig, Petrak, Mycoth. Gen. 146 (M). **Norway**, Møre og Romsdal County, on *N. ossifragum*, M. di Menna (CBS 843.91).

*Notes*: Due to rather large conidia with coarse surface ornamentation, this species was included in a revision of the *Cladosporium herbarum* complex (Schubert *et al.* 2007b). Type material of *Napicladium ossifragi* is not preserved in Rostrup's herbarium (on *Narthecium ossifragum*, Faeroe Islands, Viderö, Viderejde and Österö, Svinaa, *sine dato*, *leg.* Ostenfeld & Harz). However, other authentic collections seen and examined by Rostrup are deposited at CP. Lind (1913) re-examined these samples, synonymised *N. ossifragi* with *H. magnusianum* and correctly introduced the combination *H. ossifragi*. Nevertheless, the correct oldest name for this fungus has been ignored by most authors. David (1997), who clearly stated that *N. ossifragi* is the earliest name for this species, preferred to use the name *C. magnusianum* because the typification of Rostrup's name was still uncertain. Despite the lacking type material, there is no doubt about the correct identity of *N. ossifragi* since authentic material of this species, examined by and deposited in Rostrup's herbarium (CP), is preserved. Therefore, there is no reason to reject the oldest valid name for this species. The original collection of *C. magnusianum* cited by Jaap (1902) (on leaves of *Narthecium ossifragum*, Denmark, Tønder, Rømø, peatbog by Twismark, Jul.–Aug. 1901, Jaap), but not designated as type, is not preserved (David 1997). It is neither deposited at B, HBG nor S. However, in the protologue Jaap (1902) also referred to material of this species found near Hamburg, which was, hence, syntype material available for a lectotypification proposed by Schubert *et al*. (2007b).

**112. *Cladosporium oxysporum*** Berk. & M.A. Curtis, J. Linn. Soc., Bot. 10: 362. 1869. Figs 228, 229.

*Holotype*: **Cuba**, on dead leaves of *Passiflora* sp. (*Passifloraceae*), C. Wright, Fungi cubensis Wrightiani, No. 489 (K 121562).

= *Cladosporium subtile* Rabenh., Fungi Eur. Exs., Ed. Nov., Ser. 2, Cent. 24, No. 2364. 1876, *nom. nud*. [syntypes: *e.g.* B, HAL, HBG].
= ?*Cladosporium atriellum* Cooke, Grevillea 6(40): 139. 1878 [syntypes: Ravenel, F. Amer. Exs. 296, *e.g.*, K, NY, PH 01020433].
= *Cladosporium artocarpi* Gonz. Frag. & Cif., Bol. Soc. Esp. Hist. Nat. 25: 366. 1925 and Publ. Estac. Agron. Haina, Ser. B, Bot. 1: 14. 1925 [holotype: MA 06393].

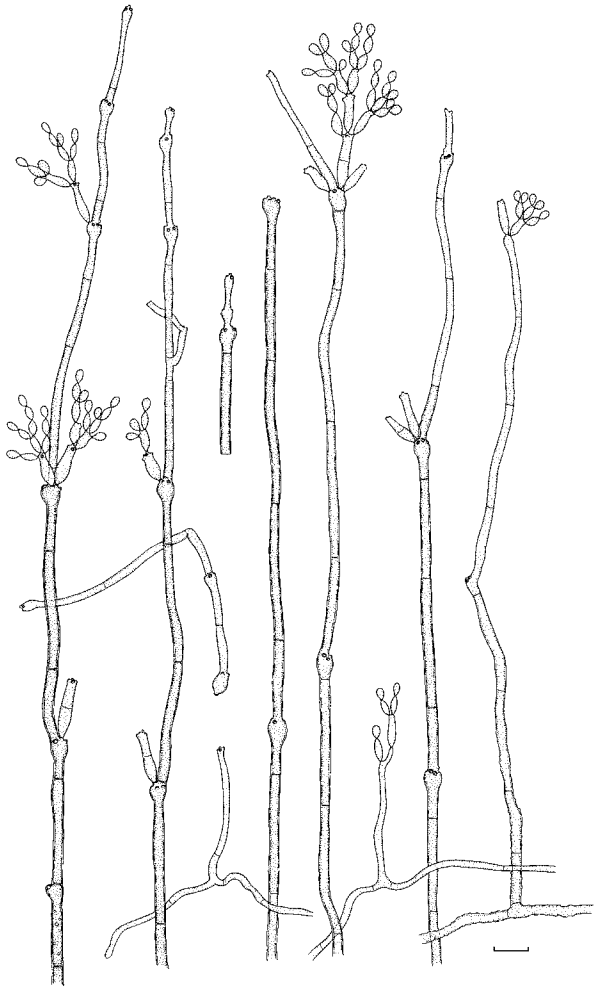


**Fig. 228.** *Cladosporium oxysporum* (CBS 125991). Macro- and micronematous conidiophores, conidia and microcyclic conidiogenesis with conidia forming secondary conidiophores *in vitro*. Scale bar = 10 µm. K. Bensch *del*.

= *Cladosporium sorghi* S.R. Chowdhury, Sydowia 23(6): 50. "1969" 1970 [holotype: IMI 125190b].

*Lit*.: Saccardo (1886: 363), Ellis (1971: 312), McKemy & Morgan-Jones (1991b), David (1997: 81), Bagyanarayana & Braun (1999: 13), Ho *et al*. (1999: 137), de Hoog *et al*. (2000: 589), Zhang *et al*. (2003: 138–139), Schubert & Braun (2004: 308–309), Heuchert *et al*. (2005: 48), Schubert (2005b: 159–160), Bensch *et al.* (2010: 61–63).
*Ill*.: Ellis (1971: 313, fig. 216 A), McKemy & Morgan-Jones (1991b: 399, pl. 1; 401, fig. 1; 403, fig. 2), David (1997: 62, fig. 17 A–E), Ho *et al*. (1999: 138, fig. 39), de Hoog *et al*. (2000: 589–590, figs), Zhang *et al*. (2003: 139, fig. 93), Bensch *et al.* (2010: 62–63, figs 50–51).

*In vivo*: *Colonies* effuse, rarely punctiform, dingy olivaceous to greyish brown, thinly hairy to velvety, loose to moderately dense. *Mycelium* immersed, occasionally superficial, hyphae branched, 2–5 µm wide, septate, subhyaline, pale olivaceous to brownish, smooth, thin-walled, with age sometimes becoming variously inflated, swollen hyhal cells sometimes forming loose to moderately dense aggregations or sometimes strands. *Stromata* lacking, but sometimes with small to moderately large, flat, often loose, stromatic hyphal aggregation, composed of swollen hyphal cells, 2.5–10(–15) µm diam, yellowish to medium brown, smooth, wall soemwhat thickened, 0.5–1.5 µm wide. *Conidiophores* solitary to caespitose, forming loose aggregations, distinct fascicles lacking, erumpent, macronematous, arising from immersed hyphae or swollen hyphal cells, erect, cylindrical-filiform, straight to slightly sinuous, but barely geniculate, unbranched, nodulose to distinctly nodose, (50–)70–350(–400) × (2.5–)3–6(–7) µm, at the very base occasionally somewhat enlarged, up to 10 µm wide, nodulose swellings 4–9 µm diam, pale to mid brown throughout or somewhat paler towards the apex, smooth or almost so, wall slightly thickened, 0.5–1(–1.5) µm. *Conidiogenous cells* integrated, terminal and intercalary, 10–60 µm long, conidiogenous loci distinctly coronate, confined to nodulose swellings, (1–)2–4(–6), slightly protuberant, 1–2.5 µm diam, thickened and darkened. *Ramoconidia* lacking or developed, but not very abundant, up to 25(–30) × 5–6 µm, 1–2(–3)-septate. *Conidia* catenate, in branched chains, small terminal conidia and intercalary conidia subglobose, obovoid, ellipsoid-ovoid, broadly fusiform, limoniform, 3–15 × 2.5–5 µm, 0(–1)-septate, secondary ramoconidia abundant, ellipsoid-ovoid, subcylindrical, fusiform, 8–20(–25) × (3–)4–6 µm, 0–1(–2)-septate, with 2–4 terminal hila, pale olivaceous, olivaceous-brown to brown, smooth or almost so, thin-walled, 0.5–0.8 µm, hila slightly protuberant, 0.8–2 µm diam; microcyclic conidiogenesis not observed.

*In vitro: Mycelium* internal and superficial, hyphae loosely branched, 1–4 µm wide, septate, not constricted at septa, but sometimes irregular due to swellings and constrictions, subhyaline to pale olivaceous, darker towards the base of the conidiophores, medium olivaceous-brown, smooth, walls unthickened or slightly thick-walled, occasionally forming ropes. *Conidiophores* macronematous, sometimes also micronematous, solitary, arising terminally and laterally from hyphae, erect, straight to slightly flexuous, nodose with nodes being quite apart of each other, with a single node at the apex or just below and few additional nodes on a lower level, 1–7 nodes per conidiophore, swellings 3–6 µm wide, unbranched, rarely branched, conidiophores long, 40–720 µm or even longer, 2–4 µm wide, at the base up to 5 µm wide, slightly attenuated towards the apex, pluriseptate, not constricted at septa, pale to medium olivaceous-brown, sometimes dark brown, often paler at the apex, smooth, walls somewhat thick-walled, about 0.5(–1) µm wide; micronematous conidiophores paler, narrower and shorter, also with nodules or only subnodulose or geniculate, often attenuated towards the apex, 30–115 × 1.5–2 µm, nodes 3–4 µm wide. *Conidiogenous cells* integrated, terminal and intercalary, with a single node, conidiogenous loci confined to these swellings, with 1–4 loci per node, sometimes subnodulose or once geniculate, 14–46 µm long, loci conspicuous, subdenticulate, 0.8–1.5 µm diam, somewhat thickened and darkened-refractive. *Ramoconidia* rarely occurring. *Conidia* catenate, in branched chains, up to five conidia in the terminal unbranched part of the chain, branching in all directions, small terminal conidia globose, subglobose to obovoid, 3–5 × 2–3 µm (av. ± SD: 4.2 ± 0.6 × 2.5 ± 0.4), aseptate, apex rounded, intercalary conidia ovoid, limoniform to ellipsoid, (4–)5–11 × 2.5–3.5(–4) µm (av. ± SD: 7.2 ± 1.9 × 3.0 ± 0.4), aseptate, rarely 1-septate, not constricted at septa, with 2–5(–6) distal hila, attenuated towards apex and base, secondary ramoconidia ellipsoid to subcylindrical, 7–21(–24) × (2.5–)3–4 µm (av. ± SD: 15.0 ± 5.1 × 3.3 ± 0.4), 0–1-septate, not constricted at septa, pale olivaceous to pale olivaceous-brown, smooth, walls unthickened or almost so, with 2–4(–5) distal hila, subdenticulate, 0.5–1.5(–2) µm diam, thickened and darkened-refractive; sometimes microcyclic conidiogenesis occurring with conidia forming secondary conidiophores.

*Culture characteristics*: Colonies on PDA attaining 68–78 mm diam after 14 d, smoke-grey to pale olivaceous-grey, reverse leaden-grey, grey-olivaceous at margins both surface and reverse, felty-

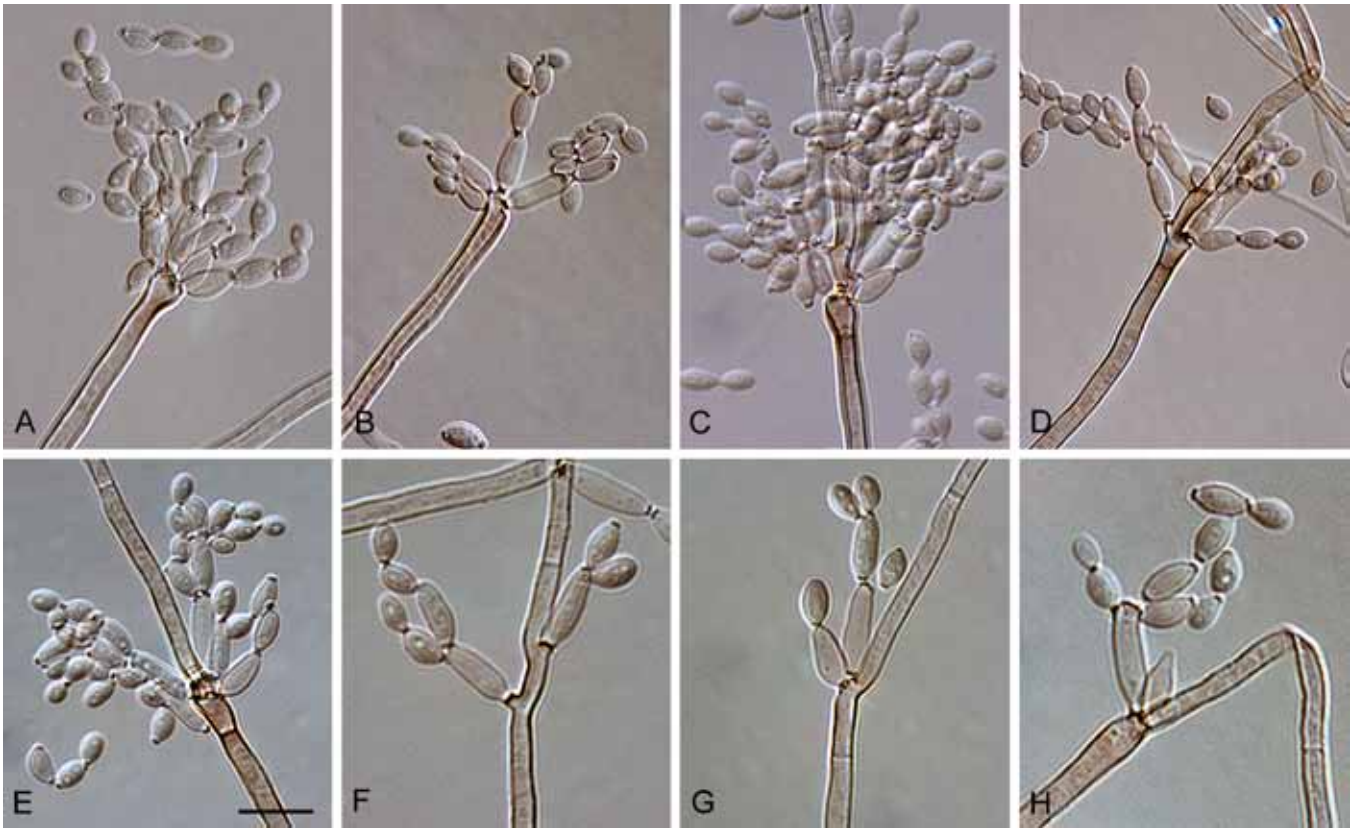



**Fig. 229.** *Cladosporium oxysporum* (CBS 125991). A–B. Tips of macronematous conidiophores, in A typically nodulose, and conidial chains. C–H. Intercalary conidiogenous cells and conidia. Scale bar = 10 µm.

floccose, margins broad, regular, whitish, glabrous, aerial mycelium abundant, covering most parts of the colony surface, felty-floccose or fluffy, growth low convex, without prominent exudates, sporulating. Colonies on MEA attaining 58–70 mm diam after 14 d, whitish to smoke-grey or pale olivaceous-grey at margins, reverse olivaceous-grey to black, woolly-floccose, margins colourless to whitish, glabrous, regular, radially furrowed, aerial mycelium abundant, covering most of the colony surface, woolly-floccose, whitish to smoke-grey, growth low convex, without prominent exudates, sporulation sparse. Colonies on OA reaching 53–62 mm diam after 14 d, whitish to pale olivaceous-grey or smoke-grey, reverse leaden-grey, pale olivaceous-grey at margins, woolly-floccose, margins colourless, narrow, glabrous, regular, aerial mycelium abundant, white to smoke-grey, densely woolly-floccose, covering most of the colony surface, growth flat to low convex, sometimes several prominent exudates, sporulation sparse.

*Substrates and distribution*: Isolates from air, soil, on dead parts of leaves and stems of herbaceous and woody plants and other organic matter; common and widespread, especially in the tropics and subtropics.

*Additional specimens examined*: *Sine loco et dato*, on *Ficus hispida* (*Moraceae*) (M-0057754). **Australia**, Toowoomba, isolated from *Cucumis melo* fruits (*Cucurbitaceae*), 31 Oct. 1977, P.E. Meyers T8069 (IMI 223440). **China**, terracotta army site, isol. from soil, 2000, coll. S. Gravesen, isol. B. Andersen (CBS H-20441, CBS 125991 = CPC 14371, BA 1738, reference strain of *C. oxysporum*). **Cuba**, Boyamo, on pods of *Adenanthera pavonina* (*Fabaceae*), 13 Sep. 1967, R. Urtiaga (IMI 130161). **India**, Ludhiana, isolated from *Arachis hypogaea* (*Fabaceae*), 16 Apr. 1973, J.S. Chohan 199 (IMI 1555); Madhya Pradesh, Raipur, Coll. of Science, on inflorescences of *Sorghum bicolor* (= *S. vulgare*) (*Poaceae*), Dec. 1966, S.R. Chowdhury (IMI 125190b, **holotype** of *C. sorghi*). **Mexico**, intercepted at Laredo, Texas, USA by Cary, on *Oncidium* sp. (*Orchidaceae*), 13 Apr. 1954, det. A.H. Lewis (BPI 427293, as *C. orchidearum*). **New Caledonia**, Plateau de la Chute de la Riviere des Lacs, isolated from *Dacrydium araucarioides* (*Podocarpaceae*), 15 Sep. 1066, B. Huguenin L25 (IMI 123453). **USA**, Florida, Winter Haven, on *Citrus* leaves, 21 Jun. 1967, E. Fisher (IMI 128147); Texas, on leaves of *Ulmus* sp. (*Ulmaceae*), 1894 (NY, as *C. brunneum* Corda); Ellis (NY). **Venezuela**, isol. from indoor air before renovation in lab, 2007, coll. K. Lyhne, isol. B. Andersen (BA 1707 = CBS 126351 = CPC 14308).

*Notes*: *Cladosporium oxysporum* is well-characterised by a combination of nodulose conidiophores, as in *C. herbarum* and allied species, and relatively small, smooth conidia. It is a rather common and widespread saprobic hyphomycete, especially in tropical and subtropical areas, inhabiting a wide range of ecological niches, including dead parts of leaves and stems of herbaceous and woody plants, also as secondary invader on necrotic leaf lesions caused by other fungi, and living host plants on which it has been recorded to induce leaf spots (Fisher 1967, Hammouda 1992, Lamboy & Dillard 1997). Type material of *C. oxysporum* has been re-examined, described and illustrated by McKemy & Morgan-Jones (1991b) and David (1997), confirming the interpretation of the species by Ellis (1971) to be accurate. Type material is in poor condition and almost exhausted, but a few typical conidia and nodulose conidiophores could be observed (Schubert 2005b).

The number of examined strains of *C. oxysporum* was rather limited, and cultures from Cuba or other Carribean areas were not at hand. Therefore, an epitypification is postponed until appropriate collections will be available, but CBS strain 125991 from China, which agrees very well with the species concept of *C. oxysporum*, can serve as reference strain.

An unusual phenomenon of the two strains included in Bensch *et al.* (2010) on PDA is that the conidiophores do not possess the typical swellings, but are unbranched or branched, once or several times geniculate-sinuous, secondary ramoconidia are longer, up to 37 µm long and true ramoconidia are formed.

CBS strain 125.80, which was used as reference strain for *C. oxysporum* in de Hoog *et al.* (2000), Wirsel *et al.* (2002) and Zalar *et al.* (2007) and illustrated by de Hoog *et al.* (2000) with nodose conidiophores, is not conspecific with this species. Morphologically it belongs to the *C. cladosporioides s. lat*. complex, and clusters quite apart from *C. oxysporum* (see Bensch *et al.* 2010, fig. 1, part a *vs.* c) which suggests that it probably got contaminated.

**113. *Cladosporium pannosum*** Cooke, Grevillea 12(61): 24. 1883, *sub* "*Chaetophoma musae* Cooke". Fig. 230.

*Holotype*: **USA**, South Carolina, on *Musa* sp. (*Musaceae*), H.W. Ravenel, No. 3056 (K 121564).

*Lit*.: Saccardo (1884: 201), Heuchert *et al*. (2005: 48–50).
*Ill*.: Heuchert *et al*. (2005: 49, fig. 19).

*In vivo*: *Colonies* medium brown, effuse, confluent, velvety, also on the necrotic leaf tissue of the host plant. *Mycelium* internal and external; hyphae 2–5 µm wide, septate, often constricted at the septa, hyphal cells occasionally swollen, up to 10 µm wide, medium to dark brown, forming dense hyphal aggregations or stromata, which are composed of swollen subglobose hyphal cells, 5–10 µm diam, medium brown, smooth. *Conidiophores* solitary, in loose groups or fasciculate, arising from swollen hyphal cells or stromata, erect, straight to slightly curved, geniculate-sinuous, unbranched or only rarely branched, 7–126 × (2–)3–5(–6) µm, up to 6 µm wide at the very base, 0–4-septate, without or with constrictions at the septa, pale to medium brown, somewhat paler towards the apex, smooth to faintly rough-walled, walls slightly thickened, unthickened near the tips, usually < 1 µm. *Conidiogenous cells* integrated, terminal and intercalary, 5–45 µm long, polyblastic, proliferation sympodial, with several more or less protuberant, thickened and somewhat darkened-refractive conidiogenous loci, 1–2 µm diam. *Conidia* usually in branched chains, straight, subglobose, obovoid, ellipsoid, subcylindrical, limoniform, 5–18(–25) × 2–6(–7) µm, 0–3-septate, non-constricted at the septa, pale olivaceous-brown to medium brown, smooth or almost so to verruculose, apex rounded to somewhat attenuated, with up to five hila, base truncate to convex, hila more or less protuberant, thickened, refractive, 1–2 µm diam; microcyclic conidiogenesis occurring.

*Substrate and distribution*: Saprobic, on dead leaves and stems; Europe (Italy), North America (USA).

*Additional specimen examined*: **Italy**, Siena, Botanical Garden, on dead stems of *Echeandia echeandoides* (= *E. eleutheranda*) (*Asparagaceae*), Nov. 1898, without collector (SIENA).

*Notes*: The name *Cladosporium pannosum* was introduced by Cooke in connection with the ascomycete *Chaetophoma musae* and meant to be its possible conidial form (anamorph). However, this association is undoubtedly wrong since *C. pannosum* is a true member of *Cladosporium s. str*. The ecology of *C. pannosum* is unclear. An association with other fungi has not been observed. It is very probably a saprobic fungus, which was found together with *Chaetophoma musae* on the same leaves by accident. *Cladosporium pannosum* is *C. cladosporioides*-like, but differs in having intercalary conidiogenous cells, often with numerous conidiogenous loci. Furthermore, the conidiophores tend to be geniculate. Cooke (1883) published the following original diagnosis:

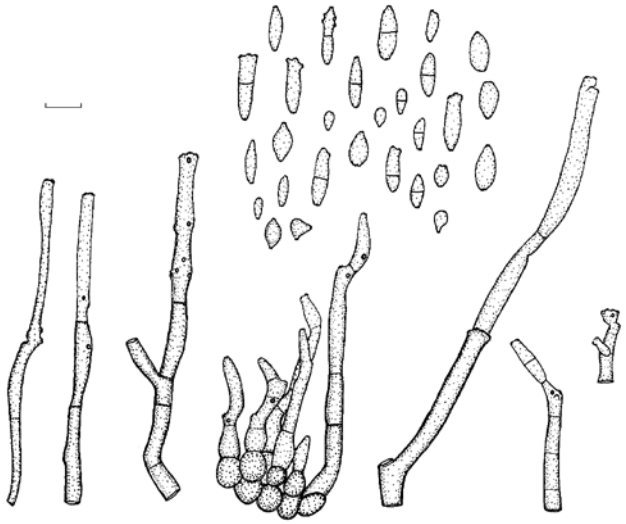


**Fig. 230.** *Cladosporium pannosum* (K 121564). Conidiophores, solitary or in loose groups arising from swollen hyphal cells or stromata, conidiogenous cells and conidia *in vivo*. Scale bar = 10 µm. B. Heuchert *del*.

"Effusa, atro-fusca, pannosa. Hyphis intertextis, cladosporoides (*Cladosporium pannosum*, Cooke). Peritheciis globoso-depressis, membrenaceis, fuscis (.08 mm. diam). Sporis ellipticis, hyalinis (.004 × .002 mm)".

A collection on rotten leaves of *Prunus lyonii* (USA, California, St. Catalina, Golf Links, 27 Dec. 1920, L.W. Nuttall, F 1166312) is close to *C. pannosum*, but the conidia are consistently verruculose. A sample from Brazil (State of Ceará, São Benedito City, on *Rosa* sp., 30 Oct. 2001, F. Freire, HAL) is morphologically also very close, but the colonies occur on leaf spots and secondary ramoconidia are up to 25 × 7 µm.

**114. *Cladosporium paracladosporioides*** Bensch, Crous & U. Braun, Stud. Mycol. 67: 63. 2010. Figs 231, 232.

*Holotype*: Isol. by G.A. de Vries, deposited by Raistrick, No. 4079, Sep. 1954 (CBS H-20442). *Ex-type culture*: CBS 171.54 = ATCC 11278 = 200943 = IFO 6369 = IMI 049626 = MUCL 917 = NCTC 4097.

*Ill*.: Bensch *et al.* (2010: 63–64, figs 52–53).

*In vitro: Mycelium* immersed and abundantly superficial; hyphae sparingly branched, 1.5−5 µm wide, septate, not constricted at septa, pale brown to medium brown or olivaceous-brown, septa mostly quite regular, sometimes 2−3 in short succession, smooth to asperulate or irregularly rough-walled, somewhat dimorphic, many hyphae look like macronematous conidiophores but are not yet sporulating, medium brown and smooth. *Conidiophores* macro-and micronematous, arising terminally and laterally from ascending or plagiotropous hyphae, erect, straight to mostly flexuous, sometimes hardly distinguishable from hyphae. *Macronematous conidiophores* cylindrical-oblong, non-nodulose, sometimes distinctly geniculate-sinuous due to sympodial proliferation, once or several times, unbranched or once branched, (17−)50−180(−300) × (2−)3−4 µm, pluriseptate, sometimes slightly constricted at septa, pale to medium brown or olivaceous-brown, smooth to irregularly asperulate or loosely delicately verruculose, walls thickened. *Conidiogenous cells* integrated, terminal, cylindrical-oblong, sometimes intercalary, occasionally geniculate-sinuous, 8−40 µm long, with 2−4 apical loci

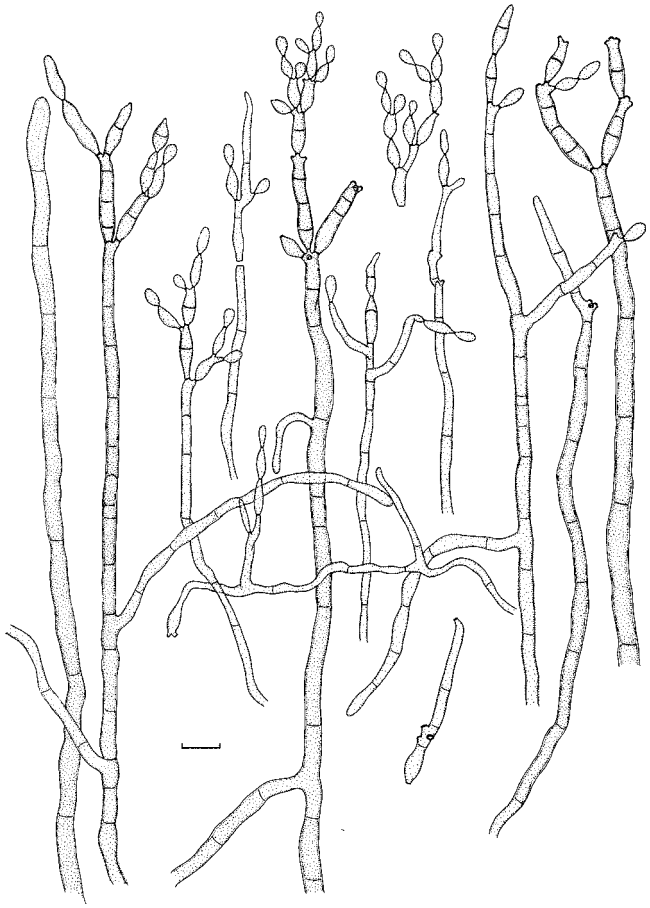


**Fig. 231.** *Cladosporium paracladosporioides* (CBS 171.54). Dimorphic mycelium, macro- and micronematous conidiophores, ramoconidia, conidia and microcyclic conidiogenesis *in vitro*. Scale bar = 10 µm. K. Bensch *del*.

or up to five loci per cell, sometimes situated on lateral shoulders or on short lateral prolongations at the apex, protuberant, denticle-like, 1.5−2 µm diam, thickened and darkened-refractive. *Micronematous conidiophores* narrower and paler, filiform, unbranched, up to 165 µm long or even longer, 2−2.5(−3) µm wide, subhyaline to pale brown. *Conidiogenous cells* integrated, terminal, narrowly cylindrical-oblong, usually with a single apical locus, sometimes with few loci. *Ramoconidia* occasionally formed, hardly distinguishable from secondary ramoconidia. *Conidia* catenate, in branched chains, up to four conidia in the unbranched terminal part of the chain, straight, small terminal conidia obovoid, subglobose, sometimes obpyriform, 4−7(−14) × 3−3.5 µm (av. ± SD: 5.3 ± 1.1 × 3.1 ± 0.2), aseptate, intercalary conidia limoniform, fusiform to ovoid, 6−9(−11) × 3−3.5(−4) µm (av. ± SD: 7.7 ± 1.5 × 3.4 ± 0.3), 0(−1)-septate, with 1−2(−3) distal hila, secondary ramoconidia ellipsoid, fusiform to subcylindrical, with up to four distal hila, 7−26(−30) × (3−)3.5−5 µm (av. ± SD: 16.2 ± 6.2 × 4.0 ± 0.4), sometimes obclavate, up to 36 µm long, 0−3-septate, sometimes slightly constricted at septa, first septum median or often slightly to distinctly in the upper half, sometimes in the lower, with 2−3 septa sometimes irregular, cells of different size, septa darkened, pale brown, smooth or almost so to very finely asperulate, walls somewhat thickened, attenuated towards apex and base, hila protuberant, denticulate, broadly truncate, 0.8−2(−2.5) µm diam, thickened and darkened-refractive; microcyclic conidiogenesis occurring, forming secondary conidiophores.

*Culture characteristics*: Colonies on PDA olivaceous-grey to iron-grey and olivaceous-black, reverse greenish grey to olivaceous-black, woolly-fluffy, margin colourless to white, glabrous to feathery, very narrow, aerial mycelium fluffy, loose, high, colonies somewhat

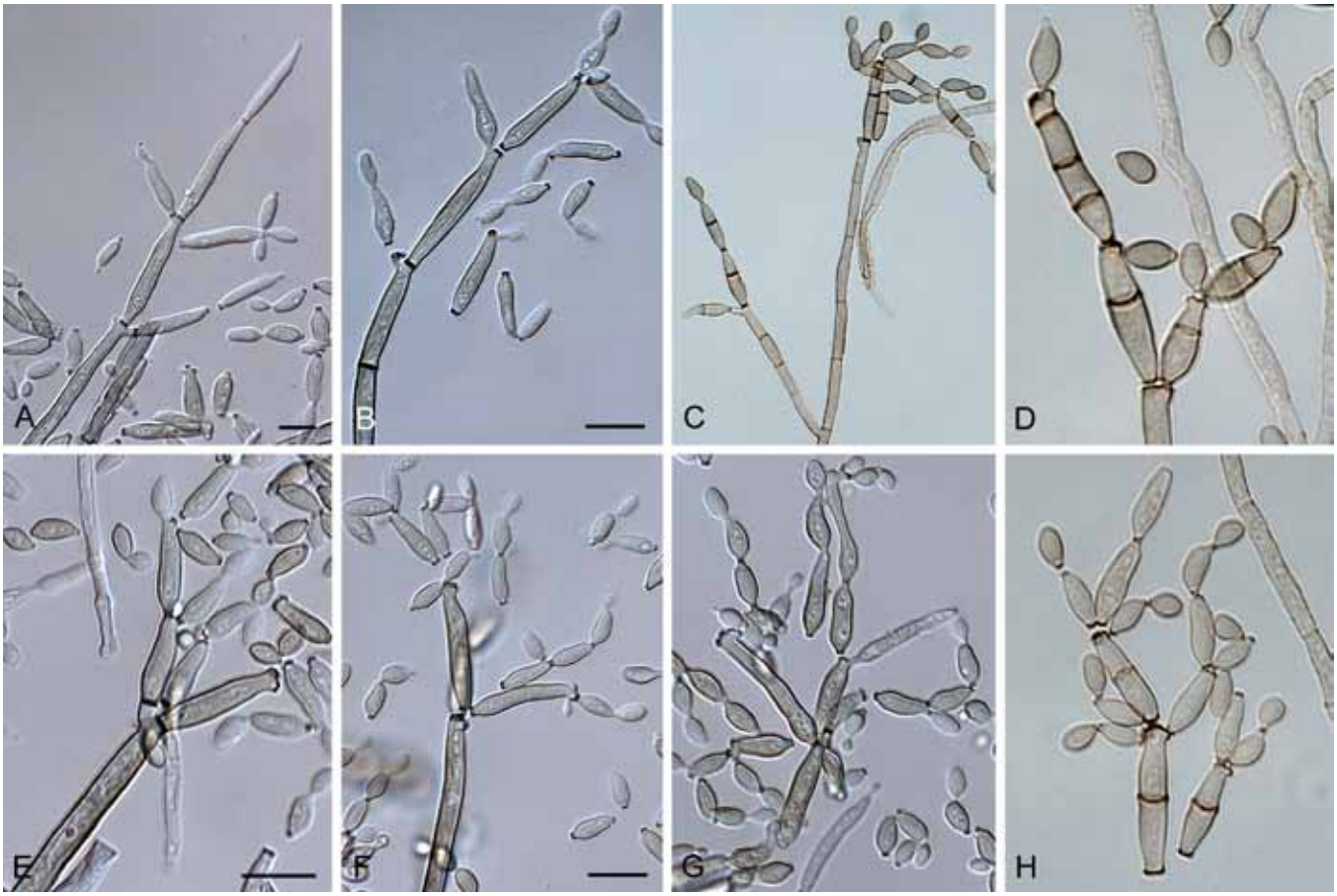



**Fig. 232.** *Cladosporium paracladosporioides* (CBS 171.54). A–C, E–F. Macronematous conidiophores and conidial chains. D, H. Conidial chains, septa of secondary ramoconidia distinctly darkened. G. Microcyclic conidiogenesis. Scale bars = 10 µm.

shiny, without prominent exudates, sporulation profuse. Colonies on MEA olivaceous-grey to greenish olivaceous due to profuse sporulation, pale olivaceous-grey towards margins, somewhat zonate, reverse olivaceous-grey, velvety to felty, margin narrow, colourless to white, radially furrowed, colonies folded and wrinkled, aerial mycelium abundant, loose to dense, without conspicuous exudates, sporulating. Colonies on OA olivaceous-grey to iron-grey, smoke-grey due to mycelium and sporulation, reverse greenish black to leaden-grey, powdery to felty, margin colourless to white, narrow, glabrous, aerial mycelium loose, diffuse to dense, felty-fluffy, without exudates, sporulating.

*Substrate and distribution*: Substrate and distribution unknown.

*Notes*: *Cladosporium paracladosporioides* is phylogenetically close to *C. varians* (see Bensch *et al.* 2010, fig. 1, part a), which is, however, easily distinguishable due to different conidiophores, conidiogenous loci and conidia. Morphologically *C. paracladosporioides* is rather similar to *C. cladosporioides* and *C. iranicum*, but differs from the latter species in having shorter conidial chains, wider terminal and intercalary, non-rostrate conidia and wider, 0(−1)-septate secondary ramoconidia, and from *C. cladosporioides* in having somewhat wider, often septate, smooth or almost so to very finely asperulate conidia.

**115. *Cladosporium perangustum*** Bensch, Crous & U. Braun, Stud. Mycol. 67: 65. 2010. Figs 233–235.

*Holotype*: **South Africa**, Pretoria, Walter Sisulu park, isol. from *Cussonia* sp. (*Araliaceae*), 20 Feb. 2007, P.W. Crous (CBS H-20451). *Ex-type culture*: CBS 125996 = CPC 13815.

*Ill.*: Bensch *et al.* (2010: 66−67, figs 54−56).

*In vitro: Mycelium* internal and superficial; hyphae filiform to narrowly cylindrical-oblong, loosely branched, (0.5−)1−4 µm wide, septate, sometimes slightly constricted at septa, sometimes irregular due to intercalary swellings and constrictions, subhyaline to pale olivaceous or pale olivaceous-brown, smooth to usually verruculose or irregularly rough-walled, walls unthickened or almost so, sometimes swollen at the base of conidiophores, sometimes forming dense ropes. *Conidiophores* solitary, sometimes in pairs, macronematous, semimacronematous or micronematous, arising terminally and laterally from hyphae or from swollen hyphal cells, erect, straight or slightly flexuous, filiform to narrowly cylindrical-oblong, usually neither geniculate nor nodulose, sometimes geniculate-sinuous or unilaterally slightly swollen at the apex, unbranched, occasionally branched, once or several times, branches short, peg-like or up to 30 µm long, conidiophores (8−)12−130(−150) × (1.5−)2−3.5(−4) µm, 0−6 septate, usually not constricted at septa, occasionally septa darkened, subhyaline, pale olivaceous or pale olivaceous-brown, more or less rough-walled, especially towards the base of conidiophores, asperulate-verruculose, at the apex smooth or almost so, walls unthickened or slightly thickened, about 0.5 µm wide, sometimes slightly attenuated towards the apex, at the base sometimes up to 4.5 µm wide. *Conidiogenous cells* integrated, mainly terminal, sometimes also intercalary or pleurogenous, narrowly cylindrical-oblong, sometimes geniculate-sinuous, non-nodulose, in intercalary cells loci situated on small peg-like lateral prolongations or just below the septum, 7−40 µm long, with 1−4(−5) apically crowded loci, forming clusters of pronounced scars, conspicuous, subdenticulate to denticulate, 0.8−1.5 µm diam, thickened and darkened-refractive. *Ramoconidia* cylindrical-oblong, 25−45 × 2.5−3(−4.5) µm, aseptate, rarely 1(−2)-septate, base truncate, 2−2.5(−4) µm wide, sometimes slightly darkened or refractive. *Conidia* numerous, catenate, in branched chains, branching in all directions, 1−4 conidia in the terminal unbranched part of the chain, small terminal conidia globose, subglobose or ovoid to obovoid, 2−4(−5) × (1.5−)2−2.5 µm (av. ± SD: 3.1 ± 0.6 × 2.1 ± 0.2), apex broadly rounded or slightly attenuated, intercalary conidia ovoid, limoniform to ellipsoid, somewhat fusiform or subcylindrical, 4−16(−19) × 2−3(−3.5) µm (av. ± SD: 8.7 ± 3.8 × 2.5 ± 0.4), 0(−1)-septate, attenuated towards apex and base, with 1−3(−5) distal hila, secondary ramoconidia narrowly ellipsoid to cylindrical-oblong, 6−30(−34) × 2−3(−3.5) µm (av. ± SD: 17.8 ± 7.4 × 2.5 ± 0.4), 0−1(−3)-septate, septum median or often somewhat in the upper half, with 2−4(−7) distal hila, pale olivaceous-brown, smooth or almost so to finely verruculose (LM), under SEM smooth or surface with somewhat irregularly reticulate structure or embossed stripes probably caused by diminishing turgor and shriveling of tender conidia, thin-walled, hila conspicuous, subdenticulate to denticulate, (0.8−)1−1.5(−1.8) µm diam, thickened and darkened-refractive; microcyclic conidiogenesis occasionally occurring.

*Culture characteristics*: Colonies on PDA attaining 33−76 mm diam after 14 d, grey-olivaceous to olivaceous, olivaceous-grey or iron-grey, sometimes with patches of smoke-grey or pale greenish grey, reverse dull green, leaden-grey to olivaceous-grey, iron-grey or olivaceous-black, sometimes releasing an olivaceous-buff or orange to luteous soluble pigment into the agar, fluffy, floccose or powdery, margins glabrous to feathery, whitish, olivaceous-buff or pale luteous due to the pigment, broad, regular or somewhat undulate, aerial mycelium diffuse to loosely floccose or felty, growth effuse, usually without prominent exudates, occasionally numerous small to large prominent exudates formed, sporulation profuse. Colonies on MEA reaching 40−72 mm diam after 14 d, pale olivaceous-grey to glaucous-grey or grey-olivaceous, whitish to smoke-grey due to aerial mycelium, reverse olivaceous-grey to iron-grey, occasionally releasing an orange solube pigment into the agar, velvety to floccose, margins white, narrow, regular to undulate, glabrous to somewhat feathery, aerial mycelium abundantly formed, covering most parts of colony surface, loosely to densely floccose or felty, white to pale olivaceous-grey or smoke-grey, growth effuse with sometimes elevated colony centre, radially furrowed, sometimes few small prominent exudates formed, sporulation profuse. Colonies on OA 40−75 mm diam after 14 d, whitish to smoke-grey and pale olivaceous-grey or grey-olivaceous, reverse pale olivaceous-grey, pale greenish grey to olivaceous-grey, leaden-grey or sometimes amber-coloured due to the pigment released into the agar, velvety or fluffy to felty-floccose, margins colourless or greenish olivaceous, glabrous, regular, aerial mycelium abundant, covering large parts of the colony surface, dense, low to high, white, growth effuse, sometimes few prominent exudates formed, sporulating.

*Substrate and distribution*: On plant material, ascomycetes, isolated from food; widely distributed; Africa (South Africa), Asia (India, Thailand), Australasia (Australia, New Zealand, Polynesia), Europe (Germany), North America (USA).

*Additional specimens examined*: *Sine loco*, *sine dato*, isol. by C.H. Hassall, No. 4-1949, ident. by G.A. de Vries as *C. cladosporioides* (CBS 167.54 = ATCC 11276

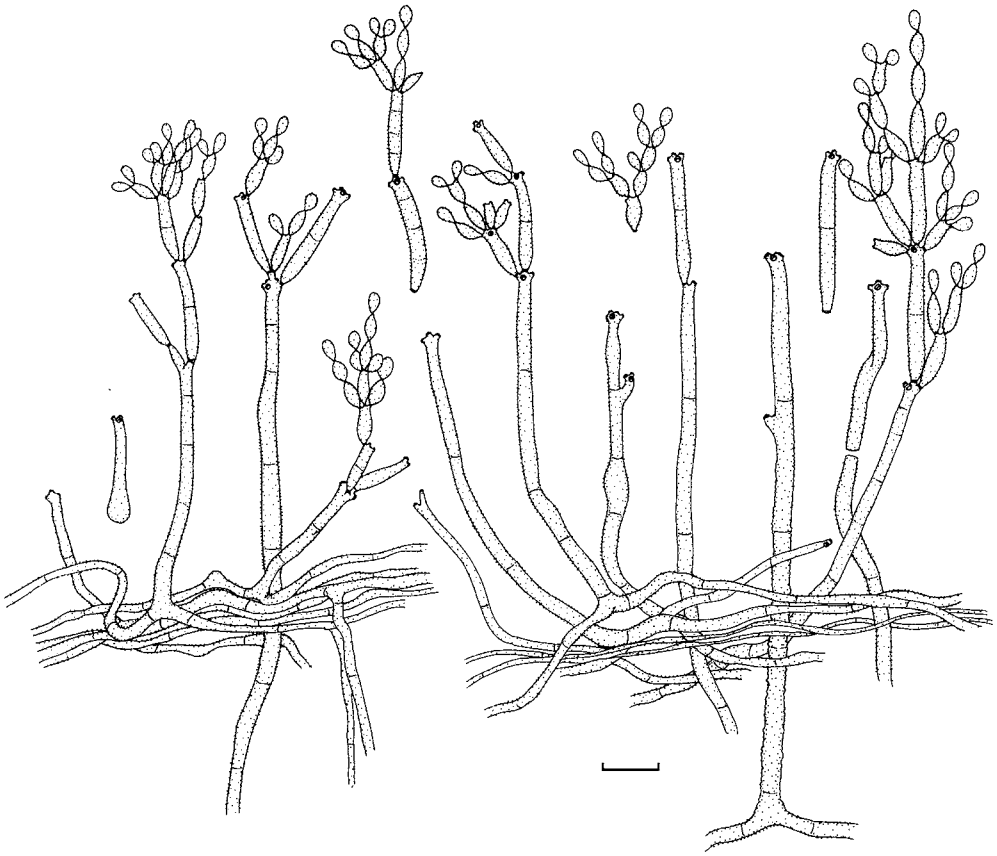


**Fig. 233.** *Cladosporium perangustum* (CBS 125996). Macro- and micronematous conidiophores, mycelium often formed in dense ropes, ramoconidia and conidial chains *in vitro*. Scale bar = 10 µm. K. Bensch *del*.

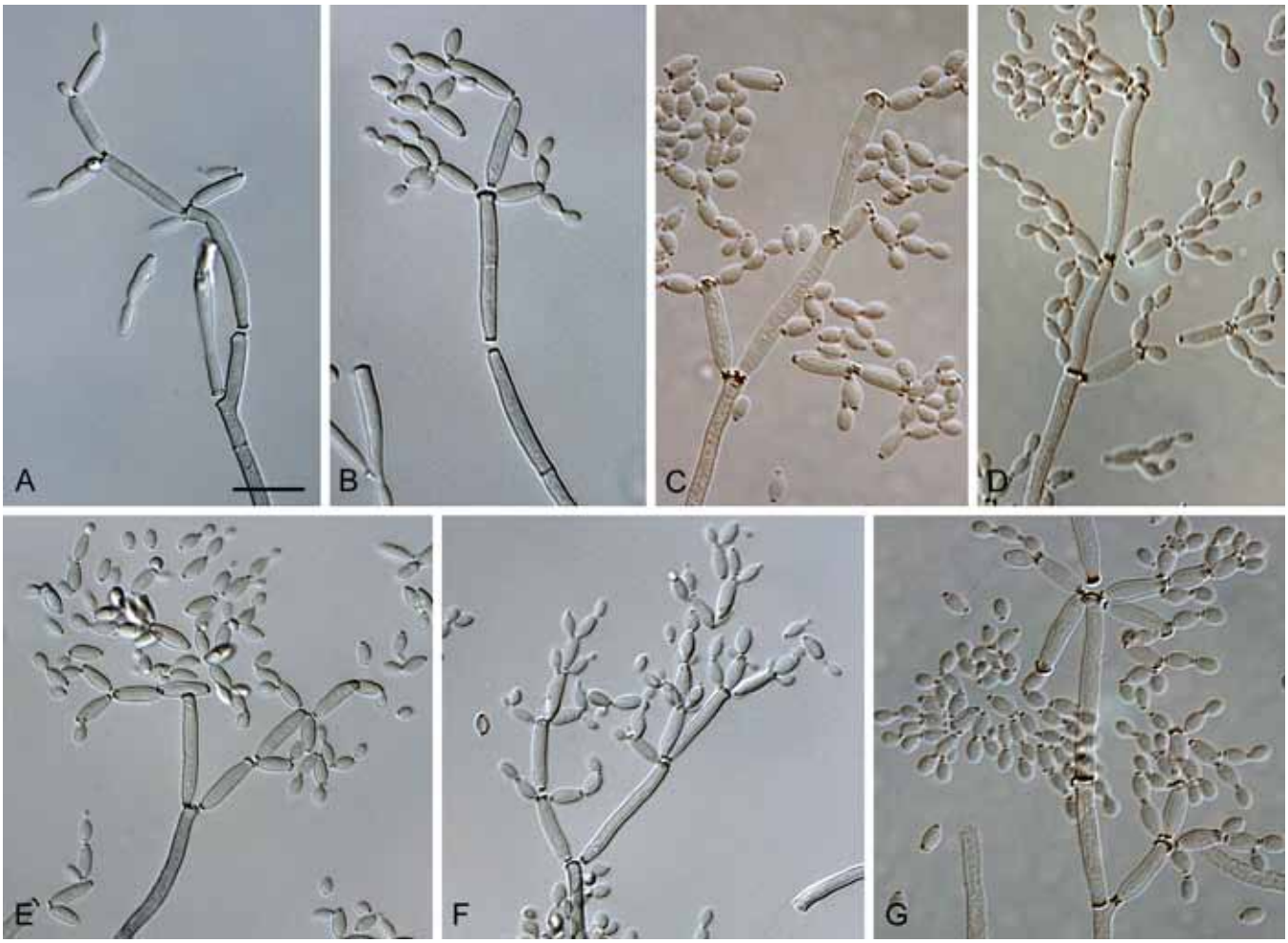



**Fig. 234.** *Cladosporium perangustum* (CBS 125996). A–G. Macronematous conidiophores and conidial chains. Scale bar = 10 µm.

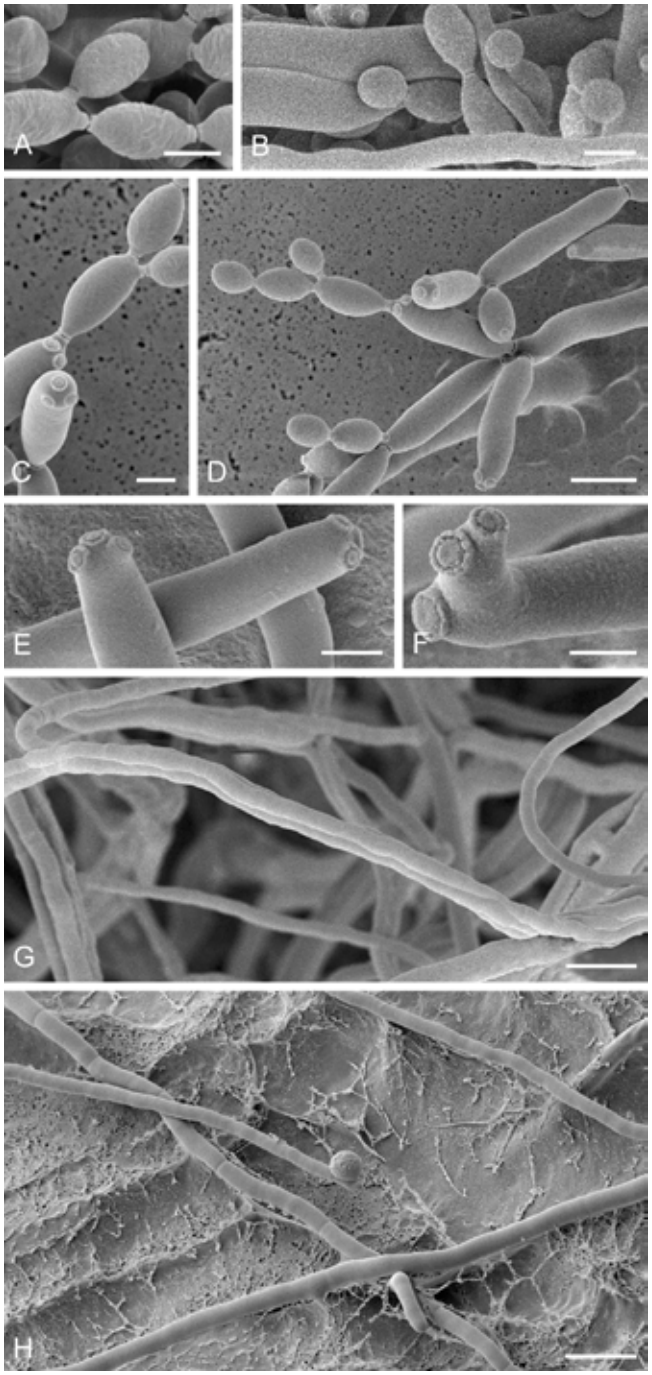



**Fig. 235.** *Cladosporium perangustum* (CBS 125996). A. Conidia with very gentle surface ornamentation showing irregularly reticulate structures. B. A coherent view on conidiophores, stipes, aerial hyphae and conidia. C. Secondary ramoconidia, conidia and scars. The conidia at the upper right show some cell wall structures. D. Conidiophore with secondary ramoconidia, intercalary and small terminal conidia. Note the disruptions of the cell walls between the conidia. E. Scars on very elongated secondary ramoconidia. F. Scar-pattern at the end of the conidiophores. Note the flattened separation domes. G. Ropes of aerial hyphae. H. Running segmented hyphae that may form conidiophores and not segmented aerial hyphae. Note the blastoconidium on one hypha. Scale bars = 2 (A, C, E–F), 5 (D, G), 10 (B, H) µm.

= IMI 049624). **Australia**, isol. from margarine, N. Charley (CPC 11046); isol. from *Eucalyptus placita* (*Myrtaceae*), coll. B.A. Summerell, isol. P.W. Crous (CPC 13686); Northern Territory, Emerald Springs, S13°37'23, E131°36'40, isol. from *Corymbia foelscheana* (*Myrtaceae*), 22 Sep. 2007, coll. B.A. Summerell, isol. P.W. Crous (CPC 14566); isol. from *Erythrophleum chlorostachys* (*Fabaceae*), 9 Jan. 2007, B.A. Summerell (CBS 126364 = CPC 14532). **Germany**, Essen, botanical garden, 51.45, 7.0167, isol. from *Morus rubra* (*Moraceae*), 2005, N. Ale-Agha (CPC 12216). **India**, isol. from *Eucalyptus* sp. (*Myrtaceae*), 3 Jan. 2004, coll. W. Gams, isol. P.W. Crous (CPC 11133); isol. from *Musa* sp. (*Musaceae*), 25 Oct. 2004, M. Arzanlou (CPC 11609). **New Zealand**, Auckland, Auckland University campus, isol. from leaves of *Oncoba spinosa* (*Salicaceae*), Sep. 2004, C.F. Hill (Hill 1076-1 = CPC 11663). **Polynesia**, reserve Pun Kukui in forest, isol. from banana "Eka ulu", 2006, coll. I. Budenhagen, isol. P.W. Crous (CPC 12792, 12793). **South Africa**, Alkmar, Laeveld Coop, isol. from wheat, 1988 (CPC 14008 = MRC 10135, as *C. sphaerospermum*); Durban, botanical garden Durban near Reunion, -29.85, 31.0167, isol. from *Strelitzia* sp. (*Strelitziaceae*), 2005, coll. W. Gams, isol. P.W. Crous (CPC 11806); Free State, Danielsrus, isol. from oats, 1983 (CPC 14004 = MRC 03367); Transkei, Mazeppa Bay, isol. from *Strelitzia* sp., growing on fruiting structures, 1 June 2008, P.W. Crous (CPC 14911); Pretoria, Walter Sisulu park, isol. from *Protea caffra* (ascospore isolate) (*Proteaceae*), 2 Jan. 2007, P.W. Crous (CPC 13730, 13774); isol. from *Teratosphaeria maculiformis* (*Teratosphaeriaceae*) on *Protea caffra*, 2 Jan. 2007, P.W. Crous (CPC 13727); Western Cape Province, Jonkershoek Nature Reserve, isol. from *Teratosphaeria fibrillosa* (*Teratosphaeriaceae*), 30 Mar. 2007, P.W. Crous (CPC 13870); Western Cape, Betties Bay, Harold Porter National park, isol. from *Protea cynaroides*, 4 Dec. 2008, L. Mostert (CPC 15192). **Thailand**, isol. from *Acacia mangium* (*Fabaceae*), 2005, coll. W. Himaman, isol. P.W. Crous (CPC 11526, 11856). **USA**, Louisiana, Baton Rouge, isol. from *Magnolia* sp. (*Magnoliaceae*), 8 Sep. 2007, P.W. Crous (CPC 14247); isol. from leaves of pecan tree, 8 Sep. 2007, P.W. Crous (CPC 14256); Washington, Seattle, University of Washington campus, isol. from chasmothecia of *Phyllactinia guttata* (*Erysiphales*) on leaves of *Corylus avellana* (*Betulaceae*), 16 Sep. 2004, D. Glawe (CBS 126365 = CPC 11820, CPC 11815, 11819, 11821, 11831).

*Notes*: *Cladosporium perangustum* is probably a common and widespread saprobic species isolated from a wide range of substrates, which formed a well-supported, but genetically not quite uniform clade in phylogenetic analyses (see Bensch *et al.* 2010, fig. 1, part b), suggesting that this species has to be considered a complex as in *C. cladosporioides* and *C. pseudocladosporioides*. However, due to the morphological uniformity of the strains concerned we tentatively prefer to maintain them as a single species until more isolates will be available or additional characters are to be found. *Cladosporium exile* and *C. scabrellum* are two species morphologically comparable with *C. perangustum* but genetically quite distinct (see Bensch *et al.* 2010, fig. 1, part b *vs.* a). *Cladosporium exile* is clearly distinguished by its usually longer and somewhat wider conidiophores, slightly wider ramoconidia and conidia, shorter intercalary conidia and somewhat wider conidiogenous loci and hila, and *C. scabrellum* differs in having mainly macronematous and somewhat wider conidiophores and slightly wider secondary ramoconidia.

**116. *Cladosporium phaenocomae*** Crous, Persoonia 26: 74. 2011. Fig. 236.

*Holotype*: **South Africa**, Western Cape Province, Hermanus, Fernkloof Nature Reserve, S 34°23'38''E 19°16'9.7'' on leaf bracts of *Phaenocoma prolifera* (*Asteraceae*), 2 May 2010, K.L. Crous & P.W. Crous (CBS H-20529). *Ex-type cultures*: CPC 18221, 18223 = CBS 128769.

*Ill.*: Crous & Groenewald (2011: 75, fig. 5)

*In vitro*: *Mycelium* immersed and superficial, abundant, 1–2.5 µm wide, septate, subhyaline to pale or medium olivaceous-brown, smooth to verruculose, at times forming hyphal ropes. *Macroconidiophores* macronematous, solitary, arising terminally and laterally from hyphae, erect, slightly flexuous, cylindrical-oblong, 60–100(–200) × 2.5–3 µm, neither geniculate nor nodulose, unbranched or branched below, 2–5-septate, not constricted at septa, pale to medium olivaceous-brown, smooth. *Microconidiophores* erect, intercalary, subcylindrical, 5–20 × 2–3 µm, 0–1-septate, pale to medium brown, smooth to finely verruculose. *Conidiogenous cells* integrated, terminal and intercalary, cylindrical-oblong, neither geniculate nor nodulose,

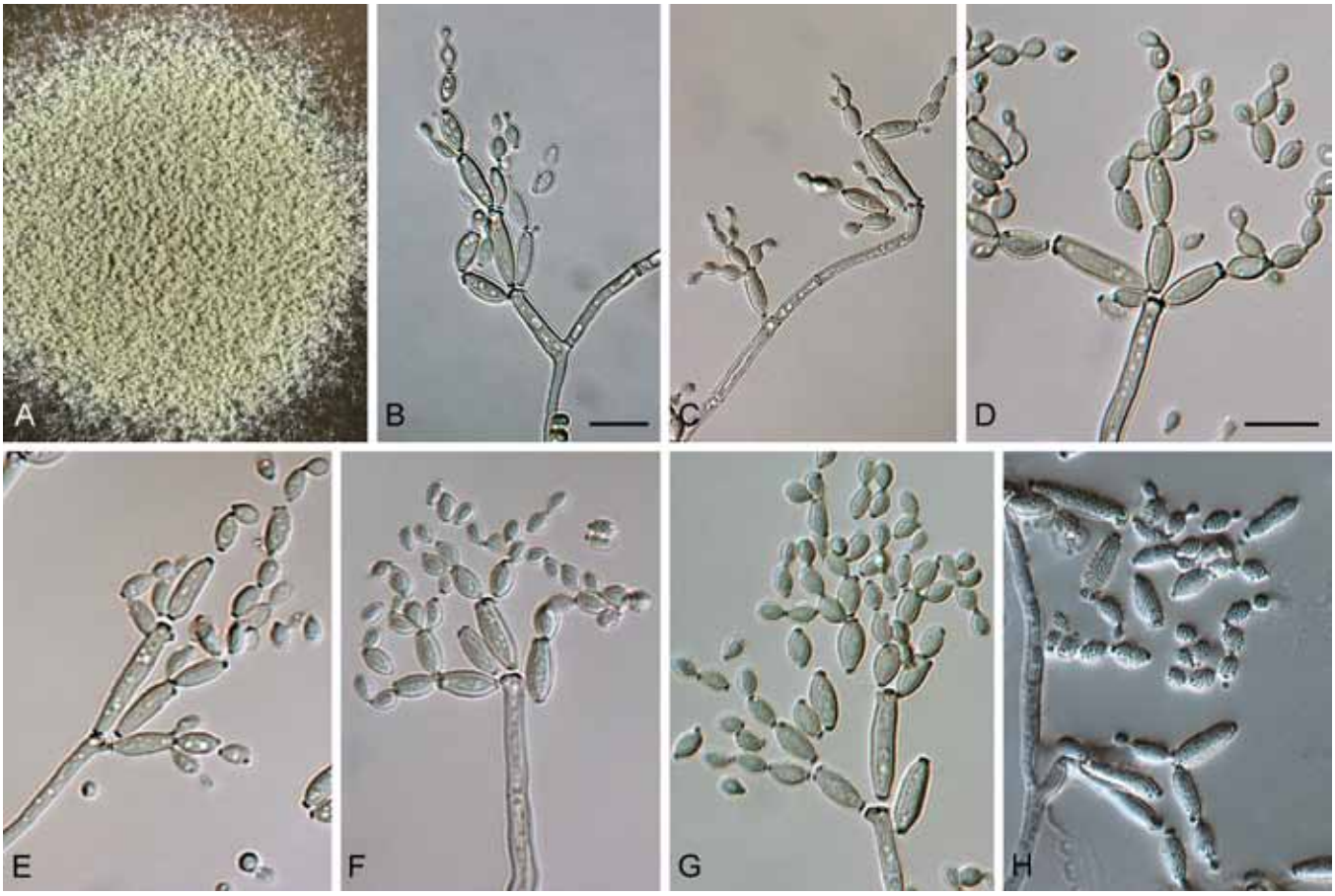



**Fig. 236.** *Cladosporium phaeocomae* (CBS 128769). A. Colony on MEA. B–H. A series of micro- and macronematous conidiophores showing conidia in chains. Scale bars = 10 µm.

5–20(–25) × (2–)3(–3.5) µm, with 1–4(–6) loci at the apex or 1–3 loci in intercalary cells with loci situated mostly all at more or less the same level, conspicuous, subdenticulate, 1–1.5 µm diam, somewhat thickened and darkened-refractive. *Ramoconidia* occasionally formed, subcylindrical, 0(–1)-septate, 17–20(–28) × (2–)3(–4) µm. *Secondary ramoconidia* fusoid-ellipsoid, aseptate, (5–)10–15(–20) × (3–)3.5(–4) µm. *Conidia* pale to olivaceous-brown, finely verruculose, catenate, in branched chains, branching in all directions, up to 2–4 conidia in the terminal unbranched part of the chain; intercalary conidia ovoid to ellipsoid, aseptate, 4–5(–10) × (2.5–)3(–3.5) µm, with 1–3 distal hila, somewhat thickened, darkened-refractive, 1–1.5 µm diam; small terminal conidia globose, subglobose to obovoid, (3–)4(–5) × 2–3 µm, aseptate, rounded at the apex; microcyclic conidiogenesis not observed.

*Culture characteristics*: Colonies after 1 wk at 25 °C in the dark, with sparse aerial mycelium and smooth, even margins, reaching 7 cm diam; on OA greenish olivaceous; on MEA dull green (surface and reverse); on PDA grey-olivaceous (surface), and olivaceous-grey in reverse; sporulating profusely on all media.

*Substrate and distribution*: On *Phaenocoma*; Australia.

*Notes*: Phylogenetically, *C. phaenocomae* is closely allied to *C. australiense* (Bensch *et al*. 2010), but can be distinguished by its narrower hyphae, conidia that are slightly roughened, and the presence of microconidiophores (Crous & Groenewald 2011).

**117. *Cladosporium phlei*** (C.T. Greg.) G.A. de Vries, Contr. Knowl. Genus *Cladosporium*: 49. 1952. Figs 237, 238.
*Basionym*: *Heterosporium phlei* C.T. Greg., Phytopathology 9: 580. 1919.

*Holotype*: **USA**, New York, Ithaca, greenhouse, on *Phleum pratense* (*Poaceae*), 6 Apr. 1918, C.T. Gregory (CUP). *Epitype* (**designated here**): **Germany**, Husum, isol. from *Phleum pratense*, isol. by U.G. Schlösser, No. 155 (CBS H-20940). *Ex-epitype culture*: CBS 358.69.

*Lit.*: Matsushima (1975: 36), Ellis (1976: 334), Harada & Mino (1976), Ellis & Ellis (1985: 508), David (1988e, 1997: 90), IMI Distribution Maps of Plant Diseases 595 (1988), Ho *et al*. (1999: 139), Zhang *et al*. (2003: 142–143).
*Ill.*: Gregory (1919: 579, fig. 2), Matsushima (1975: 53, figs 1–2), Ellis (1976: 335, fig. 254), Ellis & Ellis (1985: pl. 185, fig. 1904), David (1988e: 1, fig.; 1997: 91, fig. 23), Ho *et al*. (1999: 141, figs 40–41), Zhang *et al*. (2003: 142, fig. 95).

*In vivo*: Leaf spots short ellipsoidal-fusiform, oblong, purple-violet to brown, ochraceous, greyish, with narrow purple-violet margin, 1–4 × 0.5–2 mm, sometimes confluent and larger. *Colonies* amphigenous, mainly hypophyllous, inconspicuous, punctiform to subeffuse, brown. *Mycelium* internal and external; hyphae septate, subhyaline to pigmented, wall thin to somewhat thickened. *Stromata* lacking or small, *i.e.*, with small aggregations of swollen hyphal cells, occasionally larger, up to 70 µm diam, brown, cells 3–10 µm wide. *Conidiophores* solitary, in small groups or occasionally in fascicles,

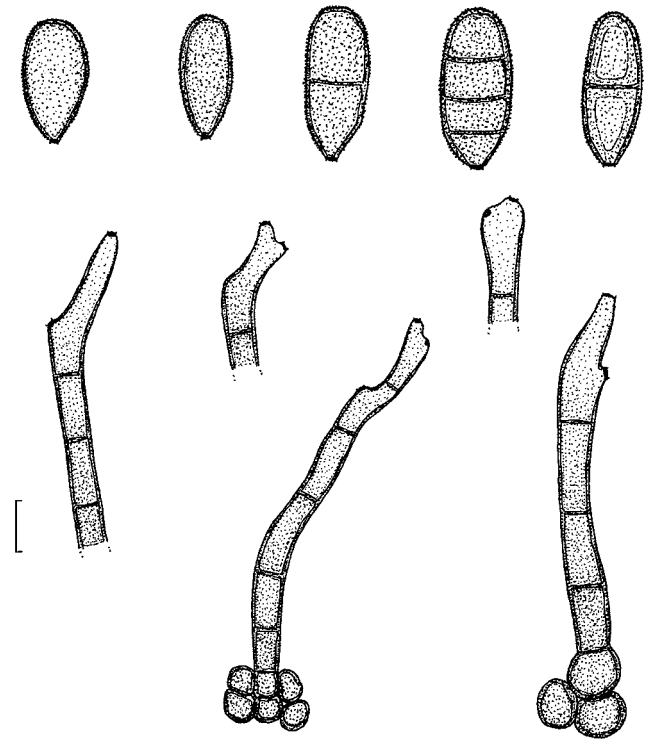


**Fig. 237.** *Cladosporium phlei* (IMI 167692). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. U. Braun *del.*

arising from internal hyphae or stromatic cells, erect, straight, subcylindrical to moderately geniculate-sinuous to subnodulose, usually unbranched, 50–300 × 5–10 µm, pluriseptate, usually not constricted at septa, pale to medium olivaceous-brown or brown throughout or tips somewhat paler, wall up to 1.5 µm thick, smooth or almost so. *Conidiogenous cells* integrated, terminal, occasionally intercalary, sympodial, with up to three coronate conidiogenous loci, 1.5–2.5 × 1 µm, somewhat protuberant. *Conidia* solitary, broadly ellipsoid-ovoid, obovoid to short cylindrical, often somewhat broader at the distal end, (10–)15–35(–55) × 7–14 µm, 0–3(–5)-septate, usually not or barely constricted at the septa, pale to medium dark brown, densely echinulate-verruculose, wall up to 1(–1.5) µm wide, conidial cells sometimes with distinct lumen giving the impression that the conidial walls are two-layered and rather thick-walled, apex broadly rounded, base rounded to short obconically truncate, basal hilum coronate, slightly protuberant, 1–2.5 × 1 µm.

*In vitro*: *Mycelium* immersed and superficial; hyphae loosely branched, 0.5–4(–5) µm wide, septate, without swellings and constrictions, subhyaline to pale brown or olivaceous-brown, smooth or almost so, walls unthickened or only slightly so, narrow hyphae sometimes twisted. *Conidiophores* macro- and micronametous, arising terminally from ascending hyphae and laterally from plagiotropous hyphae, erect, straight to somewhat flexuous, solitary. *Macronematous conidiophores* cylindrical-oblong to irregular in outline in the upper portion due to distinct sympodial proliferations and swellings, slightly swollen at tip, subnodulose with loci situated on small lateral shoulders or nodulose, swellings 5–8 µm diam, sometimes slightly to distinctly geniculate, occasionally even zigzag-like, continuing growth in an angle of 45°, unbranched or sometimes branched, 10–260 × (3–)3.5–5(–6) µm, 0–10(–14)-septate, not constricted at septa, septa sometimes not very conspicuous, pale to medium olivaceous-brown, smooth, occasionally verruculose, walls slightly thickened to distinctly thick-walled, up to 1 µm wide. *Conidiogenous cells*

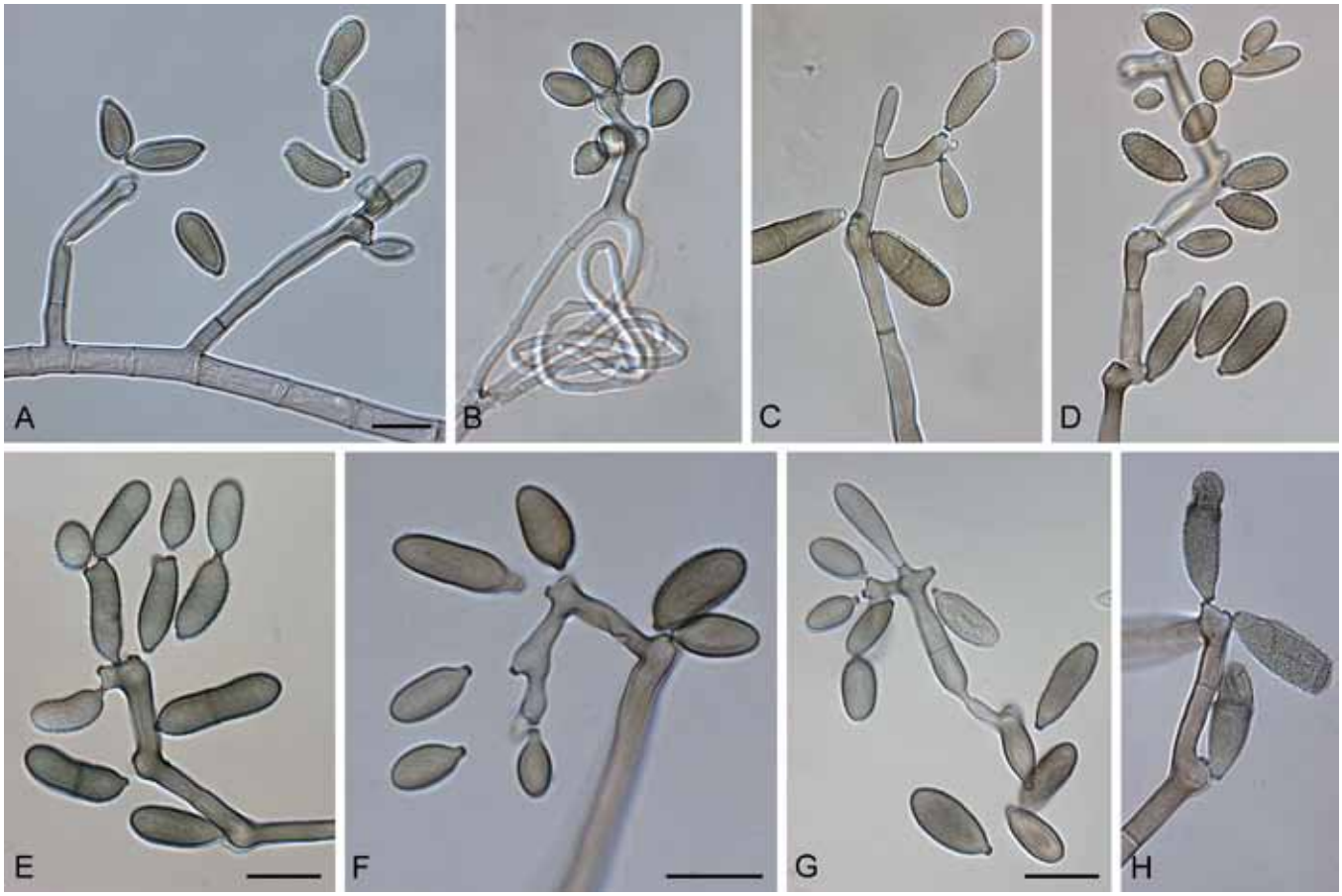



**Fig. 238.** *Cladosporium phlei* (CBS 358.69). A–F, H. Conidiophores being slightly to distinctly geniculate with solitary conidia or conidia arranged in short chains. G. Microcyclic conidiogenesis. Scale bars = 10 µm.

integrated, terminal and intercalary, cylindrical, subnodulose or nodulose, slightly to distinctly geniculate-sinuous, with a single or several loci, sometimes forming clusters of pronounced scars with loci being situated on small lateral prolongations, subdenticulate or denticulate, conspicuous, (1–)1.5–2 µm diam, thickened and darkened-refractive. *Micronematous conidiophores* small, narrow, often only as small lateral peg-like prolongations of hyphae, short conical to cylindrical, mostly without swellings, sometimes geniculate, unbranched, 5–30 × 1.5–2.5 µm, 0–2-septate, subhyaline to pale brown, smooth, walls unthickened, often reduced to conidiogenous cells, with a single or few apical loci, protuberant, 1–1.5 µm diam, thickened and darkened. *Ramoconidia* both formed by macro- and micronematous conidiophores, cylindrical-oblong, sometimes irregular due to swellings and sympodial proliferation, 16–50 × 3.5–5.5 µm, 0–3-septate, smooth or occasionally verruculose, base broadly truncate, 2–3 µm wide. *Conidia* catenate, solitary or in short unbranched or branched chains, small conidia subglobose, ovoid, obovoid to broadly ellipsoid, 6.5–13 × 4–7(–7.5) µm, 0(–1)-septate, apex broadly rounded, larger conidia (solitary ones, intercalary conidia and secondary ramoconidia) ellipsoid, broadly ellipsoid-ovoid, subcylindrical-oblong, sometimes obclavate or clavate, 11–40 × 5–9(–10) µm, 0–1(–3)-septate, usually not constricted at septa, septum median or somewhat in the upper half, with age septa sometimes becoming sinuous, pale to medium or dark olivaceous-brown or brown, surface ornamentation variable ranging from smooth or almost so in young small terminal conidia to verruculose, verrucose or distinctly echinulate, loose to dense, verrucae up to 1 µm high, walls unthickened or somewhat thickened, conidial cells sometimes with distinct lumen giving the impression that the conidial walls are two-layered and rather thick-walled, apex broadly rounded, base rounded to short obconically truncate, hila protuberant, sessile or subdenticulate, 1–2 µm diam, thickened and darkened-refractive; microcyclic conidiogenesis often occurring with conidia forming secondary conidiophores or conidia germinating.

*Culture characteristics*: Colonies on PDA attaining up to 67 mm diam after 2 wk, pale olivaceous-grey to olivaceous-black, reverse fuscous-black, dark brick towards margins, releasing vinaceous pigment into the agar, margins broad, feathery, regular, aerial mycelium covering large parts of the colony, vinaceous-grey, floccose, loose to dense, growth effuse with somewhat elevated colony centre, without prominent exudates, not sporulating. Colonies on MEA reaching 50–63 mm, whitish, smoke-grey to dark vinaceous, reverse iron-grey to livid-red or vinaceous, releasing vinaceous pigment into the agar, fluffy, floccose, margins glabrous, regular, aerial mycelium abundant, covering almost the whole surface, fluffy, floccose, dense, growth effuse, somewhat wrinkled, without exudates, sporulating. Colonies on OA reaching 55–65 mm diam, grey-olivaceous to olivaceous-grey and livid-red, reverse livid-red to dark vinaceous, floccose, margins livid-red, glabrous, regular, aerial mycelium pale vinaceous, floccose, growth flat, without exudates, sporulating.

*Substrate and distribution*: On *Phleum pratense*; Asia (China, Japan, Korea), Australasia (New Zealand), Europe (Austria, Byelorussia, Denmark, Estonia, Finland, Germany, Iceland, Ireland, Netherlands, Norway, Poland, Russia, Sweden, UK), North America (Canada; USA, widespread).

*Additional specimens examined*: **Austria**, Steiermark, Graz, Bezirk Mariatrost, on *Phleum pratense*, 19 June 2008, C. Scheuer, ex herb. GZU (HAL 2243 F). **Ireland**, Co. Kildare, Dept. of Agric. Farm, on *P. pratense*, 17 Jul. 1972, A. Mangan (IMI 167692). **Netherlands**, Bennekom, isol. from Phleum sp., isol. by J. Florschütz-de Waard (CBS 307.50). **UK**, England, Whitechurch, on *P. pratense*, 21 Jul. 1972, E. Roberts (IMI 167525).

*Notes*: Zhang *et al.* (2003) described and illustrated this species from China on *Holcus* sp. This record could not be proven. European collections forming lesions on *Calamagrostis* cf. *arundinacea* (Europe, Germany?, locality and date unclear, leg. Starcs, ex herb. A. Ludwig, 13354, B 700006506) and *Elymus arenarius* (Germany, Schleswig-Holstein, Sylt, Munkmarsch, 20 Aug. 1953, A. Ludwig, B 700006492) are morphologically indistinguishable from *C. phlei*. The biology of the collections concerned is quite unclear. It is possible that *C. phlei* has a wider host range on various other grasses. But it could also be that we have a complex of some morphlogically similar, but biologically different species.

The choosen epitype well agrees with type material of *C. phlei*. The species was originally described from North America but an epitypification with European material is justified due to its pathogenicity to the grass genus *Phleum* and its cosmopolitan distribution.

**118. *Cladosporium phyllactiniicola*** Bensch, Glawe, Crous & U. Braun, Stud. Mycol. 67: 67. 2010. Figs 239, 240.

*Holotype*: **USA**, Seattle, University of Washington campus, 47.6263, -122.3331, isol. from chasmothecia of *Phyllactinia guttata* (*Erysiphales*) on leaves of *Corylus avellana* (*Betulaceae*), 2 Dec. 2004, D. Glawe (CBS H-20443). *Ex-type cultures*: CBS 126355 = CPC 11830, CBS 126352 = CPC 11836, CBS 126353 = CPC 11823, CBS 126354 = CPC 11825.

*Ill.*: Bensch *et al.* (2010: 68, figs 57−58).

*In vitro: Mycelium* immersed and superficial, plagiotropous, ascending to erect, not dimorphic; hyphae sparingly branched,

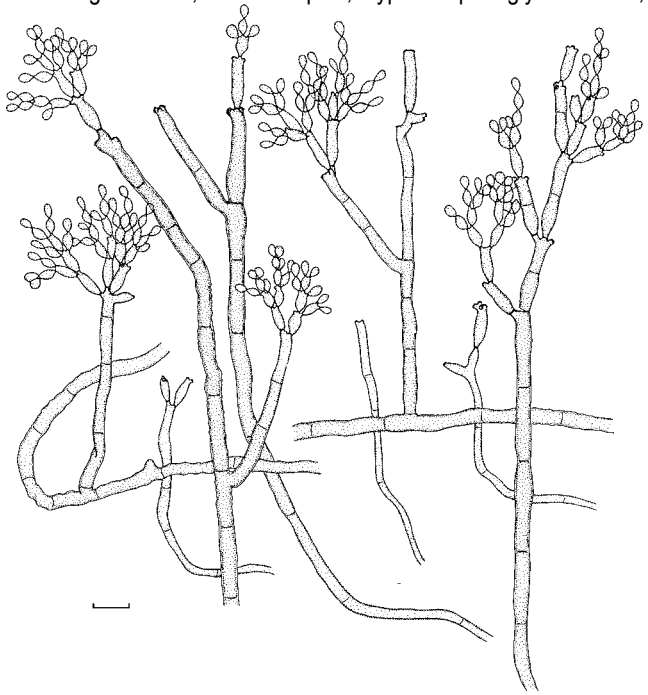


**Fig. 239.** *Cladosporium phyllactiniicola* (CBS 126352). Macro- and micronematous conidiophores, mycelium and conidial chains *in vitro*. Scale bar = 10 µm. K. Bensch *del*.

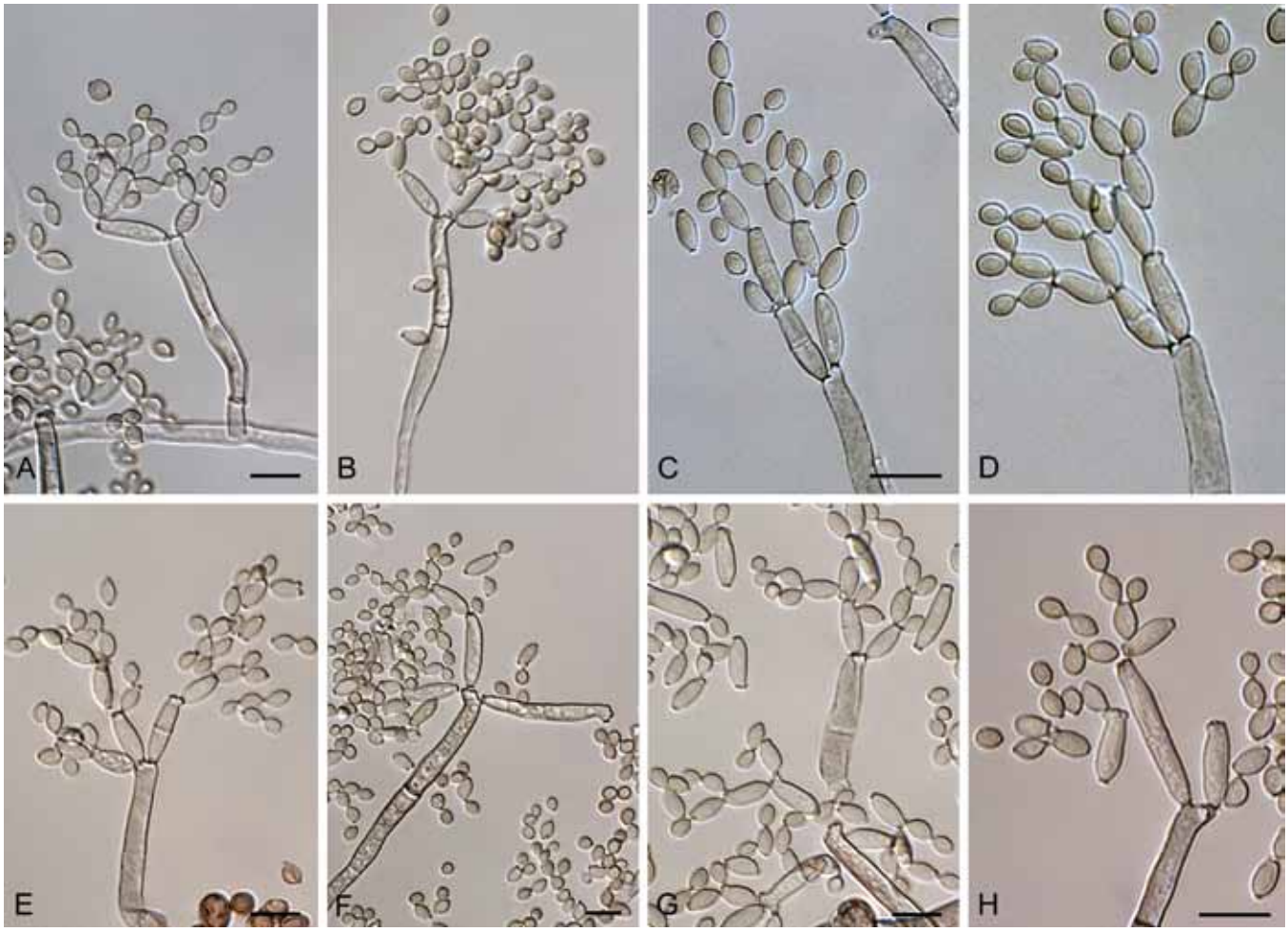



**Fig. 240.** *Cladosporium phyllactiniicola* (CBS 126352). A–H. Macronematous conidiophores and conidial chains. Scale bars = 10 µm.

1−5(−6) µm wide, septate, not constricted at septa, sometimes swollen, subhyaline to pale brown, minutely verruculose to irregularly rough-walled, especially at the base of conidiophores, sometimes forming ropes, often irregular in outline. *Conidiophores* macro-and micronematous, arising laterally and terminally from plagiotropous and ascending hyphae, erect, straight to slightly flexuous. *Macronematous and semimacronematous conidiophores* cylindrical-oblong, non-nodulose, sometimes geniculate towards the apex, unbranched or once branched, 6−105(−120) × 2.5−5(−6) µm, 0−6(−7)-septate, occasionally slightly constricted at septa, pale to pale medium brown or olivaceous-brown, smooth or almost so, walls unthickened in the younger conidiophores, thickened in the older ones, sometimes slightly attenuated towards the apex. *Conidiogenous cells* integrated, mainly terminal, cylindrical-oblong, sometimes slightly geniculate, 6−25 µm long, with 2−4 conspicuous, subdenticulate to denticulate loci, sometimes forming small clusters or situated on lateral shoulders formed due to sympodial proliferation or on small lateral proliferations, loci protuberant, 1−2 µm diam, thickened and darkened-refractive. *Micronematous conidiophores* narrowly cylindrical-oblong to mostly filiform, unbranched, non-geniculate and non-nodulose, often only as short lateral outgrowths of hyphae, 8−40 × 2−2.5 µm, with few septa, subhyaline, smooth, walls unthickened. *Conidiogenous cells* integrated, terminal, 7−15 µm long, with a single locus or up to three apical loci, 1−1.2 µm diam. *Ramoconidia* occasionally formed, up to 28 µm long, 3.5−4 µm wide, base about 3 µm wide. *Conidia* catenate, in branched chains, branching in all directions, up to four conidia in the unbranched terminal part, straight, small terminal conidia subglobose to obovoid, 3−6(−7) × 2−4 µm (av. ± SD: 4.2 ± 1.4 × 2.8 ± 0.8), aseptate, attenuated towards the base, broadly rounded at the apex, intercalary conidia limoniform to ellipsoid-ovoid, 5−10 × 3−4(−4.5) (av. ± SD: 6.2 ± 1.1 × 3.4 ± 0.6), 0(−1)-septate, secondary ramoconidia limoniform to usually narrowly to broadly ellipsoid-ovoid to subcylindrical, 5−17(−24) × (2−)3−4.5 µm (av. ± SD: 11.8 ± 4.2 × 3.7 ± 0.7), conidia formed by micronematous and semimacronematous conidiophores shorter and narrower, 0−1(−2)-septate, mainly aseptate, not constricted at septa, subhyaline to pale brown or pale olivaceous-brown, smooth or almost so to finely asperulate, walls unthickened to slightly thickened, often almost not attenuated towards apex and base, hila conspicuous, subdenticulate to denticulate, 0.5−2 µm diam, thickened and darkened-refractive; microcyclic conidiogenesis not observed.

*Culture characteristics*: Colonies on PDA olivaceous-grey to iron-grey, smoke-grey to pale olivaceous-grey due to aerial mycelium, reverse leaden-grey, felty-woolly, margin narrow, white, somewhat feathery, aerial mycelium sparse to abundant, felty, high, sometimes few small, not very prominent exudates, formed, sporulating. Colonies on MEA olivaceous-grey surface and reverse or grey-olivaceous to greenish grey on surface, with patches of white or smoke-grey due to dense abundant aerial mycelium, fluffy, woolly, margin narrow, white, glabrous to somewhat feathery, greenish olivaceous at margins due to profuse sporulation, wrinkled, sometimes radially furrowed, without exudates, sporulating. Colonies on OA olivaceous-grey to grey-olivaceous or olivaceous,

whitish to smoke-grey due to aerial mycelium, reverse leaden-grey, olivaceous-grey to iron-grey, margin narrow, white, glabrous, aerial mycelium absent, diffuse to dense, low to high, fluffy to felty-woolly, without prominent exudates, sporulating.

*Substrate and distribution*: Mycophilic, occurring on chasmothecia of *Phyllactinia guttata*; USA.

*Notes*: *Cladosporium phyllactiniicola*, which was isolated from ascomata of a powdery mildew, is morphologically comparable with *C. uredinicola*, also known to occur on hosts of the *Erysiphales* (Morgan-Jones & McKemy 1990, Heuchert *et al.* 2005), but genetically quite distinct (see Bensch *et al.* 2010, fig. 1, part a *vs.* b) and morphologically easily separable by its longer conidiophores, longer, 0−2-septate intercalary conidia and longer, 0−3(−5)-septate secondary ramoconidia. *Cladosporium exile*, also isolated from chasmothecia of *Phyllactinia guttata* and comparable with *C. phyllactiniicola*, is morphologically clearly distingusihed by having somewhat narrower conidiophores, narrower terminal and intercalary conidia, 2−3 µm wide, and longer and narrower secondary ramoconidia, 7−25(−35) × 2.5−3.5(−4) µm.

**119. *Cladosporium phyllophilum*** McAlpine, Agric. Gaz. New South Wales 7: 153. 1896. Figs 241–243.

*Lectotype* (designated by Heuchert *et al*. 2005): **Australia**, Victoria, Armadale, on leaves and twigs of *Prunus persica* (= *Persica vulgaris*) (*Rosaceae*) infected with and deformed by *Taphrina deformans* (= *Exoascus deformans*), 16 Feb. 1896, D. McAlpine (VPRI 2490). *Epitype* (designated in Bensch *et al.* 2010): **Germany**, Sachsen-Anhalt, Halle (Saale), botanical garden, isolated from fruits of *Prunus cerasus* infected with *Taphrina* sp., 2004, K. Schubert (CBS H-20444). *Ex-type culture*: CBS 125992 = CPC 11333.

= *Cladosporium exoasci* Ellis & Barthol., in Shear, Fungi Columb., Cent. XV, No. 1493. 1901, *nom. nud*. [syntypes: B 700006330, NY].
= *Cladosporium exoasci* Lindau, in Rabenhorst, Krypt.-Fl., ed. 2, 1(8): 808. 1907. [lectotype (designated by Heuchert *et al*. 2005): Jaap, Fungi Sel. Exs. 248 (B 700006337); isolectotypes: Jaap, Fungi Sel. Exs. 248, *e.g.* HAL].

*Lit*.: McAlpine (1902: 100), Saccardo (1906: 575, 1913a: 1370), Lindau (1910: 796), Braun (2001: 53–56), Heuchert *et al*. (2005: 36–40), Bensch *et al.* (2010: 69–71).
*Ill*.: McAlpine (1902: figs 87–88), Braun (2001: 55, fig. 1), Heuchert *et al*. (2005: 37–38, figs 13–14, pl. 2, fig. 12), Bensch *et al.* (2010: 70, fig. 59).
*Exs*.: Braun, Fungi Sel. Exs. 50, 51, 80; Jaap, Fungi Sel. Exs. 248; Petrak, Fl. Bohem. Morav. Exs. Pilze 556; Shear, Fungi Columb. 1493; Sydow, Mycoth. Germ. 1780; Triebel, Microf. Exs. 534.

*In vivo*: *Colonies* on fruits, leaves, rarely also twigs, usually on deformations caused by *Taphrina* spp., olivaceous-brown to dark brown, occasionally yellowish brown or greyish olivaceous, loose to dense, confluent, caespitose, effuse, velvety. *Mycelium* immersed and external, superficial; hyphae creeping, interwoven, branched, 2–7(–10) µm wide, cells 4–15 µm long, septate, often constricted at the septa, with swellings, olivaceous-brown or pale brown, occasionally subhyaline. *Stromata* diffuse, immersed, loose to dense, confluent, composed of swollen hyphal cells, subglobose,

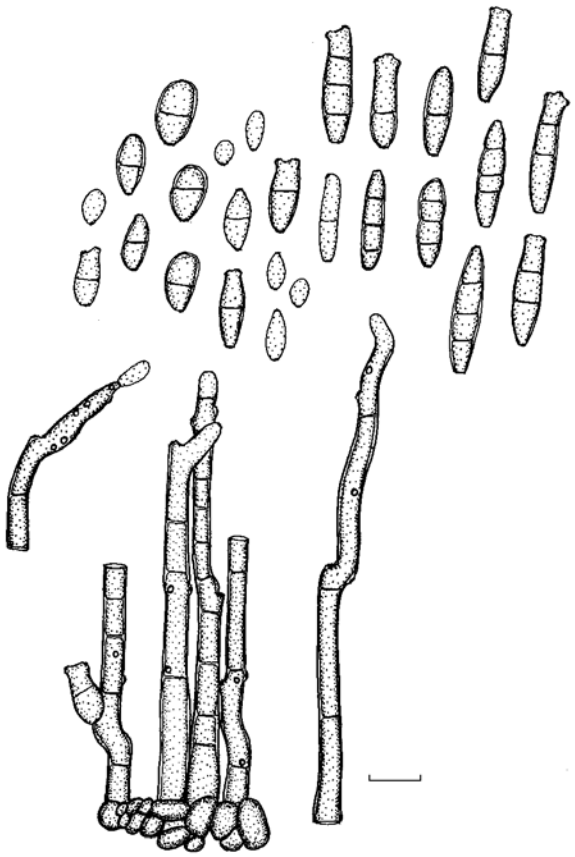


**Fig. 241.** *Cladosporium phyllophilum* (VPRI 2490). Erect conidiophores arising from stromata, conidiogenous cells, ramoconidia and conidia *in vivo*. Scale bar = 10 µm. B. Heuchert *del*.

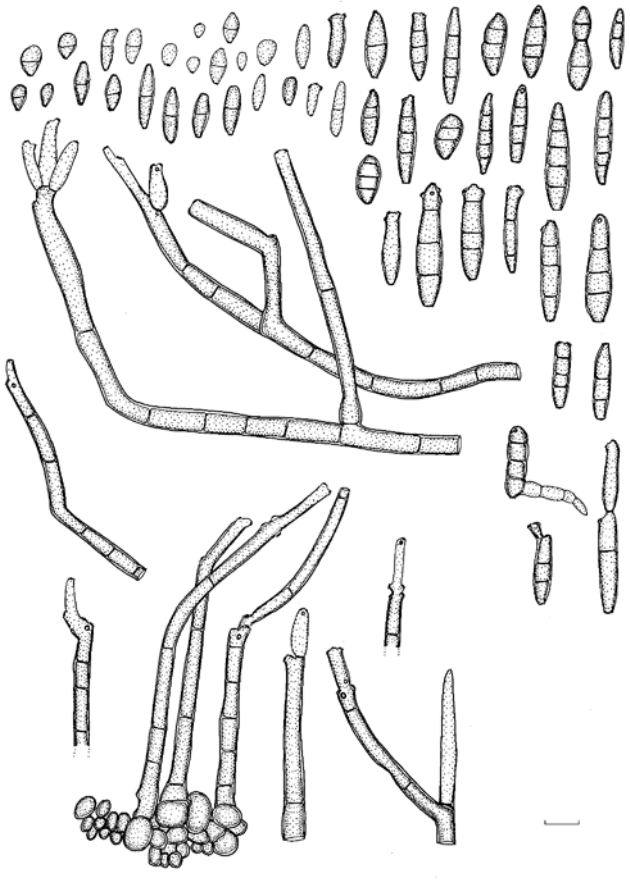


**Fig. 242.** *Cladosporium phyllophilum* (B 700006334 and B 700006335, lectoparatypes of *C. exoasci* Lindau). Erect conidiophores arising from stromata, creeping conidiophores, conidiogenous cells, ramoconidia and conidia. Scale bar = 10 µm. B. Heuchert *del*.

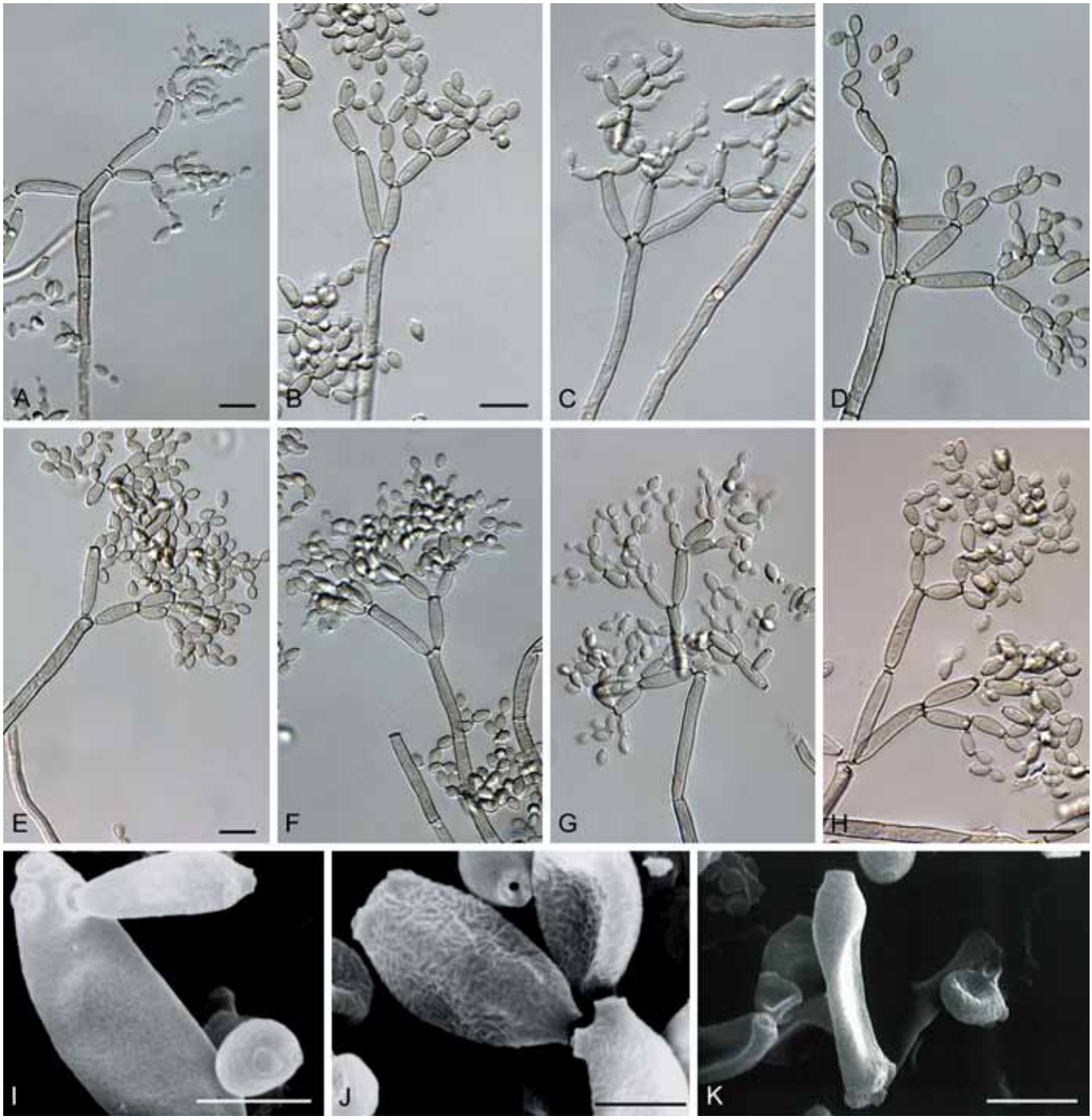



**Fig. 243.** *Cladosporium phyllophilum* (CBS 125992). A–H. Macronematous conidiophores and conidial chains *in vitro*. I–K. SEM photos showing the smooth or somewhat shrivelling surface ornamentation of conidia and details of the coronate scar structure. Scale bars = 5 (I–K), 10 (A–H) µm.

2–13 µm diam, olivaceous to medium brown, smooth, walls slightly thickened. *Conidiophores* solitary, arising from hyphae or swollen hyphal cells, or in loose to dense groups, arising from stromata, erect to decumbent, creeping, straight to curved, geniculate-sinuous, simple to often multibranched, (6–)20–233(–250) × 3–8 µm, occasionally even longer, sometimes swollen at the base, 7–11 µm wide, densely 4–14-septate, cells 10–15 µm long, usually not constricted at the septa, olivaceous to medium brown, occasionally paler, usually paler towards the apex, sometimes subhyaline at the tip, smooth to faintly rough-walled, wall slightly thickened, above all near the base, but thin-walled towards the apex, rarely with enterogenous, monopodial proliferation. *Conidiogenous cells* integrated, terminal and intercalary, occasionally pleurogenous, subcylindrical, 7–63 µm long, polyblastic, proliferation sympodial, conidiogenous loci protuberant, 1.5–3 µm diam, thickened, darkened. *Ramoconidia* clavate, ellipsoid, subcylindrical, fusiform, 13–35(–38) × 3–10 µm, (0–)1–5(–6)-septate, occasionally constricted at the septa, base truncate to convex, 2–3.5 µm wide, without a cladosporioid hilum. *Conidia* usually in branched chains, straight to slightly curved, subglobose, ellipsoid-ovoid, obovoid, 3.5–18(–26) × 2–6(–7) µm, 0–1-septate, usually without any constrictions, subhyaline to pale brown, smooth, walls unthickened to slightly thickened, apex rounded to somewhat attenuated, with up to five hila, base truncate to convex, occasionally slightly attenuated, hila protuberant, (0.5–)1–2.5 µm diam, thickened and darkened; microcyclic conidiogenesis occurring.

*In vitro*: *Mycelium* immersed to superficial; sparingly branched, 1−4 µm wide, septate, not constricted at septa, pale, almost hyaline to olivaceous-brown or brown, smooth to irregularly

rough-walled, verruculose or verrucose with large wart-like structures, walls thin or slightly thickened. *Conidiophores* semimacronematous or macronematous, solitary, arising laterally or terminally from plagiotropous or ascending hyphae. *Macronematous conidiophores* erect to decumbent, straight or flexuous, cylindrical-oblong, unbranched or branched, usually once, sometimes twice or up to four times, branches often start as short lateral outgrowth just below a septum, becoming longer with age, up to 65(−90) µm long, often at an angle of 45°, sometimes up to 90°, neither nodulose nor geniculate, 15−180 × 4−5(–6) µm, pluriseptate, not constricted at septa, pale olivaceous to medium olivaceous-brown or brown, smooth to sometimes asperulate, especially towards the apex, walls somewhat thickened, up to 1 µm wide, base sometimes also covered by wart-like structures. *Conidiogenous cells* integrated, terminal or intercalary, cylindrical-oblong, sometimes slightly geniculate towards the apex, 13−41 µm long, mostly with up to three or four subdenticulate protuberant loci, sitting close together at the apex, 1.5−2 µm diam, thickened and darkened-refractive. *Semimacronematous conidiophores* paler, smaller and narrower, unbranched or branched once or twice, 15−100 × 2−3 µm, septate, conidiogenous cells 7−19 µm long, with up to seven distal scars, subdenticulate, crowded at the apex, hila 1−1.5 µm diam. *Ramoconidia* occasionally formed (hardly distinguishable from secondary ramoconidia), cylindrical-oblong, 17−33 × 4 µm, aseptate, sometimes 1-septate, pale olivaceous, smooth, walls unthickened or almost so, base truncate. *Conidia* numerous, catenate, in branched chains, branching in all directions, 1−3 conidia in the terminal unbranched part of the chain, small terminal conidia obovoid to ovoid, 3−7 × 2−3 µm (av. ± SD: 4.8 ± 1.4 × 2.5 ± 0.3), aseptate, hila 0.5−0.8 µm diam, intercalary conidia ovoid, ellipsoid-ovoid, 6−13 × 3−4 µm (av. ± SD: 8.9 ± 2.1 × 3.2 ± 0.3), aseptate, with up to 4(−5) distal hila, hila 0.8−1.2 µm diam, secondary ramoconidia ellipsoid, subcylindrical to cylindrical, 7−32 × 2.5−4(−5) µm (av. ± SD: 18.7 ± 7.2 × 3.7 ± 0.6), 0(−2)-septate, not constricted at septa, subhyaline, pale olivaceous, smooth or almost so, with 1−4 distal hila, walls unthickened, hila 1−2.2 µm diam, thickened and darkened-refractive; conidia formed by semimacronematous conidiophores shorter, paler and narrower.

*Culture characteristics*: Colonies on PDA attaining 41−46 mm diam after 1 mo, grey-olivaceous to olivaceous, reverse iron-grey to greyish blue, powdery to felty, margin white, narrow, glabrous, regular, aerial mycelium diffuse to loose, fluffy, mainly in colony centre, growth flat, without prominent exudates, sporulation profuse. Colonies on MEA reaching 49−52 mm diam after 1 mo, smoke-grey to olivaceous-grey or brownish, whitish towards margins, reverse olivaceous-grey, velvety to woolly, margin white, glabrous, radially furrowed, aerial mycelium sparse to more abundantly formed, fluffy, few prominent exudates formed, sporulation profuse. Colonies on OA reaching 44−49 mm diam after 1 mo, grey-olivaceous to olivaceous or olivaceous-grey, reverse leaden-black to leaden-grey, powdery to fluffy, margin white, narrow, glabrous, aerial mycelium sparse, diffuse to more abundantly formed in colony centre, high, fluffy-felty, without prominent exudates, sporulation profuse.

*Substrate and distribution*: On species of *Taphrina*, including *T. cerasi*, *T. communis*, *T. deformans* and *T. pruni* on *Prunus s. lat*. species; Asia (Armenia, Georgia, Kazakhstan, Uzbekistan), Australia, Europe (Czech Republic, France, Germany, Romania, Switzerland), North America (USA) – on *Taphrina cerasi* on *Prunus cerasus* (Germany, Kazakhstan), *T. communis* on *P. americana* (USA, CO), *T. deformans* on *P. persica* (Australia, Germany, Uzbekistan), *T. pruni* on *P. americana* (USA, WI ?), *T. pruni* on *P. avium* (Switzerland), *T. pruni* on *P. cerasus* (Germany), *T. pruni* on *P. domestica* (Germany, Kazakhstan), *T. pruni* on *Prunus* sp. (Armenia, France, Czech Republic), ?*Taphrina* sp. on *Malus* ×*zumi* (Germany), *Taphrina* sp. on *P. armeniaca* (Australia), *Taphrina* sp. on *P. persica* (Australia), *Taphrina* sp. on *P. spinosa* (Germany, Romania), *Prunus avium*, *P. cerasus* and *P. domestica* (Lithuania), host unknown (Georgia). On *Teratosphaeria proteae-arboreae*; South Africa.

*Additional specimens examined*: **Czech Republic**, Mähren, Eisgrub, Grenzteiche, on *Taphrina pruni* (*Taphrinaceae*), 7 Jun. 1911, H. Zimmermann, Petrak, Fl. Bohem. Morav. Exs. Pilze 556 (HBG, M-0057605). **France**, Lothringen, Forbach, Kreuzberg, on *T. pruni* on *Prunus domestica* (*Rosaceae*), 25 Jun. 1916, A. Ludwig (B 700006333). **Germany**, Bavaria, on *P. spinosa*, Jun. 1909, A. Vill (HBG); on *T. deformans* on *P. persica*, Jun. 1909, A. Vill (HBG); Gerolzhofen, on *T. pruni* on *P. domestica*, 7 Jul. 1909, A. Vill (HBG); Kr. Freising, Freising/Weihenstephan, on *Taphrina* sp. on *Prunus* sp., Jun. 1918, Bons (B 700006336); Brandenburg, Kr. Prignitz, Triglitz, on *T. pruni* on *P. domestica*, 1 Oct. 1904, O. Jaap (B 700006335); Rangsdorf near Zossen, on *T. cerasi* on *P. cerasus*, 24 Jun. 1919, H. Sydow, Sydow, Mycoth. Germ. 1780 (PH); He-Nassau, Dillkreis, Donsbach, on *T. pruni* on *P. domestica*, 21 Jun. 1936, A. Ludwig (B 700006331); Rhön, near Gersfeld, *ca.* 500 m, on *T. pruni* (= *Exoascus rostrupianus*) on *P. spinosa*, 31 Jul. 1906, O. Jaap, Jaap, Fungi Sel. Exs. 248 (B 700006327, **lectotype** of *C. exoasci* Lindau, isolectotypes: Jaap, Fungi Sel. Exs. 248); Sachsen, Kirchberg, Alte Hartmannsdorfer Str., garden Bensch, on *T. pruni* on *P. domestica*, 25 Jul. 2004, K. Schubert (HAL) and Braun, Fungi Sel. Exs. 50; Sachsen-Anhalt, Halle, botanical garden, on *T. pruni* on *P. cerasus*, 11 Jun. 2004, B. Heuchert (HAL 1823); on ?*Taphrina* sp. on *Malus* ×*zumi*, 14 Jun. 2004, U. Braun, Braun, Fungi Sel. Exs. 51 (HAL); Osterhausen, Freiplatz 14, in a garden, on *Taphrina* sp. on *Prunus padus*, 9 Jul. 2006, K. Schubert, U. Braun, Fungi Sel. Exs. 80 (HAL). **South Africa**, Western Cape Province, Jonkershoek Nature Reserve, on *Teratosphaeria proteae-arboreae* (*Teratosphaeriaceae*) on *Protea nitida* [= *P. arborea*] (*Proteaceae*), 30 Mar. 2007, P.W. Crous, CPC 13873. **Switzerland**, Kt. Bern, Berner Oberland, Kandersteg, on *Taphrina pruni* on *Prunus avium*, 19 Jul. 1905, O. Jaap, Jaap, Fl. Schweiz 16 (B 700006334, **syntype** of *C. exoasci* Lindau). **USA**, Colorado, Walsenberg, on *T. communis* on *P. americana*, Jul. 1900, C.L. Shear, Shear, Fungi Columb. 1493 (B 700006330, **syntype** of *C. exoasci* Ellis & Barthol.); Pope (WI ?), on *T. pruni* on *P. americana*, 1 Jul. 1929 (NY)

*Notes*: *Cladosporium phyllophilum* occurs on woody host plants usually associated with *Taphrina* species. A South African strain isolated from *Teratosphaeria proteae-arboreae* clustered together with the epitype [on ACT the two strains are 98 % identical (217/220 bases), whereas on TEF only 96 % (374/387 bases and 4 gaps) (see Bensch *et al.* 2010)], which is, however, morphologically slightly different by its shorter, mostly unbranched conidiophores and shorter, less-septate, smooth to asperulate conidia. The South African fungus is only tentatively assigned to *C. phyllophilum*. It possibly represents a cryptic species, but additional collections are necessary to prove its identity. *Cladosporium phyllophilum* is phylogenetically close to *C. licheniphilum* and *C. phyllactiniicola* (see Bensch *et al.* 2010, fig. 1), but morphologically clearly separable by several differences in the characters of conidiophores and conidia (see Bensch *et al.* 2010). Heuchert *et al.* (2005) pointed out that *C. phyllophilum* represents the oldest name for this species that was previously usually known as *C. exoasci*. In the type collection of *C. exoasci* (B 700006336), with relatively short [14−99 × 3−5(−6) µm], unbranched, non-decumbent conidiophores, the otherwise characteristic dimorphism of the conidia could not be observed, and typical ramoconidia were lacking, but the designated epitype agrees well with the description given in Braun (2001) and Heuchert *et al.* (2005), although conidiophore and conidial measurements are slightly narrower *in vitro* than on the natural host.

A collection recently found on fruits of the unusual host *Malus* ×*zumi* in Germany (HAL) is morphologically indistinguishable from *C. phyllophilum*. Infections of the fruits by *Taphrina* could not

be proven with certainty. Valiuškaitė (2002) recorded *C. exoasci* from Lithuania on plum, sweet and sour cherry, but without any reference to *Taphrina*.

**120. *Cladosporium pini-ponderosae*** K. Schub., Gresl. & Crous, Persoonia 22: 118. 2009. Figs 244–246.

*Holotype*: **Argentina**, Neuquén, Aluminé, Lagos Marmol property, 39°22'52"S, 71°5'38"W, on needles of *Pinus ponderosa* (*Pinaceae*), Jan. 2005, A. Greslebin (CBS H-20210). *Isotypes*: BAFC 51696, HAL 2322 F. *Ex-type cultures*: CBS 124456 = CIEFAP 322 = CPC 13980.

*Ill.*: Schubert *et al.* (2009: 118–119, figs 7–9).

*In vivo*: Isolated from needles becoming necrotic from the top to the base, no discrete leaf lesions formed. *Colonies* punctiform, sometimes coalescing, dark brown, distributed along the stomatal lines in upper and under sides of the needles but more abundant on the lower side. *Mycelium* internal, immersed, but also external, superficial, composed of septate, smooth, subhyaline to pale brown, thin to slightly thick-walled hyphae, 2.5–6(–8) µm diam, hyphae somewhat constricted at septa, often swollen, forming substomatal, pseudoparenchymatous stromata, small to extended, 50–135 µm diam or even larger, several layers deep, composed of thick-walled, olivaceous to brown, rounded cells, 8–15 µm diam. *Conidiophores* in small to large dense fascicles, arising from stromata, emerging through stomata, subcylindrical, sinuous, slightly geniculate due to sympodial proliferation and slightly tapered towards the apices, mostly unbranched, rarely branched, 12–70(–100) × 3.5–8 µm, 0–3-septate, rarely forming more septa, pale to dark olivaceous-brown, paler towards apices, walls brown, thick-walled, often 2-layered (two distinct wall layers visible), darkened and thickened towards the base, often enteroblastically proliferating, once or twice. *Conidiogenous cells* integrated, mostly terminal but also intercalary, subhyaline to pale brown, geniculate, polyblastic, proliferation sympodial with several conidiogenous loci situated terminally or laterally on small shoulders, cicatrised, loci protuberant, denticulate, thickened and darkened-refractive. *Conidia* single or catenate, in unbranched or branched chains, ovoid, ellipsoid to subcylindrical, 5–20(–31) × (3–)4–8(–9) µm (av. ± SD: 13.1 ± 5.9 × 5.7 ± 1.5), 0–3-septate, pale brown to brown, slightly thick-walled, almost smooth to usually verruculose, sometimes verrucose, hila conspicuous, 1–2 µm diam, thickened and darkened-refractive; microcyclic conidiogenesis observed.

*In vitro*: *Mycelium* immersed and superficial; hyphae unbranched or loosely branched, 1.5–5(–8) µm wide, septate, without any constrictions or swellings, subhyaline to pale greyish brown or dingy-brown, smooth to irregularly rough-walled to verruculose or walls covered by polysaccharide-like material, walls unthickened or only slightly thickened. *Conidiophores* macronematous, arising terminally from ascending or laterally from plagiotropous hyphae, solitary, sometimes in pairs of two, erect, straight or slightly flexuous, subcylindrical to cylindrical-oblong, sometimes slightly geniculate towards the apex, once or twice, unbranched, sometimes once branched, rarely twice, non-nodulose, 14–190 × (2.5–)3.5–5.5 µm, septate, not constricted at septa, branches as short lateral outgrowths just below a septum, later becoming longer, greyish brown or dingy brown, sometimes paler towards the apex, almost smooth to minutely verruculose to irregularly rough-walled, walls thickened, 0.5–1(–1.5) µm wide, sometimes even appearing to be 2-layered (two distinct wall layers visible), not or only very slightly attenuated towards the apex. *Conidiogenous cells* integrated, mainly terminal, sometimes intercalary, subcylindrical to cylindrical-oblong, sometimes slightly geniculate towards the apex, 14–45 µm long, conidiogenous loci mostly crowded at the apex, (1–)2–4(–6) loci, broadly truncate, central convex dome not very prominent, 1.5–2.5 µm diam, somewhat thickened and darkened-

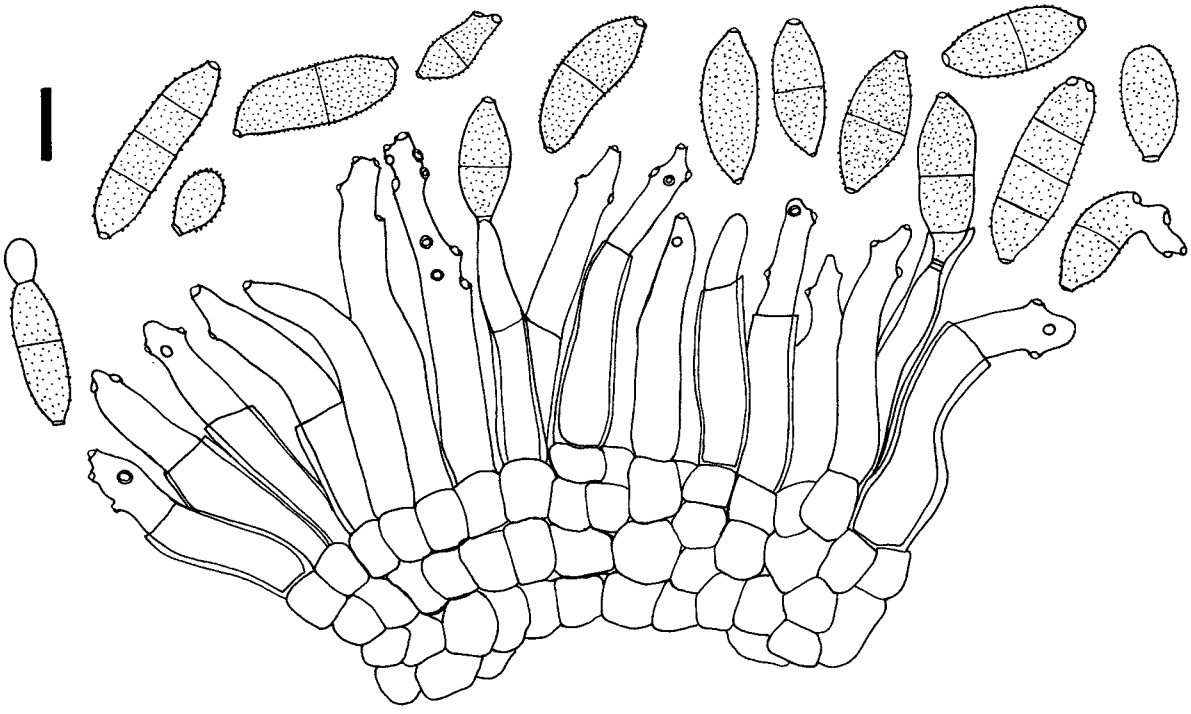


**Fig. 244.** *Cladosporium pini-ponderosae* (BAFC 51696). Fascicle of conidiophores arising from extended stromata and conidia *in vivo*. Scale bar = 10 µm. A. Greslebin *del*.

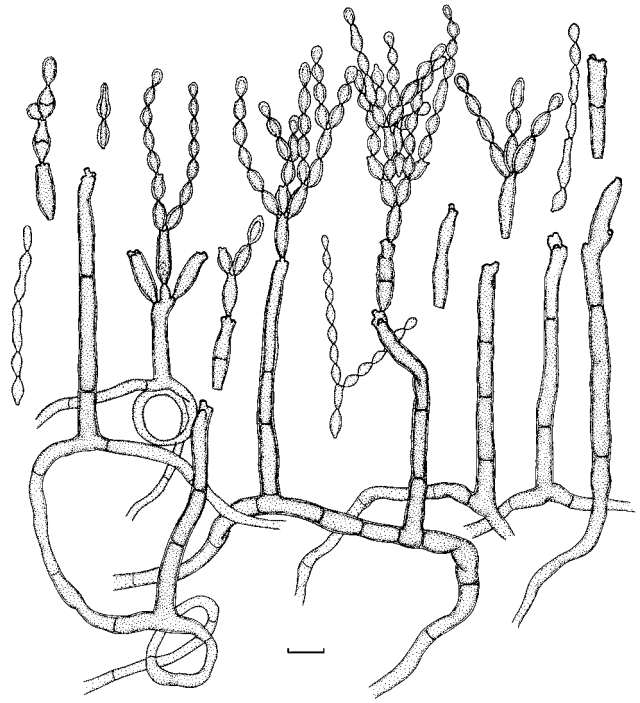


**Fig. 245.** *Cladosporium pini-ponderosae* (CBS 124456 = CPC 13980). Conidiophores and conidia *in vitro*. Scale bar = 10 µm. K. Bensch *del*.

refractive. *Ramoconidia* cylindrical-oblong, not attenuated towards the base, 20–45 × 3.5–5(–5.5) µm, 0–1(–3)-septate, not constricted, concolorous with the tips of conidiophores, walls thickened, base unthickened, broadly truncate. *Conidia* catenate, in unbranched or branched chains, branching in all directions, up to nine conidia in the terminal chain, small terminal conidia obovoid to ellipsoid-ovoid, 5–6 × 2.5–4(–4.5) µm (av. ± SD: 5.5 ± 0.5 × 3.3 ± 0.6), broadly rounded at the apex, slightly attenuated towards the base, aseptate, hila 0.5–1(–1.2) µm diam, intercalary conidia ellipsoid-ovoid, fusiform, sometimes rostrate towards the distal end, attenuated towards apex and base, 6–15(–22) × 3–4(–5) µm (av. ± SD: 9.9 ± 3.8 × 3.8 ± 0.5), aseptate, rarely 1-septate, mostly with a single but sometimes up to three distal hila, hila 0.8–1.5 µm diam, secondary ramoconidia fusiform to subcylindrical, 10–30(–36) × 3.5–5 µm (av. ± SD: 20.3 ± 6.4 × 4.3 ± 0.4), 0–1(–2)-septate, very rarely 3-septate, not constricted at septa, septa sometimes slightly darkened, becoming somewhat sinuous with age, with up to four distal hila, attenuated towards apex and base, pale to medium greyish brown or dingy brown, small terminal conidia and young conidia subhyaline, verruculose to very irregularly rough-walled, younger conidia almost smooth, walls appear to be very thick-walled, lumen distinct, very pale between inner and outer wall, hila broadly truncate, 0.5–2.5 µm diam, somewhat thickened and darkened-refractive; microcyclic conidiogenesis occurring.

*Culture characteristics*: Colonies on PDA attaining 65–73 mm diam after 1 mo, grey-olivaceous to olivaceous-grey, reverse olivaceous-grey to iron-grey, velvety to powdery, margin white,

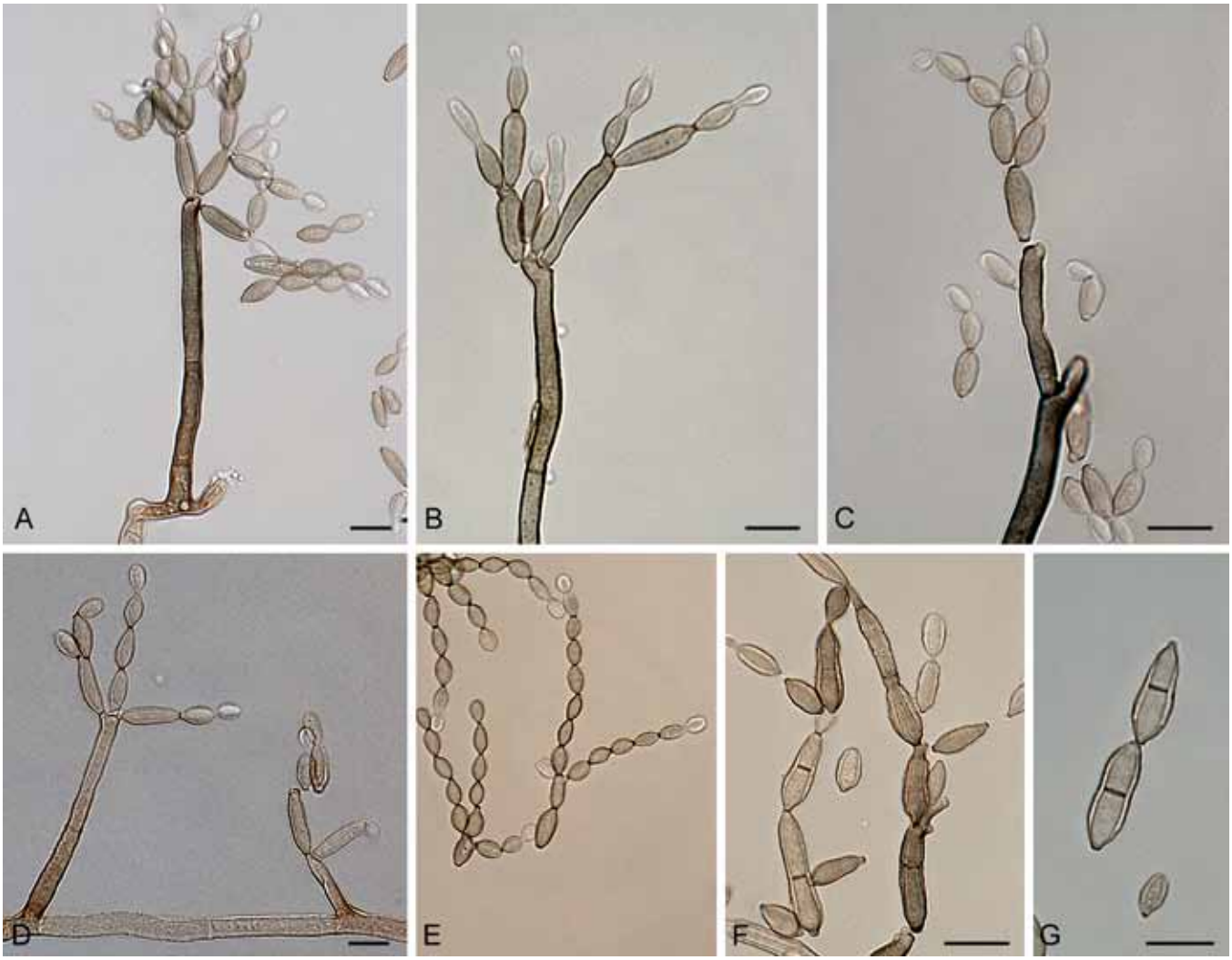



**Fig. 246.** *Cladosporium pini-ponderosae* (CBS 124456 = CPC 13980). A–D. Conidiophores with conidial chains. E–G. Conidia. Scale bars = 10 µm.

narrow, glabrous to feathery, regular, entire edge to slightly undulate, aerial mycelium formed, pale olivaceous-grey, somewhat fluffy, especially in colony centre, growth flat, without conspicuous exudates, sporulation profuse. Colonies on MEA reaching 64–74 mm diam after 1 mo, olivaceous-grey to grey-olivaceous due to profuse sporulation, greenish grey towards the margin, velvety, margin white, narrow, regular, glabrous, radially furrowed, growth flat, often folded, without conspicuous exudates.

*Substrate and distribution*: On *Pinus ponderosa*; Argentina.

*Notes*: *Cladosporium pini-ponderosae* is genetically close to *C. chubutense*, which has also been described from dead and living needles of *Pinus ponderosa* collected in pine plantations in Argentina (Patagonia). ITS data of the two species are almost identical, but ACT and TEF sequence are distinct (see Schubert *et al.* 2009, figs 1, 3, table 3), and *C. chubutense* is distinguished from *C. pini-ponderosae* by forming both macro- and micronematous conidiophores in culture which are slightly to distinctly geniculate towards the apex and somewhat narrower *in vitro* [(1.5–)2.5–4 µm *vs* (2.5–)3.5–5.5 µm in *C. pini-ponderosae*] and conidia with quite distinct surface ornamentation formed in much shorter chains.
*Pinus ponderosa* is not native to Argentina, so the fungus could have been imported with the pine or jumped onto the pine from a different host.

**121. *Cladosporium pipericola*** R.A. Singh & Shankar, Mycopathol. Mycol. Appl. 43(1): 110. 1971, as "*pipericolum*". Figs 247, 248.

*Lectotype* (**designated here**): **India**, Uttar Pradesh, Varanasi, on living leaves of *Piper betle* (*Piperaceae*), 15 Jan. 1965, G. Shankar (IMI 116933). *Isolectotype*: MSP, No. 342.

*Lit.*: David (1988d), Schubert (2005b: 120–122).
*Ill.*: Singh & Shankar (1971: 111, pl. 1, figs 3–4), David (1988d: 1, fig.), Schubert (2005b: 121, fig. 56, pl. 22, figs D–F).

*In vivo*: Leaf spots irregular in shape, 20–100 × 15–30 mm wide, brown, with characteristically zonate ring formation, starting on the lower leaf surface, but eventually affecting both sides. *Colonies* usually hypophyllous, rarely epiphyllous, pale greenish to olivaceous-brown, villose. *Mycelium* external, superficial; hyphae branched, 1–3(–4) µm wide, septate, not constricted at the septa, pale brown, smooth or rarely slightly rough-walled, walls slightly thickened, forming stromata by aggregation. *Stromata* (40–)50–80(–100) diam, composed of more or less isodiametrical brown cells, (5–)7–9.5(–12) µm wide, forming a textura angularis. *Conidiophores* solitary, arising from creeping hyphae, or in small loose groups, arising from stromata, erect, straight to slightly flexuous, unbranched or often branched, at the base and, above all, towards the apex, 15–300 × 2.5–8 µm, septate, not constricted at the septa, pale olivaceous to olivaceous-brown, thick-walled, verruculose and wider at the base, becoming thin, smooth-

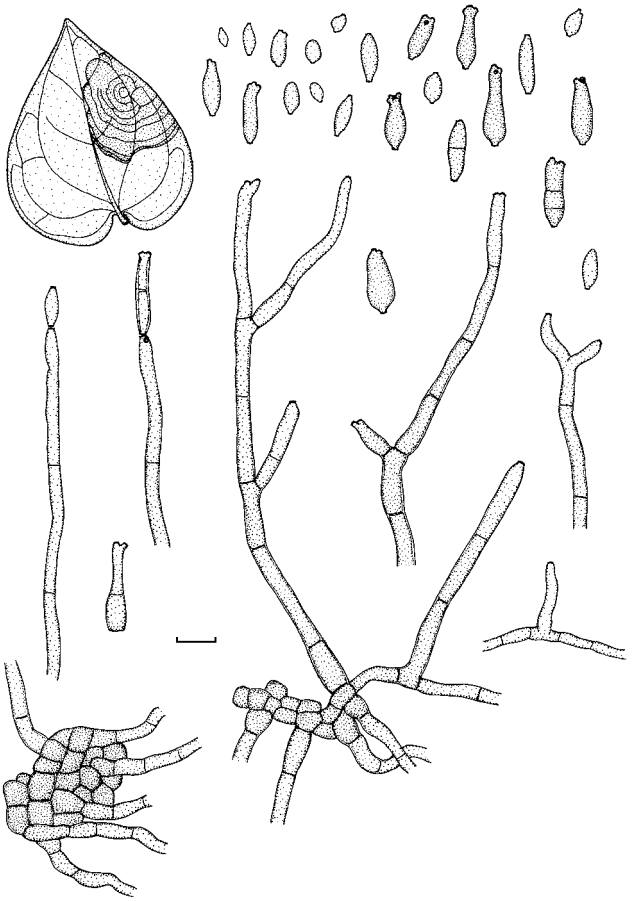


**Fig. 247.** *Cladosporium pipericola* (IMI 116933). Symptoms, stromata (*textura angularis*), conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

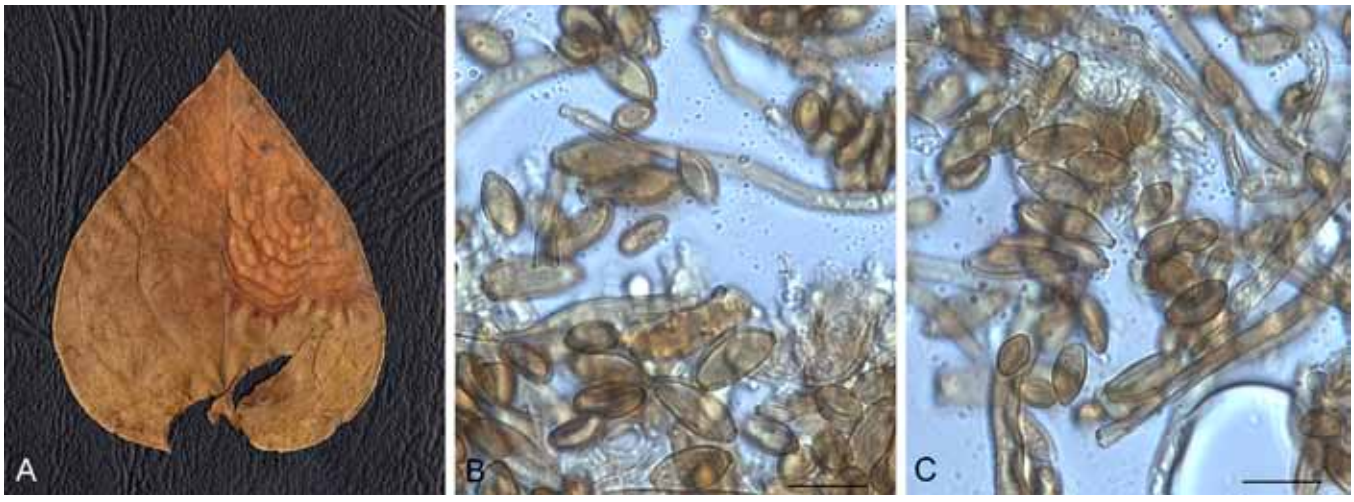



**Fig. 248.** *Cladosporium pipericola* (IMI 116933). A. Symptoms. B, C. Conidiophores and conidia. Scale bars = 10 (B–C) µm.

walled and attenuated towards the apex, sometimes more or less nodulose with small swellings which are not connected with the conidiogenesis. *Conidiogenous cells* integrated, mostly terminal, cylindrical, 14–35 µm long, proliferation sympodial, with a single or only few conidiogenous loci, protuberant, subdenticulate, truncate to slightly convex, 1–2.5 µm diam, thickened, somewhat darkened-refractive. *Conidia* catenate, in branched chains, straight to slightly curved, variable in shape and size, obovoid, ellipsoid, limoniform, fusiform, cylindrical, (3–)4.5–21(–28.5) × (1.5–)3–6.5(–8.5) µm, 0–2(–5)-septate, not constricted at the septa, pale olivaceous-brown to olivaceous-brown, smooth, sometimes distinctly verrucose with age, walls unthickened to slightly thickened, apex rounded or with up to four apical hila, truncate or slightly convex at the base, hila protuberant, 0.5–2(–2.5) µm diam, thickened and somewhat darkened-refractive; microcyclic conidiogenesis not observed.

*Substrate and distribution*: On *Piper betle*; India.

*Notes*: Infection starts at the tips or margins of the leaves and spreads over main parts of the leaf lamina. Lesions develop fast under favourable conditions (cold damp weather) and soon cover the entire leaf surface causing premature defoliation. Infection symptoms initially are evident in December becoming severe in January and February (Singh & Shankar 1971).

*Cladosporium pipericola* is morphologically closely allied to *C. cladosporioides* but differs, in having wider, often branched and sometimes nodulose conidiophores and 0–2(–5)-septate, somewhat wider conidia.

**122. *Cladosporium pisicola*** W.C. Snyder, Phytopathology 24: 899. 1934. Fig. 249.

≡ *Cladosporium cladosporioides* f. sp. *pisicola* (W.C. Snyder) G.A. de Vries, Contr. Knowl. Genus *Cladosporium*: 61. 1952.

*Neotype* (**designated here**): **USA**, California, Berkeley, on pods of *Pisum sativum* (*Fabaceae*), 20 Oct. 1940, W.C. Snyder, herb. Dearness 2395 (DAOM).

*Lit.*: Farr *et al*. (1989: 629), Bensch *et al.* (2010: 34).
*Ill.*: Snyder (1934: 893, fig. 2).

*In vivo*: Lesions on living pods and seeds, subcircular in outline to irregularly shaped, occasionally oblong, 1–8 mm diam, brown, later with paler centre, pale brown, straw-coloured, dingy grey, margin darker brown. *Colonies* confined to lesions, effuse, brown. *Mycelium* internal. *Stromata* lacking. *Conidiophores* solitary, occasionally loosely grouped, arising from internal hyphae or small hyphal aggregations, erect, straight, subcylindrical to distinctly geniculate-sinuous, occasionally branched, 20–180 × 3–5(–7) µm, continuous to usually septate, pale olivaceous to olivaceous-brown, smooth, wall thin, < 1 µm. *Conidiogenous cells* integrated, terminal and intercalary, 10–30 µm long, often distinctly geniculate, conidiogenous loci few to usually numerous, often densely aggregated, 1–2.5 µm diam, sometimes protuberant, subdenticulate. *Conidia* in simple or branched chains, with up to six terminal hila, smaller conidia 3–10 × 2–5 µm, 0(–1)-septate, secondary ramoconidia 8–26 × 3–5(–7) µm, 0–1(–3)-septate, pale olivaceous to olivaceous-brown, smooth, thin-walled, < 1 µm, hila 1–2 µm diam, often somewhat protuberant; microcyclic conidiogenesis not observed.

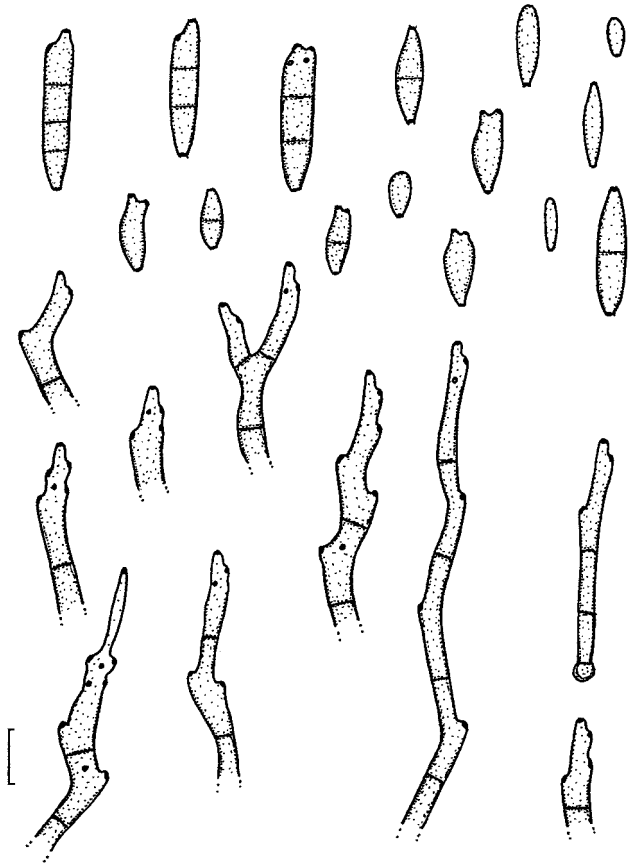


**Fig. 249.** *Cladosporium pisicola* (DAOM). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. U. Braun *del*.

*Substrates and distribution*: On *Pisum sativum*; North America (USA, California).

*Additional specimens examined*: **USA**, California, Berkeley, on seeds of *Pisum sativum*, 20 Jul. 1940, W.C. Snyder, herb. Dearness 2395 (DAOM); isolated from infected pods of *Pisum sativum*, Dec. 1940, W.C. Snyder (BPI 427394, 427395; DAOM 41245; WIS); Santa Cruz Co., Watsonville, on pods of *Pisum sativum*, 22 Nov. 1943, Ramsey & Cameron 253 (BPI 427396).

*Notes*: Snyder (1934), who introduced the name *C. pisicola* for a plant pathogenic leaf, stem and pod spot disease, confused this species with *C. cladosporioides*, which is rather common on the phyllosphere of pea. Therefore, it is not surprising that several original strains, including CBS 144.35, which is an authentic culture of W.C. Snyder from 1935, proved to belong to *C. cladosporioides* based on morphology and molecular sequence analyses. This is also the reason for the decision of de Vries (1952) who reduced *C. pisicola* to synonymy with *C. cladosporioides*. *Cladosporium pisicola* was based on heterogeneous elements, *i.e.* cultures of *C. cladosporioides* and *in vivo* material with a morphologically distinct leaf spotting *Cladosporium*. Thus, the application of the name *C. pisicola* depends on its typification. Since *C. pisicola* is a leaf-spotting, obviously biotrophic fungus, morphologically clearly distinct from *C. cladosporioides* by its distinctly sympodially proliferating, geniculate conidiophores with terminal as well as intercalary conidiogenous cells and numerous, often crowded conidiogenous loci, we prefer to keep it as a separate species. Several authentic cultures and samples deposited by W.C. Snyder have been examined, but unfortunately all of them date back to 1935 and 1940 and cannot be considered as type collections since this species was already described in 1934. Therefore, a neotypification is necessary.

Records of *C. pisicola* from South Africa (Doidge *et al*. 1953, Crous *et al*. 2000) are unclear and have to be proven and confirmed.

**123. *Cladosporium polygonati*** M.B. Ellis, More Dematiaceous Hyphomycetes: 338. 1976. Fig. 250.

*Holotype*: **Ireland**, Wicklow, Eniskerry, Bray, Powerscourt, on *Polygonatum* sp. (*Asparagaceae*), Oct. 1965, C.H. Dickson (IMI 116694).

*Lit*.: David (1997: 57–58).
*Ill*.: David (1997: 38, fig. 8 D–G; 56, fig. 16).

*In vivo*: On faded leaves, distinct leaf spots lacking, with diffuse discolorations or with dark spots, mainly caused by dense fruiting. *Colonies* amphigenous, punctiform, brown, loose to dense, scattered over the whole leaf surface. *Mycelium* internal. *Stromata* lacking or only with small aggregations of a few swollen hyphal cells. *Conidiophores* solitary to caespitose, erect, usually strongly nodulose-geniculate, often almost monilioid, often swollen at the conidiogenous cells, unbranched, 80–250(–300) × 5–16 µm, swellings up to 20 µm wide, basal cells also often swollen, pluriseptate, often constricted at the septa, medium to dark brown throughout, wall smooth to faintly rough-walled, wall thickened, 1–2 µm wide, one-layered or occasionally distinctly two-layered, sometimes with a distict lumen giving the cells a seemingly very thick-walled appearance. *Conidiogenous cells* integrated, terminal and occasionally intercalary, 10–50 µm long, with 1–4 conspicuous conidiogenous loci, coronate, 3–4 µm wide and 1.5–2 µm high, somewhat darkened-refractive. *Conidia* solitary or in short, unbranched chains, initially ovate with a swollen base, later broadly ellipsoid-subcylindrical, 30–70 × 15–25 µm, 1–3-septate, often constricted at the septa, olivaceous to pale brown, densely echinulate, wall thin, 1–1.5 µm wide, ends rounded, with a single conspicuous basal hilum or basal and terminal hila, barely protuberant, 3–5 µm diam, somewhat darkened-refractive.

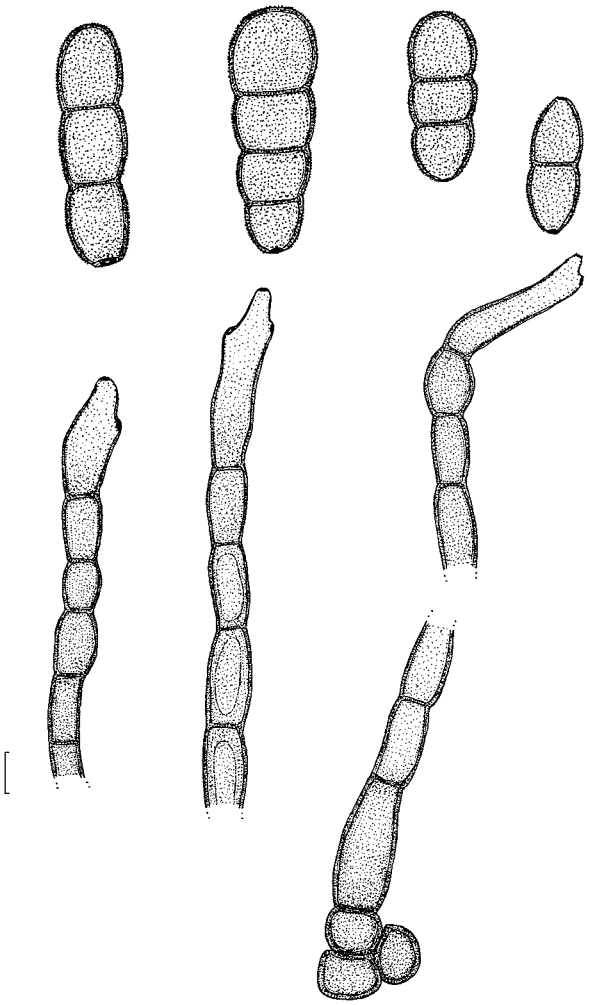


**Fig. 250.** *Cladosporium polygonati* (IMI 116694). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. U. Braun *del*.

*Substrate and distribution*: On *Polygonatum* sp.; Ireland.

*Notes*: *Cladosporium polygonati* is easily distinguishable from all other *Cladosporium* species due to very large, above all wide, echinulate conidia, with distinct constrictions at the septa, and strongly nodulose-nodose, often almost monilioid conidiophores. The ecology of this species is not quite clear. This species is only known from the type collection, which contains brown, nectrotic leaves without distinct leaf spots, suggesting a saprobic fungus, but it is also possible that this species initially occurs on green living host leaves. New collections are necessary to answer these questions. The type material of *C. polygonati* contains at least two additional *Cladosporium* species, one with *C. herbarum*-like conidia, 8–20 × 4–7(–8) µm, and another one with long, filiform-setiform, brown, thick-walled conidiophores and small, pale, smooth to faintly rough-walled conidia, resembling *C. tenuissimum*.

**124. *Cladosporium populicola*** K. Schub. & U. Braun, Schlechtendalia 14: 76. 2006. Figs 251, 252.

*Holotype*: **Germany**, Schleswig-Holstein, Missunde, Schlei ferry, river bank, on *Populus tremula* (*Salicaceae*), 30 Aug. 2004, U. Braun (HAL 1833 F).

*Lit*.: Schubert (2005b: 122–123).
*Ill*.: Schubert (2005b: 123, fig. 57, pl. 25, figs A–H), Schubert *et al*. (2006: 77, fig. 10, pl. 2, figs D–F).

*In vivo*: Leaf spots amphigenous, at first small, subcircular to irregular, later extending, becoming oblong or often irregular, greyish white, surrounded by a distinct, narrow, irregular, dark brown to almost blackish margin, finally confluent, covering large areas of the leaves. *Colonies* amphigenous, loosely scattered, dark brown, sometimes visible as greyish to blackish dots on the whitish spots. *Mycelium* internal, subcuticular to intraepidermal; hyphae sparingly branched, (2–)3–4.5 µm wide, septate, pale olivaceous-brown, near the base of the conidiophores somewhat wider and darker, with swellings and constrictions, smooth, with slightly to distinctly thickened walls, occasionally even distinctly two-layered. *Stromata* or stromatic hyphal aggregations absent to well-developed, mostly small, 15–35(–45) µm diam, composed of swollen, subglobose to somewhat angular-oblong cells, 6–11(–15) µm wide, medium to dark olivaceous-brown, smooth, thick-walled. *Conidiophores* solitary, in pairs or small loose groups, arising from swollen hyphal cells or from stromata, erumpent through the cuticle, erect, straight to slightly flexuous, subcylindrical or cylindrical-oblong, unbranched to apically branched, not to sporadically somewhat geniculate-sinuous, 50–175 × (4–)5–8(–11) µm, pluriseptate, not constricted at the septa, medium to dark olivaceous-brown, somewhat

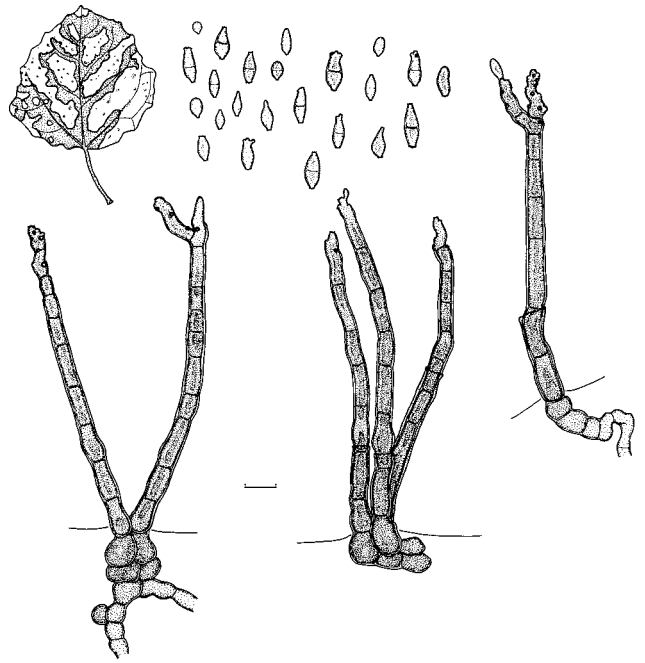


**Fig. 251.** *Cladosporium populicola* (HAL 1833 F). Symptoms, conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

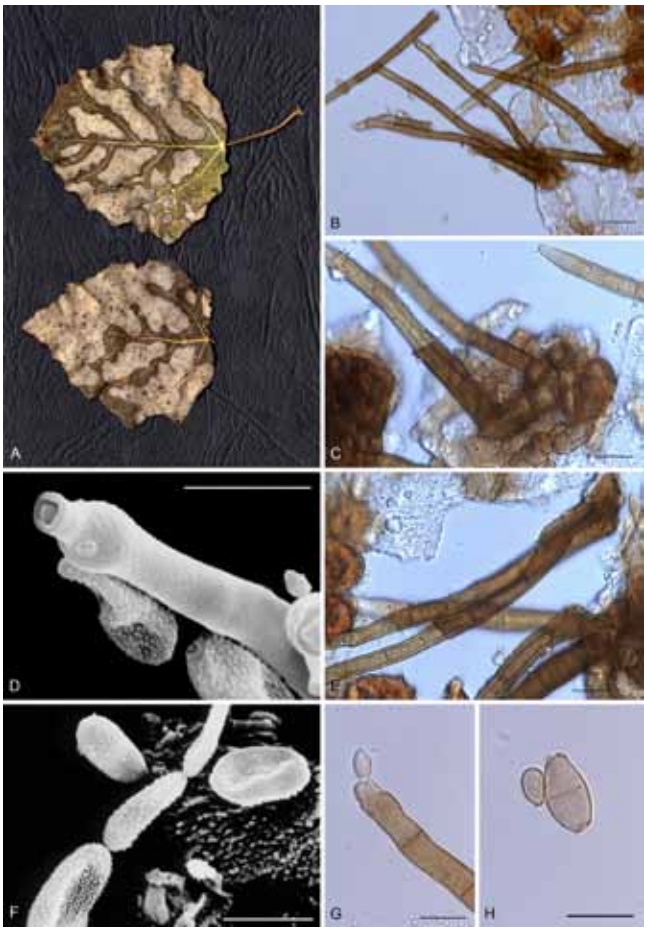



**Fig. 252.** *Cladosporium populicola* (HAL 1833 F). A. Symptoms. B. Overview. C, E. Conidiophores with percurrent, enteroblastic proliferations and thickened, distinctly two-layered walls. D. Conidiophore and conidia with coronate scars. F. Conidia showing surface ornamentation. G. Tip of a conidiophore with young conidium. H. Conidia. Scale bars = 10 (C–H), 20 (B) µm.

paler and attenuated towards the apex, smooth to occasionally minutely verruculose, thick-walled, often distinctly two-layered, (0.5–)1–2 µm wide, cells often with a distinct small inner lumen clearly separated from the inner wall of the conidiophore, often enteroblastically proliferating. *Conidiogenous cells* integrated, terminal and intercalary, 6–24 µm long, proliferation sympodial, with a single to several conidiogenous loci, sometimes located on small lateral shoulders, protuberant, 1–2 µm diam, slightly darkened-refractive. *Conidia* catenate, in unbranched or branched chains, straight, obovoid, ellipsoid to rarely subcylindrical, 4–14 × 3–5(–5.5) µm, 0–1(–2)-septate, not constricted at the septa, pale olivaceous to pale olivaceous-brown, smooth or almost so to slightly verruculose (light microscopy), but most conidia minutely verruculose when viewed by SEM, walls more or less thickened, cells occasionally with a distinct lumen clearly separated from the thick wall, apex rounded or slightly attenuated, with up to three apical hila, protuberant, 1–2 µm diam, somewhat darkened-refractive; microcyclic conidiogenesis not observed.

*Substrate and distribution*: On *Populus tremula*; Germany.

*Notes*: Several species of *Cladosporium s. lat*. have been described on *Populus* spp. (*C. asteroma*, *C. lethiferum*, *C. maculicola*, *C. martianoffianum*, *C. ramulosum*, *C. subsessile*), but all of them have to be excluded from *Cladosporium s. str*. and belong in *Fusicladium* (Schubert *et al*. 2003). Type material of *C. brunneum*, described on dead leaves of *Populus* sp., could not be traced at PRM and is probably not preserved.

*Cladosporium populicola* is morphologically similar to *C. cladosporioides*, which differs, however, in having narrower conidiophores, 2.5–5 µm wide, with thinner and usually one-layered, not two-layered walls, without enteroblastic proliferations, as well as longer conidia, 5–30 µm. *Cladosporium oncobae* is also morphologically close to this species, but clearly separated by narrower conidiophores, (2.5–)3–6(–7) µm wide, cells without a distinct, separated lumen, and longer conidia, 3–20(–25) µm, with up to three septa (Schubert *et al*. 2006).

**125. *Cladosporium praecox*** (Niessl) U. Braun, Schlechtendalia 5: 34. 2000. Figs 253, 254.
*Basionym*: *Fusicladium praecox* Niessl, in Rabenhorst, Fungi Eur. Exs., Ed. Nov., Ser. II, No. 1166. 1868 and Hedwigia 7: 124. 1868.

*Lectotype* (**designated here**): **Czech Republic**, "pr. Bistenz ad Brunnam Moraviae", on leaves of *Tragopogon orientalis* (*Asteraceae*), May, G. de Niessl, Rabenhorst, Fungi Eur. Exs. 1166 (M-0057733). *Isolectotypes*: Rabenhorst, Fungi Eur. Exs. 1166 (*e.g.*, B, HAL, HBG).

*Lit*.: Schubert (2005b: 124–125).
*Ill*.: Braun (2000: 33, fig. 3), Schubert (2005b: 124, fig. 58, Pl. 22, figs G–I).
*Exs*.: Rabenhorst, Fungi Eur. Exs. 1166.

*In vivo*: On living and fading leaves, causing diffuse yellowish ochraceous to yellowish brown discolorations. *Colonies* amphigenous, subeffuse, not very conspicuous, ochraceous, brownish. *Mycelium* internal, substomatal and intraepidermal; hyphae branched, 3–4.5 µm wide, septate, pale olivaceous, smooth. *Stromata* absent to well-developed, 10–55 µm diam, cells subcircular to irregular in outline, 2–8 µm diam, yellowish brown, ochraceous. *Conidiophores* solitary or in small to moderately large fascicles, loose to dense, arising from hyphae, swollen hyphal cells

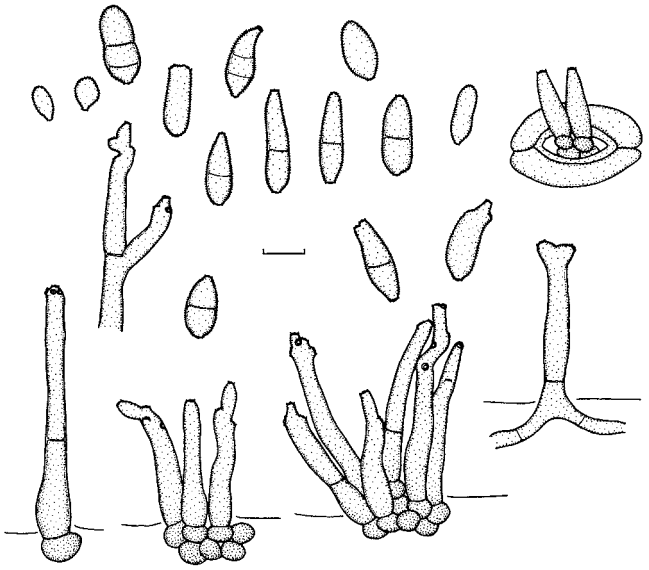


**Fig. 253.** *Cladosporium praecox* (M-0057733). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

or stromata, emerging through stomata or erumpent through the cuticle, erect, straight, subcylindrical to attenuated towards the apex, somewhat geniculate-sinuous, unbranched or rarely branched, 8–54 × (2.5–)3.5–6(–7) µm, 0–1(–2)-septate, subhyaline to pale yellowish ochraceous or yellowish brown, smooth, walls slightly thickened, often somewhat swollen at the base, up to 9 µm wide. *Conidiogenous cells* integrated, terminal, or conidiophores often reduced to conidiogenous cells, 8–50 µm long, with one to several conidiogenous loci, protuberant, (1–)1.5–2.5 µm diam, thickened, darkened-refractive. *Conidia* catenate, in unbranched or branched chains, ellipsoid-ovoid, fusiform, (6.5–)12–26(–31) × 4–7(–8) µm, 0–1(–3)-septate, yellowish, pale yellowish brown, ochraceous or pale brown, faintly to conspicuously verruculose-echinulate, walls thin to slightly thickened, with 1–3 hila, protuberant, 1–2 µm diam, thickened, darkened-refractive; rarely microcyclic conidiogenesis occurring.

*Substrate and distribution*: On *Tragopogon orientalis*; Czech Republic.

*Notes*: Based on the cladosporioid structure of the conidiogenous loci and hila Braun (2000) assigned *Fusicladium praecox* to *Cladosporium*. *Cladosporium praecox* is well-characterised by having uniformly short, very pale conidiophores. *Cladosporium agoseridis*, known from North America on *Agoseris* spp., is easily distinguishable in having longer and wider conidiophores and conidia and, above all, wider conidiogenous loci and hila; and *C. inopinum*, occurring on another host belonging to the *Asteraceae*, differs in forming mainly external mycelium on trichomes and 0–3(–4)-septate conidia.

### 126. *Cladosporium pseudiridis* K. Schub., C.F. Hill, Crous & U. Braun, Stud. Mycol. 58: 135. 2007. Figs 255, 256.

*Holotype*: **New Zealand**, Auckland, Mt. Albert, Carrington Road, Unitec Campus, isolated from lesions on living leaves *Iris* sp. (*Iridaceae*), 15 Aug. 2004, C.F. Hill (CBS H-19861). *Ex-type culture*: CBS 116463 = LYN 1065 = ICMP 15579.

*Ill*.: Schubert *et al*. (2007b: 136–137, figs 29–30).

*In vitro*: *Mycelium* sparingly branched, 2–7 µm wide, septate, not constricted at the septa, subhyaline to pale brown, smooth or almost so, walls somewhat thickened, guttulate or protoplasm appearing granular, sometimes enveloped by a slime coat. *Conidiophores* arising mostly terminally from ascending hyphae, sometimes also laterally from plagiotropous hyphae, erect, more or less straight, broadly cylindrical-oblong, once or several times slightly to distinctly geniculate-sinuous, forming more or less pronounced lateral shoulders, nodulose, unbranched, 100–320(–500) × 7–11 µm, swellings 10–14 µm wide, becoming narrower and paler towards the apex, septate, not constricted at the septa, septa mainly basal, apical cell often very long, pale to medium olivaceous-brown, subhyaline at the apex, smooth or almost so, sometimes minutely verruculose, walls usually distinctly thickened, sometimes even two-layered, up to 1(–2) µm thick, protoplasm granular, often clearly contrasting from the outer wall. *Conidiogenous cells* integrated, terminal and intercalary, cylindrical-oblong, slightly to distinctly geniculate-sinuous, nodulose with conidiogenous loci confined to swellings or lateral shoulders, 30–110 µm long, proliferation percurrent to sympodial, with a single or three, sometimes up to five geniculations per cell, usually only a single

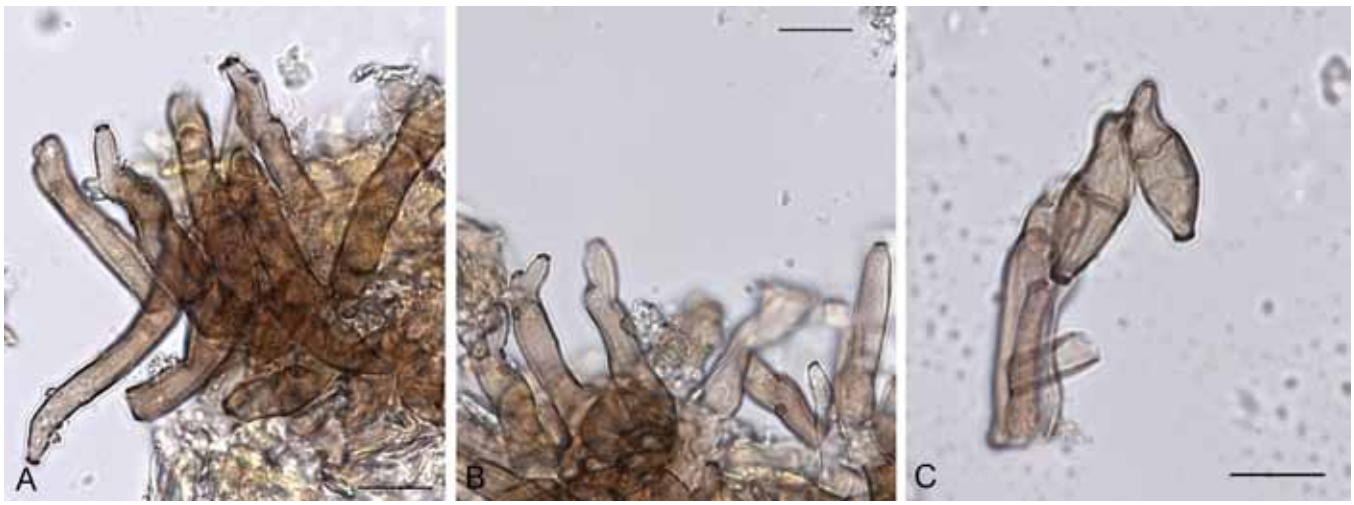



**Fig. 254.** *Cladosporium praecox* (M-0057733). A. Fascicle of conidiophores. B. Conidiophores. C. Conidia. Scale bars = 10 (A–C) µm.

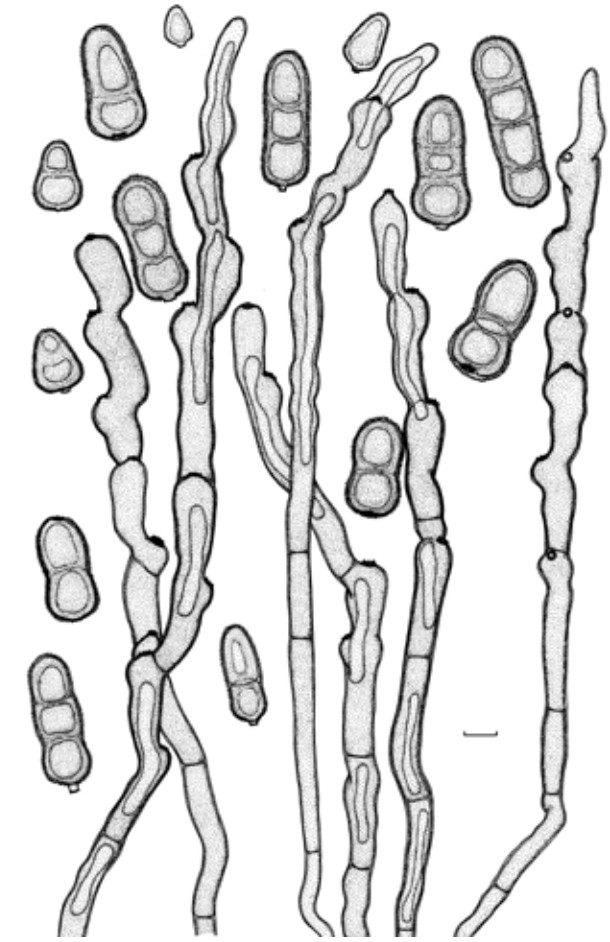


**Fig. 255.** *Cladosporium pseudiridis* (CBS 116463). Conidiophores and conidia *in vitro*. Scale bar = 10 µm. K. Bensch *del*.

locus per swelling, protuberant, very prominent, short cylindrical, peg-like, clearly composed of a dome and surrounding rim, dome often higher than the periclinal rim, broad, somewhat paler than rim, conically narrowed, (2–)2.5–4 µm wide, up to 2 µm high, thickened and darkened-refractive. *Conidia* solitary, sometimes in short unbranched chains of two or three, straight to slightly curved, young conidia small, 0–1-septate, broadly ovoid to pyriform, 15–26 × (9–)11–16(–18) µm [av. ± SD, 19.2 (± 4.3) × 14.2 (± 3) µm], first septum somewhat in the upper half, the upper cell is much smaller but gradually extending as the conidium matures, mature conidia 1–3-septate, broadly pyriform, cylindrical-oblong or soleiform, usually with a distinctly bulbous base, 30–55 × 12–19(–21) µm [av. ± SD, 41.5 (± 6.8) × 17.1 (± 2.1) µm], broadest part of conidia usually at the bulbous base, mostly attenuated towards the basal septum, septa becoming sinuous with age, pale to medium olivaceous-brown or brown, usually echinulate, sometimes coarsely verrucose, walls distinctly thickened, up to 2 µm thick, often appearing layered with a large lumen in the centre of the cell, broadly rounded to flattened at apex and base, hila often very prominent, often peg-like elongated, up to 3 µm long, with age becoming less prominent, visible as a thickened flat plate just below the outer echinulate wall layer, slightly raised towards the middle, 2–3.5 µm diam, thickened and darkened-refractive; microcyclic conidiogenesis not observed.

*Culture characteristics*: Colonies on PDA attaining 6 mm diam after 14 d at 25 ºC, whitish, smoke-grey to pale olivaceous-grey due

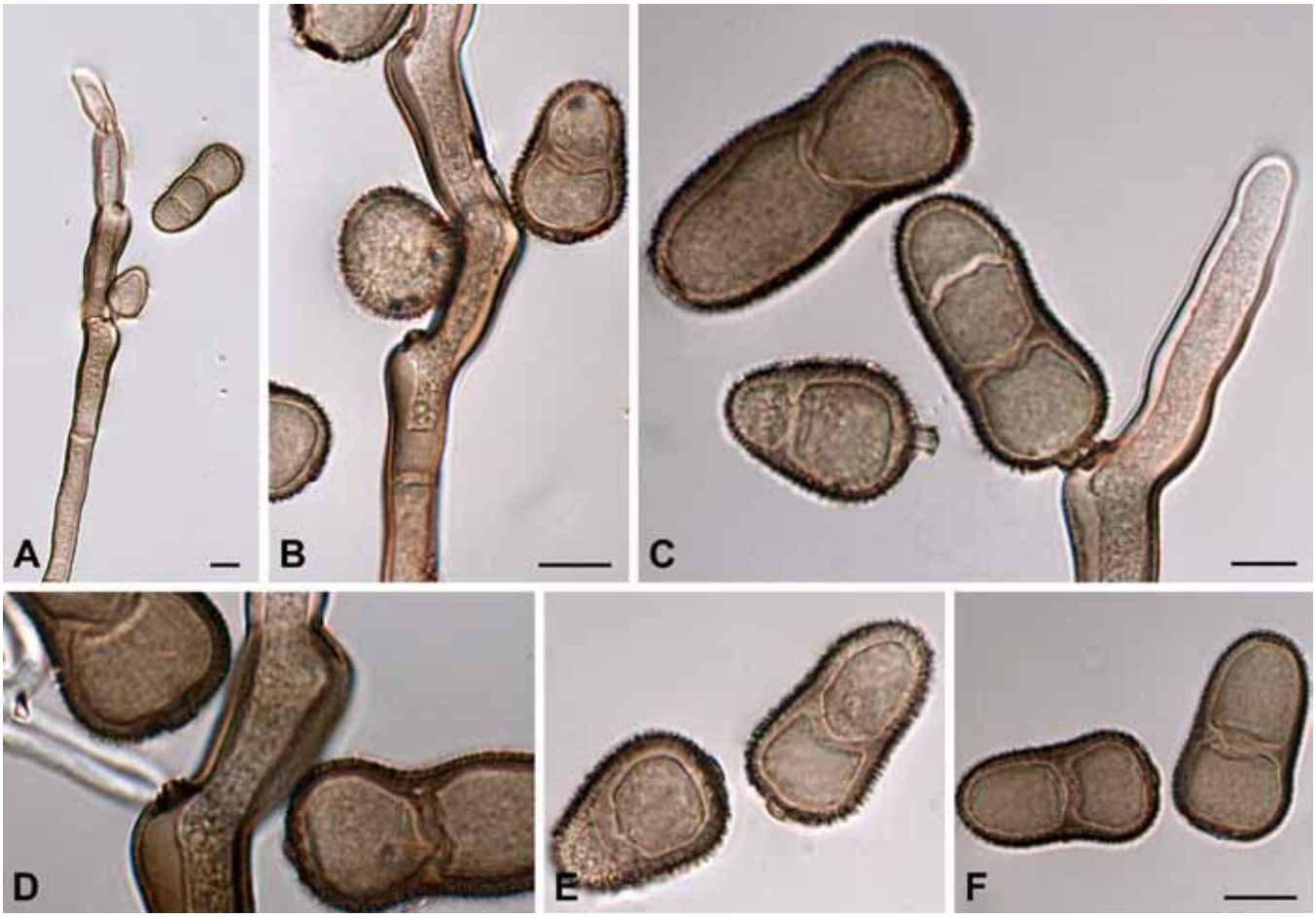



**Fig. 256.** *Cladosporium pseudiridis* (CBS 116463). A–C. Conidiophores and conidia. D. Part of a conidiogenous cell showing a protuberant cladosporioid conidiogenous locus. E–F. Conidia. Scale bars = 10 µm.

to abundant aerial mycelium, olivaceous-black reverse, margin narrow, white, more or less crenate, aerial mycelium zonate, fluffy, covering most of the colony, mainly in the colony centre, growth convex to raised, deep into the agar, with age few large prominent exudates formed, sparingly sporulating. Colonies on MEA attaining 7 mm diam after 14 d at 25 ºC, olivaceous-grey, pale olivaceous-grey to pale rosy-buff due to abundant aerial mycelium covering almost the whole colony, iron-grey reverse, margin colourless or white, broad, regular, more or less glabrous, aerial mycelium fluffy, dense, high, growth convex to umbonate, sometimes with elevated colony centre, prominent exudates lacking, sporulation sparse. Colonies on OA attaining 8 mm diam after 14 d at 25 ºC, white, pale buff to pale olivaceous-grey in the centre, margin grey-olivaceous, olivaceous- to iron-grey reverse, margin entire edge or somewhat undulate, somewhat feathery, growth raised with a somewhat depressed centre forming an elevated outer rim, without prominent exudates, sporulation more abundant.

*Substrate and distribution*: On *Iris* sp.; New Zealand.

*Notes*: Host range and origin of *C. pseudiridis*, which is morphologically close to the common and widespread *C. iridis*, are still unknown as the genus *Iris* is not indigenous to New Zealand. The latter species is easily distinguishable from *C. pseudiridis* by its (0–)2–6(–7)-septate, longer and narrower conidia, (18–)30–75(–87) × (7–)10–16(–18) µm (Schubert *et al.* 2007b).

**127. *Cladosporium pseudocladosporioides*** Bensch, Crous & U. Braun, Stud. Mycol. 67: 71. 2010. Figs 257, 258.

*Holotype*: **Netherlands**, Zwolle, isol. from outside air, 7 Jan. 2007, M. Meijer (CBS H-20445). *Ex-type cultures*: CBS 125993 = CPC 14189, CPC 14193

*Ill.*: Bensch *et al.* (2010: 71−72, figs 60−61).

*In vitro: Mycelium* immersed and superficial; hyphae unbranched or sparingly branched, (0.5−)1−4 µm wide, septate, sometimes constricted at septa, especially in wider ones, subhyaline to pale olivaceous or pale olivaceous-brown, smooth or almost so, walls sometimes slightly thickened, about 0.5 µm wide, sometimes irregular in outline due to swellings and constrictions, sometimes forming small ropes of few hyphae, sometimes cells swollen, up to 6.5 µm wide, fertile hyphae minutely verruculose, mainly at the base of conidiophores. *Conidiophores* macronematous, sometimes also micronematous, solitary or in small loose groups, arising terminally and laterally from hyphae or swollen hyphal cells, erect, straight to slightly flexuous, cylindrical-oblong, non-nodulose, sometimes once geniculate-sinuous or slightly swollen at the apex, unbranched or branched once or twice, occasionally three times, branches often only as short denticle-like lateral outgrowth just below a septum, 15−155 µm long, 2−4 µm, sometimes attenuated towards apex, 0−5-septate, sometimes slightly constricted at septa, pale to pale medium olivaceous-brown, sometimes paler towards the apex, smooth or almost so, at the base asperulate or finely verruculose like fertile hyphae, walls slightly thickened, about 0.5 µm wide or unthickened; micronematous conidiophores filiform, narrower, not attenuated, about 1.8 µm wide. *Conidiogenous cells* integrated, terminal, sometimes intercalary, slightly attenuated, narrowly cylindrical-

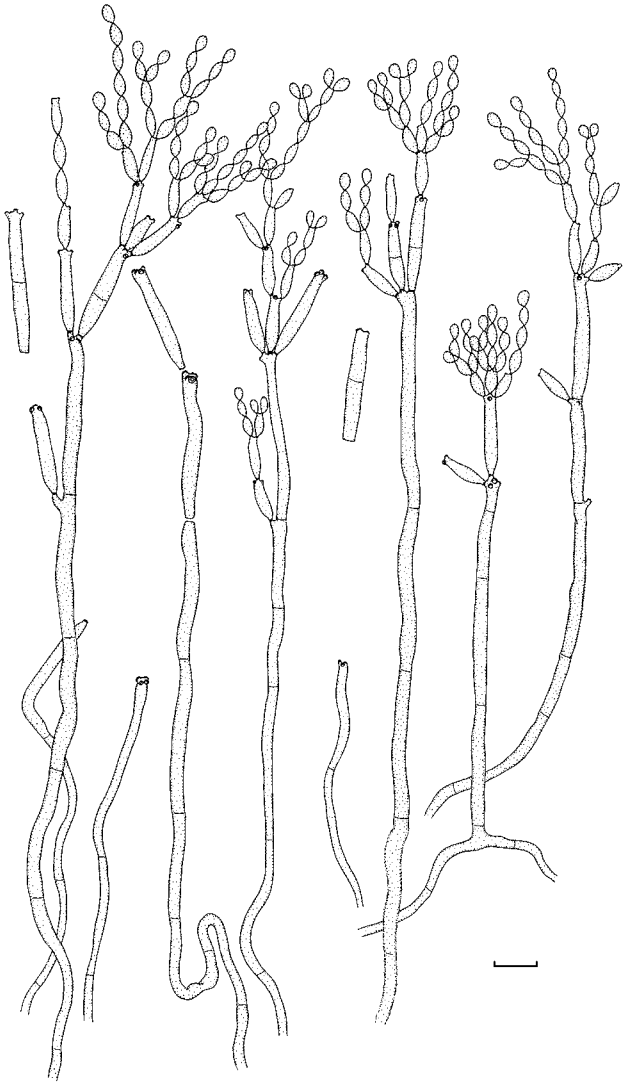


**Fig. 257.** *Cladosporium pseudocladosporioides* (CBS 125993). Macro- and micronematous conidiophores, ramoconidia and conidial chains *in vitro*. Scale bar = 10 µm. K. Bensch *del*.

oblong, sometimes once geniculate, non-nodulose, (6.5−)9−33 µm long, with 1−4 loci at the apex, occasionally with up to seven loci crowded at or towards the apex, in intercalary cells loci situated on small lateral peg-like outgrowths, 1−2(−3) loci, conspicuous, subdenticulate, 1−1.5(−1.8) µm diam, somewhat thickened and darkened-refractive. *Ramoconidia* cylindrical-oblong, 19−48 × 3−4 µm, 0−2(−3)-septate, pale olivaceous-brown, smooth, base broadly truncate, 2−3 µm wide, unthickened or slightly thickened, sometimes slightly refractive. *Conidia* very numerous, catenate, in branched chains, branching in all directions with 3−6(−9) conidia in the terminal unbranched part of the chain, small terminal conidia obovoid, ovoid to limoniform or ellipsoid, sometimes subglobose, 3−5.5 × (1−)1.5−2.5 µm (av. ± SD: 4.1 ± 0.7 × 2.1 ± 0.3), apex rounded or attenuated towards apex and base, intercalary conidia ovoid, limoniform to ellipsoid or subcylindrical, 4.5−13(−19) × (1.8−)2−3 µm (av. ± SD: 8.8 ± 3.9 × 2.6 ± 0.3), 0(−1)-septate, slightly attenuated towards apex and base, with 1−4(−5) distal hila, secondary ramoconidia ellipsoid-ovoid to subcylindrical or cylindrical-oblong, (6.5−)8−23(−29) × (2−)2.5−3.5(−4) µm (av. ± SD: 16.1 ± 5.1 × 2.9 ± 0.3), 0−1(−2)-septate, septum median or often somewhat in the lower half, pale olivaceous to pale olivaceous-brown, smooth or almost so, sometimes slightly rough-walled, walls unthickened, with (1−)2−4(−6) distal hila,

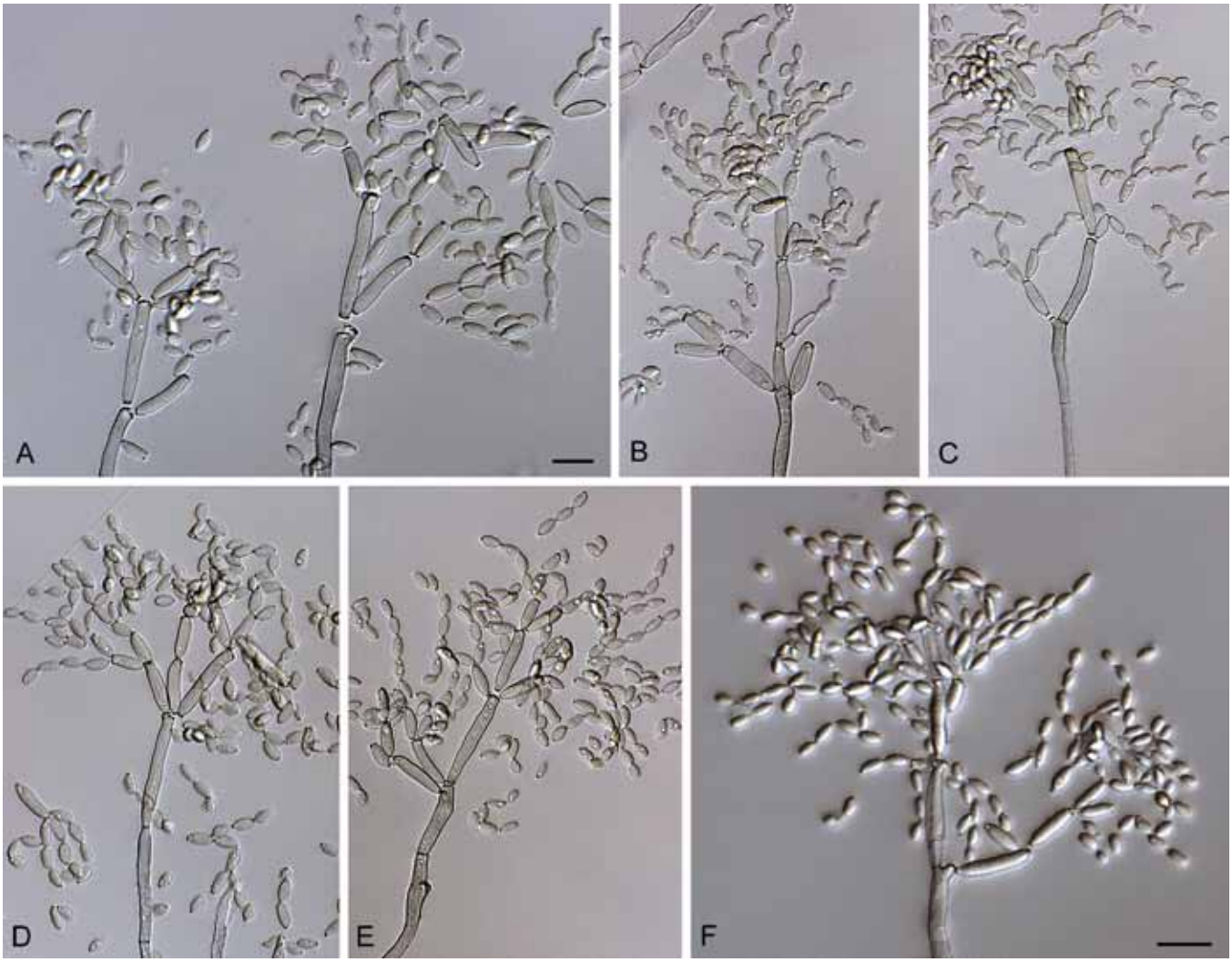



**Fig. 258.** *Cladosporium pseudocladosporioides* (CBS 125993). A–F. Macronematous conidiophores and conidial chains. Scale bars = 10 µm.

conspicuous, subdenticulate, 0.5−1.5(−1.8) µm diam, somewhat thickened and darkened-refractive; microcyclic conidiogenesis not observed.

*Culture characteristics*: Colonies on PDA attaining 65−78 mm diam after 14 d, olivaceous-grey to grey-olivaceous, reverse leaden-grey to olivaceous-black, felty-floccose, margins regular, glabrous to feathery, grey-olivaceous, aerial mycelium felty-floccose, growth effuse to low convex, few small prominent exudates formed, sporulation profuse. Colonies on MEA attaining 52−75 mm diam after 14 d, smoke-grey to dark smoke-grey or grey-olivaceous, reverse iron-grey, floccose, margins white, narrow, glabrous to somewhat feathery, aerial mycelium white, floccose, abundant, dense, growth effuse and somewhat radially furrowed, mostly without prominent exudates, sporulation profuse. Colonies on OA reaching 55−73 mm diam after 14 d, olivaceous to grey-olivaceous or olivaceous-buff, pale olivaceous-grey to greenish grey towards margins, reverse pale greenish grey, leaden-grey to iron-grey, floccose, margins colourless, glabrous, regular, aerial mycelium floccose to felty, sometimes covering large parts of colony surface, growth effuse with few prominent exudates, sporulation profuse.

*Substrates and distribution*: On plant material and fungal fruiting bodies, isolated from air, soil, water and food; widely distributed, Africa (Uganda, South Africa), Asia (Indonesia, South Korea), Australasia (Australia, New Zealand), Europe (France, Germany, Italy, Netherlands, Romania, Russia, Slovenia), North America (Canada, USA), South America (Brazil, Chile).

*Additional specimens examined*:*Sine loco*, isol. from cloud water, coll. & isol. by M. Sancelme, ident. as *C. tenuissimum* by G.S. de Hoog (CBS 117134). **Australia**, Bimbadeen Lookout, *ca.* 10 km of Cessnock, North Coast, isol. from *Eucalyptus placita* (*Myrtaceae*), 10 Nov. 2006, coll. B.A. Summerell, isol. P.W. Crous, NSW 734672 (CPC 13683); New South Wales, Douglas Park, isol. from *E. moluccana*, 31 Aug. 2006, coll. B.A. Summerell, isol. P.W. Crous (CPC 13339, 13340). **Brazil**, Vicosa, Parque National de Serra du Brigadeiro, isol. from *Vernonia* sp. (*Asteraceae*), 27 Jul. 2006, O. Pereira (CPC 13488). **Canada**, Ontario, Pearth, River Tay, isol. from *Sagittaria graminea* (*Alismataceae*), 9 Jan. 2006, W. Gams & K.A. Seifert (CPC 13529); British Colombia, Victoria, isol. from *Acer macrophyllum* (*Aceraceae*), 9 Jun. 2007, coll. B. Callan, isol. P.W. Crous (CPC 14382). **Chile**, Easter Island, isol. from soil, 2007, B. Andersen (BA 1694 = CPC 14295). **France**, Caves de Madelaine, isol. from leaves, 21 Aug. 2007, P.W. Crous (CBS 126356 = CPC 14278). **Germany**, Frankfurt/Main, Botanical Garden, isol. from *Paeonia* sp. (*Paeoniaceae*), 7 Oct. 2004, R. Kirschner [CBS 117153, stored as *Graphiopsis chlorocephala* (Fresen.) Trail]; Schwäbische Alb, Kuppenalb, isol. from *Myrothecium inundatum* growing on an old fungal fruit body, 5 Oct. 2006, M. Grube (CBS 126390 = CPC 13499, CPC 13500, 13501). **Indonesia**, Tele, isol. from *Eucalyptus* sp. (*Myrtaceae*), endophyte spots after herbicide, 2008, coll. M.J. Wingfield, isol. P.W. Crous (CPC 14992). **Italy**, S. Michele all'Adige, isol. from leaves of *Malus sylvestris* (*Rosaceae*), depos. by G. de Stanchina, Dec. 1980, ident. by G.S. de Hoog (CBS 667.80 = IHEM 3705). **Netherlands**, Putten, isol. from pine needles of *Pinus* sp. (*Pinaceae*), 24 Jul. 2007, P.W. Crous (CPC 14230). **New Zealand**, Auckland, Alfriston, Emblings Bridge, -36.8667, 174.7667, isol. from leaves of *Phalaris aquatica* (*Poaceae*), 26 Nov. 2002, C.F. Hill (Hill 730 = ICMP 14870 = CPC 11841). **Romania**, isol. from *Pteridium aquilinum* (CBS 176.82). **Russia**, mycophilic, ident. by W. Gams as *C. cladosporioides* (CBS 574.78A = VKM F-422); Moscow region, isol. from *Melampsoridium betulae* (*Pucciniastraceae*), ident. by W. Gams as *C. cladosporioides* (CBS 574.78B = VKM

F-2759). **Slovenia**, Gabrovka, isol. from a fruit of *Rosa canina* (*Rosaceae*) attached to shrub, 3 Jan. 2008, H.-J. Schroers (HJS 1038 = CPC 14975a). **South Africa**, Eastern Cape, Aiwal North, isol. from wheat, 1989 (CPC 14020 = MRC 10814); Free state, Amersfoort, isol. from oats, 1984 (CPC 14005 = MRC 03850); Danielsrus, isol. from oats, 1983 (CPC 14003 = MRC 03366); Hoopstad, isol. from wheat, 1988 (CPC 14014 = MRC 10232); Modderpoort, Ladybrand, isol. from wheat, 1983 (CPC 14006 = MRC 03978); Slabberts, isol. from oats, 1983 (CPC 14001 = MRC 03240, CPC 14002 = MRC 03245); Tugela, isol. from wheat, 1988 (CPC 14013 = MRC 10221); Westminster, isol. from oats, 1983 (CPC 14007 = MRC 03979); Northern Cape, Prieska, isol. from *Aloe dichotoma* (*Xanthorrhoeaceae*), 2005 (CPC 13998 = CAMS 001160); unknown location, isol. from *Sorghum* sp. (*Poaceae*), 1988 (CPC 14010 = MRC 10183, as *C. cucumerinum*). **South Korea**, Hoengseong, N37°32'09'' E128°07'07'', isol. from *Agrimonia pilosa* (*Rosaceae*), 4 Aug. 2004, H.-D. Shin (CPC 11605); Namyangju, N37°34'59'' E127°13'52'', isol. from *Glebionis coronaria* (= *Chrysanthemum coronarium* var. *spatiosum*) (*Asteraceae*), 30 Sep. 2004, H.-D. Shin (CPC 11392). **Uganda**, Mubende, isol. from coffee leaf, 2000, coll. J.L. Sørensen, isol. B. Andersen (BA 1677 = CPC 14357). **USA**, Illinois, Peoria, isol. from *Triticum aestivum* (*Poaceae*), 1966, C.W. Hesseltine, NRRL A-14110 (CBS H-10342, culture CBS 149.66); Louisiana, Baton Rouge, isol. from pruned wood, 2006, K.A. Seifert (CPC 12850); New York, Binghamton, isol. from creosote-treated southern pine pole (ATCC 66669 = CPC 5100); Virginia, Front Royal, isol. from pods of Kentucky coffee tree, 2007, P.W. Crous (CPC 13992).

*Notes*: *Cladosporium pseudocladosporioides* is a common, widespread saprobic hyphomycete phylogenetically and morphologically very close to *C. cladosporioides* but clearly distinct by forming a separate lineage in phylogenetic analyses (see Bensch *et al.* 2010, fig. 1, part b *vs.* c) and by having shorter and somewhat narrower, 0−1(−2)-septate secondary ramoconidia, narrower conidiogenous loci and hila, and hyphae sometimes forming ropes. However, the distinction between the two species only based on morphology is difficult and not always possible with certainty, which is additionally complicated by the genetical structure of the *C. pseudocladosporioides* clade suggesting that it possibly represents a complex containing cryptic species (observed in both ACT and TEF alignments in Bensch *et al.* 2010). Uncertain strains should simply be referred to as *C. cladosporioides s. lat.* (complex). *Cladosporium paracladosporioides* is also similar but differs in having wider, 0−3-septate secondary ramoconidia, wider conidiogenous loci and hila and is phylogenetically distinct (see Bensch *et al.* 2010, fig. 1, part b).

## 128. *Cladosporium psoraleae* M.B. Ellis, Mycol. Pap. 131: 16. 1972. Figs 259, 260.

*Holotype*: **Myanmar** (Burma), Mandalay, on living leaves of *Cullen corylifolium* (≡ *Psoralea corylifolia*) (*Fabaceae*), 25 Nov. 1971, M. Thaung (IMI 163005).

*Lit.*: Ellis (1976: 344), Schubert (2005b: 125–126).
*Ill.*: Ellis (1972: 17, fig. 16; 1976: 343, fig. 260 C), Schubert (2005b: 126, fig. 59, pl. 26, figs A–D).

*In vivo*: Leaf spots amphigenous, subcircular to irregular in outline, 1–4(–9) mm wide, pale brown to greyish brown, surrounded by a narrow, irregular, medium brown margin and a somewhat irregular yellowish ochraceous halo. *Colonies* amphigenous, short caespitose, pale greyish brown, short villose. *Mycelium* internal, subcuticular; hyphae branched, 2–6 µm wide, septate, not or slightly constricted at the septa, sometimes swollen, up to 8 µm wide, pale olivaceous, sometimes subhyaline, smooth, with slightly thickened walls, forming swollen hyphal cells, subcircular to somewhat oblong, up to 15 µm diam, smooth, walls thickened. *Conidiophores* solitary or in loose, small groups, arising from hyphae or swollen hyphal cells, erumpent through the cuticle, straight to slightly flexuous, somewhat geniculate-sinuous, non-nodulose, unbranched or only once or twice branched, 22–130 × 3–6 µm, septate, with 1–4 septa, not constricted at the septa, pale brown, pale olivaceous, sometimes subhyaline, smooth, walls slightly thickened, one-layered, occasionally swollen at the base, up to 10 µm wide. *Conidiogenous cells* integrated, terminal or intercalary, cylindrical, oblong, proliferation sympodial, with numerous, occasionally crowded conidiogenous loci, protuberant, sometimes subdenticulate, truncate to slightly convex, 1.5–3 µm diam, dome and periclinal rim conspicuous, thickened and somewhat darkened-refractive. *Conidia* catenate, in unbranched or branched chains, straight, cylindrical, ellipsoid, fusiform, limoniform, 5–30 × 3.5–7 µm, 0–1(–2)-septate, septum more or less median, not constricted at the septum, subhyaline to pale brown, smooth,

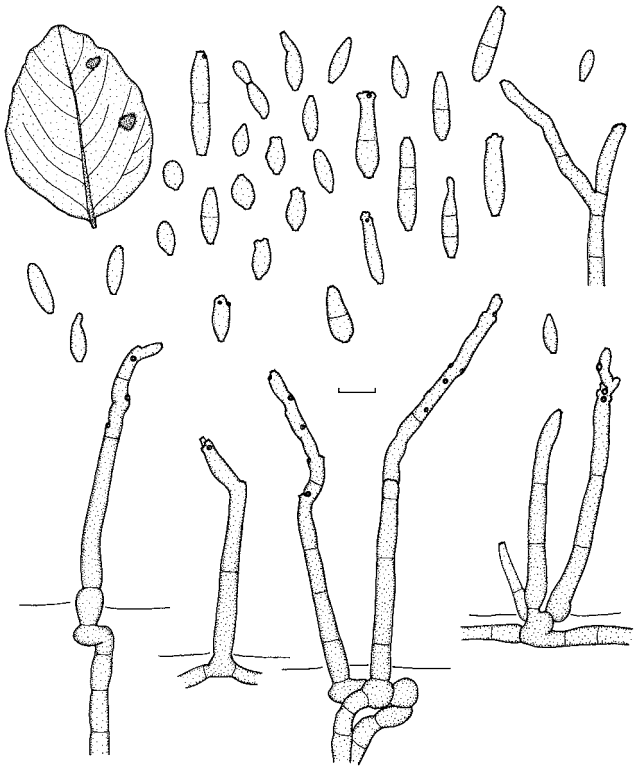


**Fig. 259.** *Cladosporium psoraleae* (IMI 163005). Symptoms, conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

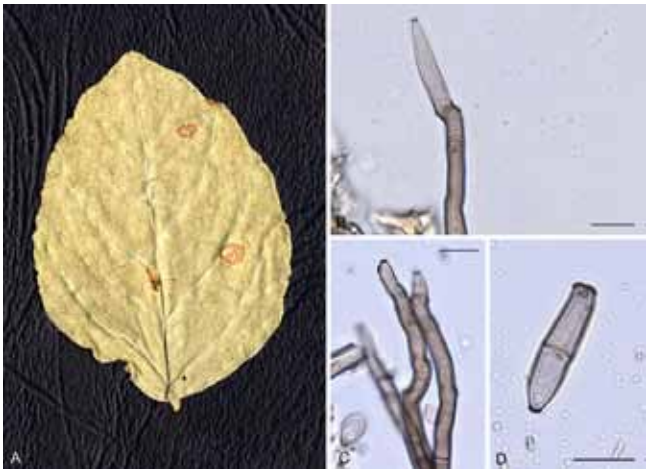


**Fig. 260.** *Cladosporium psoraleae* (IMI 163005). A. Symptoms. B, C. Conidiophores. D. Conidium. Scale bars = 10 (B–D) µm.

walls slightly thickened, apex rounded to attenuated or with 1–5 apical scars, truncate at the base, hila protuberant, truncate to slightly convex, 1–2.5 µm diam, thickened, somewhat darkened-refractive; microcyclic conidiogenesis not observed.

*Substrate and distribution*: On *Cullen corylifolium*, Myanmar.

*Notes*: *Cladosporium psoraleae* is morphologically close to *C. cladosporioides* but distinct in having conidiogenous cells with numerous, sometimes crowded conidiogenous loci, somewhat wider conidia and, above all, conspicuous leaf spots. *C. vignae* is also very close, but possesses somewhat narrower conidiogenous loci and hila and somewhat shorter and narrower conidia; subglobose and obovoid terminal conidia are usually lacking in *C. psoraleae*. Owing to these small differences *C. psoraleae* is tentatively maintained as a separate species, but additional collections and, above all, molecular data are urgently needed to clarify the status of this taxon. Bilgrami *et al*. (1991) cited a record of the latter species on living leaves of *Gardenia turgida* from India (UP), which seems to be very doubtful.

**129. *Cladosporium psychrotolerans*** Zalar, de Hoog & Gunde-Cimerman, Stud. Mycol. 58: 175. 2007. Fig. 261.

*Holotype*: **Slovenia**, Sečovlje salterns, isolated from hypersaline water, May 1999, S. Sonjak (CBS H-19730). *Ex-type culture*: EXF-391 = CBS 119412.

*Ill*.: Zalar *et al*. (2007: 166, fig. 5 e, 176, fig. 11).

*In vitro*: *Mycelium* partly superficial and partly submerged, with numerous lateral pegs, consistently enveloped in polysaccharide-like material; hyphae unbranched or sparingly branched, 1–3(–5) µm wide, septate, not constricted at septa, pale brown or pale olivaceous-brown, almost smooth to verruculose, thin-walled. *Conidiophores* macronematous, arising terminally and laterally from hyphae, erect or ascending, straight or somewhat flexuous, neither geniculate nor nodulose, cylindrical-oblong, unbranched or branched, once or few times, 20–220 × (2–)3–4(–5) µm, septate, not constricted at septa, pale olivaceous-brown or brown, smooth or almost so, sometimes verruculose at the base, walls slightly thickenend, about 0.5 µm wide. *Conidiogenous cells* integrated, terminal and intercalary, cylindrical, 12–65 µm long, producing sympodial clusters of pronounced, conspicuous denticles (1–4 loci) at their distal ends, loci 1.5–2 µm diam, often seceding at a septum and behaving like conidia. *Ramoconidia* cylindrical with a broadly truncate base, 19–43(–47) × (2–)3–4(–4.5) µm, aseptate, rarely 1(–2)-septate, not or only very slightly attenuated towards the base, base 2–2.5 µm wide, somewhat darkened-refractive. *Conidia* catenate, in branched chains, branching in all directions, terminal chains with up to six conidia, small terminal conidia subglobose to ovoid, globose, (2–)3–5 × 2–2.5(–3) µm (av. ± SD: 3.9 ± 0.8 × 2.7 ± 0.4), aseptate, pale brown, smooth to minutely verruculose, rounded at the apex, attenuated towards the base, hila 0.5–0.8 µm diam, intercalary conidia ovoid, limoniform to ellipsoid, 5–12 × 2.5–3(–3.5) µm (av. ± SD: 7.2 ± 1.9 × 3.2 ± 0.5), 0(–1)-septate, pale brown, smooth to minutely verruculose, with up to three distal hila, 0.5–1 µm diam, secondary ramoconidia ellipsoid to cylindrical, (7.5–)12–25(–29) × 2.5–3.5(–4.5) µm (av. ± SD: 17.8 ± 5.6 × 3.3 ± 0.4), 0–1(–2)-septate, not constricted at septa, pale brown or olivaceous-brown, smooth, somewhat attenuated towards apex and base, with 3(–5) distal hila, protuberant, denticulate, 1–2 µm diam, thickened and darkened-refractive; microcyclic conidiogenesis not observed.

*Culture characteristics*: Colonies on PDA reaching 10–27 µm diam in 14 d at 25 °C, grey-olivaceous to olivaceous, becoming pale olivaceous grey or smoke grey due to abundant aerial mycelium, reverse olivaceous-grey to iron-grey and leaden-grey, velvety to felty-wooly; margin narrow to wide, white, regular to undulate, glabrous to feathery; aerial mycelium at first absent, later abundantly formed, felty, high; growth flat to later convex, sometimes either heaped or radially furrowed; few prominent exudates formed; sporulation profuse. Colonies on OA reaching 7–20 mm diam, at first grey-oliavceous to olivaceous, reverse leaden-grey to leaden-black, later pale mouse-grey to pale olivaceous due to aerial mycelium, reverse black, velvety to filty; margin white, glabrous, regular or either undulate or arachnoid, deeply furrowed; aerial mycelium sparse to felty, dense, pale mouse-grey, covering only parts of the colony, mainly the colony centre; growth flat with papillate surface; without prominent exudates; sporulation profuse. Colonies on MEA reaching 8–19 mm diam, grey-olivaceous, glaucous-grey at margin, smoke-grey to pale mouse-grey or whitish due to aerial mycelium, reverse olivaceous-grey to iron-grey, velvely to wooly-felty, margin white, narrow, glabrous to feathery, radially furrowed; aerial mycelium abundant, fluffy; few prominent exudates formed; sporulation profuse. Colonies on MEA with 5 % NaCl growing much faster than on other media, reaching 25–38 mm diam, of different colours, mostly reseda-green and granulate due to profuse sporulation, margin olive-yellow, reverse yellow to dark green. Maximum tolerated salt concentration: MEA + 17 % NaCl after 14 d. Cardinal temperatures: No growth at 4 °C, optimum and maximum temperature at 25 °C (8–19 mm diam), no growth at 30 °C (from Zalar *et al.* 2007).

*Substrates and distribution*: Isolated from hypersaline water, indoor environments and plant material; Europe (Germany, Slovenia), North America (USA), West Indies (Dominican Republic).

*Additional specimens examined*: **Dominican Republic**, salterns (EXF-714). **Germany**, Sachsen-Anhalt, Halle, isol. from silicone at a window, 2007, U. Braun (CPC 13822); botanical garden, isol. from leaves of *Corylus avellana* (*Betulaceae*), 11 Jun. 2004, K. Schubert (CPC 11330). **Slovenia**, Sečovlje salterns, isolated from hypersaline water (EXF-326, EXF-332). **USA**, Seattle, University of Washington campus, 47.6263, -122.3331, isol. from chasmothecia of *Phyllactinia guttata* (*Erysiphales*) on leaves of *Corylus avellana*, 16 Sep. 2004, D. Glawe (CPC 11814, CPC 11824, CPC 11834).

*Notes*: *Cladosporium psychrotolerans*, belonging to the *C. sphaerospermum* complex, differs from *C. halotolerans* in having 0–1(–2)-septate secondary ramoconidia with septa neither darkened nor thickened and globose, subglobose or ovoid small terminal conidia. It seems to be more common than indicated in Zalar *et al.* (2007) and also occur in indoor environments.

*Cladosporium langeronii* and *C. psychrotolerans* are closely related but *C. langeronii* is particularly well distinguishable from all other *Cladosporium* species by its slow growing colonies (1–7 mm diam / 14 d) and relatively large conidia (4–5.5 × 3–4 µm). *Cladosporium psychrotolerans* has smaller conidia (3–4 × 2.5–3 µm) but a similar length : width ratio and faster expanding colonies (8–18 mm diam / 14 d) (Zalar *et al.* 2007).

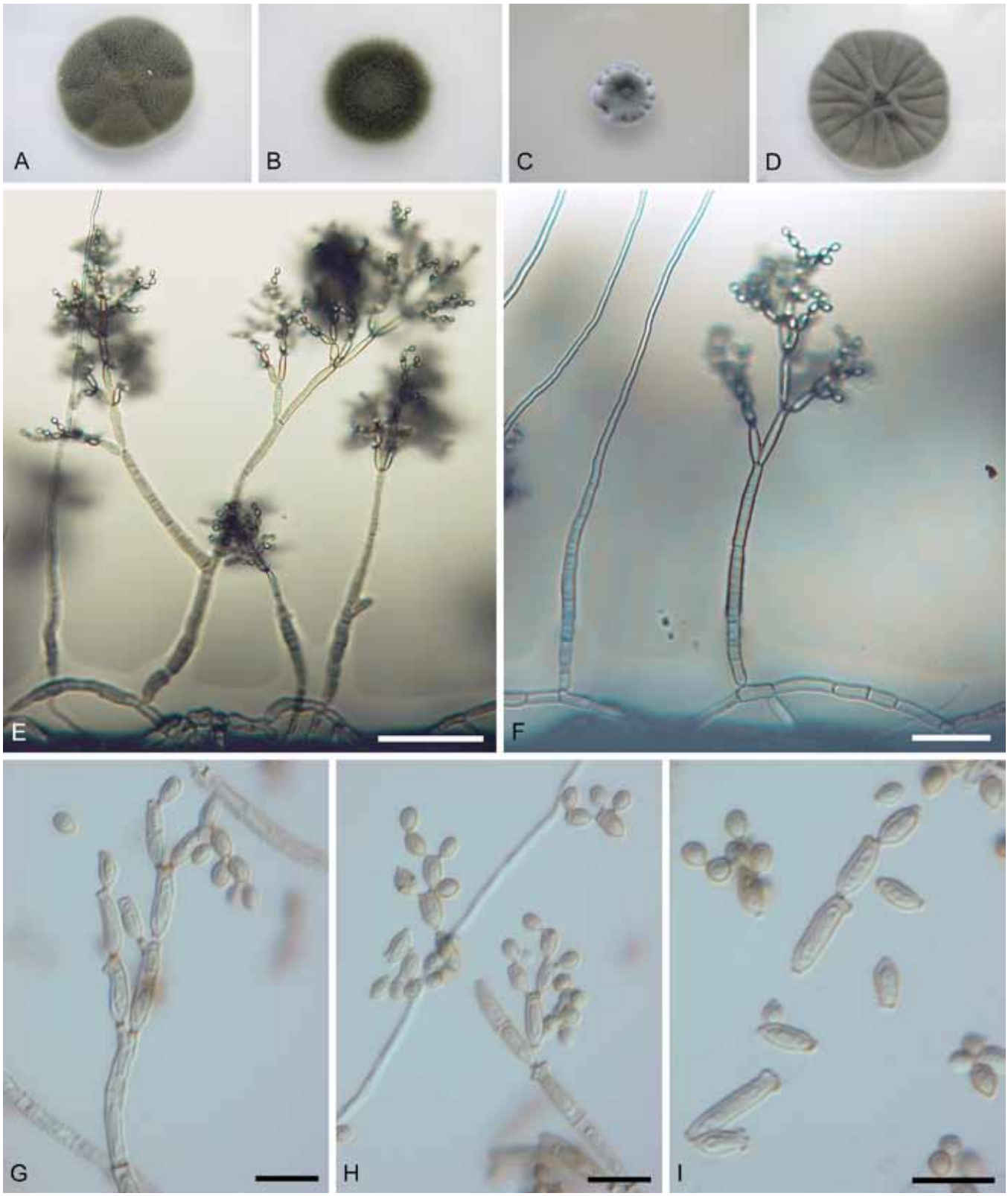



**Fig. 261.** *Cladosporium psychrotolerans* (CBS 119412) (from Zalar *et al.* 2007). A–D. Colony surface grown on PDA (A), OA (B), MEA (C) and MEA plus 5 % NaCl (D) of strains incubated for 14 d at 25 ºC in darkness. E–F. Conidiophores. G. Apical part of a conidiophore. H–I. Secondary ramoconidia and conidia. E–I. All from 7-d-old SNA slide cultures. All but C, from EXF-391 (ex-type strain); C, from EXF-714. Scale bars = 10 (G–I), 50 (F), 100 (E) µm.

**130. *Cladosporium ramotenellum*** K. Schub., Zalar, Crous & U. Braun, Stud. Mycol. 58: 137. 2007. Figs 262–264.

*Holotype*: **Slovenia**, Sečovlje, isolated from hypersaline water from reverse ponds, salterns, 2005, P. Zalar (CBS H-19862). *Isotype*: HAL 2026 F. *Ex-type culture*: CBS 121628 = CPC 12043 = EXF-454.

*Ill.*: Schubert *et al*. (2007b: 138–139, figs 31–33).

*In vitro*: *Mycelium* unbranched or only sparingly branched, 1.5–4 µm wide, septate, without swellings and constrictions, hyaline or subhyaline, smooth, sometimes irregularly rough-walled, walls unthickened. *Conidiophores* solitary, macronematous and micronematous, arising as lateral branches of plagiotropous hyphae or terminally from ascending hyphae, erect, straight or slightly flexuous, cylindrical, neither geniculate nor nodulose, without head-like swollen apices or intercalary swellings,

**Fig. 262.** *Cladosporium ramotenellum* (CPC 12043). Conidiophores and conidia *in vitro*. Scale bar = 10 µm. K. Bensch *del*.

unbranched, sometimes branched, branches often only as short lateral prolongations, mainly formed below a septum, 14–110 × 2–4 µm, septate, not constricted at the septa, subhyaline to pale olivaceous or brown, smooth to minutely verruculose, walls unthickened, sometimes guttulate. *Conidiogenous cells* integrated, terminal, sometimes also intercalary, cylindrical, not geniculate, non-nodulose, 10–28(–50) µm long, proliferation sympodial, with few conidiogenous loci, mostly 1–3, loci sometimes situated on small lateral prolongations, protuberant, 0.5–1.5(–2) µm diam, thickened and somewhat darkened-refractive. *Ramoconidia* formed, cylindrical-oblong, up to 47 µm long, 2–4 µm wide, 0–1-septate, rarely up to 4-septate, subhyaline to very pale olivaceous, smooth or almost so, with a broadly truncate base, without any dome and raised rim, 2–3 µm wide, not thickened but somewhat refractive. *Conidia* numerous, polymorphous, catenate, in branched chains, straight, sometimes slightly curved, small terminal conidia numerous, globose, subglobose or ovoid, obovoid or limoniform, 2.5–7 × 2–4(–4.5) µm [av. ± SD, 5.1 (± 1.3) × 3.1 (± 0.6) µm], aseptate, without distal hilum or with a single apical scar, intercalary conidia ellipsoid to subcylindrical, 8–15 × 3–4(–4.5) µm [av. ± SD, 11.5 (± 2.4) × 3.6 (± 0.5) µm], 0–1-septate; secondary ramoconidia subcylindrical to cylindrical-oblong, 17–35 × 3–4(–5) µm [av. ± SD, 22.5 (± 5.6) × 3.7 (± 0.5) µm], 0–3-septate, not constricted at the septa, subhyaline to very pale olivaceous, minutely verruculose (granulate under SEM), walls unthickened or almost so, apex broadly rounded or slightly attenuated towards apex and base, sometimes guttulate, hila protuberant, conspicuous, 0.8–1.5(–2) µm diam, somewhat thickened and darkened-refractive; microcyclic conidiogenesis occurring.

*Culture characteristics*: Colonies on PDA reaching 46–49 mm diam after 14 d at 25 ºC, olivaceous to grey-olivaceous due to abundant sporulation, appearing zonate in forming concentric zones, margin entire edge to slightly undulate, white, glabrous, aerial mycelium absent or sparse, growth flat with a somewhat folded and wrinkled colony centre, without prominent exudates, sporulation profuse. Colonies on MEA reaching 48–49 mm diam after 14 d at 25 ºC, grey-olivaceous to olivaceous-grey, velvety, olivaceous-grey to iron-grey reverse, margin entire edge to undulate, radially furrowed, colourless, glabrous to feathery, aerial mycelium sparse, diffuse, growth flat with slightly elevated colony centre, distinctly wrinkled, prominent exudates not formed, abundantly sporulating. Colonies on OA attaining 40 mm diam after 14 d at 25 ºC, grey-olivaceous, margin entire edge, colourless or white, glabrous, aerial mycelium absent or sparse, growth flat, without exudates, sporulation profuse.

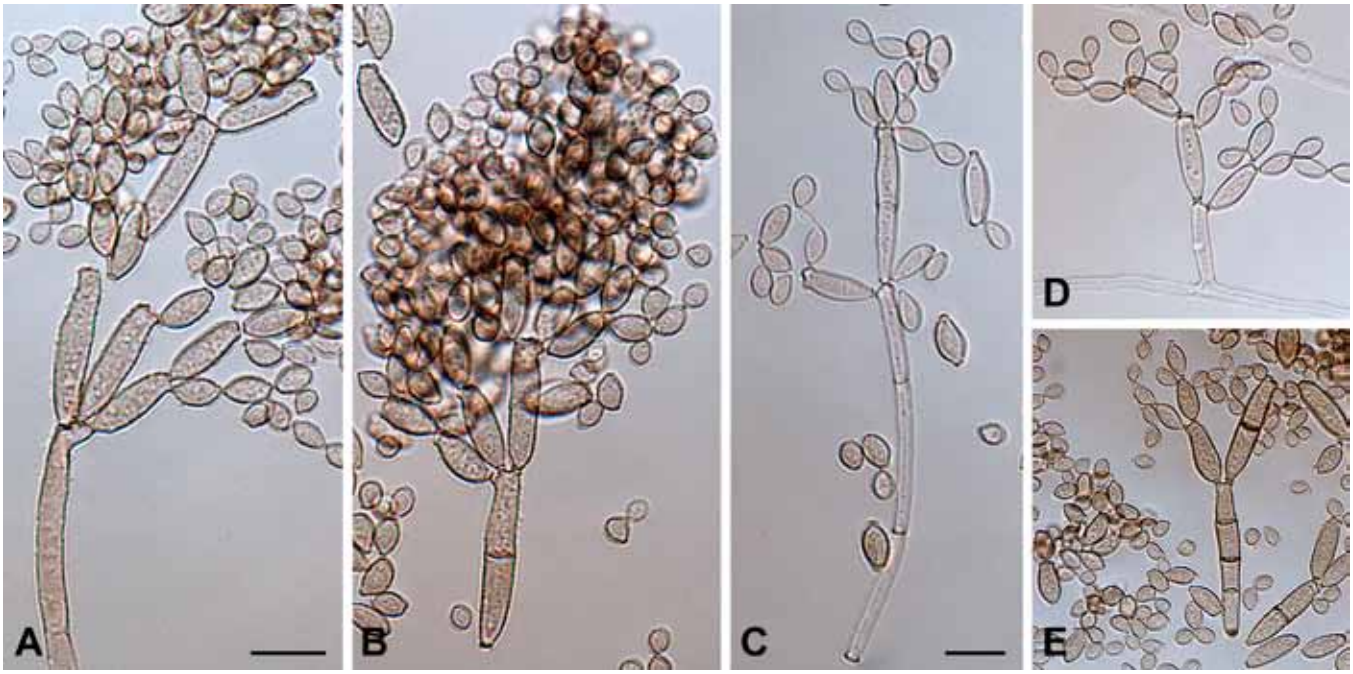



**Fig. 263.** *Cladosporium ramotenellum* (CPC 12043). A, C. Macronematous conidiophore. B. Conidial chain. D. Micronematous conidiophore. E. Ramoconidia and conidia. Scale bars = 10 µm.

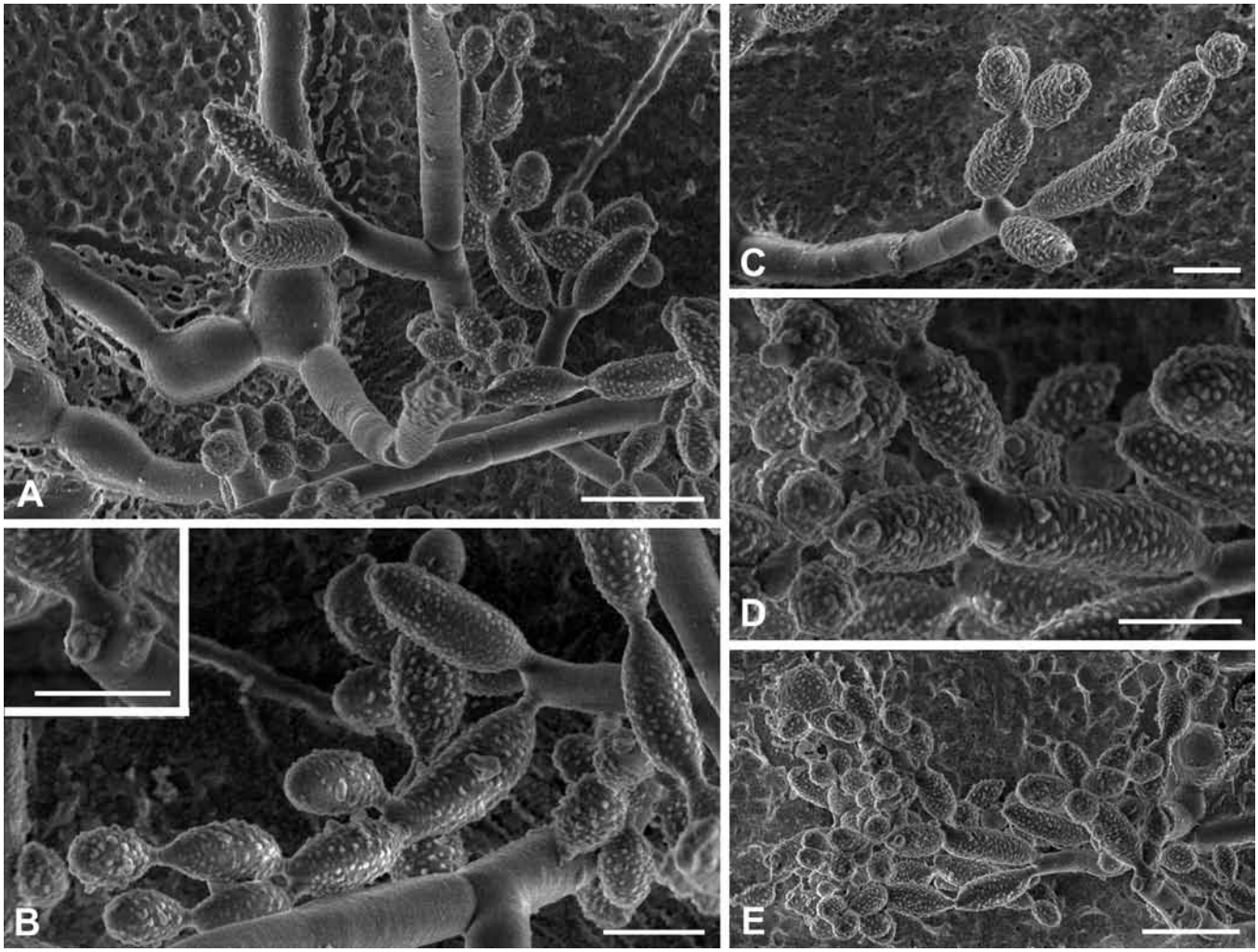



**Fig. 264.** *Cladosporium ramotenellum* (CPC 12043). A. Survey of colony development showing a large bulbous "foot cell" that gives rise to conidiophores, which can be branched. B. Details of conidiophores showing secondary ramoconidia and conidia. The inset shows scar formation on a conidiophore. C. Conidiophore and several conidia. D. Details of ornamentation on conidia. Note the wide, but relatively low ornamentation units. E. A micrograph illustrating the organisation within a conidiophore. Scale bars = 5 (A–D), 10 (E) µm.

*Substrate and distribution*: Hypersaline water, air; Europe (Slovenia).

*Additional specimen examined*: **Slovenia**, Ljubljana, isolated from an air conditioning system (bathroom), 2004, M. Butala (CBS 121627 = CPC 12047 = EXF-967).

*Notes*: Due to its consistently minutely verruculose conidia, *C. ramotenellum* was described in Schubert *et al.* (2007b) in a revision of the *C. herbarum* complex, although this species, which is probably a saprobe in air and hypersaline water, morphologically rather resembles *C. cladosporioides* and *C. tenellum*. The latter species is slower growing *in vitro* and has conidiophores with numerous conidiogenous loci, usually crowded towards the apex forming sympodial clusters of pronounced scars, and shorter, somewhat wider, 0–1(–2)-septate conidia, 3–20(–28) × (2.5–)3–5(–6) µm (Schubert *et al.* 2007b). *Cladosporium cladosporioides* is easily distinguishable by its smooth conidia.

A collection of a *Cladosporium* on and in old, necrotic glumes and utricles of *Carex nigra*, partly infected by *Anthracoides heterospora* and associated with *C. herbarum s. lat.* (Poland, Bory Tucholskie forest, Mętne Reserve, *ca.* 18 km NE of Chojnice, 11 Aug. 2005, M. Piątek, HAL 2235 F), agrees well with the features of *C. ramotenellum* (with ramoconidia, smooth or almost so, conidia and secondary ramoconidia 4–30 × 2–6 µm, 0–4(–5)-septate, verruculose). However, the conidiophores are longer, the conidiogenous cells are often intercalary and the conidia are somewhat wider, up to 6 µm, with up to 4(–5) septa. *Cladosporium ramotenellum* has been described from cultures, *i.e.* its features and variability *in vivo* is unknown. Therefore, the identification of herbarium samples is rather difficult and almost impossible without additional cultures.

Recent unpublished molecular studies indicate that *C. ramotenellum* is a quite common saprobic species occurring on various substrates with a wider geographic distribution than given in Schubert *et al.* (2007b). Its species description will have to be emended in a paper dealing with additions to the *C. herbarum* complex.

**131. *Cladosporium rectangulare*** K. Schub. & U. Braun, Sydowia 56(2): 309. 2004. Figs 265, 266.

*Holotype*: Ex England, intercepted at Hoboken, New Jersey, USA, on still living and fading leaves of *Prosthechea prismatocarpa* (≡ *Epidendrum prismatocarpum*) (*Orchidaceae*), 29 Sep. 1941, D.P. Limber (BPI 427292, as "*C. orchidearum*").

*Lit.*: Schubert (2005b: 127–128).
*Ill.*: Schubert & Braun (2004: 310, fig. 6), Schubert (2005b: 127, fig. 60, pl. 22, figs J–L).

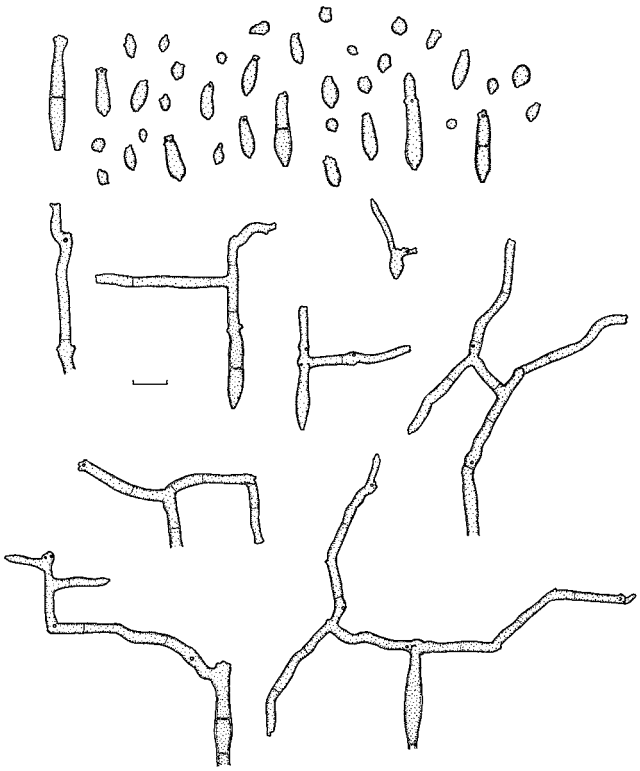


**Fig. 265.** *Cladosporium rectangulare* (BPI 427292). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del.*

*In vivo*: On leaves, forming crustaceous, stromatic layers, effuse, dark brown to black. *Mycelium* internal. *Conidiophores* solitary, erect to decumbent, straight to flexuous, somewhat geniculate-sinuous, occasionally subnodulose, at first unbranched, later repeatedly characteristically branched, right-angled, 25–125 × 2.5–4(–5) µm, sometimes longer, attenuated towards the apex, septate, septa not very conspicuous, olivaceous-brown to somewhat reddish brown, paler towards the apex, smooth, walls slightly thickened, occasionally two-layered, 0.5(–1) µm wide. *Conidiogenous cells* integrated, terminal and intercalary, cylindrical, 8–28 µm long, proliferation sympodial, with few subdenticulate, protuberant conidiogenous loci, 0.5–1.5 µm diam, slightly thickened and darkened-refractive. *Conidia* catenate, often in branched chains, straight, small terminal conidia (without or only with a single apical hilum) numerous, subglobose, ovoid, obovoid, limoniform, ellipsoid, 2.5–9 × 2–4(–5) µm, aseptate, large conidia (secondary ramoconidia) ovoid, ellipsoid, subcylindrical to cylindrical, 5–33 × 2.5–5(–6) µm, 0(–1)-septate, pale to medium olivaceous-brown or somewhat reddish brown, almost smooth to verruculose, walls only slightly thickened, apex rounded or slightly attenuated towards apex and base, hila protuberant, 0.5–1.5 µm diam, somewhat thickened and darkened-refractive; microcyclic conidiogenesis often occurring with conidia forming secondary conidiophores and conidia.

*Substrate and distribution*: On *Prosthechea prismatocarpa*; England.

*Notes*: The characteristic features described above could also be observed in a small dried culture added to this collection. There are no differences between the collections *in vitro* and *in vivo* with regard to colour, septation, ramification and length, although these features are often variable in cultures of *Cladosporium* species. The distinctive right-angled branched and erect to decumbent, geniculate-sinuous conidiophores segregate *C. rectangulare* from the superficially similar *C. cladosporioides* and allied taxa.

**132. *Cladosporium rectoides*** Bensch, H.-D. Shin, Crous & U. Braun, Stud. Mycol. 67: 73. 2010. Figs 267, 268.

*Holotype*: **South Korea**, Jinju, N35°11'24'' E128°10'56'', isol. from *Vitis flexuosa* (*Vitaceae*), 18 Oct. 2004, coll. H.-D. Shin, isol. P.W. Crous (CBS H-20446). *Ex-type culture*: CBS 125994 = CPC 11624.

*Ill.*: Bensch *et al.* (2010: 74−75, figs 62−63).

*In vitro: Mycelium* sparingly developed to more abundantly superficial, hyphae unbranched or sparingly branched, 1−4.5 µm wide, sometimes up to 6 µm wide, septate, not constricted at septa, pale olivaceous or pale olivaceous-brown, smooth to minutely verruculose or verruculose, sometimes verrucose, walls unthickened, sometimes forming ropes. *Conidiophores* solitary, macronematous, occasionally micronematous, arising terminally and laterally from hyphae, erect, straight to slightly flexuous, narrowly cylindrical-oblong, once or twice slightly to often distinctly geniculate-sinuous or slightly nodulose but often neither geniculate nor nodulose, with few apical loci, unbranched or branched, branches sometimes quite long, up to 80 µm, conidiophores 19−210 × (2−)2.5−4 µm, pluriseptate, not constricted at septa, sometimes growth proceeding at an angle


**Fig. 266.** *Cladosporium rectangulare* (BPI 427292). A. Right-angled branched conidiophore. B, C. Conidia. Scale bars = 10 (A–C) µm.

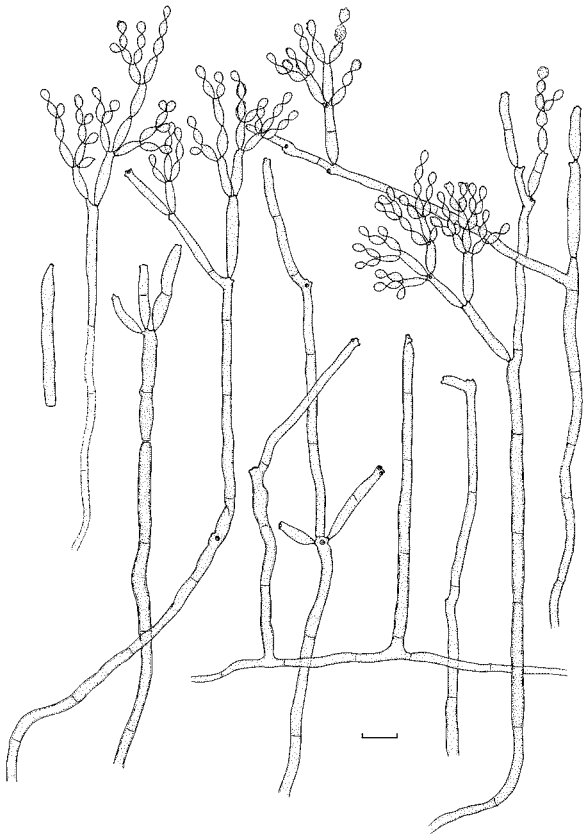


**Fig. 267.** *Cladosporium rectoides* (CBS 125994). Conidiophores, ramoconidia and conidial chains *in vitro*. Scale bar = 10 µm. K. Bensch *del*.

of 45−90°, geniculations mostly intercalary, quite apart of the apex, pale to pale medium olivaceous-brown, smooth, walls slightly thick-walled, about 0.5 µm wide. *Conidiogenous cells* integrated, terminal and intercalary, distinctly sympodially proliferating, cylindrical-oblong, sometimes geniculate or right-angled, 12−47 µm long, sometimes few additional loci at a lower level, often arranged like a garland round about the stalk, in intercalary cells loci often situated on small lateral shoulders, conspicuous, subdenticulate, 1−2 µm diam, somewhat thickened and darkened-refractive. *Ramoconidia* cylindrical-oblong, 16−56 × 3−4 µm, 0−1-septate, commonly formed, base truncate, 2.2−3 µm wide, not thickened, sometimes slightly refractive. *Conidia* catenate, in branched chains, branching in all directions, up to 4(−5) conidia in the unbranched terminal part of the chain, small terminal conidia globose, subglobose to obovoid, (2.5−)3−4(−5) × 2−3 µm (av. ± SD: 3.8 ± 0.7 × 2.5 ± 0.4), aseptate, subhyaline, smooth, apex rounded, the outer wall often seems to detach, somewhat refractive, appearing to be like a halo and walls appearing to be thick-walled, intercalary conidia ovoid, ellipsoid to subcylindrical, 5−15(−17) × (2.5−)3−3.5 µm (av. ± SD: 9.2 ± 3.2 × 3.0 ± 0.3), 0−1-septate, not constricted at septum, with 1−3(−4) distal hila, the outer wall also seems to detach as in small terminal conidia, secondary ramoconidia ellipsoid to subcylindrical or cylindrical, 8−28 × (2.5−)3−4 µm (av.

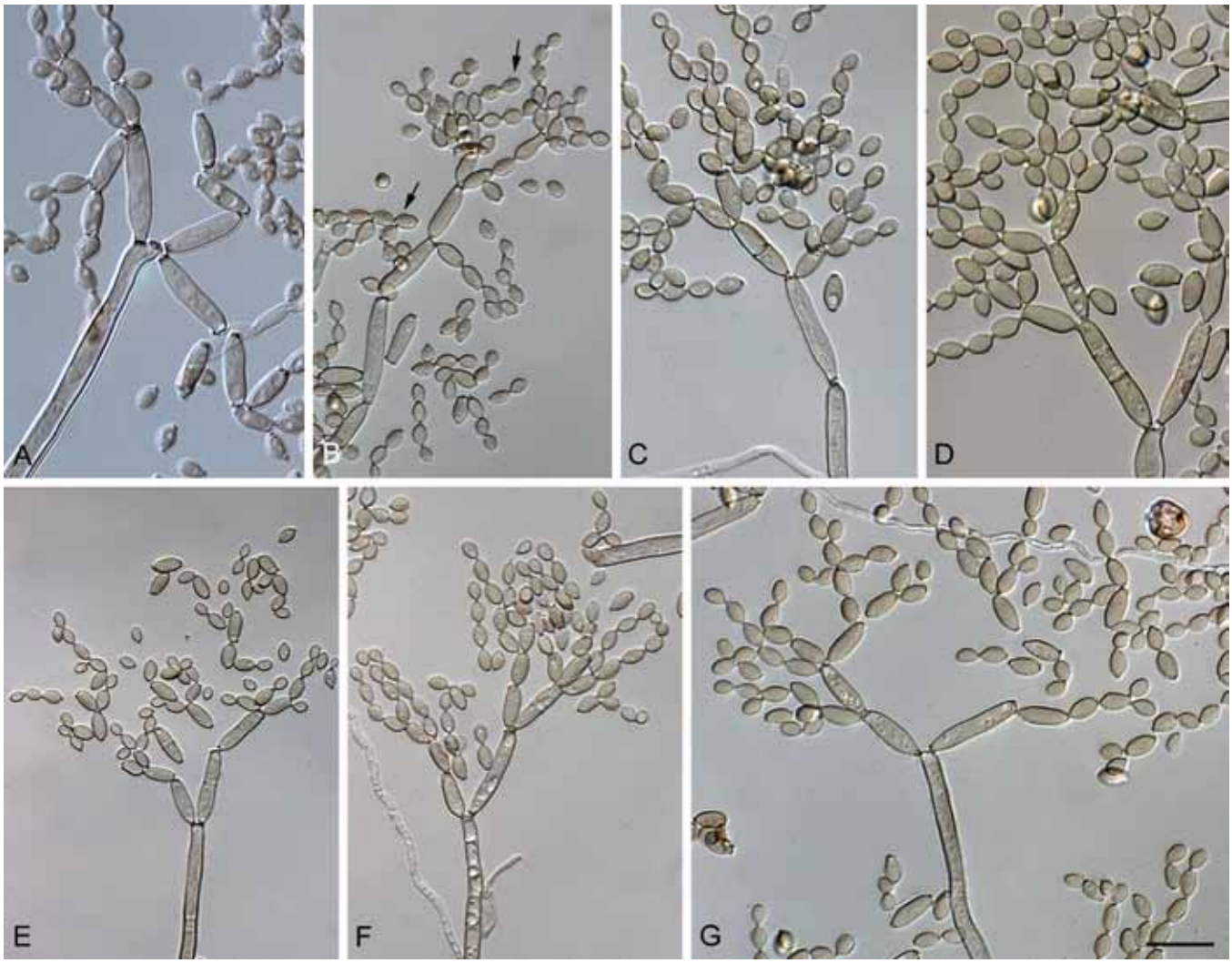



**Fig. 268.** *Cladosporium rectoides* (CBS 125994). A–G. Macronematous conidiophores and conidial chains; small terminal conidia sometimes with surface ornamentation indicated by the arrows in B. Scale bar = 10 µm.

± SD: 17.4 ± 5.3 × 3.4 ± 0.3), 0−1(−2)-septate, pale olivaceous-brown, smooth, walls unthickened or slightly thick-walled, slightly attenuated towards apex and base, cells with one or more cavities, with 2−3(−4) distal hila, hila conspicuous, subdenticulate, 0.5−2 µm diam, somewhat thickened and darkened-refractive; microcyclic conidiogenesis not observed.

*Culture characteristics*: Colonies on PDA attaining 68−82 mm diam after 14 d, olivaceous-grey to iron-grey, whitish to pale olivaceous-grey due to aerial mycelium, reverse olivaceous-black, velvety to floccose or fluffy, margins feathery, colourless, regular, aerial mycelium mainly in colony centre, fluffy-floccose, growth effuse, deep into the agar, without prominent exudates, sporulation profuse. Colonies on MEA reaching 65−80 mm diam after 14 d, smoke-grey, grey-olivaceous to brownish, whitish to pale olivaceous-grey due to aerial mycelium, reverse iron-grey, powdery to fluffy-floccose, margins regular, feathery, colourless, aerial mycelium mainly in colony centre, loose, diffuse to densely fluffy-floccose, growth effuse, somewhat furrowed or wrinkled in colony centre, without prominent exudates, sporulation profuse. Colonies on OA attaining 60−77 mm diam after 14 d, pale olivaceous-grey to smoke-grey, greenish grey, iron-grey or grey-olivaceous at margins, reverse sky-grey to olivaceous-grey, velvety to woolly-floccose, margins colourless, glabrous, regular, aerial mycelium mainly in colony centre, white to smoke-grey, loosely to densely floccose, growth effuse, without prominent exudates, sporulation profuse.

*Substrate and distribution*: On different plants; Asia (South Korea).

*Additional specimen examined*: **South Korea**, Jinju, N35°11'24" E128°10'56", isol. from *Plectranthus* sp. (*Lamiaceae*), 1 Jul. 2004, coll. H.-D. Shin, isol. P.W. Crous (CBS 126357 = CPC 11405).

*Notes*: *Cladosporium rectoides* resembles *C. rectangulare*, above all with regard to its conidiophores, but the two species are genetically quite distinct (see Bensch *et al.* 2010, fig. 1, part b *vs.* c), and the latter species differs in lacking ramoconidia and in having wider conidia [2−5(−6) µm wide] with secondary ramoconidia being mostly aseptate and narrower conidiogenous loci and hila, 0.5−1.5 µm diam (Schubert & Braun 2004).

### 133. *Cladosporium rhododendri* K. Schub., Schlechtendalia 16: 69. 2007. Figs 269, 270.

*Holotype*: **Germany**, Sachsen-Anhalt, Halle (Saale), Pyrastraße, on *Rhododendron* sp. (*Ericaceae*), 11 Jun. 2004, D. Seidel, mixed infection with *C. herbarum* (HAL 1834 F).

*Lit.*: Schubert (2005b: 128–130).
*Ill.*: Schubert (2005b: 129, fig. 61, pl. 27, figs A–F), Braun & Schubert (2007: 70, fig. 5).

*In vivo*: On living leaves, leaf spots amphigenous, irregular in shape and variable in size, often arising at leaf margins and extending towards the midrib, dark brown to somewhat greyish brown, on the upper leaf surface often covered by the whitish grey, membranous detached cuticle. *Colonies* hypophyllous, scattered, in dense, low tufts, pale olivaceous, velvety. *Mycelium* internal, subcuticular to intraepidermal. *Stromata* absent to well-developed, 20–50 µm diam, composed of subglobose to somewhat oblong, densely aggregated cells, 5–9 µm wide, pale to medium olivaceous-brown, smooth,

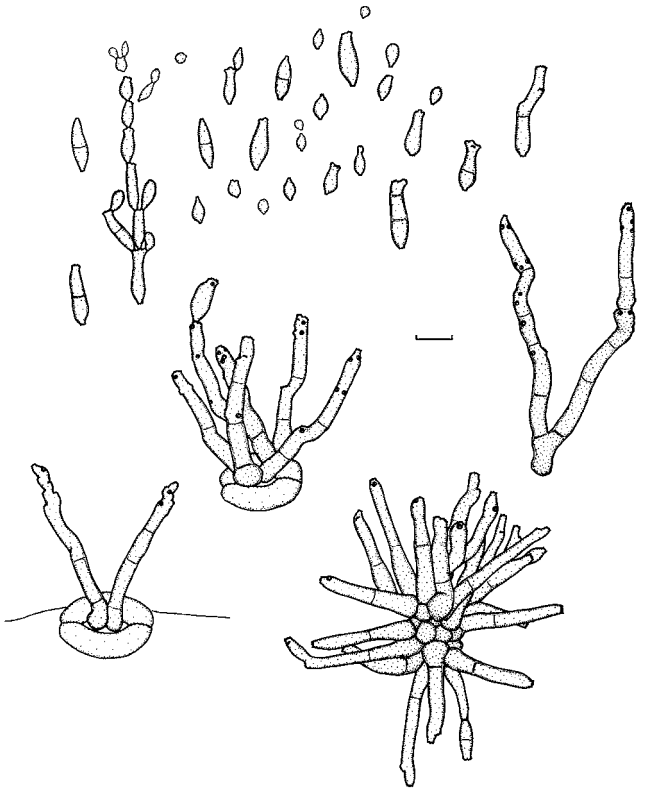


**Fig. 269.** *Cladosporium rhododendri* (HAL 1834 F). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

thick-walled. *Conidiophores* in small to large, loose to dense fascicles, arising from swollen hyphal cells or stromata, usually emerging through stomata, occasionally erumpent through the cuticle, erect, straight to slightly flexuous, unbranched, occasionally branched at the base, often somewhat geniculate-sinuous, without intercalar swellings, 15–80 × 3–6 µm, mostly up to 50 µm long, 0–5-septate, not constricted at the septa, pale olivaceous to medium olivaceous-brown throughout or sometimes slightly paler towards the apex, smooth, walls slightly thickened, somewhat swollen at the base and slightly attenuated towards the apex. *Conidiogenous cells* integrated, terminal and intercalary, cylindrical, 8–30 µm long, proliferation sympodial, with several conidiogenous loci, often crowded and situated on small shoulders, protuberant, 1–1.5(–2) µm diam, well differentiated in a central convex dome and a periclinal rim, thickened, slightly darkened-refractive. *Conidia* catenate, usually in branched chains, straight to slightly curved, subglobose, obovoid, limoniform, ellipsoid, fusiform, subcylindrical, 1.5–18 × (1–)2–5 µm, 0–1(–2)-septate, septum more or less median and not constricted, very pale olivaceous to pale olivaceous-brown, smooth or almost so to minutely verruculose or irregularly rough-walled, walls only slightly thickened, apex rounded or somewhat attenuated, hila protuberant, slightly convex, 0.5–1.5(–2) µm diam, dome and raised rim conspicuous, thickened, slightly darkened-refractive; occasionally with microcyclic conidiogenesis.

*Substrate and distribution*: On *Rhododendron* sp.; Germany.

*Notes*: The hyphomycete found on a herbarium sample deposited under the name "*Cladosporium rhododendri*" (*in herb.*, on *Rhododendron* sp., Switzerland, Bern, Berner Oberland, vom Faulhorn, 7/58, B 700006700, without any author and collector) does not belong in *Cladosporium s. str.* and must be excluded, although the generic affinity of this fungus is not yet clear.

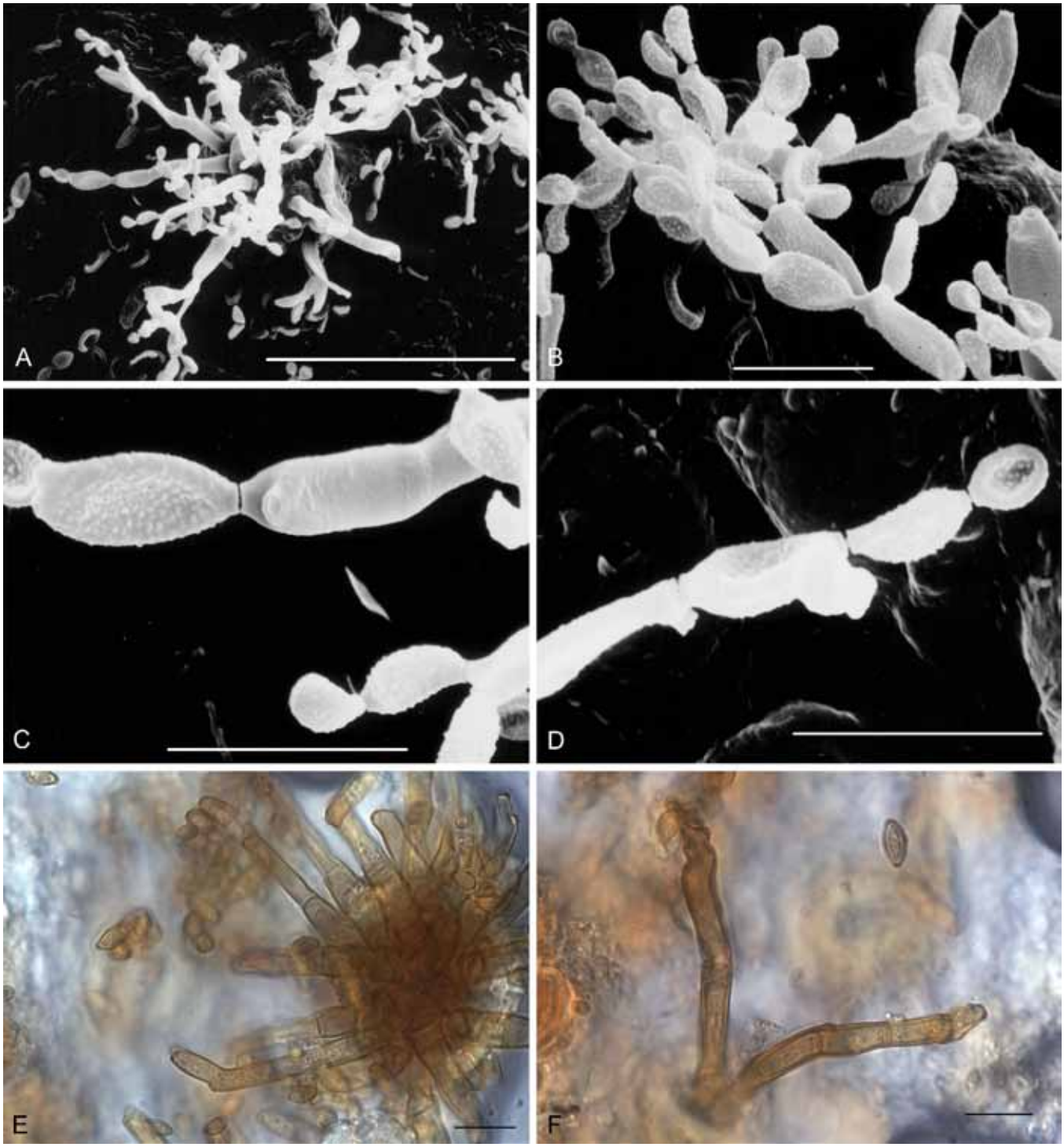



**Fig. 270.** *Cladosporium rhododendri* (HAL 1834 F). A. Fascicle of conidiophores. B. Conidial chains. C. Tip of a conidiophore with still attached conidium. D. Conidial chain, conidia just separating but still attached at the central domes. E, F. Fascicles of conidiophores emerging through stomata and conidia. Scale bars = 10 (B–F), 50 (A) µm.

*Cladosporium rhododendri* pertains to a group of leaf-spotting *Cladosporium* species characterised by relatively short, fasciculate conidiophores usually emerging through stomata, as *e.g.*, *C. praecox* [conidia larger, above all wider, (6.5–)12–26(–31) × 4–8 µm, faintly to conspicuously verruculose-echinulate], *C. orchidearum* (conidia wider, 4–7 µm, 0–3-septate, usually verruculose, and loci wider, 1.5–2.5 µm diam), *C. agoseridis* [conidiophores wider, (3–)4–10(–13) µm, conidia larger and, above all, wider, (10–)12–40(–50) × (5–)6–13(–15) µm, densely verrucose] and *C. lupiniphilum* (conidiophores wider, 3–8 µm, conidia larger and, above all, wider, 6–28 × 4–8 µm) [Braun 1998, 2000, Braun & Rogerson 1995, Ellis 1976, Schubert & Braun 2004]. It is morphologically also close to *C. jacarandicola*, described from New Zealand on living leaves of *Jacaranda mimosifolia*, which is, however, distinguished by having 0–3-septate conidia (Schubert & Braun 2004).

**134. *Cladosporium rivinae*** Speg., Anales Mus. Nac. Buenos Aires 20: 437. 1910. Figs 271, 272.

*Holotype*: **Argentina**, near Metán, Salta, on living leaves of *Rivina humilis* (= *R. laevis*) (*Phytolaccaceae*), Jun. 1905, C. Spegazzini, Mycetes Argent. Nr. 1108 (LPS 13.137).

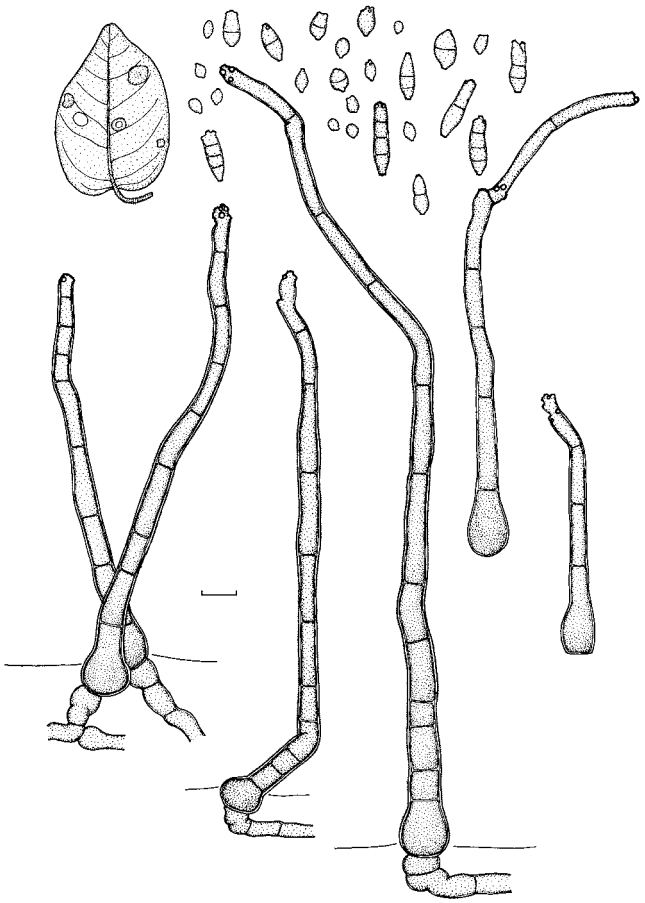


**Fig. 271.** *Cladosporium rivinae* (LPS 13.137). Symptoms, conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

*Lit.*: Saccardo (1913a: 1369), Farr (1973: 251), Schubert (2005b: 130–131).
*Ill.*: Schubert (2005b: 131, fig. 62, pl. 26, figs E–H).

*In vivo*: Leaf spots amphigenous, subcircular-oval to somewhat irregular, 2–7 mm wide, very pale yellowish ochraceous, membranous, pale greyish brown in the centre, sometimes surrounded by a narrow, pale yellowish brown, raised margin, finally leaf spots turning fragile and dropping out, forming shot hole symptoms. *Colonies* epiphyllous, loose, pale greyish brown, villose, often only sparingly fruiting. *Mycelium* internal; hyphae branched, 1.5–7 µm wide, septate, often with small swellings and constrictions, subhyaline to pale olivaceous or pale olivaceous-brown, smooth, walls unthickened or slightly thickened, at the base of the conidiophores somewhat swollen and darker, concolorous with conidiophores, up to 10 µm wide, sometimes aggregated. *Stromata* absent. *Conidiophores* solitary or in small groups of 2–3, non-fasciculate, arising from hyphae or swollen hyphal cells, erumpent through the cuticle, sometimes also emerging through stomata, erect, more or less straight, sometimes slightly flexuous towards the apex, filiform, attenuated towards the apex, usually non-geniculate and non-nodulose, unbranched, rarely branched at the apex, 40–240 µm long, (4–)6–9(–11) µm wide near the base, narrower towards the apex, 3.5–5 µm wide, septate, sometimes

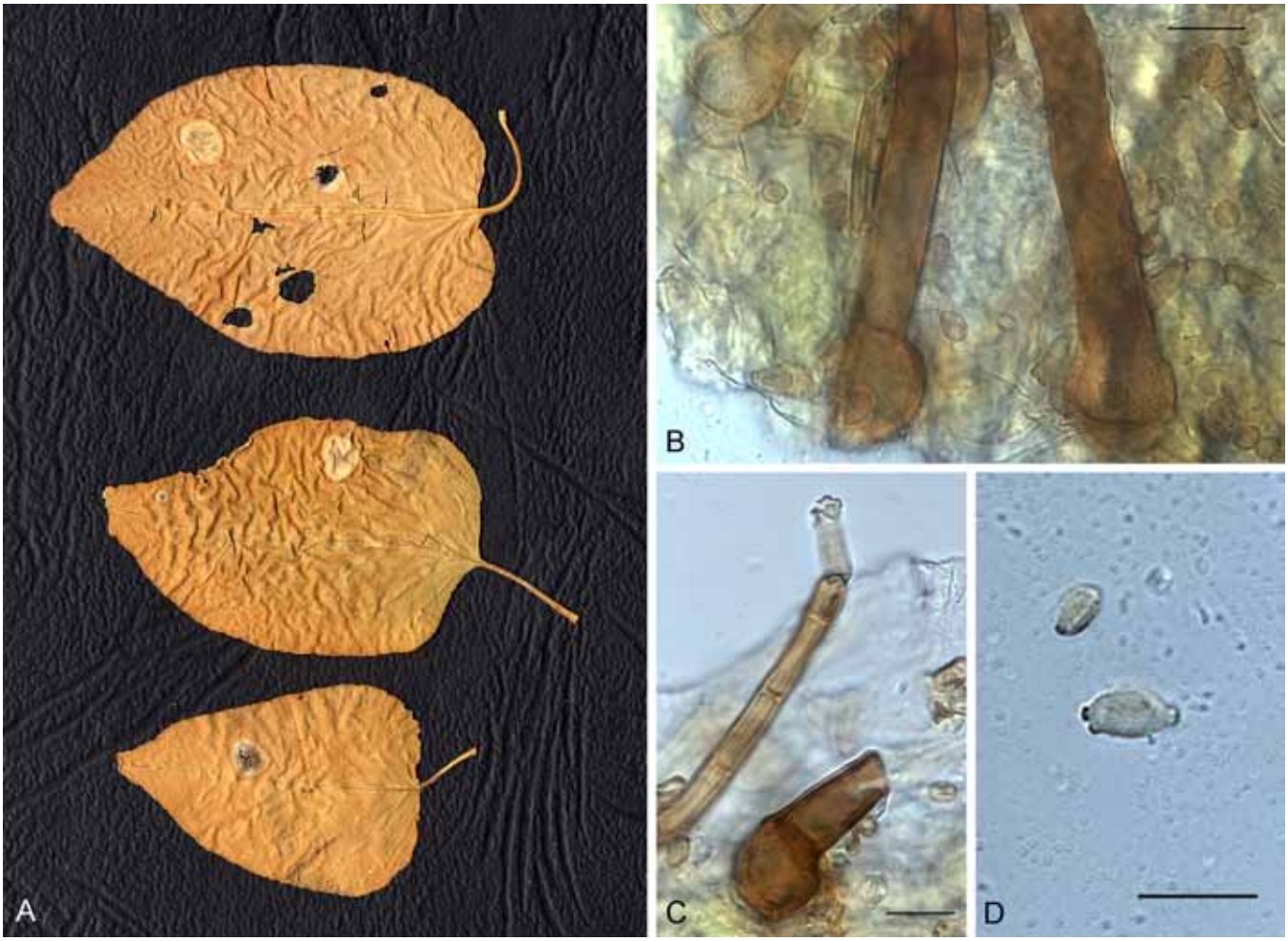



**Fig. 272.** *Cladosporium rivinae* (LPS 13.137). A. Symptoms. B. Bulbous, distinctly swollen bases of conidiophores. C. Tip of a conidiophore with several darkened-refractive conidiogenous loci. D. Conidia. Scale bars = 10 (B–D) µm.

slightly constricted at the septa, pale to medium olivaceous-brown, smooth to somewhat asperulate with age, walls thickened, mostly distinctly two-layered, 0.5–2(–2.5) µm wide, usually distinctly swollen, bulbous and somewhat darker at the base, up to 16 µm wide. *Conidiogenous cells* integrated, terminal and intercalary, 6–26 µm long, proliferation sympodial, with a single to several conidiogenous loci, often somewhat crowded near the apex, protuberant, subdenticulate, 1–2 µm diam, thickened, darkened-refractive. *Conidia* catenate, in branched chains, more or less straight, globose or almost so, obovoid, ellipsoid to cylindrical, 3–23 × 2.5–4.5(–6) µm, 0–3-septate, sometimes slightly constricted at the septa, very pale olivaceous to pale olivaceous-brown, almost smooth to usually minutely verruculose, apex rounded or with a single or several hila, protuberant, short cylindrical, 0.5–2 µm diam, thickened, darkened-refractive; microcyclic conidiogenesis not observed.

*Substrate and distribution*: On *Rivina humilis*; Argentina.

*Notes*: *Cladosporium rivinae*, which is the only biotrophic species occurring on a host belonging to the *Phytolaccaceae*, differs from all morphologically allied taxa in having conidiophores with a wide, distinctly swollen, bulbous base, up to 16 µm wide (Schubert 2005b). Recently, *C. basiinflatum* has been described *in vitro* which also possesess conidiophores being distinctly attenuated towards the apex and having swollen, but often foot-like basal cells. Isolated from *Hordeum* in Germany, this specis differs from *C. rivinae* in having usually aseptate conidia and rigid conidiophores with only terminal conidiogenous cells (Bensch *et al.* 2010).

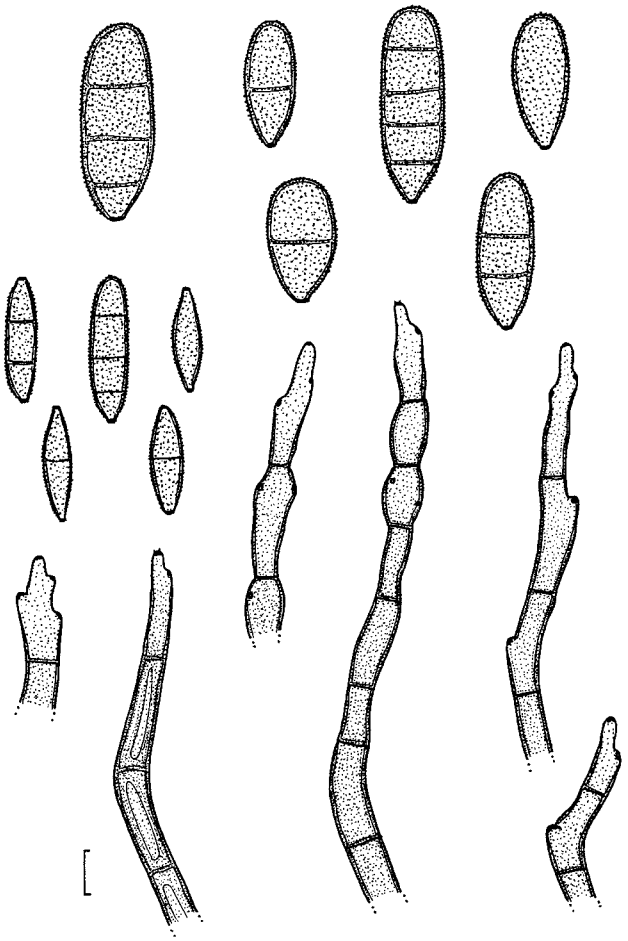


**Fig. 273.** *Cladosporium robiniae* (BPI 802193). Conidiophores and dimorphic conidia *in vivo*. Scale bar = 10 µm. U. Braun *del*.

**135. *Cladosporium robiniae*** (Kabát & Bubák) J.C. David, Mycol. Pap. 172: 92. 1997. Fig. 273.
*Basionym*: *Heterosporium robiniae* Kabát & Bubák, Hedwigia 43: 421. 1904.

*Lectotype* (**designated here**): **Czech Republic**, Bohemia, Turnau [Turnov], on *Robinia pseudoacacia* (*Fabaceae*), 20 Nov. 1904, J. E. Kabát (BPI 802193). *Isolectotypes*: Kabát & Bubák, Fungi Imperf. Exs. 596 (*e.g.*, BPI 802192, K).

*Lit*.: Saccardo (1906: 585), Lindau (1910: 84), David (1997: 92–94).
*Ill*.: David (1997: 84, fig. 19 H–K, 94, fig. 24).
*Exs*.: Kabát & Bubák, Fungi Imperf. Exs. 596.

*In vivo*: Leaf spots lacking or only with discolorations, up to 1.5 mm diam, subcircular to angular, solitary to confluent. *Caespituli* amphigenous, mainly hypophyllous, punctiform, brown, loose to dense. *Mycelium* internal. *Stromata* lacking or sparingly developed as loose stromatic aggregations of swollen hyphal cells at the base of the conidiophore tufts. *Conidiophores* in well developed fascicles, about 20 to 30, loose to moderately dense, arising from a stromatic base, erumpent, erect, straight, subcylindrical, but usually moderately to strongly geniculate-sinuous or geniculate-nodulose, the swellings being well spaced, unbranched, 100–250 µm long, 5–7.5(–8.5) µm wide, up to 10 µm wide at nodes, pluriseptate throughout, pale to medium brown or reddish brown, paler to wards the tips, wall thin or somewhat thickened, 0.5–1.5 µm wide, cells sometimes with distinct lumen (then cells of the conidiophores seemingly very thick-walled, at the septa up to 4 µm), wall smooth or occasionally slightly roughened. *Conidiogenous cells* integrated, terminal and intercalary, 10–40 µm long, with a single or several conidiogenous loci, distinctly coronate, somewhat protuberant, thickened and pigmented, 1.5–2(–2.5) µm diam. *Conidia* dimorphic, concolorous with the conidiophores, small conidia solitary or in short, usually simple chains, ellipsoid-ovoid to cylindrical, 10–25 × 5–8.5 µm, 0–3(–4)-septate, verrucose, large conidia solitary, broadly ellipsoid-ovoid to subcylindrical, 22–45 × 8.5–18 µm, 0–4(–6)-septate, coarsely verrucose-echinulate, wall 0.5–1.5 µm wide, apex broadly rounded, base rounded to sligthly attenutaed, hila coronate, somewhat thickened and darkened, 1–2.5 µm diam; microcyclic conidiogenesis not observed.

*Substrate and distribution*: On *Robinia pseudoacacia*; Europe (Czech Republic), North America (USA, NY).

*Additional specimen examined*: **USA**, New York, Ithaca, Cornell University Campus, on *Robinia pseudacacia*, 2 Nov. 1939, J.É. Jacques 84 (CUP 26875).

*Notes*: *Cladosporium robiniae* is a *Heterosporium*-like species, easily distinguishable from allied species by its fasciculate, nodulose conidiophores and dimorphic conidia.

David (1997) considered BPI material to be the holotype, which is, however, incorrect. Kabát and Bubák distributed duplicates of the type material as Fungi Imperf. Exs. 596, but did not designate holotype material. Therefore, the BPI material concerned should rather be used for a lectotypification.

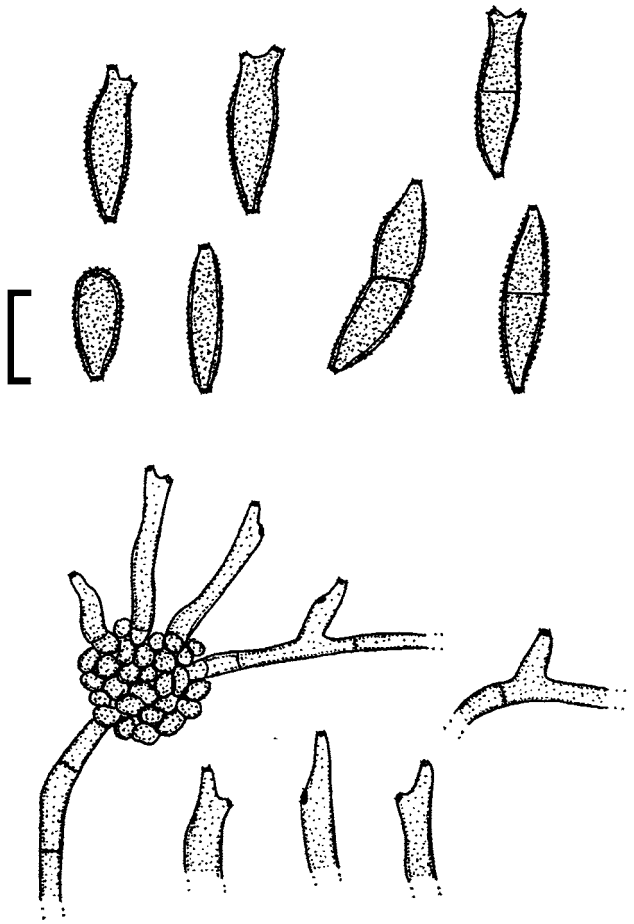


**Fig. 274.** *Cladosporium rutae* (BAK). Conidiophores loosely fasciculate, conidiogenous cells and conidia *in vivo*. Scale bar = 10 µm. U. Braun *del*.

**136. *Cladosporium rutae*** (T.M. Akhundov) U. Braun, A monograph of *Cercosporella*, *Ramularia* and allied genera (phytopathogenic hyphomycetes), Vol. 2: 306. 1998. Fig. 274.

*Basionym*: *Ramularia rutae* T.M. Akhundov, Novosti Sist. Nizsh. Rast. 24: 96. 1987.

*Holotype*: **Azerbaijan**, Apsheron, botanical garden, on *Ruta graveolens* (*Rutaceae*), 25 Mar. 1961, Akhundov (BAK). *Isotype*: LE 42008.

*Lit.*: Schubert (2005b: 132).
*Ill.*: Braun (1998: 307, fig. 571), Schubert (2005b: 132, fig. 63).

*In vivo*: Leaf spot amphigenous, shape and size variable, often entire leaves discoloured, yellowish, ochraceous to pale brown, margin indefinite. *Colonies* amphigenous, mostly hypophyllous, effuse to dense, greyish white to pale brown. *Mycelium* internal; hyphae pale, forming loose to dense hyphal aggregations, substomatal to intraepidermal, pale olivaceous to olivaceous-brown, composed of swollen hyphal cells, 3–8 µm diam. *Conidiophores* solitary to caespitose, loosely fasciculate, arising from stromatic hyphal aggregations, erect, straight, subcylindrical to somewhat geniculate-sinuous, often somewhat attenuated towards the apex, unbranched, rarely branched, 10–40 × 3–7 µm, 0–1(–2)-septate, subhyaline to pale olivaceous or olivaceous-brown, smooth. *Conidiogenous cells* integrated, terminal or conidiophores often reduced to conidiogenous cells, with a single or two conidiogenous loci, protuberant, 1.5–2.5 µm diam, thickened and darkened. *Conidia* catenate, often in branched chains, broadly ellipsoid-ovoid, subcylindrical-fusiform, 6–18 × 3–6 µm, 0–1-septate, subhyaline to pale olivaceous, almost smooth to verruculose, ends obtuse to attenuated, hila protuberant, 1.5–2.5 µm diam; thickened and darkened.

*Substrate and distribution*: On *Ruta graveolens*; Azerbaijan.

*Notes*: During the course of monographic studies within the genus *Ramularia*, Braun (1998) re-examined the type material of *Ramularia rutae*. Due to the cladosporioid structure of the conidiogenous loci and hila and the pigmented conidiophores he placed it in *Cladosporium s. str.* stating that there is no closely allied species in the latter genus.

**137. *Cladosporium salinae*** Zalar, de Hoog & Gunde-Cimerman, Stud. Mycol. 58: 175. 2007. Fig. 275.

*Holotype*: **Slovenia**, Sečovlje salterns, isolated from hypersaline water, Feb. 1999, S. Sonjak (CBS H-19731). *Ex-type culture*: CBS 119413 = EXF-335.

*Ill.*: Zalar *et al.* (2007: 166, fig. 5 f, 177, fig. 11).

*In vitro*: *Mycelium* partly superficial partly submerged, sparingly developed, 1–3 µm wide, with numerous lateral pegs but not distinctly branched, septate, not constricted at septa, subhyaline to pale brown, smooth or almost so to sometimes irregularly rough-walled, walls unthickened or somewhat thickened, consistently enveloped in polysaccharide-like material. *Conidiophores* poorly differentiated, micronematous, arising terminally and laterally from hyphae, erect, straight to flexuous, filiform to narrowly cylindrical-oblong, slightly to distinctly geniculate-sinuous at or towards the apex, once or several times and often in short succession, sometimes bent, non-nodulose, unbranched or occasionally branched with short peg-like lateral outgrowths, 5–60(–75) × (1.5–) 2–3(–4) µm, irregularly densely septate with 0–4(–6)-septa, not constricted at septa, pale to medium olivaceous-brown or brown, smooth to often minutely verruculose or irregularly rough-walled, walls somewhat thickenend. *Conidiogenous cells* integrated, mostly terminal, sometimes intercalary, narrowly cylindrical, slightly to distinctly geniculate-sinuous towards the apex forming sympodial clusters of pronounced denticles at their distal end, loosely to densely crowded, conidiogenous loci protuberant, 1–1.5 µm diam, thickened and darkened-refractive. *Conidia* catenate, in branched chains, branching in all directions, terminal chains with up to six conidia, straight, small terminal conidia obovoid, 3–6 × 2–3 µm [av. (± SD) 4.8 (± 1.2) × 2.4 (± 0.4)], aseptate, smooth to occasionally minutely verruculose, hila 0.8–1 µm diam, intercalary conidia with 1–2 distal hila fusiform or ellipsoid, 6–9(–10) × (2–)2.5–3(–3.5) µm [av. (± SD) 7.5 (± 1.1) × 3.0 (± 0.4)], 0(–1)-septate, usually smooth, sometimes very slightly rough-walled, attenuated towards apex and base, hila 0.8–1 µm diam, secondary ramoconidia ellipsoid to cylindrical, (7.5–)8–19(–25) × 2.5–3.5(–4.5) µm [av. (± SD) 13.4 (± 4.0) × 3.1 (± 0.5)], 0–1(–3)-septate, not constricted at septa, septa becoming sinuous with age, pale to pale medium olivaceous-brown or brown, smooth or almost so, sometimes very slightly rough-walled, walls thickened, slightly attenuated towards apex and base, with up to six pronounced denticulate distal hila, sometimes

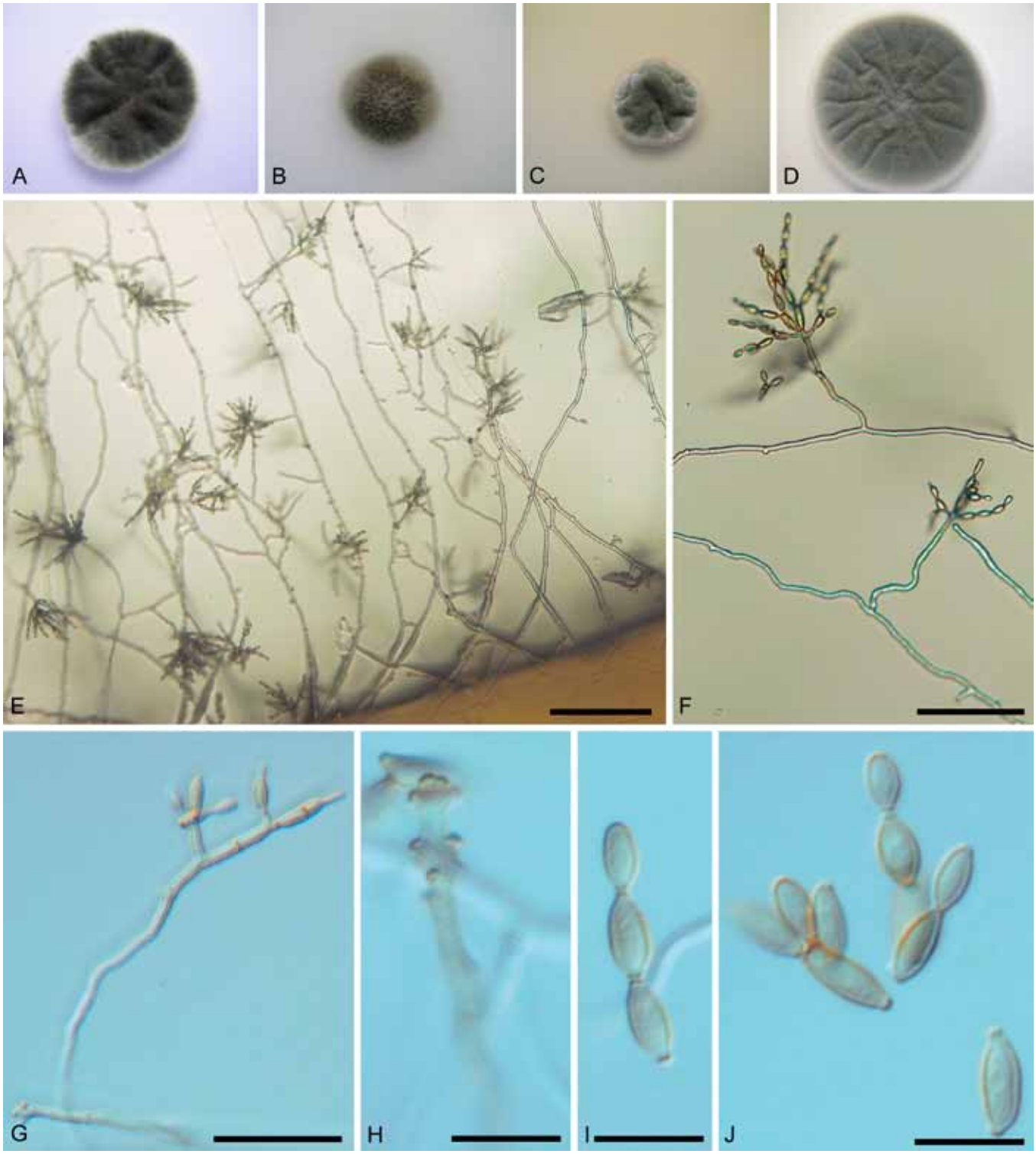



**Fig. 275.** *Cladosporium salinae* (CBS 119413). A–D. Colony surface grown on PDA (A), OA (B), MEA (C) and MEA plus 5 % NaCl (D) of strains incubated for 14 d at 25 ºC in darkness. E–F. Habit of conidiophores. G. Conidiophore. H. Detail of apical part of conidiophore. I. Conidia. J. Secondary ramoconidia and conidia. E–J. All from 7-d-old SNA slide cultures. A–D, from EXF-604; E–J, from EXF-335 (ex-type strain). Scale bars = 10 (H–J), 30 (G), 50 (F), 100 (E).

situated on small irregular lateral outgrowth, hila 1–1.5(–1.8) µm diam, thickened and darkened; microcyclic conidiogenesis occasionally occurring.

*Culture characteristics*: Colonies on PDA reaching 10–27 mm diam, greenish olivaceous to grey-olivaceous or dull-green, reverse leaden-grey, felty-wooly or velvety, margin narrow, white, feathery, regular to undulate, aerial mycelium formed, felty-wooly, high, growth low convex, without prominent exudates, sporulation profuse. Colonies on OA reaching 7–20 mm diam, grey-olivaceous to dull-green or mouse-grey, reverse olivaceous-grey to iron-grey or dark mouse-grey, velvety, aerial mycelium sparse, smoke-grey, diffuse to fluffy, growth flat with papillate surface, without prominent exudates, sporulation profuse. Colonies on MEA reaching 8–19 mm diam, grey- to greenish olivaceous, reverse olivaceous-grey to iron-grey, velvety to fluffy-felty, margin white, narrow, feathery to undulate, aerial mycelium mainly in colony centre, felty-fluffy, high, colonies radially furrowed, wrinkled or folded, centre elevated, without prominent exudates, sporulation profuse. Colonies on MEA with 5 % NaCl growing much faster than on other media, reaching

25–38 mm diam, of different colours, mostly reseda-green (2E6) and granulate due to profuse sporulation, margin olive-yellow (2D6), reverse yellow to dark green. *Maximum tolerated salt concentration*: MEA + 17 % NaCl after 14 d. *Cardinal temperatures*: No growth at 4 °C, optimum and maximum temperature at 25 °C (8–19 mm diam), no growth at 30 °C.

*Substrate and distribution*: Isolated from hypersaline water in the Mediterranean basin; Europe (Slovenia, Spain).

*Additional specimens examined*: **Slovenia**, Sečovlje salterns, isol. from hypersaline water (EXF-322). **Spain**, Santa Pola, isol. from hypersaline water (EXF-604).

*Notes*: *Cladosporium salinae* morphologically resembles species of the genus *Fusicladium* because its conidia are oblong-ellipsoid to fusiform and conidiogenous loci of ramoconidia are placed closely together. As any other *Cladosporium* species, its conidia show typical cladosporioid scar structures, however. *Cladosporium salinae* seems to have a separate position within the genus *Cladosporium* since it seems to be distantly related to any other described *Cladosporium* species or currently known species complex within *Cladosporium* (Zalar *et al.* 2007).

**138. *Cladosporium sarmentorum*** (Riedl & Ershad) U. Braun, Schlechtendalia 19: 63. 2009. Fig. 276.
*Basionym*: *Acrosporella sarmentorum* Riedl & Ershad, Sydowia 29: 166. 1977.

*Holotype*: **Iran**, village Love, near Minoudasht, 100–200 m high, on dead tendrils of *Rubus* sp. (*Rosaceae*), 23 Apr. 1974, Riedl & Ershad F5 (W). *Isotype*: EVIN.

*Ill.*: Riedl & Ershad (1977: 167, fig. 4), Braun (2009: 64, fig. 1).

*In vivo*: *Colonies* on dead stems, wood and tendrils, punctiform, scattered to aggregated, or forming dense villose black patches or layer. *Mycelium* internal, sometimes also external; hyphae pale olivaceous to medium brown or olivaceous brown, 2–7 µm diam, septate, smooth. *Stromata* lacking to well-developed, immersed to erumpent, 20–120 µm diam, dark brown, composed of swollen hyphal, 3–15 µm diam, brown, wall up to 1.5 µm thick, often with diffuse aggregations and layers of stromatic hyphal cells, often forming superficial strands of swollen cells, up to 10 µm diam, with constrictions at the septa, monilioid. *Conidiophores* solitary, caespitose, in small to large, loose to moderately dense fascicles, arising from swollen hyphal cells or stromata, erect to decumbent, 20–250 × 3–9 µm, simple to frequently branched in the upper portion, with short lateral branchlets or long branches, up to 90 µm in length, subcylindrical to sinuous, slightly geniculate, rarely subnodulose, pluriseptate throughout, often densely septate and constricted at the septa, pale to dark brown or olivaceous-brown, tips usually paler, subhyaline to olivaceous, wall 0.5–1(–2) µm thick, smooth to somewhat rough-walled or rugose, cells sometimes with distinct lumina, giving the impression that the walls are very thick, occasioanlly guttulate, rarely with monopodial rejuvenation. *Conidiogenous cells* integrated, terminal and intercalary, 5–25 µm long, at first often monoblastic, later polyblastic, sympodial, but conidiogenous cells not or only slightly geniculate, conidiogenous loci (1–)1.5–2(–2.5) µm diam, less conspicuous than in most other species of the genus, barely or only slightly protuberant, slightly darkened-refractive, central dome not very conspicuous.

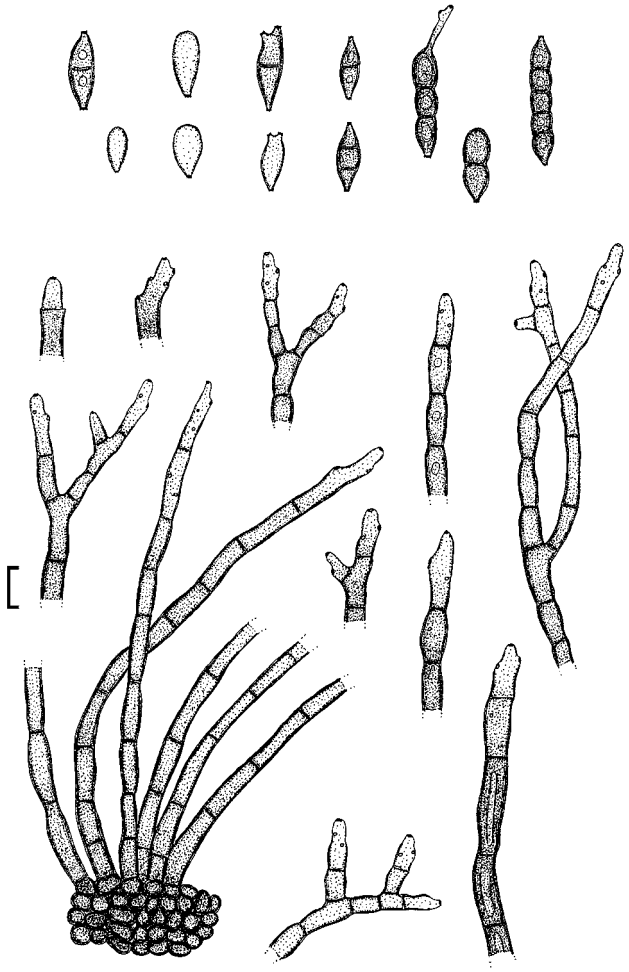


**Fig. 276.** *Cladosporium sarmentorum* (W). Fascicle of conidiophores arising from stromata, frequently branched upper portions of conidiophores, conidia and microcyclic conidiogenesis *in vivo*. Scale bar = 10 µm. U. Braun *del*.

*Conidia* solitary and catenate, in short simple to branched chains, subglobose, broadly ellipsoid-ovoid, fusiform, subcylindrical, limoniform, (3–)5–24(–30) × (2–)4–7(–8) µm, 0–3(–5)-septate, often slightly constricted at the septa, small, young conidia subhyaline, later olivaceous, olivaceous-brown to medium brown, wall up to 1 µm wide, smooth, rarely faintly rough-walled, ends rounded to somewhat attenuated, hila not or somewhat protuberant, 0.75–2 µm diam, slightly darkened-refractive; occasionally with microcyclic conidiogenesis.

*Substrate and distribution*: Saprobic on dead wood, stems and tendrils; Asia (Iran), Europe (Italy, Russia).

*Additional specimens examined*: **Italy**, South Tirol, Trentino, Seis, on dead wood (planks), 1870, G. Hausmann (B 700006723). **Russia**, Leningrad Oblast, Vyborg District, Roshchino, Pionerskoje Forestry, on dead wood of *Picea abies* (*Pinaceae*), 23 Aug. 2005, D.A. Shabunin (HAL 2172 F, LE 256895); St. Petersburg, Vyborg District, Institutskij prospect, near house 21, on dead cones of *Picea pungens*, 24 Dec. 2009, D.A. Shabunin (HAL 2350 F).

*Notes*: This is a saprobic species. The colonies, conidiophores and conidia resemble those of *C. delicatulum* and *C. nigrellum*, but the conidiophores are frequently branched. *Cladosporium sarmentorum* differs from most other *Cladosporium* species in having barely geniculate conidiogenous cells with less conspicuous, barely protuberant, barely or only slightly darkened-refractive conidiogenous loci. The loci are cladosporioid, but the central dome is not very conspicuous and the surrounding rim is rather low.

*Cladosporium xylophilum*, another species occurring on wood, is easily distinguishable from the latter species in having narrower, usually unbranched conidiophores, 2–4 µm wide, and narrower [(2−)2.5−4(−5) µm wide], 0–1(–3)-septate, smooth or often irregularly rough-walled, loosely verruculose to verrucose conidia with numerous distal hila crowded at the apex or situated on small lateral prolongations (Bensch *et al.* 2010).

**139. *Cladosporium scabrellum*** Bensch, Schroers, Crous & U. Braun, Stud. Mycol. 67: 75. 2010. Figs 277–279.

*Holotype*: **Slovenia**, Boštanj near Sevnica, on wilted part of leaf of *Ruscus hypoglossum* (*Asparagaceae*), 2 Jan. 2008, H.-J. Schroers (CBS H-20447). *Ex-type culture*: CBS 126358 = CPC 14976 = HJS 1031.

*Ill.*: Bensch *et al.* (2010: 76−77, figs 64−66).

*In vitro: Mycelium* immersed and superficial, hyphae unbranched or loosely branched, 0.5−4 µm wide, mostly 1−3 µm wide, septate, sometimes constricted at septa, subhyaline to pale medium olivaceous-brown, smooth to minutely verruculose or loosely verruculose, walls unthickened or almost so, often with intercalary swellings and constrictions, forming loose to usually dense long characteristic ropes, somewhat interlaced, hyphae which give rise

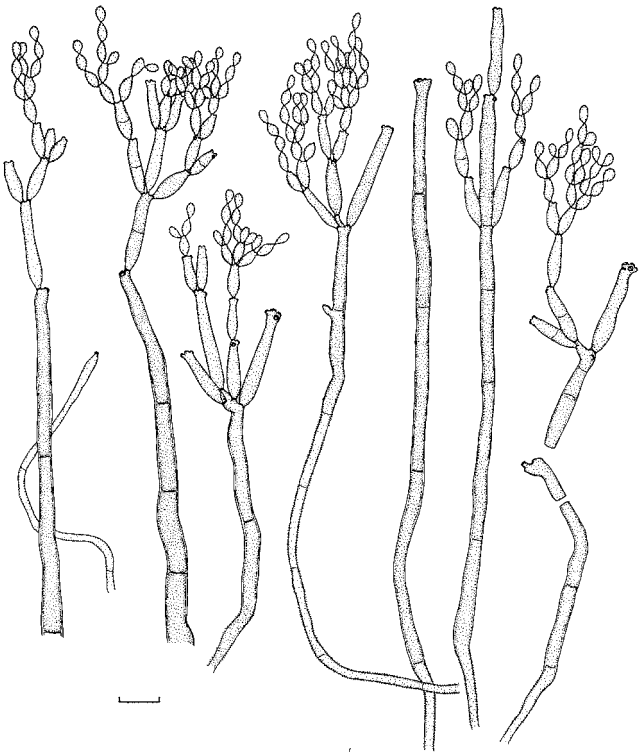


**Fig. 277.** *Cladosporium scabrellum* (CBS 126358). Macro- and micronematous conidiophores, ramoconidia and conidial chains *in vitro*. Scale bar = 10 µm. K. Bensch *del.*

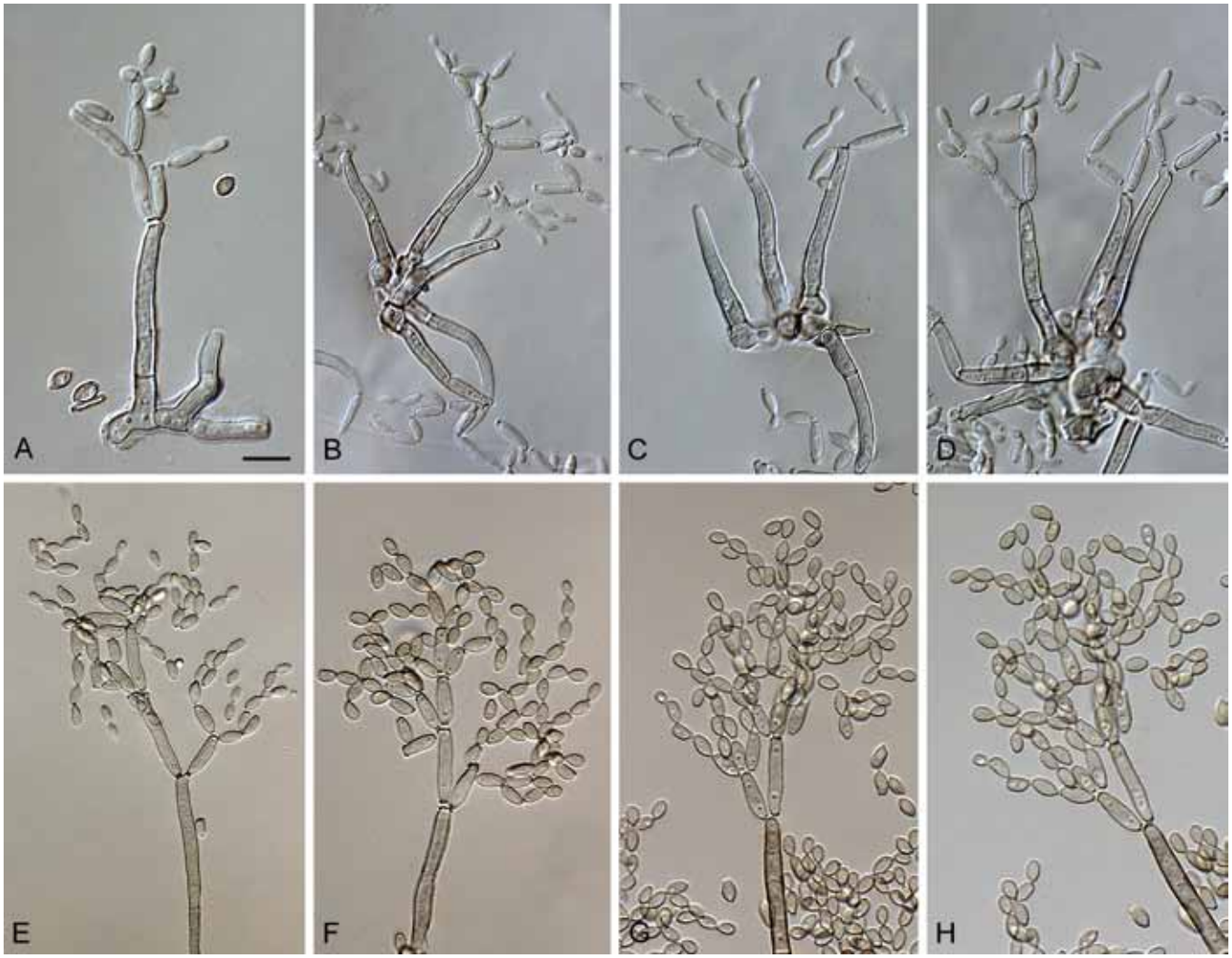



**Fig. 278.** *Cladosporium scabrellum* (CBS 126358). A–D (after 3 d). Macronematous conidiophores arising solitary or in small loose groups from hyphae or swollen hyphal cells and short conidial chains. E–H (after 7 d). Macronematous conidiophores and conidial chains. Scale bar = 10 µm.

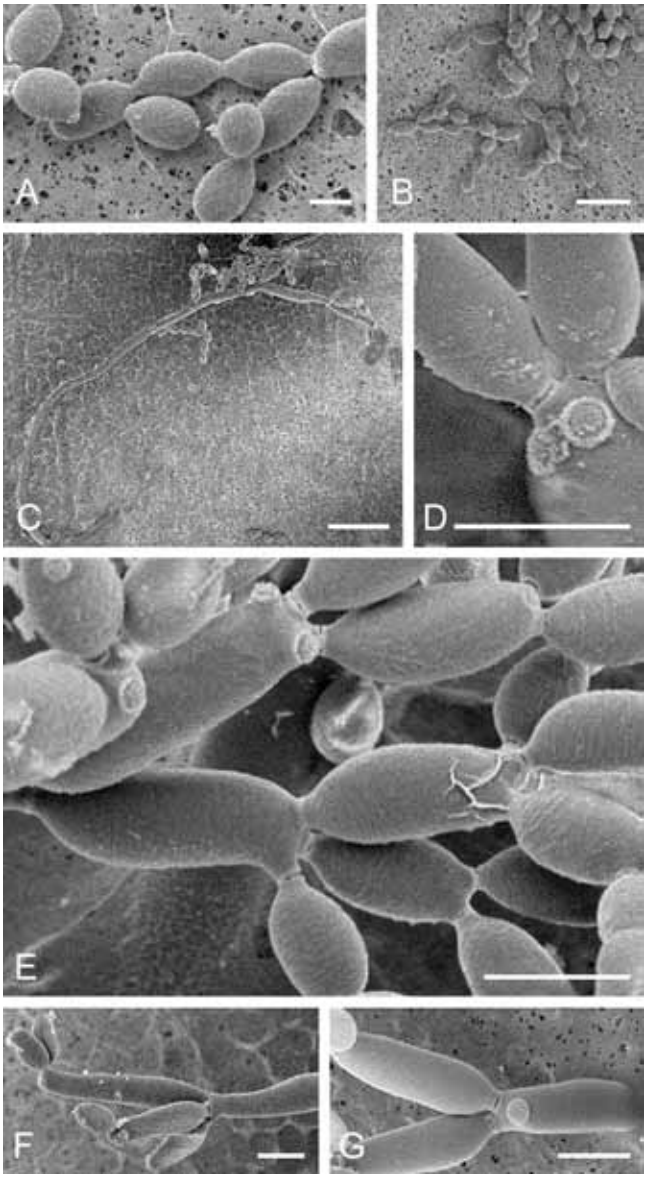



**Fig. 279.** *Cladosporium scabrellum* (CBS 126358). A. Globose conidia with nearly smooth surface. B. Overview of conidial chains. C. Elongated conidiophores. D. Secondary ramoconidium with large scars. E. Whorls of secondary ramoconidia and conidia. Note the presence of four scars on the top ramoconidium and the reticulate ornamentation of one of the conidia. F. Secondary ramoconidia of which one elongated. G. Conidiophore with secondary ramoconidia and large scar. Scale bars = 2 (A), 5 (D–G), 10 (B), 50(C) µm.

to conidiophores solitary and not in ropes, sometimes slightly wider at the base of conidiophores. *Conidiophores* macronematous, occasionally micronematous, solitary, arising laterally and terminally from hyphae, erect, straight, cylindrical-oblong, neither nodulose nor geniculate, unbranched, occasionally once branched with quite short branches just below a septum, 40−115(−185) × 3−4 µm, at the base up to 5 µm wide, septate, not constricted at septa, medium olivaceous-brown, smooth or finely verruculose, walls only slightly thickened, about 0.5 µm wide. *Conidiogenous cells* integrated, mainly terminal, but also intercalary, cylindrical-oblong, neither geniculate nor nodulose, 25−53 µm long, with up to four loci at the apex, conspicuous, subdenticulate, 1−1.8 µm diam, thickened and darkened-refractive. *Ramoconidia* occasionally formed, cylindrical-oblong, up to 34 µm long, 4 µm wide, base 2−2.5 µm wide, smooth or finely verruculose. *Conidia* very numerous, catenate, in densely branched chains, branching in all directions, up to four conidia in the unbranched terminal part, small terminal conidia subglobose to obovoid, 3.5−4.5(−5) × 2−2.2(−2.5) µm (av. ± SD: 4.1 ± 0.5 × 2.1 ± 0.2), aseptate, intercalary conidia limoniform, fusiform, ellipsoid to subcylindrical, 5−13 × 2−3(−3.5) µm (av. ± SD: 8.2 ± 2.9 × 2.7 ± 0.4), 0−1-septate, not constricted, slightly attenuated towards apex and base, with 1−4 distal hila, secondary ramoconidia ellipsoid to subcylindrical or cylindrical, 10−25 × 2.5−3.5(−4) µm (av. ± SD: 17.2 ± 4.6 × 3.1 ± 0.4), 0−1-septate, not constricted, with 3−4(−5) distal hila, pale to pale medium olivaceous-brown, smooth or almost so to often indistinctly asperulate or loosely minutely verruculose, more obvious in small terminal and intercalary conidia, under SEM smooth or surface reticulate or with embossed stripes caused by diminishing turgor and shriveling of tender young conidia, walls unthickened, hila conspicuous, subdenticulate, 0.5−1.8 µm diam, somewhat thickened and darkened-refractive; without microcyclic conidiogenesis.

*Culture characteristics*: Colonies on PDA grey-olivaceous to iron-grey, reverse iron-grey to olivaceous-black, grey-olivaceous towards margins, velvety to floccose, margins white, glabrous to feathery, aerial mycelium scattered, floccose, smoke-grey, growth flat, few small to large prominent exudates, sporulation profuse. Colonies on MEA olivaceous-grey to smoke-grey in colony centre due to aerial mycelium and lack of sporulation, most of the colony grey-olivaceous due to abundant sporulation, reverse olivaceous-grey to iron-grey, velvety to felty-floccose, margins white, glabrous to feathery, growth effuse with elevated colony centre, tip of the colony immersed, sometimes radially furrowed, without exudates. Colonies on OA olivaceous, greenish olivaceous towards margins and with stripes and triangles of iron-grey, reverse iron-grey to pale greenish grey, floccose to felty-villose, margins colourless, narrow, glabrous, aerial mycelium mainly in colony centre, floccose to felty-villose, pale olivaceous-grey, growth flat, without exudates, sporulation profuse.

*Substrate and distribution*: On wilted leaves of *Ruscus*; Europe (Slovenia).

*Notes*: *Cladosporium scabrellum* morphologically resembles *C. cladosporioides* and *C. tenuissimum*, but in phylogenetic analyses the three species proved to be quite distinct (see Bensch *et al.* 2010, fig. 1, part a *vs.* c), and there are some morphological differences. Above all, *C. scabrellum* often forms long dense ropes, the conidiophores are shorter and the smooth or mostly indistinctly asperulate conidia are very numerous.

**140. *Cladosporium silenes*** Crous, IMA Fungus 2(1): 64. 2011. Fig. 280.

*Holotype*: **UK**, Pembrokeshire, Skomer Island, stems of exposed *Oberna uniflora* (= *Silene maritima*) (*Caryophyllaceae*) 22 Aug. 2000, A. Aptroot 49319 (CBS H-19874). *Ex-type culture*: CBS 109082.

*Ill.*: Crous *et al.* (2011b: 64, fig. 4).

*In vivo*: *Ascomata* occurring in exposed twigs, amphigenous, black to dark brown, subepidermal, to 70 µm diam, visible by an erumpent, central, periphysate ostiole, 5–10 µm; wall of 2–3 layers of red-brown *textura angularis*. *Asci* aparaphysate, fasciculate, bitunicate with fissitunicate discharge, subsessile, obovoid to

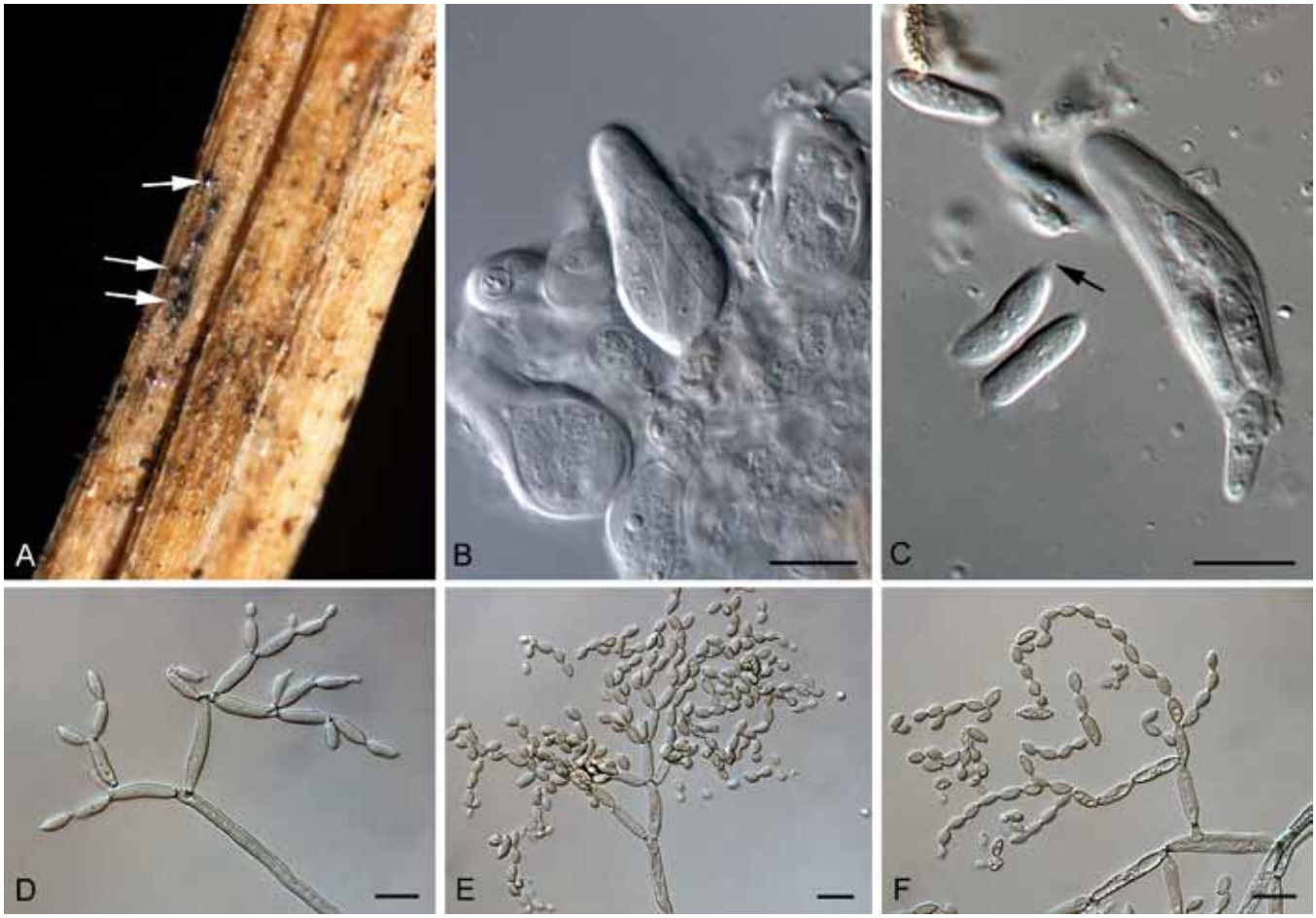



**Fig. 280.** *Cladosporium silenes* (CBS H-19874). A. Ascomata on host tissue (arrows). B. Asci. C. Ascospores (arrow denotes mucoid appendage); D–F. Conidiophores with conidial chains. A–C from Bensch *et al.* 2010. Scale bars = 10 µm.

broadly ellipsoid, straight to slightly curved, 8-spored, 25–35 × 10–12 µm, with visible apical apiculus. *Ascospores* tri- to multiseriate, hyaline, nonguttulate with angular inclusions, thick-walled, straight to slightly curved, fusoid-ellipsoid with obtuse ends, medianly 1-septate, widest in middle of apical cell, not to slightly constricted at the septum, tapering towards both ends, but slightly more to lower end, (10–)11–13(–14) × (3–)3.5(–4) µm; turning brown once discharged, and some containing remnants of a mucoid layer; germinating from both ends, distorting, becoming brown and finely verruculose.

*In vitro*: *Mycelium* consisting of branched, septate, pale to medium brown 2(–4) µm wide hyphae, without any swellings and constrictions, smooth to minutely verruculose, walls unthickened. *Conidiophores* solitary, macronematous or micronematous, arising terminally from ascending hyphae or laterally, straight to somewhat flexuous, narrowly cylindrical to cylindrical-oblong, non-nodulose, not geniculate-sinuous, 15−100(−200) × 3−4(−4.5) µm, unbranched, pluriseptate, usually not constricted at septa, pale to medium olivaceous-brown, smooth to minutely verruculose, especially towards the base, walls unthickened, base sometimes swollen, up to 8 µm wide; micronematous conidiophores shorter, unbranched, 10−30 × 3−4 µm. *Conidiogenous cells* integrated, usually terminal, sometimes intercalary, cylindrical-oblong, not geniculate, non-nodulose, (10−)20−60 µm long, with up to three loci crowded at the apex, subdenticulate to denticulate, protuberant, 2(−2.5) µm diam, central dome mostly flat, somewhat thickened and darkened-refractive. *Ramoconidia* straight to slightly curved, cylindrical-oblong, 15−20(–25) × 3−4(–4.5) µm, aseptate, pale olivaceous-brown, concolorous with tips of conidiophores, smooth, base not cladosporioid, 2−2.5 µm wide, thickened, somewhat refractive. *Secondary ramoconidia* aseptate, smooth, pale olivaceous-brown, cylindrical-oblong, (8–)10–15(–20) × 3.5–4 µm. *Conidia* numerous, catenate, in branched chains of up to 6 in the upper unbranched part, branching in all directions. *Intercalary conidia* limoniform, ellipsoid-ovoid, 7−8(−10) × (2−)2.5−3 µm, aseptate, with up to 3 distal hila. *Small terminal conidia* aseptate, subglobose, obovoid, ovoid to limoniform, 4−5(−6) × (2.5−)3(−3.5) µm; hila darkened and somewhat thickened, 0.5–1 µm diam.

*Culture characteristics*: Colonies after 2 wk at 24 °C spreading with moderate aerial mycelium and smooth, lobate margins, reaching 40 mm diam after 2 wk. On MEA surface pale olivaceous-grey to olivaceous-grey, reverse iron-grey. On OA surface grey-olivaceous to olivaceous-grey. On PDA surface grey-olivaceous, reverse olivaceous-grey.

*Substrate and distribution:* On *Oberna*; UK.

*Notes*: Strain CBS 109082 represents an ascospore isolate, obtained from material of *Silene maritima* and initially identified as *Mycosphaerella tassiana* var. *arthopyrenioides*. Morphologically the CBS strain is similar to *C. cladosporioides*, but is a member of a distinct clade (*C. cladosporioides s.lat*. Lineage 3; see fig. 1, part A in Bensch *et al.* 2010). *Cladosporium silenes* is the first sexual species known from the *C. cladosporioides* complex. Given that these ascomata are rather inconspicuous (immersed, approx. 100 µm diam), it is not surprising that they have been largely overlooked

in the past (Crous *et al.* 2011b). *Cladosporium silenes* differs from *C. cladosporioides* in having shorter, unbranched conidiophores, longer conidiogenous cells, shorter ramo- and intercalary conidia (Bensch *et al*. 2010).

**141. *Cladosporium sinuosum*** K. Schub., C.F. Hill, Crous & U. Braun, Stud. Mycol. 58: 141. 2007. Figs 281, 282.

*Holotype*: **New Zealand**, Te Anau, isolated from leaves of *Fuchsia excorticata* (*Onagraceae*), 31 Jan. 2005, A. Blouin, C.F. Hill 1134A (CBS H-19863). *Ex-type culture*: CBS 121629 = CPC 11839 = ICMP 15819.

*Ill*.: Schubert *et al*. (2007b: 140–141, figs 34–35).

*In vitro*: *Mycelium* sparingly branched, 1–7 µm wide, septate, not constricted at the septa, subhyaline to pale brown, smooth to minutely verruculose, walls unthickened or slightly thickened, sometimes with small swellings. *Conidiophores* arising laterally from plagiotropous hyphae or terminally from ascending hyphae, erect, more or less straight to flexuous, often once or several times slightly to distinctly geniculate-sinuous, sometimes even zigzag-like, nodulose with small to large lateral shoulders, shoulders somewhat distant from each other or in close succession giving them a knotty/gnarled appearance, unbranched or once branched, 25–260 × 5–7 µm, shoulders up to 10 µm wide, pluriseptate, septa sometimes in short succession, not constricted at the septa, pale brown to medium brown, smooth to minutely verruculose, walls thickened, often distinctly two-layered, up to 1 µm thick. *Conidiogenous cells* integrated, terminal or intercalary, often slightly to distinctly geniculate-sinuous, nodulose with small to large laterally swollen shoulders, 8–30 µm long, proliferation sympodial, with a single or up to three conidiogenous loci, usually confined to lateral shoulders, protuberant, often denticle-like or on the top of short cylindrical stalk-like prolongations, 1.2–2(–2.2) µm diam, mainly 2 µm, somewhat thickened and darkened-refractive, dome often slightly higher than the surrounding rim. *Conidia* solitary or in short unbranched chains with up to three conidia, straight, obovoid, oval, broadly ellipsoid to subcylindrical or sometimes clavate (broader at the apex), 9–21 × (5–)6–8 µm [av. ± SD, 14.5 (± 2.5) × 6.6 (± 0.7) µm], 0–1-septate, not constricted at the septa, septum more or less median, pale greyish brown, densely echinulate, spines up to 1 µm long, walls thickened, apex mostly broadly rounded or sometimes attenuated, towards the base mostly distinctly attenuated forming a peg-like prolongation, up to 2 µm long, hila protuberant, 1.2–2 µm diam, mainly 2 µm, somewhat thickened and darkened-refractive; microcyclic conidiogenesis not observed.

*Culture characteristics*: Colonies on PDA attaining 20 mm diam after 14 d at 25 ºC, pale olivaceous-grey due to abundant aerial mycelium, olivaceous-grey towards margins, iron-grey to olivaceous-black reverse, margin regular, entire edge, aerial mycelium abundant, cottony, dense, high, growth regular, low convex, radially furrowed in the centre, growing deep into the agar, with age numerous small to large prominent exudates, sporulation sparse. Colonies on MEA attaining 16 mm diam after 14 d at 25 ºC, white to pale smoke-grey, fawn reverse, velvety, margin undulate, glabrous, aerial mycelium abundant, dense, high, fluffy, growth raised with elevated colony centre, laterally furrowed, without prominent exudates. Colonies on OA attaining 18 mm diam after 14 d at 25 ºC, olivaceous, white to pale olivaceous-grey in the centre due to abundant aerial mycelium, olivaceous-grey reverse, margin white, entire edge, glabrous, aerial mycelium loose to dense, high, fluffy to felty, growth flat to low convex, regular, without prominent exudates, sporulating.

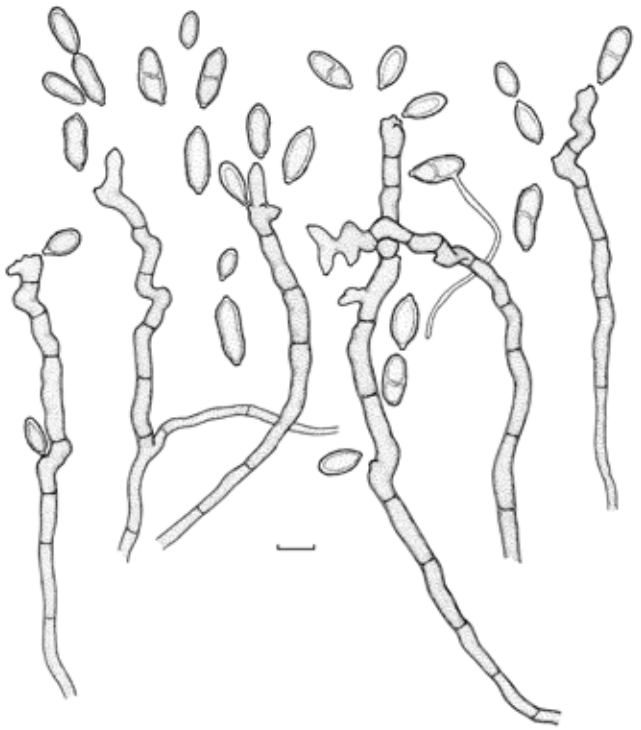


**Fig. 281.** *Cladosporium sinuosum* (CPC 11839). Conidiophores and conidia *in vitro*. Scale bar = 10 µm. K. Bensch *del*.

*Substrate and distribution*: Isolated from various plants; New Zealand.

*Additional specimens examined*: **New Zealand**, Lincoln, Kimihia, Boundary Road, isolated from *Hordeum vulgare* (*Poaceae*), 6 Dec. 2007, R. Thangavel (HAL 2237 F); isolated from *Secale cereale* (= ×*Triticum secale*) (wheat × rye hydrid), 6 Dec. 2007, R. Thangavel (HAL 2236 F).

*Notes*: *Cladosporium sinuosum* belongs to the *C. herbarum* complex, but differs from the latter species (*s. str.*) in having slightly to distinctly geniculate-sinuous, often zigzag-like conidiophores and *Heterosporium*-like conidia, *i.e.* formed singly or rarely in short unbranched chains. Morphologically comparable species with a similar combination of such conidiophores and conidia are unknown (Schubert *et al.* 2007b).

**142. *Cladosporium smilacicola*** K. Schub., Schlechtendalia 14: 77. 2006. Figs 283, 284.

*Holotype*: **Germany**, München, botanical garden, cold house, on *Smilax regelii* (= *S. grandifolia*) (*Smilacaceae*), Mar. 1895, Allescher (M-0057718), as "*C. smilacis* (Schwein.) Fr.".

*Lit*.: Schubert (2005b: 132–134).
*Ill*.: Schubert (2005b: 133, fig. 64, pl. 28, figs A–G), Schubert *et al*. (2006: 79, fig. 11, pl. 2, figs G–H).

*In vivo*: On living leaves, large areas of the leaf surface becoming necrotic, at first at leaf margins, later extending, on the upper

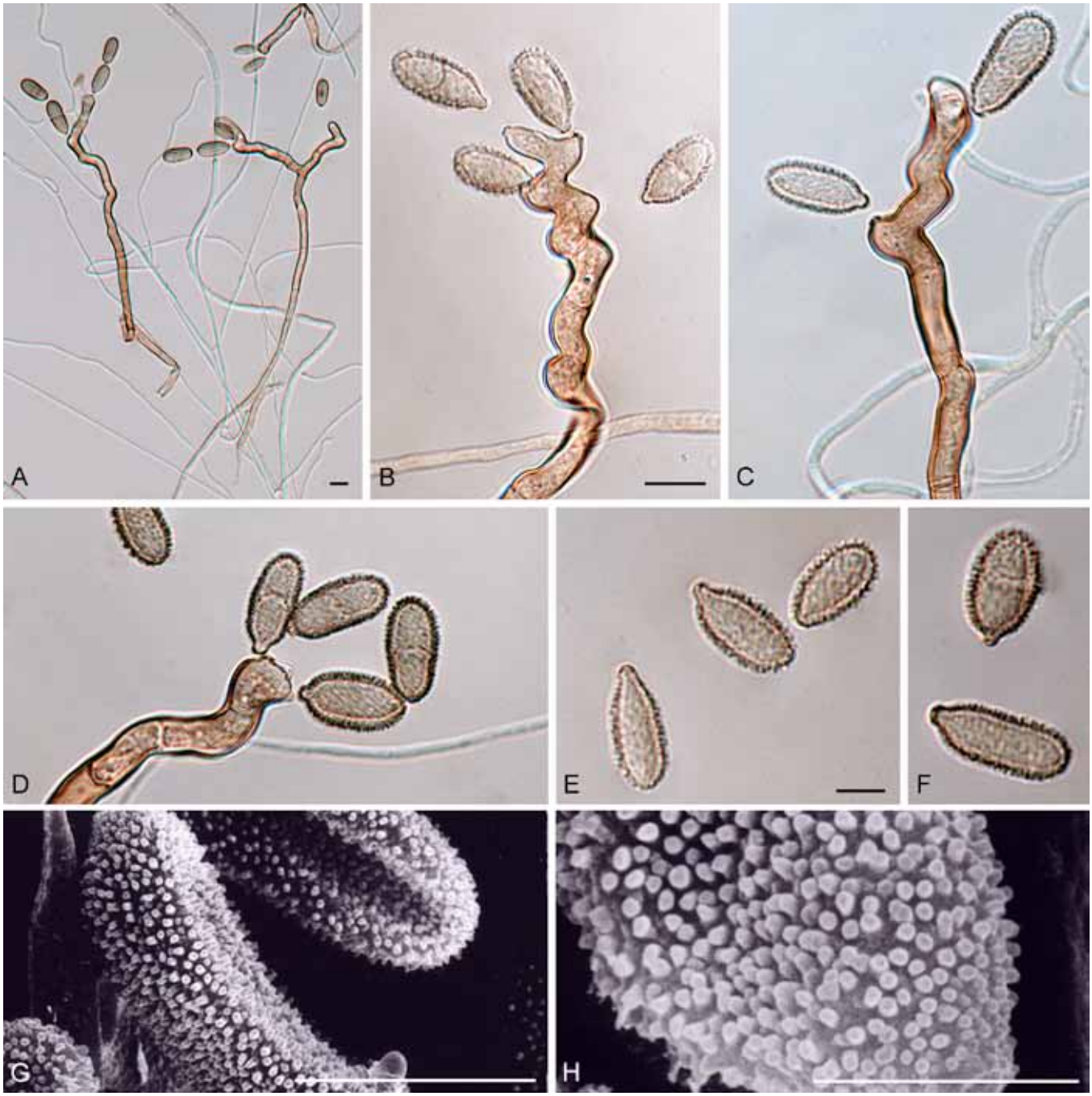



**Fig. 282.** *Cladosporium sinuosum* (CPC 11839). A–D. Conidiophores. E–F. Conidia. G–H. SEM photos showing details of the conidial surface ornamentation. Scale bars = 5 (H), 10 (A–G) µm.

leaf surface pale greyish brown to whitish, faded, below dingy olivaceous-brown to pale greyish brown, partly limited by a narrow, brown or somewhat reddish brown margin and a paler halo. *Colonies* mainly hypophyllous, sometimes sparsely fruiting on the upper leaf surface, effuse, loosely to densely caespitose, dingy greyish brown to brown, somewhat floccose with dense fructification (visible with a stereomicroscope), velvety. *Mycelium* internal, subcuticular to intraepidermal; hyphae branched, 2–6 µm wide, septate, with swellings and constrictions, subhyaline to very pale olivaceous-green, smooth, thin-walled or almost so, forming a loose network or hyphal plates. *Stromata* intraepidermal and substomatal, at first small, subglobose, later extending and flattened, compact, 15–85 µm wide or confluent and even larger, several layers deep, composed of swollen hyphal cells, subglobose to somewhat angular-oblong, 5–10 µm diam, pale to medium brown, smooth, walls somewhat thickened. *Conidiophores* in small to somewhat larger, loose fascicles, arising from stromata, emerging through stomata or erumpent through the cuticle, erect, straight to slightly flexuous, cylindrical-oblong, often slightly geniculate-sinuous near the apex, unbranched or usually branched, once or several times and often near the base, 20–150 × 2.5–5 µm, septate, pale brown to pale olivaceous-brown, somewhat darker near the base, smooth to somewhat irregularly rough-walled, sometimes minutely verruculose near the apex, walls somewhat thickened, sometimes even two-layered near the base, occasionally slightly swollen near the base, sporadically enteroblastically proliferating. *Conidiogenous cells* integrated, terminal and intercalary, cylindrical-oblong, slightly geniculate, 14–48 µm long, with a single or several conidiogenous loci, often situated on small lateral shoulders, protuberant, subdenticulate, 1–2 µm diam, dome not or only slightly higher than the surrounding rim, thickened, darkened-refractive. *Ramoconidia* sporadically occurring, broadly cylindrical-oblong, up

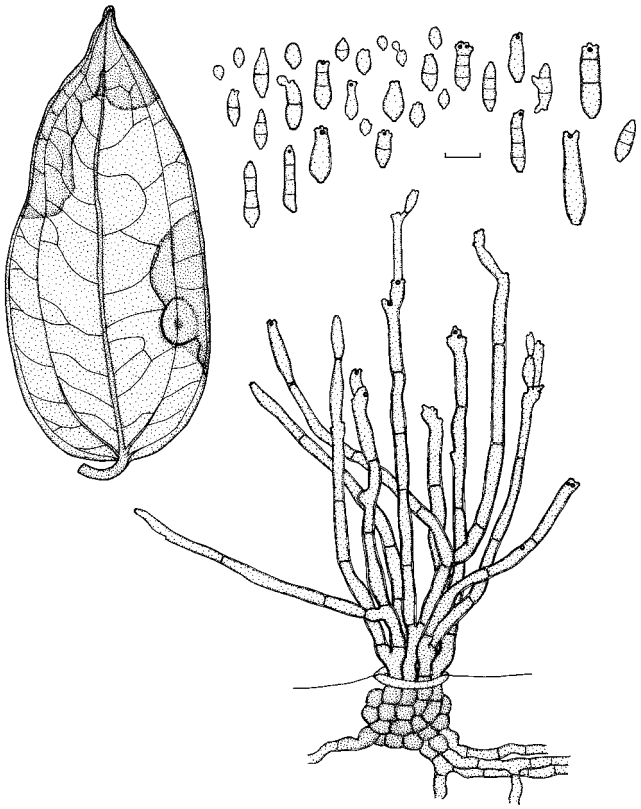


**Fig. 283.** *Cladosporium smilacicola* (M-0057718). Symptoms, fascicle of conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

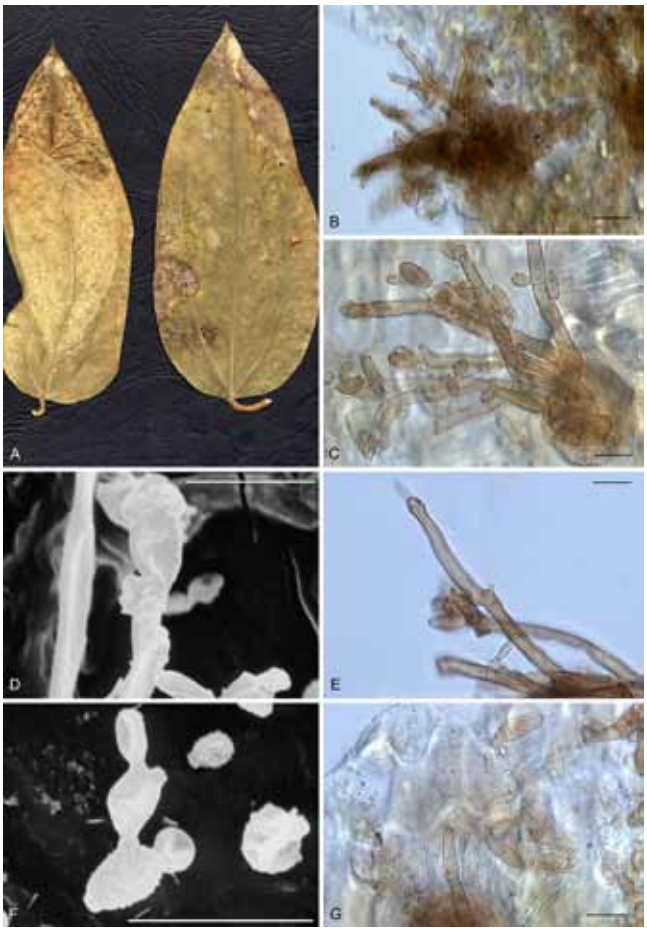


**Fig. 284.** *Cladosporium smilacicola* (M-0057718). A. Symptoms. B. Overview. C. Fascicle of conidiophores. D. Tip of a conidiophore with attached conidium, with several conidiogenous loci and hila. E. Conidiophores. F. Conidia showing surface ornamentation. G. Conidiophores, conidia and microcyclic conidiogenesis. Scale bars = 10 (C–G), 20 (B) µm.

to 26 µm long, 0(–1)-septate, with a broadly truncate, unthickened base, 3 µm wide. *Conidia* in branched chains, straight, numerous and variable in shape, subglobose, obovoid, ellipsoid, fusiform, subcylindrical to cylindrical-oblong, 2–18(–21) × 1.5–5(–6) µm, 0–3(–4)-septate, usually not constricted at the septa, pale brown to pale olivaceous-brown, almost smooth to often verruculose or irregularly rough-walled, walls somewhat thickened, apex rounded or slightly attenuated towards the apex and base, hila protuberant, short cylindrical, truncate to slightly convex, (0.5–)1–2 µm diam, thickened, somewhat darkened-refractive; microcyclic conidiogenesis occurring.

*Substrate and distribution*: On *Smilax regelii*; Germany.

*Notes*: Type material of *Cladosporium smilacis*, briefly described by Schweinitz (1822) as *Dematium smilacis* Schwein. on twigs of *Smilax* sp. from North America, is in very poor condition. No *Cladosporium* has been found, only few dark brown, 2–3-septate conidia without cladosporioid hila have been observed, so that this species has to be excluded from *Cladosporium s. str.*, but its taxonomic status remains unclear. Zhang *et al*. (2003) described and illustrated a record on *Smilax china* determinated as *C. smilacis*, which could not be obtained for examination.

*Cladosporium smilacicola* is morphologically comparable with *C. foliorum* and *C. oreodaphnes*, but the latter species is quite distinct in having wider, often subnodulose to nodulose conidiophores, wider, 0–1(–3)-septate conidia with more or less thickened, sometimes even two-layered walls and a somewhat unusual cell structure (protoplasm aggregated so that the septa and walls appear to be thickened, with a conspicuous, paler lumen in the centre of the cells giving them a somewhat zonate appearance). *Cladosporium foliorum* deviates in forming dense, *Fusicladium*-like stromatic hyphal aggregations with sometimes irregularly lobed cells, usually unbranched conidiophores and somewhat longer, 0–1(–2)-septate conidia (Schubert 2005b).

## 143. *Cladosporium soldanellae* Jaap, Ann. Mycol. 5: 270. 1907. Figs 285, 286.

*Neotype* (**proposed here**): **Germany**, Bavaria, Garmisch-Partenkirchen, Hammersbach, trail from Hammersbach to "Höllentalklamm" and Höllentalanger, near Höllentalangerhütte, wet meadow, on leaves of *Soldanella alpina* (*Primulaceae*), 23 Jun. 2006, K. Schubert, Braun, Fungi Sel. Exs. 81 (HAL 2009 F). *Isoneotypes*: Braun, Fungi Sel. Exs. 81 (BPI, GZU, HMAS, IMI, KR, KUS, LE, M, PDD, VPIR) and CBS H-19871. *Ex-neotype culture*: CBS 132186 = CPC 13153.
[*Type*: **Switzerland**, Simplonhospiz, 2010 m alt., on dead leaves of *Soldanella alpina* (not preserved).]

= *Cladosporium stysanoides* Bubák, Bot. Közlem. 15(3–4): 81. 1915. [holotype: BPI 427476].

*Lit.*: Lindau (1910: 796), Ferraris (1912: 348), Saccardo (1913a: 1368), Schubert (2005b 134–136).
*Ill.*: Schubert (2005b: 135, fig. 65, pl. 29, figs A–D).
*Exs.*: Braun, Fungi Sel. Exs. 81.

*In vivo*: On leaves and petioles, leaf spots formed as subcircular, whitish or pale brown, somewhat raised discolorations. *Colonies* amphigenous, scattered, punctiform, in small tufts, brown, at first

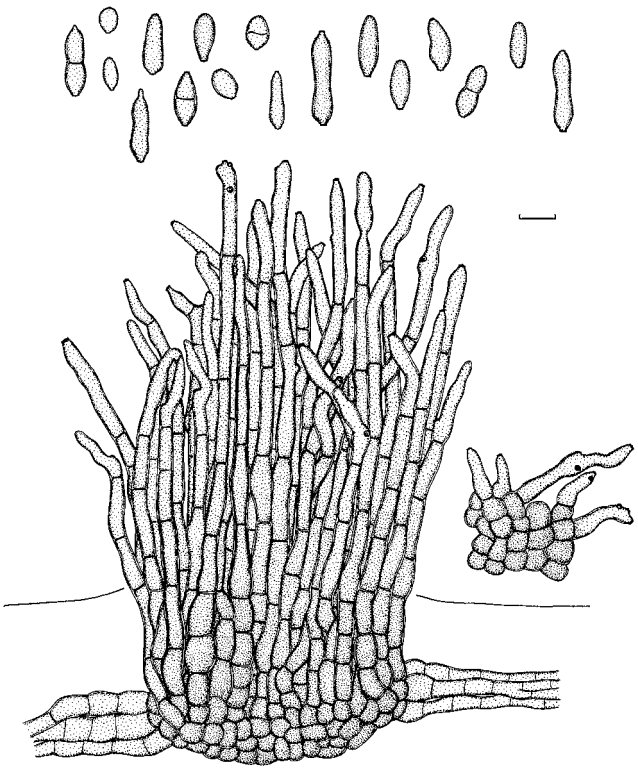


**Fig. 285.** *Cladosporium soldanellae* (BPI 427476, holotype of *C. stysanoides*). Fascicle of conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

concentrically arranged at the border of the raised discolorations, later extending. *Mycelium* internal, subcuticular to intraepidermal; hyphae branched, 1.5–8 µm wide, septate, without swellings and constrictions, subhyaline or even hyaline to very pale olivaceous-green, smooth, walls not or slightly thickened, radiating, forming hyphal plates. *Stromata* intraepidermal, sometimes substomatal, subglobose to somewhat oblong-angular, usually effuse, 40–150 µm wide, sometimes confluent and larger, several layers deep, compact, composed of subglobose to angular-oblong, polygonal cells, 4–9 µm wide, medium to dark brown, smooth, thick-walled. *Conidiophores* mostly in large, dense fascicles, numerous, arising from stromata, emerging through stomata or erumpent through the cuticle, erect, straight, especially at the base of the conidiomata more or less parallel, synnema-like, somewhat flexuous towards the apex, short cylindrical to cylindrical-oblong, non-geniculate or rarely slightly geniculate near the apex, non-nodulose or sometimes subnodulose, unbranched, rarely branched, 12–180 × 3.5–7 µm, 0–5-septate, pale to medium olivaceous-brown, paler towards the apex, smooth or almost so to minutely verruculose, walls slightly thickened, one-layered, rarely two-layered near the base, protoplasm of the cells somewhat aggregated at the septa which appear to be thickened, sometimes somewhat swollen at the base, slightly attenuated towards the apex, sporadically enteroblastically proliferating. *Conidiogenous cells* integrated, usually terminal, occasionally intercalary, or short conidiophores reduced to conidiogenous cells, cylindrical-oblong, sometimes slightly geniculate, 12–40 µm long, mostly with a single conidiogenous locus, sometimes with few loci, protuberant, 1.5–2(–2.5) µm diam, thickened, somewhat darkened-refractive. *Conidia* solitary or in unbranched chains, obovoid, ellipsoid to cylindrical, straight, 6.5–26 × 4–6(–7) µm, 0(–1)-septate, sometimes slightly constricted at the septa, pale to medium olivaceous-brown, concolorous with conidiophores, minutely verruculose, walls slightly thickened, apex rounded or attenuated towards apex and base, base often broadly truncate, hila protuberant, (1–)1.5–2(–2.5) µm diam, thickened, somewhat darkened-refractive; microcyclic conidiogenesis not observed.

*In vitro*: *Mycelium* immersed and superficial; hyphae branched, 1–4 µm wide, single cells distinctly swollen, up to 7 µm wide, pluriseptate, sometimes constricted at septa, subhyaline to pale or medium brown or olivaceous-brown, smooth, walls unthickened or slightly thickened, about 0.5 µm wide. *Conidiophores* solitary or in loose groups of 2–3, arising terminally and laterally from hyphae, erect, straight to more or less flexuous, narrowly cylindrical-oblong but due to swellings and constrictions sometimes irregular in outline, sometimes slightly geniculate towards the apex or subnodulose, unbranched or once branched, 25–200 × 3–4.5(–5) µm, pluriseptate, pale to medium olivaceous-brown, smooth or partly minutely verruculose, walls unthickened or somewhat thickened, about 0.5 µm wide. *Conidiogenous cells* integrated, mainly terminally but also intercalary, cylindrical-oblong, sometimes geniculate or subnodulose, 10–55 µm long, smooth or often somewhat verruculose, with up to four loci per cell, loci conspicuous, protuberant, 1–1.5(–2) µm diam, thickened and darkened-refractive. *Ramoconidia* occasionally formed, up to 32 µm long, often minutely verruculose, base 3–3.5 µm wide. *Conidia* catenate, numerous, in branched chains, up to four conidia in the terminal unbranched part of the chain, straight, small terminal conidia obovoid to limoniform or subglobose, 3–8 × 2–3 µm [av. (± SD) 4.7 (± 1.7) × 2.6 (± 0.4) µm], aseptate, intercalary conidia limoniform, ellipsoid to subcylindrical, 5.5–17 × (2.5–)3–4(–4.5) µm [av. (± SD) 9.9 (± 3.3) × 3.4 (± 0.4) µm], 0–1(–2)-septate, with 1–2 distal scars, secondary ramoconidia ellipsoid to subcylindrical or cylindrical, (7.5–)11–27(–31) × 3–4(–4.5) µm [av. (± SD) 19.1 (± 6.5) × 3.9 (± 0.7) µm], 0–3-septate, septa often not very conspicuous, with 2–3(–4) distal scars, almost smooth to minutely verruculose or loosely verruculose, walls unthickened or almost so, hila protuberant, (0.5–)1–1.5(–2) µm diam, thickened and darkened-refractive; microcyclic conidiogenesis occurring; conidia sometimes germinating.

*Culture characteristics*: Colonies on PDA attaining 8–20 µm after 14 days, olivaceous-grey to iron-grey, olivaceous-black at margins, smoke-grey due to aerial mycelium, reverse olivaceous-black, velvety to fluffy-wooly, margins white, very narrow, somewhat feathery, regular to somewhat irregular, aerial mycelium loose to dense, high, fluffy, growth low convex to convex, without prominent exudates, sporulation profuse. Colonies on MEA reaching 12–21 mm, smoke-grey to grey-olivaceous due to a profuse sporulation, iron-grey at margins, reverse olivaceous-grey to iron-grey, fluffy, margins colourless or white, narrow, glabrous to somewhat feathery, aerial mycelium abundant, high, fluffy, dense, growth convex with elevated and furrowed parts, without prominent exudates. Colonies on OA attaining 8–18 mm, olivaceous-grey, iron-grey at margins, smoke-grey or whitish due to aerial mycelium, reverse olivaceous-black, velvety to powdery, margins iron-grey, somewhat feathery, irregular, aerial mycelium diffuse to dense forming few large spots of fluffy dense hyphae, whitish, high, growth flat, without prominent exudates, sporulation profuse.

*Substrate and distribution*: On *Soldanella* spp.; Europe – *Soldanella alpina* (Germany, Italy, Montenegro, Switzerland), *S. hungarica* subsp. *major* (Romania), *S. montana* (Romania), *S. pusilla* (Romania).

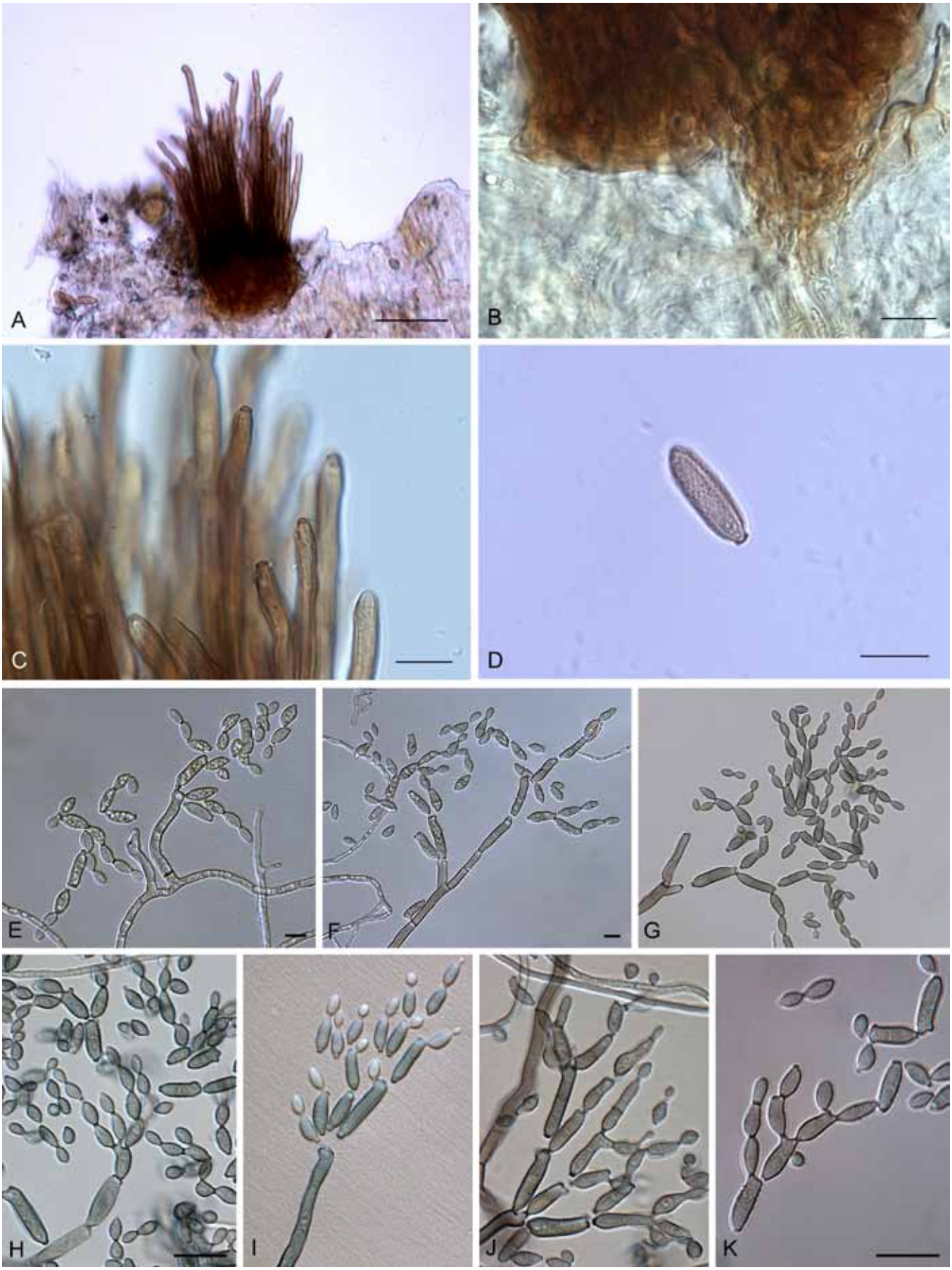



**Fig. 286.** *Cladosporium soldanellae in vivo* (BPI 427476, holotype of *C. stysanoides*) and *in vitro* (CPC 13153 = CBS 132186, ex-neotype culture of *C. soldanellae*). A. Overview, fascicle of conidiophores B. Stromata and mycelium. C. Conidiophores. D. Conidium. E–K. Conidiophores and conidial chains *in vitro*. Scale bars = 10 (B–K), 50 (A) µm.

*Additional specimen examined*: **Montenegro**, Durmitor, Lokvice, *ca.* 2200 m, on *Soldanella alpina*, 15 Aug. 1904, F. Bubák (BPI 427476, **holotype** of *C. stysanoides*).

*Notes*: Type material of *Cladosporium stysanoides* was re-examined and turned out to be a true, well-characterised *Cladosporium* species. The original diagnosis of *C. soldanellae* (Jaap 1907), recorded on leaves of *Soldanella alpina* from Switzerland, has been compared with this species and proved to be very close to *C. stysanoides*. Jaap (1907) described the colonies as punctiform, at first concentrically arranged at pale subcircular leaf spots, later extended, with unbranched conidiophores in dense fascicles, 100–175 × 4–5 µm, and 0–1-septate, cylindrical-oblong conidia, 13–15 × 4–5 µm. Although type material of *C. soldanellae* could not be traced, neither at herb. B nor HBG, both species are considered to be conspecific. *Cladosporium soldanellae*, which antedates *C. stysanoides*, has priority according to the Code of Botanical Nomenclature, and therefore, *C. stysanoides* is reduced to synonymy with the latter species. Type material of *C. soldanellae* is probably not preserved, so a neotype is proposed. Ferraris (1912) mentioned a record from Tyrol, Italy. *Soldanella hungarica* ssp. *major*, *S. montana* and *S. pusilla* have been reported as additional hosts from Romania (Bontea 1985).

*Cladosporium soldanellae* superficially resembles the saprobic *C. herbarum* but deviates in having densely fasciculate, synnema-like conidiophores arranged in punctiform, non-caespitose tufts, which usually do not have terminal and intercalar swellings with conidiogenous loci confined to them, and 0(–1)-septate conidia.

Phylogenetically it is closely related to *C. ossifragi* but the latter species differs in having closely verruculose to echinulate, (0–)1–5(–7)-septate, wider conidia [(5–)7–10(–12) µm]. Its conidiophores *in vivo* are arranged in fascicles but never synnema-like as in *C. soldanellae*.

**144. *Cladosporium sphaerospermum*** Penz., Michelia 2(8): 473. 1882. Figs 287–289.

*Neotype* (designated by Zalar *et al.* 2007): Isolated from nail of man, 1949, R.W. Zappey (CBS H-19738). *Ex-neotype culture*: CBS 193.54 = ATCC 11289 = IMI 049637.
[*Type*: **Italy**, Padova, on faded leaves and stems of *Citrus* sp. (*Rutaceae*), Feb. 1882, O. Penzig (not preserved)].

= *Cladosporium papyricola* Berk. & Broome, Trans. Linn. Soc., Ser. 2, Bot., 2: 68. 1883, as "papyricolor" [holotype: K 121565], **syn. nov.**
= *Torula lichenopsis* Höhn., Denkschr. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl. 83: 36. 1927. [holotype: FH-Höhnel 1275].
= *Cladosporium hibisci* Reichert, Bot. Jahrb. Syst. 56: 721, 1921 [holotype: B 700006553], **syn. nov.**

*Lit*.: Saccardo (1886: 355), Lindau (1907: 826), Ferraris (1912: 345), De Vries (1952: 81), Yamamoto (1959: 3), Ellis (1971: 315), Hawksworth (1979: 287), Ellis & Ellis (1985: 290, 1988), Wang & Zabel (1990: 200), Domsch *et al*. (1980: 209), Ho *et al*. (1999: 133, as *C. lignicola*, 139), de Hoog *et al*. (2000: 591), Samson *et al*. (2000: 114, 2001: 340), Zhang *et al*. (2003: 156–158), Heuchert *et al*. (2005: 50), Zalar *et al*. (2007: 177–179). Dugan *et al.* (2008: 9–16).
*Ill*.: De Vries (1952: 82, fig. 18), Yamamoto (1959: 2, figs 5–8), Minoura (1966: 141, fig. 5C), Ellis (1971: 316, fig. 218 A), Domsch *et al*. (1980: 209, fig. 85), Ho *et al*. (1999: 133, fig. 27; 141, figs 42–43), de Hoog *et al*. (2000: 591–592, figs), Samson *et al.* (2000: 114, fig. 51; 115, pl. 49), Zhang *et al*. (2003: 157, fig. 107), Zalar *et al.* (2007: 166, fig. 5 g, 178, fig. 12). Dugan *et al.* (2008: 13–14, figs 2–3).

*In vivo*: *Colonies* punctiform to effuse, sometimes larger patches, loose to dense, mostly rather thin, medium to dark olivaceous to greenish black. *Mycelium* immersed, sometimes also external. *Hyphae* branched, septate, 1.5–4 µm wide, subhyaline, olivaceous to brown, smooth or almost so to minutely verruculose, wall thin to somewhat thickened. *Conidiophores* solitary or loosely aggregated, arising from immersed or superfical hyphae, lateral or terminal, erect to decumbent, usually macronematous, but occasionaly also micronematous, subcylindrical-filiform, not or barely geniculate-sinuous, non-nodulose, micronematous conidiophores simple, macronematous ones unbranched or frequently branched, once branched to variously branched, 10–300(–500) × 2–5 µm, short micronematous conidiophores aseptate or sparingly septate, macronematous ones pluriseptate throughout, pale olivaceous to medium brown or olivaceous-brown, wall ≤ 1 µm wide, smooth to minutely verruculose. *Conidiogenous cells* integrated, terminal, occasionally intercalary or pleurogenous, 10–30 µm long, little differentiated, without swellings, non-geniculate, occasionally subdenticulate caused by the protuberant conidiogenous loci, which are somewhat thickened and darkened, 1–1.5(–2) µm diam. *Ramoconidia* abundant, cylindrical-subcylindrical, 12–35 × 3–5 µm, (0–)1–3(–4)-septate, pale to medium olivaceous or brown, wall ≤ 1 µm wide, smooth or almost so. *Conidia* in branched chains, small terminal conidia globose or subglobose, 2–5 × 2–4 µm, apex rounded, base rounded to slightly attenuated, intercalary conidia subglobose to broadly ellipsoid-ovoid, 4–10 × 3–5 µm, 0–1-septate, subhyaline, pale olivaceous to olivaceous-brown, thin-walled (ca. 0.5 µm), almost smooth to verruculose (light microscopy), warts easily visible in air bubbles, secondary ramoconidia subglobose to subcylindrical, (4–)6–20 × (2.5–)3–4.5(–5) µm, 0–2(–3)-septate, pale to medium olivaceous to olivaceous-brown, wall ≤ 1 µm wide, smooth or almost so, hila often somewhat protuberant, coronate, 0.5–1.5 diam.

*In vitro*: *Mycelium* partly submerged, partly superficial; hyphae sparingly branched, 1–3 µm wide, septate, pale to pale medium olivaceous-brown, smooth to sometimes minutely verruculose, walls slightly thickened, not enveloped in polysaccharide-like material. *Conidiophores* micronematous and macronematous, arising terminally and laterally from hyphae, erect or ascending, straight to slightly flexuous. *Macronematous conidiophores* cylindrical-oblong, neither geniculate nor nodulose, unbranched or branched, (10–)45–130(–300) × 2.5–4.5(–6) µm, pluriseptate, with relatively dense septation (cells mostly 4.5–23 µm long), septa darkened and somewhat thickened, pale medium to medium olivaceous-brown, smooth to minutely verruculose, walls thickened. Conidiogenous cells integrated, terminal, sometimes intercalary, cylindrical, usually short, 6–18 µm long, proliferation sympodial, with a single or few apical scars, loci protuberant, denticulate, 0.8–1.5 µm diam, thickened and darkened-refractive. *Micronematous conidiophores* filiform to narrowly cylindrical-oblong, up to 80 µm long or even longer, 1–2 µm wide, pluriseptate, not that densely septate as macronematous ones, septa also somewhat darkened and thickened, pale to medium olivaceous-brown, walls almost unthickened. *Conidiogenous cells* integrated, terminal and intercalary, short cylindrical, 9–27 µm long, with a few subdenticulate loci, 0.5–0.8 µm diam, thickened and darkened-refractive. *Ramoconidia* often formed, cylindrical, (11.5–)20.5–40(–48) × (2.5–)3(–3.5) µm, with up to five septa, base broadly truncate, 2 µm wide, slightly thickened and somewhat darkened-refractive, but not coronate. *Conidia* catenate, in branched chains, branching in all directions, with up to six conidia in the unbranched parts,

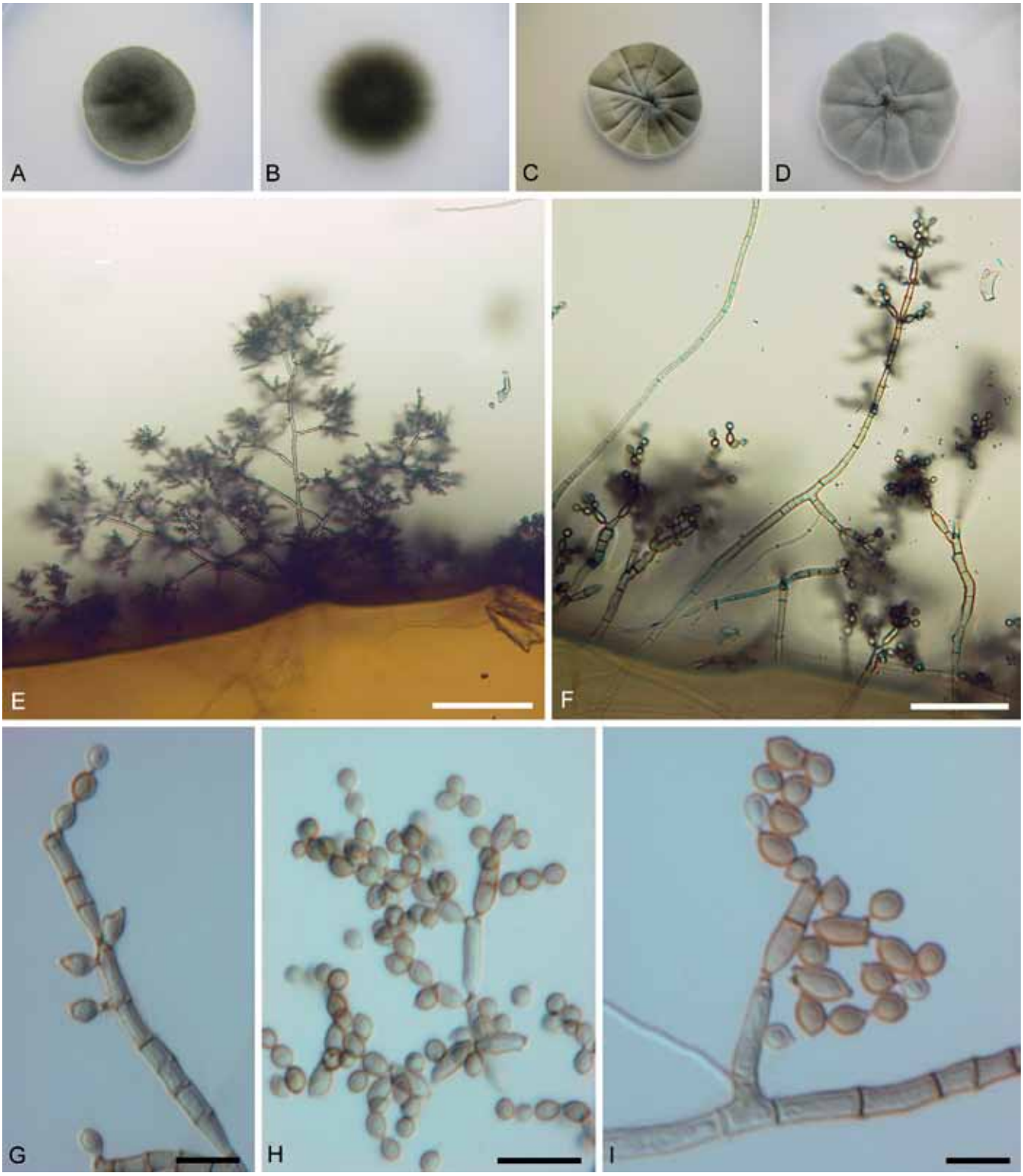



**Fig. 287.** *Cladosporium sphaerospermum* (CBS 19454) (from Zalar *et al.* 2007). A–D. Colony surface grown on PDA (A), OA (B), MEA (C) and MEA plus 5 % NaCl (D) of strains incubated for 14 d at 25 °C in darkness. E–F. Habit of conidiophores. G–I. Ramoconidia and conidia. E–I. All from 7-d-old SNA slide cultures. A, C–D, F–H, from CBS 193.54 (ex-neotype strain); B, from EXF-738; E, EXF-455; I, EXF-458. Scale bars = 10 (G–I), 50 (F), 100 (E) µm.

straight, small terminal conidia globose to subglobose, sometimes ovoid, (2–)3–5(–7) × (2–)3–3.5 µm [av. (± SD) 4.1 (± 0.7) × 3.2 (± 0.3) µm], aseptate, minutely verruculose to verrucose, narrower at both ends, intercalary conidia with 1–2 apical hila subglobose, ovoid to ellipsoid, 4.5–8.5 × 3–4(–4.5) µm [av. (± SD) 6.5 (± 1.6) × 3.6 (± 0.3) µm], aseptate, attenuated towards apex and base, secondary ramoconidia ellipsoid to cylindrical, 8–22(–37.5) × (2–)3–4(–5) µm [av. (± SD) 15.4 (± 5.1) × 3.6 (± 0.5) µm], 0–3(–4)-septate, not constricted at septa, but septa somewhat darkened and thickened, pale to usually medium olivaceous-brown, sometimes dark brown, smooth to minutely verruculose, walls thickened, with up to six pronounced, denticulate distal hila, 0.8–1.5 µm diam, sometimes loci situated at the end of protuberant, short, terminal projections, 1–2 µm long or even longer in secondary ramoconidia with beak-like ends, sometimes alternarioid, obclavate, subrostrate (not observed when cultivated on SNA after 7 d, but on PDA and MEA), thickened and darkened-refractive; microcyclic conidiogenesis not observed.

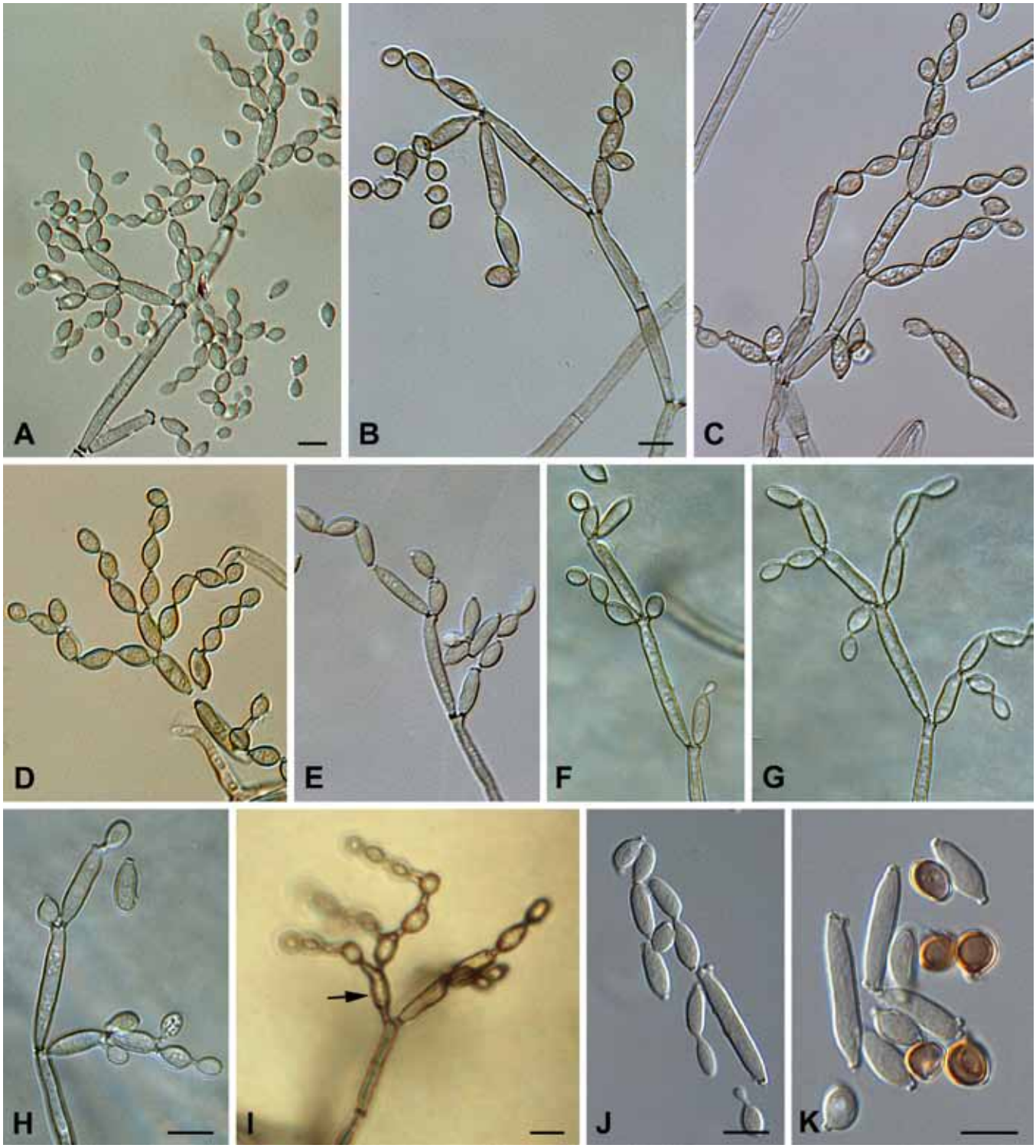



**Fig. 288.** *Cladosporium sphaerospermum* (NRRL 8131) (from Dugan *et al.* 2008). A–H. Conidiophores at various stages of development, showing their characteristic branching patterns, ramoconidia, secondary ramoconidia, intercalary conidia, and small, terminal conidia (all on SNA). I. Conidiophore with alternarioid secondary ramoconium (arrow), formed on MEA. J, K. Secondary ramoconidia and intercalary conidia (note older intercalary conidia, which become dark brown and globose). Scale bars = 10 µm.

*Culture characteristics*: Colonies on PDA reaching 21–50 mm diam in 14 d at 25 °C, grey-olivaceous or greenish olivaceous, reverse dark grey-olivaceous, iron-grey or greyish-blue, velvety, margin white, regular, narrow, somewhat feathery, aerial mycelium absent or sparse, growth flat with an elevated colony centre, numerous prominent exudates formed, sporulating, some strains release green soluble pigment into the agar. Colonies on OA reaching 21–38 mm diam, dark grey-olivaceous, olivaceous or olivaceous-grey due to profuse sporulation, reverse greenish grey, velvety, aerial mycelium absent, growth flat with papillate surface, without prominent exudates. Colonies on MEA attaining 15–45 mm diam, grey-olivaceous to olivaceous-grey, reverse olivaceous-grey to iron-grey, powdery, velvety, margin colourless or white, feathery, regular, radially furrowed, aerial mycelium almost absent, growth low convex with elevated colony centre, centre often wrinkled forming a crater-like structure, without prominent exudates, sporulation profuse. *Colonies on MEA with 5 % NaCl* growing faster than on other media, reaching 31–60 mm diam, mainly olive, either being almost flat or radially furrowed, with margin of superficial mycelium, sporulation dense, reverse ochraceous or dark green. *Maximum tolerated salt concentration*: On MEA + 20 %

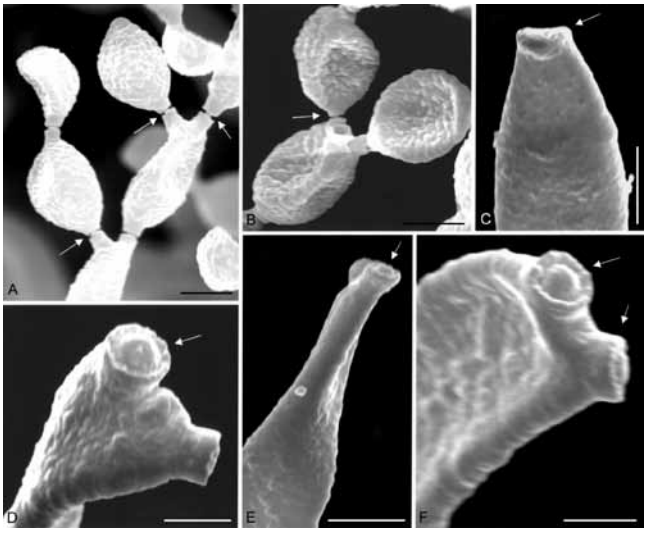


**Fig. 289.** *Cladosporium sphaerospermum* (NRRL 8131) (from Dugan *et al.* 2008). Scanning electron micrographs of *Cladosporium sphaerospermum* NRRL 8131. A, B. Branching chains of conidia, showing conidiogenous loci with disjunctors (arrows). C. Apex of conidiophore with conidiogenous scar in profile (arrow). D. Two conidiogenous loci at apex of a secondary ramoconidium, the upper (arrow) clearly coronate. E. Two conidiogenous loci at apex of a conidiophore, the one facing the viewer is clearly coronate (arrow). F. Two conidiogenous loci (arrows) at apex of a secondary ramoconidium are coronate. Scale bars = 1 (D), 1.25 (F), 2.5 (A–C), 5 (E) µm.

NaCl 89 % of all strains tested develop colonies after 7 d, 96 % after 14 d. *Cardinal temperatures*: No growth at 4 °C, optimum at 25 °C, maximum at 30 °C, no growth at 37 °C.

*Substrates and distribution*: Occurring as secondary invader on numerous plants, saprobic on dead leaves, stems, wood and other plant organs, isolated from outdoor and indoor air, soil, hypersaline water, indoor wet cells, foodstuffs and other organic matter, paint, silicone, textiles and occasionally isolated from man and animals (nails, nasal mucus, *etc.*); cosmopolitan.

*Additional specimens examined*: **Antarctica**, Edmonson Point (North Valley), near the lake, isolated from soil (ornithogenic), 24 Jan. 1995, S. Onofri 8 (IMI 377828). **Dominican Republic**, salterns, isol. from hypersaline water (EXF-715). **Egypt**, near Siut, on dry stems of *Abelmoschus esculentus* (*Malvaceae*), Oct. 1822/25, Ehrenberg (B 700006553, **holotype** of *C. hibisci*). **Germany**, Hessen, Frankfurt/Main, on *Euonymus* sp. cult. (*Celastraceae*), Jan. 1997, ex "Pflanzenschutzamt Frankfurt" (HAL), together with *Erysiphe euonymicola*. **Israel**, Dead Sea, isol. from hypersaline water (EXF-1061, EXF-1726); Eilat salterns, isol. from hypersaline water (EXF-1069, EXF-1732). **New Zealand**, Auckland, isolated from *Onychiurus pseudofimetarius* (*Collembola*), 29 Jan. 1969, J. Young 10 (IMI 137456), as *C. cladosporioides*; Henderson, on dead leaves of *Kalanchoë fedtschenkoi* (*Crassulaceae*), 17 Jun. 1980, P.J. Brook (PDD 41029); Campbell Island, on ground litter (*Dracophyllum* sp.), 6 Mar. 2000, S.L. Stephenson (PDD 74350). **Slovenia**, isol. from a bathroom (EXF-738, EXF-739, EXF-962, EXF-965); Sečovlje salterns, isol. from hypersaline water (EXF-131 = MZKI B-1005, EXF-328, EXF-385, EXF-446, EXF-455, EXF-458, EXF-461, EXF-464, EXF-465, EXF-598, EXF-644, EXF-645, EXF-649, EXF-781 = MZKI B-899, EXF-788). **Spain**, Barcelona, Salines de la Trinitat, isol. from hypersaline water (CBS 102045 = EXF-2524 = MZKI B-1066). **Russia**, Kaliningrad, isol. from gardening peat substrate (CPC 10944). **UK**, Surrey, Kew, isolated from *Arundo* sp. (*Poaceae*), Sep. 1943, G.R. Bisby (IMI 25324). **USA**, isol. from *Carya illinoinensis* leaf scale (*Juglandaceae*) (CBS 109.14 = ATCC 36950); isolated from wood (CBS H-20086, HAL 1846 F, dried culture ex ATCC 38493; cultures ATCC 38493 = CBS 117728 = CPC 12098 = NRRL 8131); Philadelphia, QM Depot, on cotton duck, 21 Nov. 1951, E.T. Reese (PH 01020458, as *C. herbarum*).

*Notes*: *Cladosporium sphaerospermum* was described by Penzig (1882) from decaying *Citrus* leaves and branches in Italy. He described *C. sphaerospermum* as a species with (i) branched, septate and dark conidiophores having a length of 150–300 µm and a width of the main conidiophore stipe of 3.5–4 µm, (ii) spherical to ellipsoid, acrogenously formed conidia of 3.4–4 µm diam, and (iii) ramoconidia of 6–14 × 3.5–4 µm. Penzig's original material is not known to be preserved. Later, a culture derived from CBS 193.54, originating from a human nail, was accepted as typical of *C. sphaerospermum.* However, de Vries (1952), incorrectly cited it as "lectotype", and thus the same specimen was designated as neotype in Zalar *et al.* (2007), with the derived culture (CBS 193.54) used as ex-neotype strain. Zalar *et al.* (2007) consider *C. sphaerospermum* as halo- or osmotolerant. Although *C. sphaerospermum* has commonly been isolated from osmotically stressed environments, it is also known from non-stressed niches. *Cladosporium sphaerospermum* is a cosmopolitan species that has been studied from the perspectives of phylogeny, halo-tolerance and general ecology (summarised in Zalar *et al.* 2007), biodegradative capacities (*e.g.*, Weber *et al.* 1995, Prenafeta-Boldú *et al.* 2001, Potin *et al.* 2004, Nieves-Rivera *et al.* 2006, Kim *et al.* 2007), and clinical aspects (summarized in de Hoog *et al.* 2000 and Zalar *et al.* 2007). Hardly any reports are available unambiguously proving that *C. sphaerospermum* is a human pathogen. It is therefore possible that CBS 193.54 was not involved in any disease process but rather occurred as a contaminant on dry nail material. *Cladosporium sphaerospermum* is a phylogenetically well-delineated species (see Fig. 5 and Zalar *et al*. 2007).

The only record of this species in connection with a fungal substrate was published by Hawksworth (1979) who reduced *Torula lichenopsis*, described from crustose lichen, to synonymy with *C. sphaerospermum*.

Type material of *C. hibisci* has been examined and proved to be identical with *C. sphaerospermum* (conidia verruculose, globose or subglobose, brown; secondary ramoconidia 0–3-septate). Zhang *et al*. (2003) cited collections of "*C. hibisci*" on *Hibiscus syriacus* (China, Shaanxi) and *H. tiliaceus* (China, Heilongjiang). The identity of these samples is, however, quite unclear. Klotzsch, Herb. Viv. Mycol. 187 (HBG) is an unusual *C. sphaerospermum*-like collection with long, occasionally branched conidiophores and globose, verruculose, terminal conidia, 3–5 µm diam, but the conidiophores are up to 10 µm wide.

The North American strain (NRRL 8131) is *C. sphaerospermum*, but differs in morphology from previously known isolates of that species (Dugan *et al.* 2008). It is easily distinguishable from *C. herbarum* (including *C. lignicola*) and all other known species of *Cladosporium s. str.*, by having obclavate, short rostrate, sometimes "alternarioid" conidia. Individual conidia often conformed to the spherical shape generally typical of isolates of *C. sphaerospermum*, but such conidia of NRRL 8131 could be somewhat larger than the upper limits of 4(–7) × 3.5(–4.5) µm given for *C. sphaerospermum* in Zalar *et al.* (2007). Furthermore, the conidiophores are at first consistently micronematous, much later they may become more macronematous, and they are usually unbranched. The conidiophores in other isolates of *C. sphaerospermum* are often branched *in vivo* as well as *in vitro*. However, not only did NRRL 8131 cluster with strains of *C. sphaerospermum* (see Dugan *et al.* 2008, fig. 1), but the neotype of *C. sphaerospermum* (CBS 193.54) occasionally displayed subrostrate "beaks" on ramoconidia (*e.g.*, fig. 5G in Zalar *et al.* 2007). Because sequence data conclusively place NRRL 8131 into *C. sphaerospermum* (see Dugan *et al.* 2008, fig. 1) and because the subrostrate "beaks" could also be located in the neotype, the authors refrained from designating the morphologically distinct NRRL 8131 as a new variety. In their treatment of *C. sphaerospermum*-like

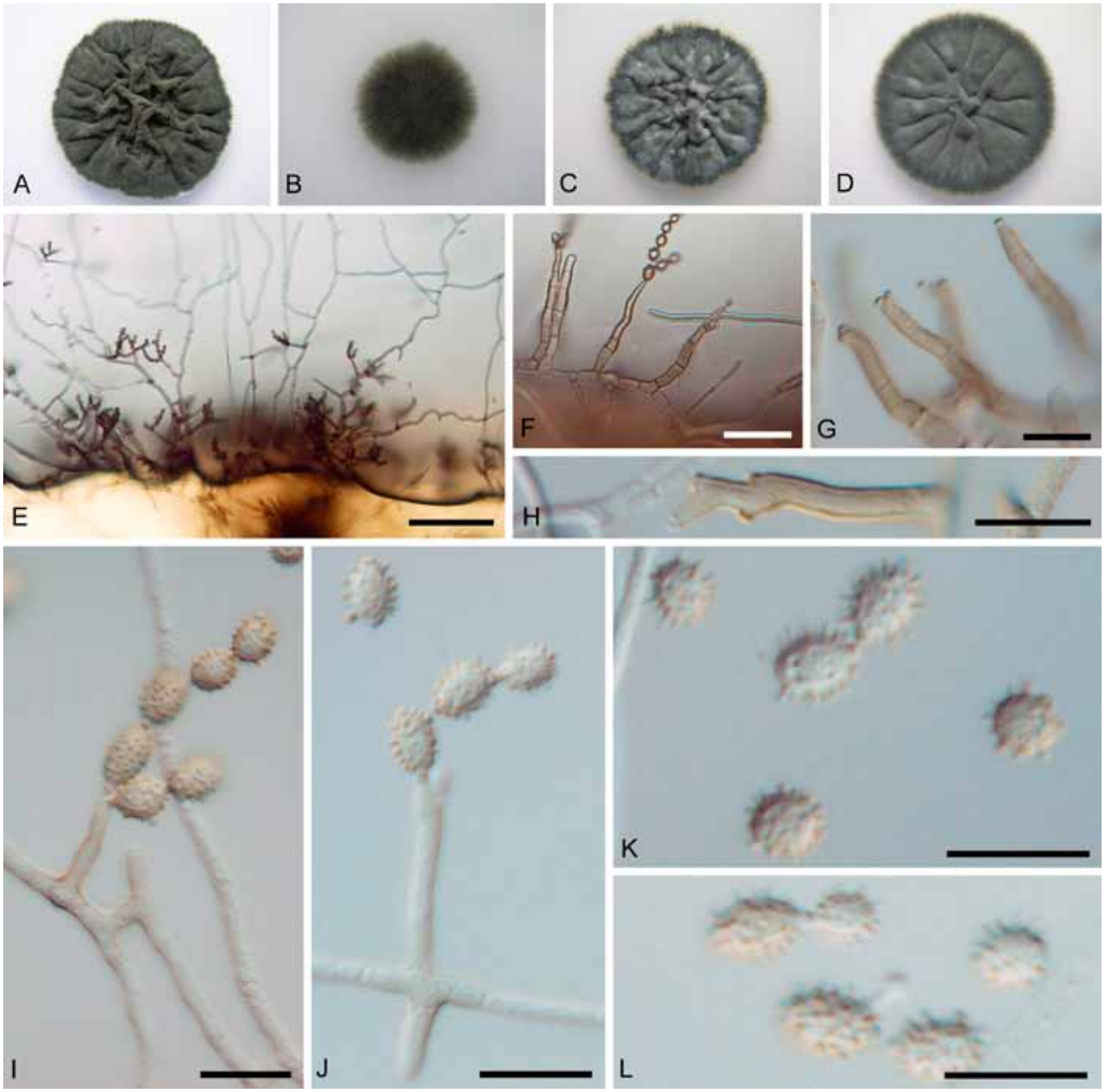



**Fig. 290.** *Cladosporium spinulosum* (CPC 12040) (from Zalar *et al.* 2007). A–D. Colony surface grown on PDA (A), OA (B), MEA (C) and MEA plus 5 % NaCl (D) of strains incubated for 14 d at 25 ºC in darkness. E. Habit of conidiophores. F–J. Conidiophores. K–L. Conidia (also visible in I–J). E–L. All from 7-d-old SNA slide cultures. A–L, from EXF-334 (ex-type strain). Scale bars = 10 (G–L), 30 (F), 100 (E) µm.

species (Zalar *et al.* 2007) some variation was observed in the ITS sequence data of all members studied, suggesting that they may not present a single monophyletic group, but could belong to a species complex within *Cladosporium*.

**145. *Cladosporium spinulosum*** Zalar, de Hoog & Gunde-Cimerman, Stud. Mycol. 58: 180. 2007. Figs 290, 291.

*Holotype*: **Slovenia**, Sečovlje salterns, isolated from hypersaline water, Feb. 1999, S. Sonjak (CBS H-19796). *Ex-type culture*: EXF-334 = CBS 119907.

*Ill.*: Zalar *et al*. (2007: 166, Fig. 5 h, 179, Fig. 13).

*In vitro*: Mycelium immersed and superficial; hyphae unbranched or sparingly branched, 1–3.5 µm wide, septate, usually without swellings and constrictions, subhyaline, smooth or almost so to somewhat irregularly rough-walled, walls unthickened, sometimes enveloped in polysaccharide-like material. *Conidiophores* solitary, arising laterally from plagiotropous hyphae or terminally from ascending hyphae, erect or ascending, straight to more or less flexuous, cylindrical, sometimes slightly geniculate, non-nodulose but loci sometimes situated on small lateral shoulders, unbranched or branched, (10–)25–110(–155) × (2–)3–4(–5) µm, 0–6(–9)-septate (cells mostly 6–20 µm long), not constricted at septa, pale to medium olivaceous-brown or brown, smooth, sometimes irregularly rough-walled to verrucose near the base, walls somewhat thickened, about 0.5 µm wide, somewhat tapering towards the apex. *Conidiogenous cells* integrated,

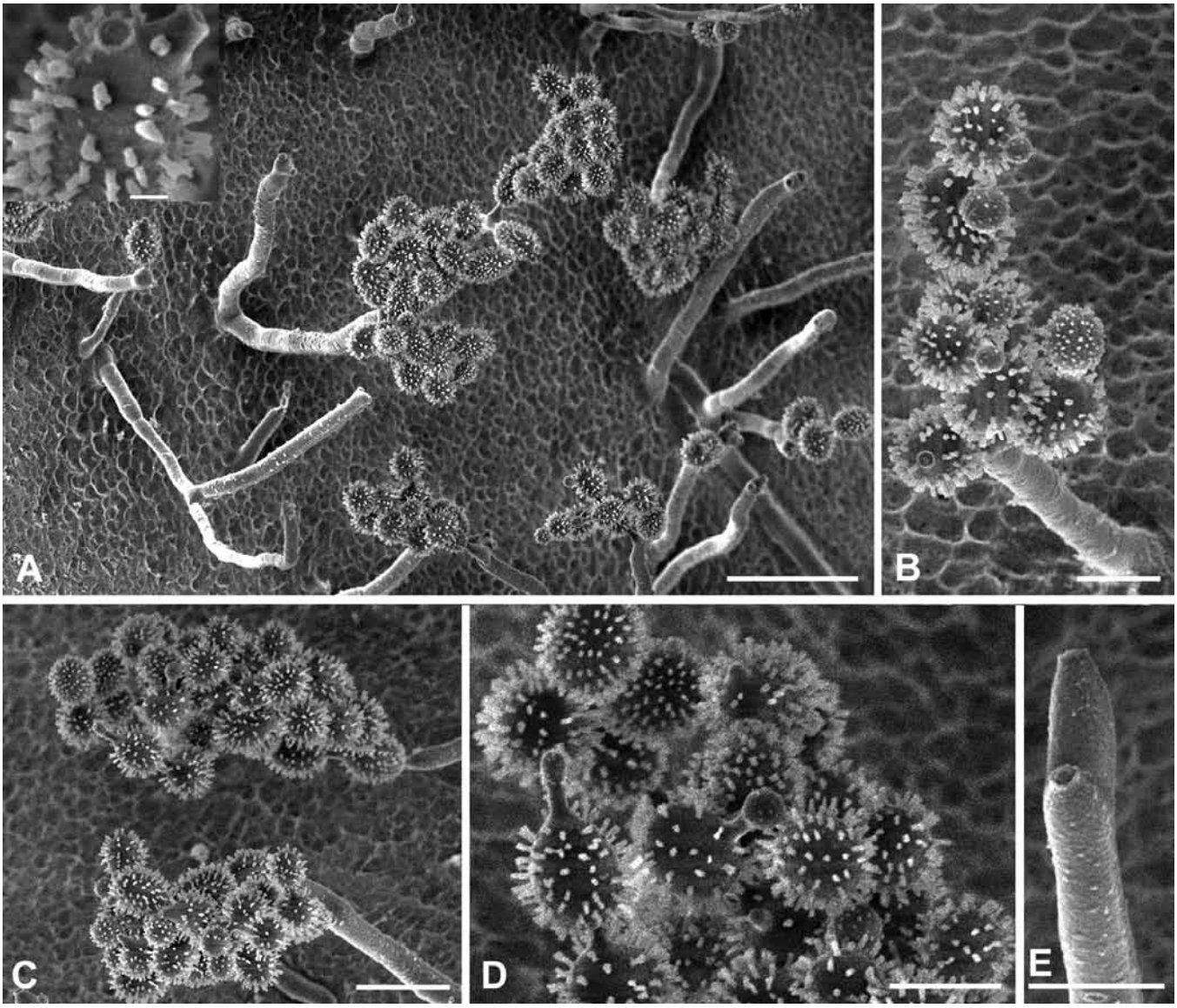



**Fig. 291.** *Cladosporium spinulosum* (CPC 12040). A. Overview on agar surface with conidiophores arising from the surface. The spore clusters on the conidiophore are very compact. Note several simple, tubular conidiophore ends. The inset shows details of a conidium showing two pronounced hila and a unique, very distinct ornamentation on the cell wall. B. Conidiophore with globose or subsphaerical secondary ramoconidia and conidia. Note the newly forming cells and hila. C. Two conidiophores. D. Details of spores and spore formation. E. The end of a conidiophore and two scars. Scale bars = 1 (A inset), 5 (B, D–E), 10 (C), 20 (A) µm.

terminal or intercalary, cylindrical, sometimes slightly geniculate, 10–30 µm long, producing sympodial clusters of pronounced denticles at their distal ends, sometimes situated on small lateral shoulders or short lateral prolongations, loci protuberant, 0.8–1.2 µm diam, thickened and darkened-refractive. *Ramoconidia* rarely formed. *Conidia* catenate, in branched chains, branching in all directions, up to four conidia in the unbranched parts, straight, small terminal and intercalary conidia globose to subsphaerical, 4–7(–8) × 3–4.5(–5) µm [av. (± SD) 5.3 (± 1.0) × 3.6 (± 0.4)], aseptate, secondary ramoconidia with up to four distal scars subsphaerical, ovoid, ellipsoid to subcylindrical, occasionally obclavate, (6–)7–15(–18) × 4–5(–6) µm [av. (± SD)11.1 (± 3.3) × 4.3 (± 0.6)], 0–1-septate, usually aseptate, not constricted at the median septum, pale olivaceous to pale olivaceous-brown, conspicuously digitate, with up to 1.3 µm long projections having parallel sides and blunt ends, loose to moderately dense, hila sometimes situated on small stalk-like elongations, protuberant, 0.8–1.2 µm diam, thickened and darkened-refractive; microcyclic conidiogenesis occurring.

*Culture characteristics*: Colonies on PDA reaching 20–30 mm diam, dull green to olivaceous-grey due to profuse sporulation, reverse olivaceous-black, velvety, either with a white and regular margin or margin narrow, undulate and feathery, colony arachnoid towards margins, aerial mycelium sparse, growth flat with elevated and distinctly wrinkled and folded colony centre, without prominent exudates, growth deep into the agar. Colonies on OA reaching 20–25 mm diam, olivaceous-grey, iron-grey reverse, margin narrow, white, glabrous, entire edge, aerial mycelium sparse, growth flat, radially furrowed or wrinkled in colony centre, without prominent exudates, sporulation profuse. Colonies on MEA reaching 17–28 mm diam, olivaceous-grey to grey-olivaceous due to profuse sporulation, iron-grey towards margins, reverse iron-grey, velvety, margin white, narrow, crenate, radially furrowed forming a crater-like structure, aerial mycelium sparse, diffuse, growth raised to convex with distinctly wrinkled and folded colony centre, without prominent exudates, sporulation profuse. Colonies on MEA with 5 % NaCl reaching 12–18 mm diam, of different colours, greenish grey (29D2), greyish green (29D5) to dark green (29F6); colony appearance variable, mostly either being almost flat with immersed

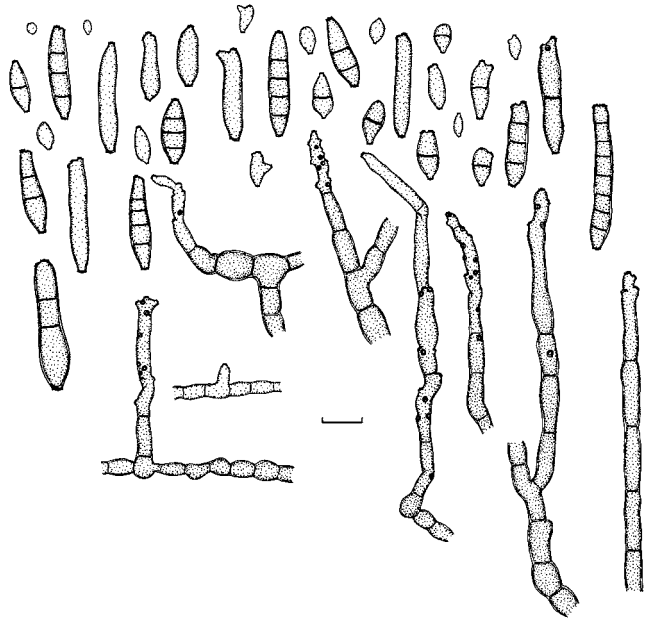


**Fig. 292.** *Cladosporium spongiosum* (K 121570). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del.*

colony centre or radially furrowed, with white to dark green margin consisting of superficial mycelium; sporulation dense. Reverse pale to dark green. *Maximum tolerated salt concentration*: On MEA + 17 % NaCl, two of three strains tested developed colonies after 14 d. *Cardinal temperatures*: Growth at 4 °C, optimum and maximum at 25 °C (17–28 mm). No growth at 30 °C.

*Substrates and distribution*: Hypersaline water; Europe (Slovenia).

*Additional specimen examined*: **Slovenia**, Sečovlje salterns, isolated from hypersaline water (EXF-382).

*Notes*: *Cladosporium spinulosum* is a member of the *C. herbarum* species complex although its globoid conidia are reminiscent of *C. sphaerospermum*. Within *Cladosporium*, the species is unique in having conspicuously digitate conidia and ramoconidia. The two strains are differing in the size of conidia. The average size of conidia in EXF-334 is 6.2 (± 0.9) × 4.2 (± 0.5) µm, and in EXF-382 it is 3.9 (± 0.6) × 3.3 (± 0.4) µm (Schubert *et al.* 2007b).

**146. *Cladosporium spongiosum*** Berk. & M.A. Curtis, J. Linn. Soc., Bot. 10(46): 362. 1869. Figs 292, 293.

≡ *Helminthosporium spongiosum* (Berk. & M.A. Curtis) Cif., Atti Ist. Bot. Lab. Crittog. Univ. Pavia, Ser. 5, 19: 109. 1962.

*Holotype*: **Cuba**, on inflorescences of *Cenchrus* sp. (*Poaceae*), C. Wright, No. 287 (K 121570).

*Lit*.: Saccardo (1886: 365), Ellis (1971: 317), Schubert (2005b: 136–138), Heuchert *et al*. (2005: 57).
*Ill*.: Ellis (1971: 316, fig. 218 B), Schubert (2005b: 138, fig. 66, Pl. 27, figs G–H).

*In vivo*: *Colonies* on still closed, dried inflorescences, effuse, dense, dark olivaceous-brown to almost blackish, sometimes crustaceous, densely felt-like. *Mycelium* internal and external, superficial; hyphae branched, 2–7(–9) µm wide, septate, often with swellings and constrictions, pale to medium brown or olivaceous-brown, smooth, walls only slightly thickened, somewhat swollen at the base of the conidiophores. *Stromata* absent. *Conidiophores* solitary, arising from internal and external plagiotropous hyphae, terminal and lateral, erect, straight to somewhat flexuous, slightly geniculate-sinuous towards the apex, unbranched or sometimes branched, 5–90 × 3–5(–6) µm, septate, often slightly constricted at the septa, pale to medium yellowish brown or olivaceous-brown, somewhat paler towards the apex, smooth, walls slightly thickened, one-layered, sometimes growing like and confusable with hyphae. *Conidiogenous cells* integrated, terminal and intercalary, cylindrical to somewhat geniculate, 4–35 µm long, proliferation sympodial, with several, subdenticulate conidiogenous loci, protuberant, short cylindrical, truncate to obconically truncate, 0.5–1.5(–2.5) µm diam, thickened, refractive to somewhat darkened. *Conidia* catenate, in unbranched or branched chains, straight to slightly curved, very variable in shape and size, small conidia subglobose, ovoid, ellipsoid, 3–13 × 2–5 µm, 0–1-septate, larger conidia ellipsoid, fusiform, subcylindrical or cylindrical, 6–41(–60) × 3.5–5.5(–7) µm, 0–4(–7)-septate, commonly 3-septate, sometimes slightly constricted at the septa, septa often thickened and distinctly darkened, pale brown to medium yellowish brown, smooth, walls somewhat thickened, apex rounded or mostly attenuated towards the apex and base, hila protuberant, short cylindrical, obconically truncate to slightly convex, 0.5–1.5(–2.5) µm diam, conspicuously differentiated in central dome and periclinal rim, thickened, refractive to darkened; microcyclic conidiogenesis occasionally occurring.


**Fig. 293.** *Cladosporium spongiosum* (K 121570). A. Conidia. B. Conidia with distinctly thickened and darkened septa. Scale bars = 10 (B), 20 (A) µm.

*Substrates and distribution*: On *Cenchrus* and *Chaetochloa* spp. (*Poaceae*); Caribbean – *Cenchrus* sp. (Cuba), *Chaetochloa setosa* (Haiti).

*Additional specimen examined*: **Haiti**, near St. Michel Caverus, Dept. du Nord, on *Chaetochloa setosa*, 5 Dec. 1925, E.C. Leonard 7759 (F).

*Notes*: Berkeley (1869) mentioned *Setaria* as a second host genus and compared the habit of his newly described species with *Helminthosporium ravenelii* M.A. Curtis. Ciferri (1962) did not examine type material of *Cladosporium spongiosum*, but rather based his new combination on material collected by himself on *Cenchrus echinatus* in the Dominican Republic (in comparing it with the very brief description given by Berkeley and Curtis). He described wider conidiophores, 6–8.5 µm, and solitary, elliptic or subfusate, wider conidia with acuminate ends, with the free end as a rule more acutate than the basal cell, 20–40.5 × 6–10 µm, which do not agree with the description given above. A re-examination of the type material showed *C. spongiosum* to be a genuine member of *Cladosporium s. str*. The conidia with its distinctly darkened and thickened septa remind one of *C. episclerotiale*, but the latter, fungicolous species is quite distinct in having much longer and, above all, wider conidiophores, (22–)97–295(–322) × 5–8(–10) µm, shorter and wider conidia, with thickened, mostly distinctly two-layered walls and somewhat wider conidiogenous loci and hila (Heuchert *et al*. 2005).

Alfieri *et al*. (1984) recorded *C. spongiosum* from Florida on *Cenchrus* sp. and Ahmad (1969) listed it on *Cenchrus pennisetiformis* from Pakistan. Furthermore, the species is mentioned in literature on several hosts belonging to quite distinct plant families. Zhang *et al*. (2003) recorded it on *Amaryllis vittata*, *Areca catechu*, *Cassia siamea*, *Chrysanthemum coronarium*, *Coix lacryma-jobi*, *Freesia refracta* and *Platycodon grandiflorus*. *Panicum maximum* (Zambia), *Setaria chevalieri* (Sierra Leone) and *Setaria pallidifusca* (Zambia) are given as additional hosts in Lenné (1990). Vittal & Dorai (1994/1995) reported *C. spongiosum* from India as colonising leaves of *Eucalyptus tereticornis*, and Williams & Liu (1976) cited *Melinis minutiflora* as host species from Sabah, Malaysia. In Haiti the species was recorded on *Chaetochloa setosa* (Benjamin & Slot 1969). The later material could be checked and proved to be the genuine *C. spongiosum*. However, most of these records, which could not be checked, are probably misidentified and not identical with *C. spongiosum*. Rao (1988) described this species on arecanut stem from India.

Bilgrami *et al*. (1991) listed this species from India as hyperparasite on *Acrosporium* (= *Oidium*) *dendrophthoae* (*Erysiphales*), and Mathur & Mukerji (1981) published two additional Indian records on *Phyllactinia dalbergiae* and *P. moricola* [as *P. corylea*], but these collections probably refer to the hyperparasitic *C. uredinicola* (Heuchert *et al*. 2005).

**147. *Cladosporium stanhopeae*** Allesch., Hedwigia 34: 221. 1895. Figs 294, 295.

*Holotype*: **Germany**, München, botanical garden, on faded leaves of *Stanhopea* sp. (*Orchidaceae*), Sep. 1894, Allescher (M-0057717).

*Lit.*: Saccardo (1895: xlviii; 1899: 1081), Lindau (1907: 817), Schubert & Braun (2004: 311), Schubert (2005b: 138–140).
*Ill.*: Schubert & Braun (2004: 312, fig. 7), Schubert (2005b: 139, fig. 67, pl. 29, figs E–G).

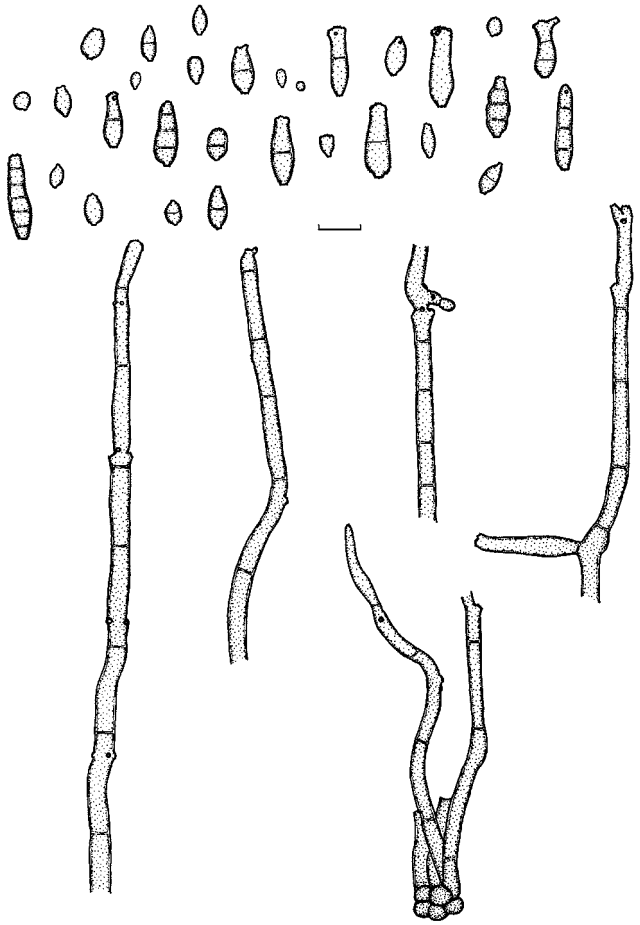


**Fig. 294.** *Cladosporium stanhopeae* (M-0057717). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del.*

*In vivo*: On faded leaves, leaf spots amphigenous, varying in shape and size, mostly irregular, medium to dark brown, sometimes almost blackish, stromatic, occasionally somewhat shiny. *Colonies* hypophyllous, small, punctiform, scattered, greyish brown, not confined to leaf spots. *Mycelium* internal; hyphae sparingly branched, 1.5–3 µm wide, septate, subhyaline to pale yellowish brown, walls unthickened to slightly thickened. *Stromata* dense, often large, up to 130 µm diam, composed of subglobose to somewhat angular cells, 4–12 µm diam, medium to dark brown, smooth, walls only slightly thickened. *Conidiophores* solitary or in small, loose fascicles, arising from stromata, erumpent through the cuticle, erect, usually more or less flexuous, unbranched, up to 250 µm long, 3–5.5 µm wide, septate, pale to medium brown, slightly paler towards the apex, smooth, walls thickened, somewhat attenuated towards the apex, without swellings. *Conidiogenous cells* integrated, terminal or intercalary, 5–25 µm long, with a single or only few conidiogenous loci, arranged on about the same level (like a garland), sometimes situated on small lateral shoulders, loci 1–2 µm diam, thickened, only slightly darkened-refractive. *Conidia* catenate, in branched chains, subglobose, ovoid, obovoid, ellipsoid, subcylindrical to cylindrical, 2–25 × 2–6 µm, 0–4(–5)-septate, mostly not constricted at the septa, pale olivaceous to pale olivaceous-brown, smooth or almost so to verruculose, walls more or less thickened, apex rounded or with up to six apical hila, truncate to slightly convex at the base, hila 0.5–2 µm diam, thickened, somewhat darkened-refractive; occasionally with microcyclic conidiogenesis.


**Fig. 295.** *Cladosporium stanhopeae* (M-0057717). A. Symptoms. B. Overview. C. Conidiophore and conidia. Scale bars = 10 (C), 50 (B) µm.

*Substrate and distribution*: On *Stanhopea*; Germany.

*Notes*: *Cladosporium herbarum*, *C. oxysporum* and *C. sphaerospermum*, widespread saprobic species occurring on a wide range of substrates, are easily distinguishable from *C. stanhopeae*. The conidia of *C. oxysporum* are smooth and only 0–1(–2)-septate, the conidiophores are consistently nodulose. *Cladosporium herbarum* differs in having conidiophores with intercalary and terminal swellings, which are connected with conidiogenesis, and verruculose to verrucose conidia (small subglobose conidia absent). *Cladosporium sphaerospermum* forms small conidia, which are globose to subglobose and distinctly verrucose, as well as 0–3-septate, smooth or verruculose secondary ramoconidia, and the conidiophores do not have any swellings.

*Cladosporium tenuissimum* is morphologically comparable with *C. stanhopeae* but deviates in having longer and somewhat wider conidiophores with often uni- or multilaterally swollen apices and 0–1-septate conidia.

**Fig. 296.** *Cladosporium subinflatum* (CPC 12041). Macro- and micronematous conidiophores and conidia *in vitro*. Scale bar = 10 µm. K. Bensch *del*.

**148. *Cladosporium subinflatum*** K. Schub., Zalar, Crous & U. Braun, Stud. Mycol. 58: 143. 2007. Figs 296–298.

*Holotype*: **Slovenia**, Sečovlje, crystallization ponds, salterns, isolated from hypersaline water, 2005, S. Sonjak (CBS H-19864). *Isotype*: HAL 2027 F. *Ex-type culture*: CBS 121630 = CPC 12041 = EXF-343.

*Ill.*: Schubert *et al*. (2007b: 143–144, Figs 37–39).

*In vitro*: *Mycelium* unbranched or occasionally branched, 1.5–3 µm wide, later more frequently branched and wider, up to 7 µm wide,

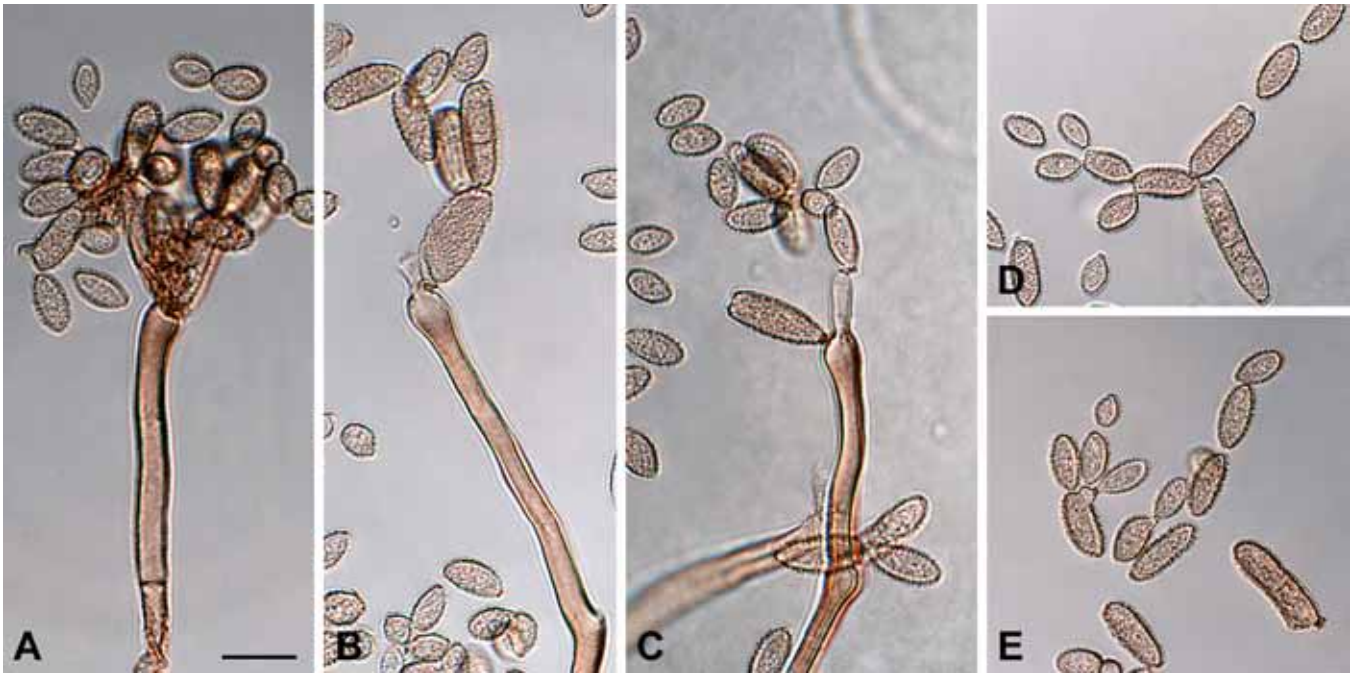



**Fig. 297.** *Cladosporium subinflatum* (CPC 12041). A–C. Macronematous conidiophores. D–E. Conidia. Scale bar = 10 µm.

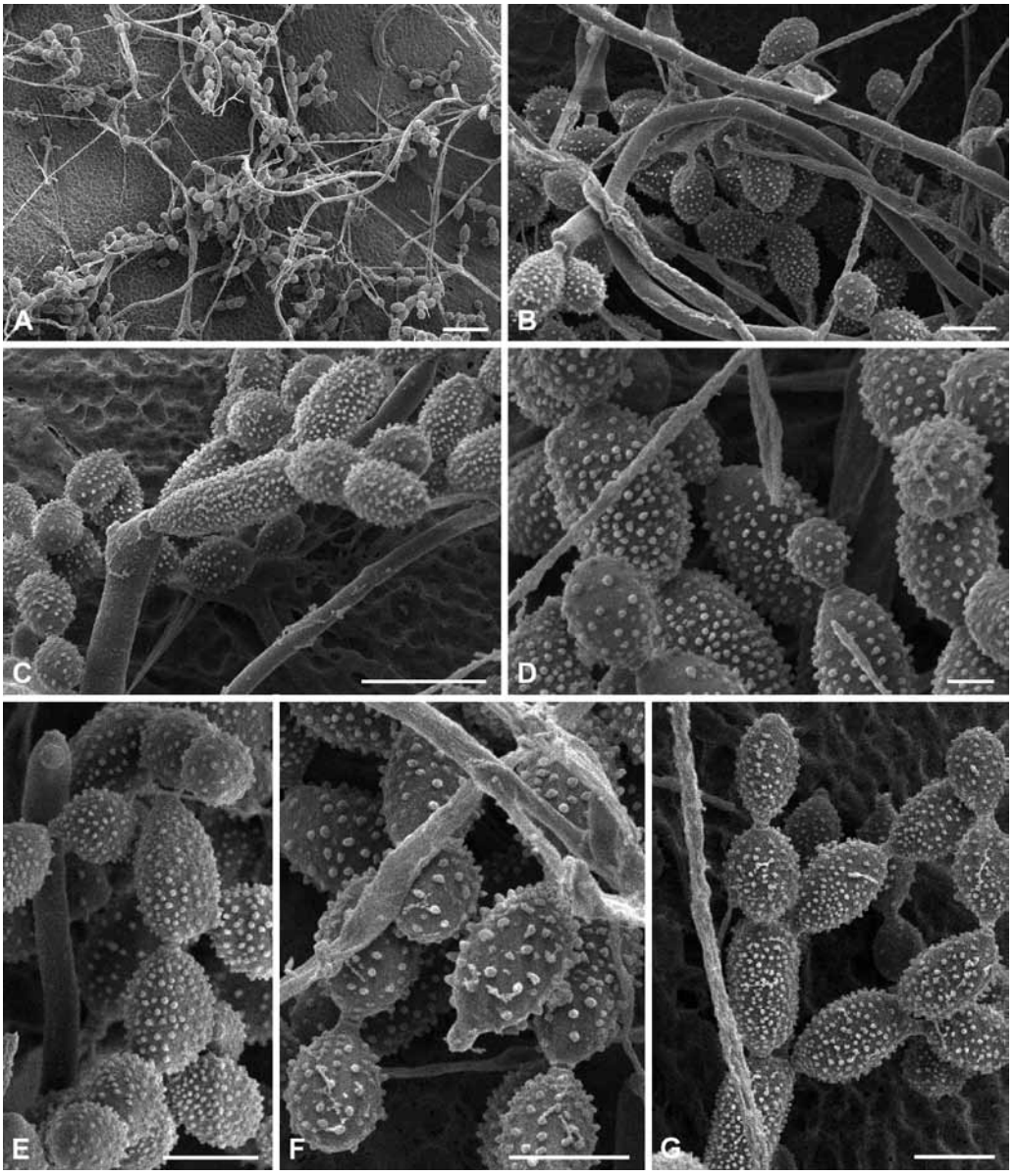



**Fig. 298.** *Cladosporium subinflatum* (CPC 12041). A–G. Images of an 11-d-old culture on SNA. A. Overview of colony with clusters of conidia and aerial hyphae. Many of the hyphae have a collapsed appearance. B. Detail of colony with conidiophores, conidia and aerial hyphae that are partly collapsed. C. Detail of a conidiophore end and a secondary ramoconidium. Note the scars at the end of the conidiophore. D. Details of conidia and ornamentation. The ornamentation consists out of markedly defined units, which have a relatively large distance from each other. Note the hilum on the right conidium. E. Conidiophore with large scars and conidia. F. Different blastoconidia with very early stages of new spore formation in the middle of the picture. G. Pattern of spore development. Scale bars = 2 (D), 5 (B, E–G), 10 (C), 20 (A) µm.

septate, not constricted at the septa, hyaline or subhyaline, almost smooth to somewhat verruculose or irregularly rough-walled, walls unthickened. *Conidiophores* mainly macronematous, sometimes also micronematous, arising terminally from ascending hyphae or laterally from plagiotropous hyphae, erect or subdecumbent, straight or flexuous, sometimes bent, cylindrical, nodulose, usually with small head-like swellings, sometimes swellings also on a lower level or intercalary, occasionally geniculate, unbranched, occasionally branched, (5–)10–270 × (1.5–)2.5–4.5(–5.5) µm, swellings 3–6.5 µm wide, aseptate or with few septa, not constricted at the septa, pale brown, pale olivaceous-brown or somewhat reddish brown, smooth, usually verruculose or irregularly rough-walled and paler, subhyaline towards the base, walls thickened, sometimes appearing even two-layered, up to 1 µm thick. *Conidiogenous cells* integrated, usually terminal or conidiophores reduced to conidiogenous cells, cylindrical, nodulose, usually with small head-like swellings with loci confined to swellings, sometimes geniculate, 5–42 µm long, proliferation sympodial, with several loci, up to four situated at nodules or on lateral swellings, protuberant, conspicuous, denticulate, (0.8–)1–2 µm diam, thickened and darkened-refractive. *Conidia* catenate, in branched chains, more or less straight, numerous globose and subglobose conidia, ovoid, obovoid, broadly ellipsoid to cylindrical, 4–17(–22) × (2.5–)3.5–5.5(–7) µm [av. ± SD, 11.7 (± 4.6) × 4.5 (± 0.8) µm], 0–1(–2)-septate, not constricted at septa, pale brown or pale olivaceous-brown, ornamentation variable, mainly densely verruculose to echinulate (loosely muricate under SEM), spines up to 0.8 µm high, sometimes irregularly verrucose with few scattered tubercles or irregularly echinulate, walls unthickened or slightly thickened, apex rounded or slightly attenuated towards apex and base, hila conspicuous, protuberant, denticulate, 0.5–2 µm diam, thickened and darkened-refractive; microcyclic conidiogenesis observed.

*Culture characteristics*: Colonies on PDA attaining 29 mm diam after 14 d at 25 ºC, olivaceous-black to olivaceous-grey towards margin, margin regular, entire edge, narrow, colourless to white, glabrous to feathery, aerial mycelium formed, fluffy, mainly near margins, growth flat, somewhat folded in the colony centre, deep into the agar, few prominent exudates formed with age, sporulation profuse. Colonies on MEA attaining 25 mm diam after 14 d at 25 ºC, olivaceous-grey to olivaceous due to abundant sporulation in the colony centre, pale greenish grey towards margin, iron-grey reverse, velvety to powdery, margin crenate, narrow, white, glabrous, radially furrowed, aerial mycelium diffuse, growth convex with papillate surface, wrinkled colony centre, without prominent exudates, sporulation profuse. Colonies on OA attaining 26 mm diam after 14 d at 25 ºC, olivaceous, iron-grey to greenish black reverse, growth flat, deep into the agar, with a single exudate, abundantly sporulating.

*Substrate and distribution*: Hypersaline water; Slovenia.

*Notes*: *Cladosporium subinflatum* is a saprobic hyphomycete well-characterised by the formation of numerous globose or subglobose conidia, resembling species of the *C. sphaerospermum* complex, with coarse surface ornamentation ranging from verruculose to distinctly spiny. *Cladosporium spinulosum*, also isolated from hypersaline water, is morphologically close to *C. subinflatum*, but differs from the latter species in having somewhat narrower macronematous conidiophores, narrower conidiogenous loci and hila, and conidia with longer spines, up to 1.3 µm. *Cladosporium allicinum* may superficially also be confusable, but its conidia are minutely verruculose to verrucose but never spiny.

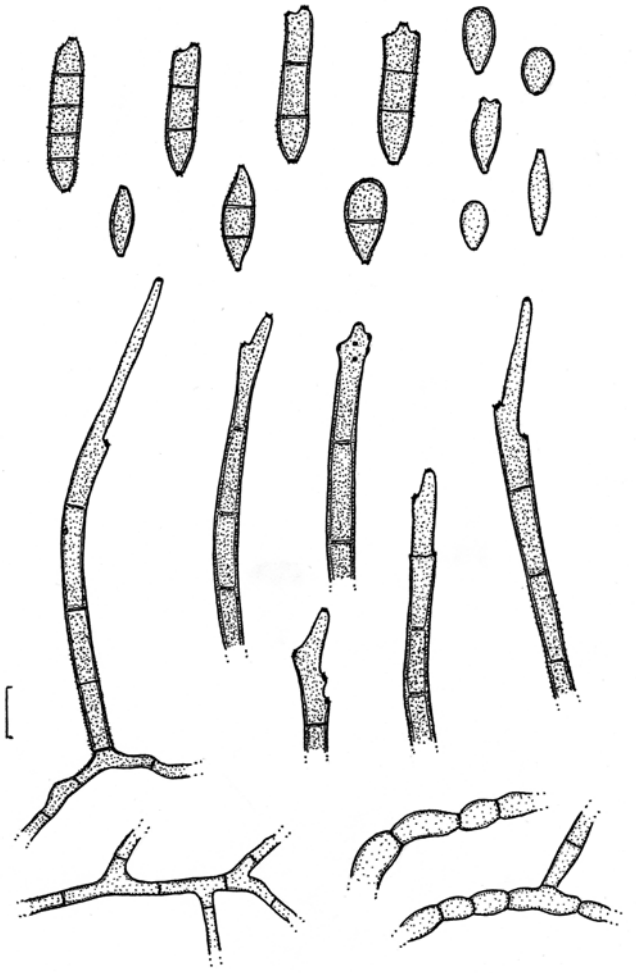


**Fig. 299.** *Cladosporium subobtectum* (NY). Mycelium, conidiophores and conidia *in vivo*. Scale bar = 10 µm. U. Braun *del*.

**149. *Cladosporium subobtectum*** U. Braun & K. Schub., Schlechtendalia 16: 71. 2007. Fig. 299.

*Holotype*: **USA**, California, Santa Clara Co., Stanford University, on *Euonymus* sp. cult. (*Celastraceae*), 26 Oct. 1901, C.F. Baker, Pacific Slope Fungi 31 (NY). *Isotypes*: Baker, Pacific Slope Fungi 31 (*e.g.*, B 700006689).

*Ill.*: Braun & Schubert (2007: 72, fig. 6).
*Exs.*: Baker, Pacific Slope Fungi 31.

*In vivo*: *Leaf blotches* large, yellowish to whitish, straw-coloured, later darkened, margin indefinite or with a narrow dark border. *Colonies* amphigenous, subeffuse, dark brownish or olivaceous-brown, velvety. *Mycelium* internal and external; superficial hyphae branched, 2–8 µm wide, septate, thin-walled (< 1 µm), subhyaline to pale olivaceous-brown, often with swellings and constrictions. *Stromata* lacking. *Conidiophores* solitary, arising from superficial hyphae, lateral, occasionally terminal, erect, straight, subcylindrical-filiform to somewhat geniculate-sinuous, unbranched, often narrowed and paler towards the apex, 20–100 × 3–6 µm, septate, thin-walled (≤ 1 µm), pale olivaceous to medium olivaceous-brown or brown, almost smooth to distinctly verruculose. *Conidiogenous cells* integrated, terminal as well as intercalary, 10–25 µm long, proliferation sympodial, occasionally percurrent, conidiogenous loci 1–2 µm diam, distinctly coronate. Ramoconidia rarely formed. *Conidia* in simple or branched

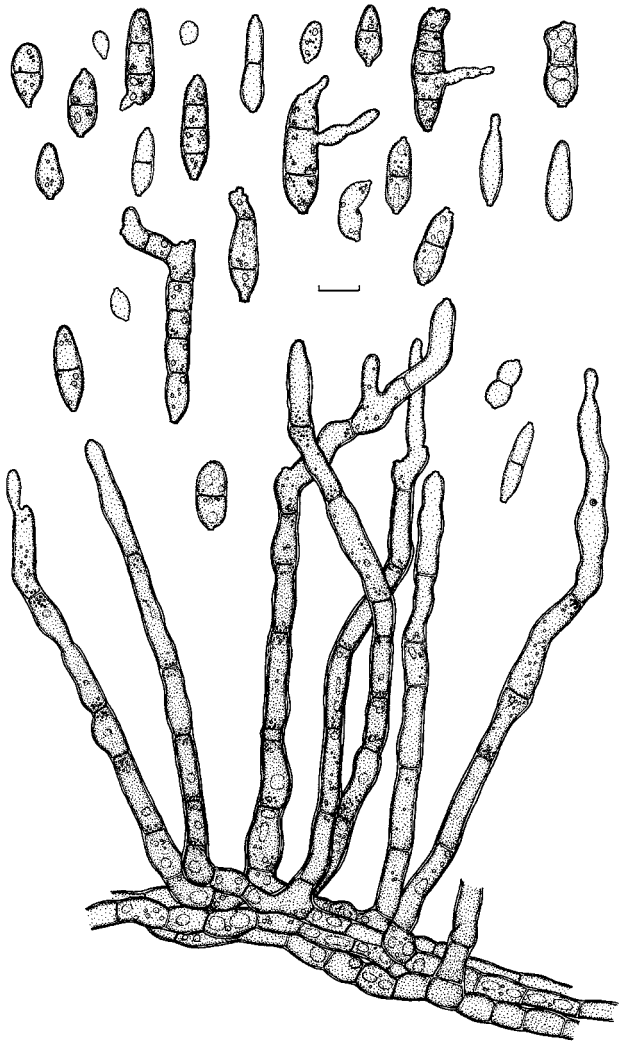


**Fig. 300.** *Cladosporium subsclerotioideum* (DAOM). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del.*

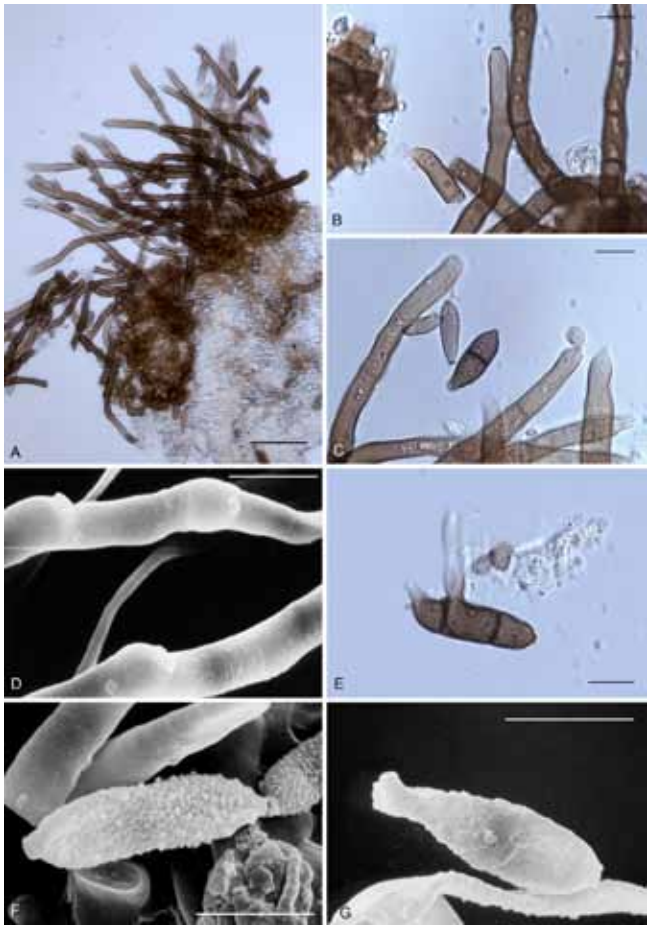


**Fig. 301.** *Cladosporium subsclerotioideum* (DAOM). A. Overview. B. Conidiophores. C. Conidiophores and conidia. D. Conidiophores with coronate scars. E. Germinating conidium. F, G. Conidia showing surface ornamentation. Scale bars = 10 (B–G), 50 (A) µm.

chains, subglobose, ellipsoid-ovoid, fusiform, subcylindrical, 5–28 × 2.5–6(–8) µm 0–4-septate, pale olivaceous to medium olivaceous-brown, occasionally darker, thin-walled (≤ 1 µm), verruculose, ends rounded to attenuated, hila 1–2 µm diam, often denticle-like; microcyclic conidiogenesis not observed.

*Substrate and distribution*: On *Euonymus* sp.; USA.

*Notes*: *Cladosporium subobtectum* is a leaf-spotting hyphomycete, which is morphologically close to *C. obtectum* (Schubert 2005b), a species causing lesions on *Artemisia maritima*. However, the latter species is distinguished from *C. subobtectum* by having much shorter conidiophores, larger conidiogenous loci and conidial hila and wider, often smooth conidia. The saprobic *C. astroideum* is another similar species, which differs from *C. subobtectum* in having much wider, (3–)4–11 µm, thick-walled (0.5–1.5 µm), smooth to verruculose conidia, often with distinct lumina that render them seemingly very thick-walled.

**150. *Cladosporium subsclerotioideum*** Bubák & Dearn., Hedwigia 58: 33. 1916. Figs 300, 301.

*Lectotype* (**designated here**): **Canada**, Ontario, London, on living leaves of *Turritis glabra* (≡ *Arabis glabra*) (*Brassicaceae*), Jun.–Jul. 1910, J. Dearness, mixed infection with *Peronospora parasitica* and *Albugo candida* (BPI 427479). *Isolectotype*: DAOM.

*Lit.*: Saccardo (1931: 790), Schubert (2005b: 140–142).
*Ill.*: Schubert (2005b: 141, fig. 68, pl. 30, figs A–G).

*In vivo*: On still living or dying leaves and stems, without distinct leaf spots or discolorations. *Colonies* amphigenous, at first punctiform, subcircular-oval, later confluent, caespitose, dense, dark brown, somewhat raised, velvety. *Mycelium* internal, subcuticular to intra-epidermal; hyphae sparingly branched, 3–7 µm wide, septate, with swellings and constrictions, pale to medium olivaceous-brown or even dark brown, smooth or almost so to somewhat rugose or rough-walled, thick-walled, cells with oil droplets giving them a granular appearance, forming dense, compact hyphal aggregations. *Conidiophores* solitary or in loose groups, arising from stromatic hyphal aggregations, erumpent through the cuticle, erect, straight to more or less flexuous, sometimes slightly geniculate-sinuous, subnodulose, but conidiogenous loci not confined to swellings, unbranched or branched, 59–240 × 4–8.5(–10) µm, pluriseptate, sometimes slightly constricted at the septa, olivaceous-brown, paler towards the apex, tips sometimes subhyaline, smooth or almost so to irregularly rugose or rough-walled, distinctly thick-walled, often distinctly two-layered, with small to somewhat larger, shiny or refractive oil droplets. *Conidiogenous cells* integrated, terminal or intercalary, cylindrical, 15–50 µm long, proliferation sympodial, with a single or only few conidiogenous loci, protuberant, slightly convex, 1–2.5 µm diam, thickened, darkened-refractive. *Conidia*

catenate, in unbranched or rarely branched chains, straight, ovoid, ellipsoid, fusiform, subcylindrical to cylindrical, 6–33(–44) × 4–8(–9) µm, 0–4-septate, occasionally slightly constricted at the septa, occasionally distoseptate, pale to medium olivaceous-brown, surface ornamentation variable, smooth or almost so to irregularly rugose or verruculose, thick-walled, sometimes even two-layered, apex rounded or attenuated, often with small oil droplets, hila protuberant, truncate to slightly convex, 1–2.5 µm diam, thickened, darkened-refractive; often germinating, occasionally microcyclic conidiogenesis occurring.

*Substrate and distribution*: On *Turritis glabra*; Canada.

*Notes*: On the label of the type collections the date is given as 1911, whereas in the original diagnosis (Bubák 1916) 1910 is published. This species is morphologically comparable with *C. herbarum*, but the latter species is quite distinct in having subnodulose or nodulose conidiophores with conidiogenous loci confined to swellings, cells without oil droplets, and usually shorter, verruculose or sometimes even verrucose, but not rugose conidia without oil droplets.

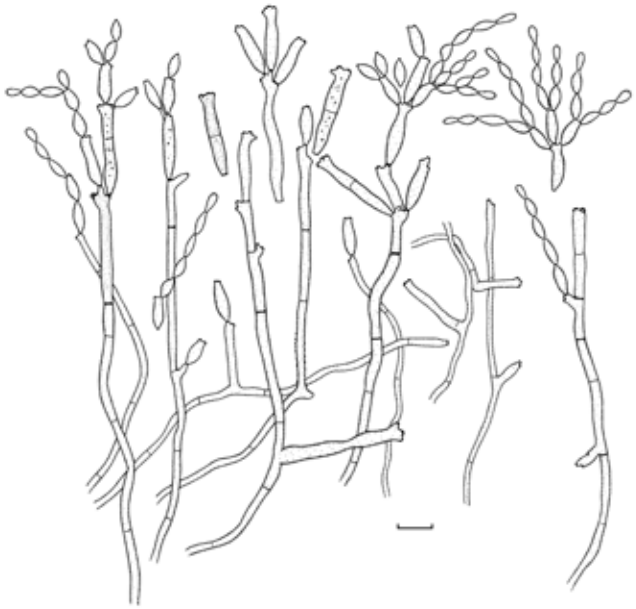


**Fig. 302.** *Cladosporium subtilissimum* (CBS 113754). Macro- and micronematous conidiophores and conidia *in vitro*. Scale bar = 10 µm. K. Bensch *del*.

**151. *Cladosporium subtilissimum*** K. Schub., Dugan, Crous & U. Braun, Stud. Mycol. 58: 146. 2007. Figs 302–304.

*Holotype*: **USA**, isolated from a grape berry, F.M. Dugan, wf 99-2-9 sci 1 (CBS H-19865). *Isotype*: HAL 2028 F. *Ex-type culture*: CBS 113754.

*Ill*.: Schubert *et al*. (2007b: 145–147, figs 40–42).
*Exs*.: ? Kabát & Bubák, Fungi Imperf. Exs. 242, p.p.

*In vitro: Mycelium* unbranched or sparingly branched, 1–5 µm wide, septate, without swellings and constrictions, hyaline to subhyaline or pale brown, smooth to minutely verruculose, walls unthickened or almost so, protoplasm somewhat guttulate or granular. *Conidiophores* macronematous and micronematous, arising laterally from plagiotropous hyphae or terminally from ascending hyphae, erect, straight to slightly flexuous, filiform to cylindrical-oblong, non-nodulose, sometimes geniculate towards

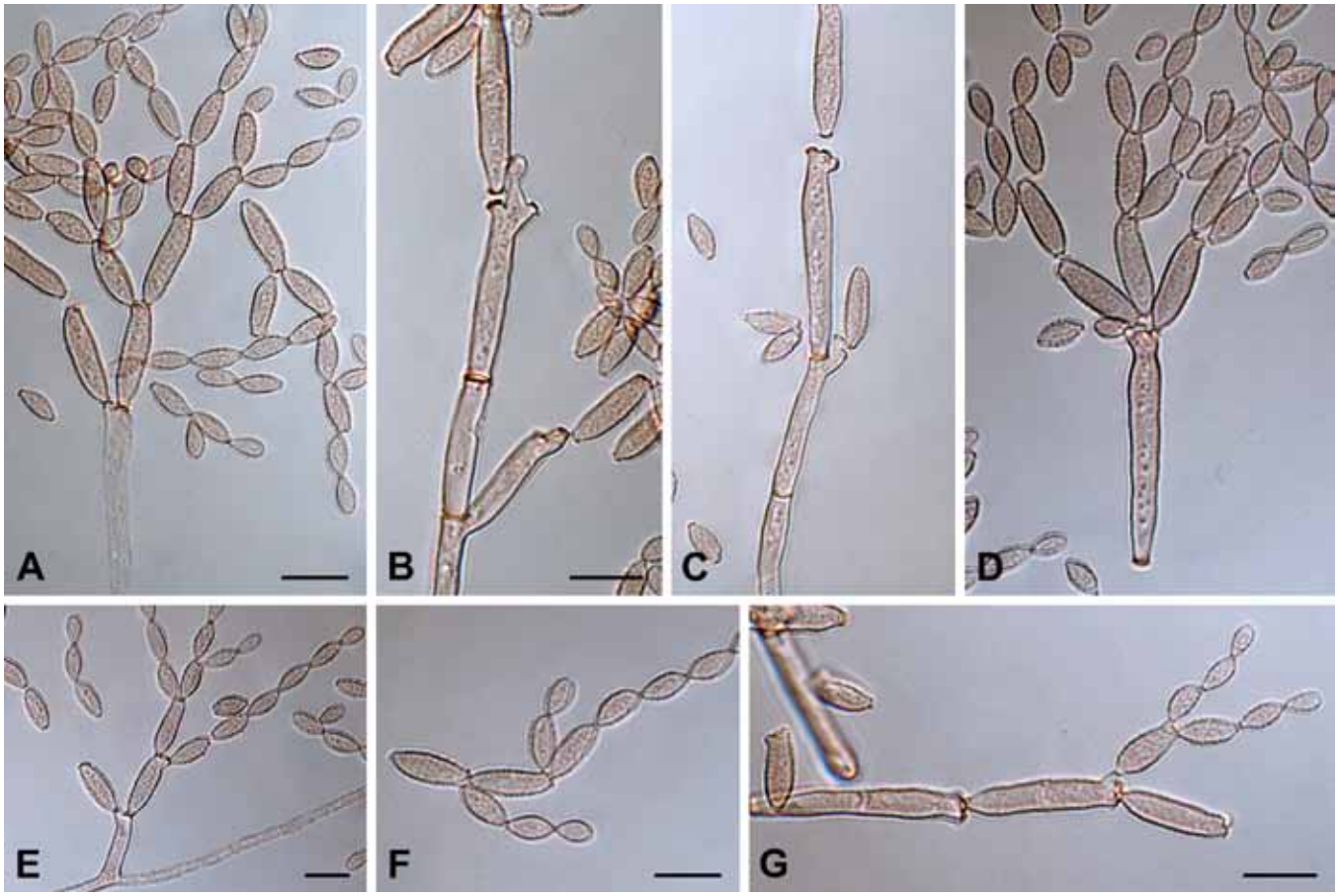



**Fig. 303.** *Cladosporium subtilissimum* (CBS 113754). A–C. Macronematous conidiophores. D. Conidial chain. E. Micronematous conidiophore. F–G. Conidia. Scale bars = 10 µm.

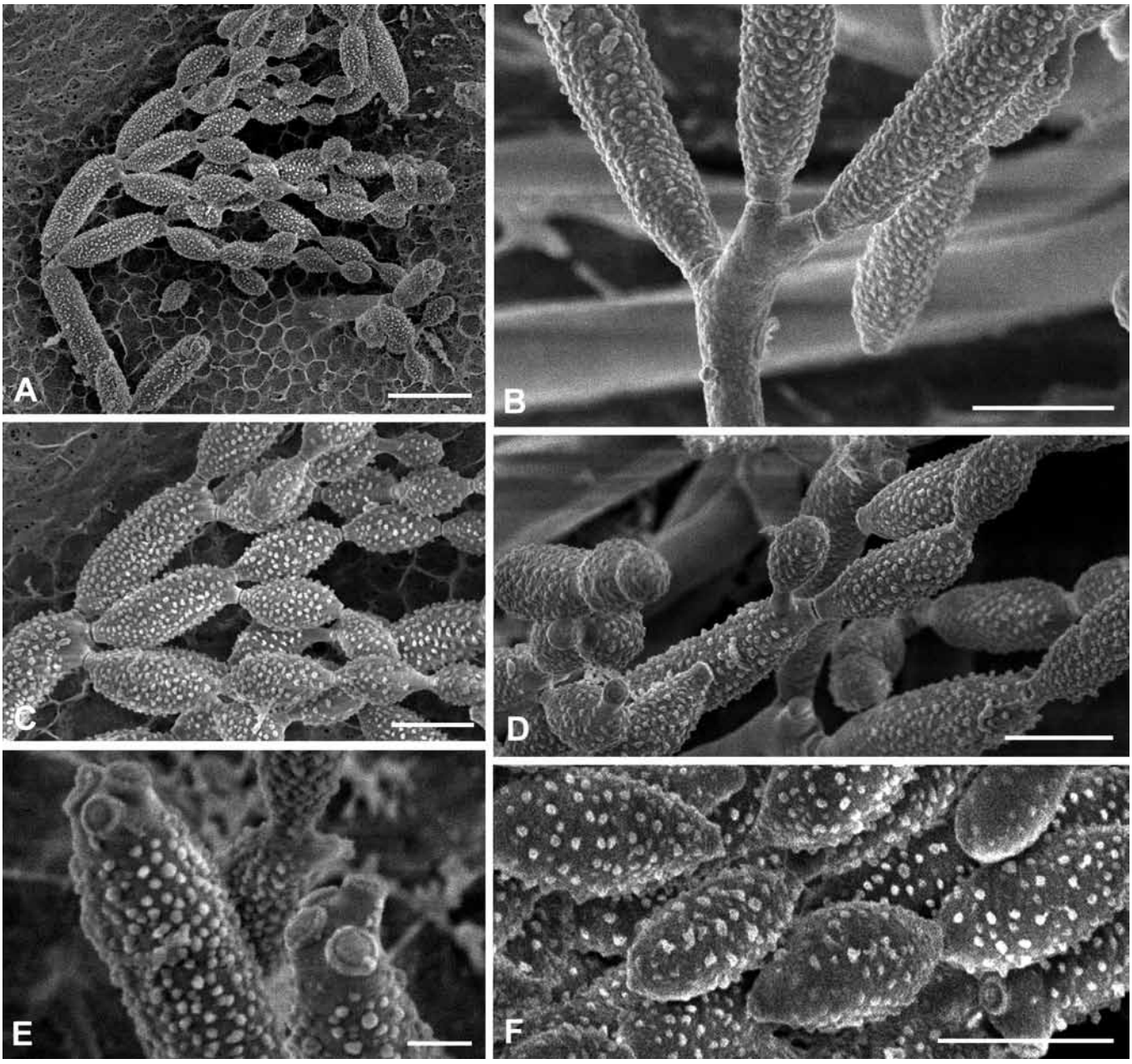



**Fig. 304.** *Cladosporium subtilissimum* (CBS 113754). A. Overview on the organisation of spore formation. The micrograph shows a large basal secondary ramoconidium which has chains of secondary ramoconidia, intercalary and small terminal conidia. The conidia are formed in rows of often three cells. Note the size difference in the different cells. B. Conidiophore showing very pronounced scars that almost appear as branches. C. Detail of (A), illustrating the scar formation between the cells. D. Conidia during different stages of formation. E. Details of pronounced hila, and prominent ornamentation on secondary ramoconidia with the central dome-formed area. F. Different conidia and hila. Scale bars = 2 (E), 5 (B–D, F), 10 (A) µm.

the apex, unbranched or once branched, branches short to somewhat longer, usually formed below a septum, sometimes only short, denticle-like or conical, 25–140 × 2–4 µm, 0–4-septate, not constricted at the septa, subhyaline to pale brown, almost smooth, minutely verruculose to verruculose, sometimes irregularly rough-walled in the lower part, walls unthickened or slightly thickened, protoplasm guttulate or somewhat granular. *Conidiogenous cells* integrated, terminal or pleurogenous, sometimes also intercalary, filiform to narrowly cylindrical, non-nodulose, sometimes geniculate, 14–57 µm long, with usually sympodial clusters of pronounced conidiogenous loci at the apex or on a lower level, denticle-like or situated on short lateral prolongations, up to five loci, intercalary conidiogenous cells usually with a short denticle-like lateral outgrowth below a septum, protuberant, denticulate, somewhat truncate, 1.2–2 µm diam, thickened and darkened-refractive. *Ramoconidia* sometimes occurring, conidiogenous cells seceding at one of the upper septa of the conidiophore and behaving like conidia, filiform or cylindrical, 20–40(–55) µm long, 1.5–4 µm wide, 0–1-septate, concolorous with conidiophores, not attenuated towards apex and base, base broadly truncate, non-cladosporioid, without any dome and raised rim, 2–3.5 µm wide, neither thickened nor darkened, sometimes slightly refractive. *Conidia* catenate, in branched chains, up to 12 or even more in a chain, straight, small terminal conidia numerous, subglobose, narrowly obovoid, limoniform or fusiform, 4–9 × 2–3.5 µm [av. ± SD, 6.4 (± 1.5) × 2.8 (± 0.4) µm], with up to three distal scars, aseptate, hila (0.5–)0.8–1 µm diam, intercalary conidia narrowly ellipsoid, fusiform to subcylindrical, 9–18 × 3–4(–6) µm [av. ± SD, 13.0 (± 2.5) × 3.8 (± 0.3) µm], 0(–1)-septate, hila 1–1.2(–1.8) µm diam, with up to four distal scars, secondary ramoconidia ellipsoid, fusiform or subcylindrical, (13–)17–32(–37) × 3–5(–6) µm [av. ± SD, 21.4 (± 4.4) × 4.1 (± 0.5) µm], 0–1(–2)-septate, septum median or somewhat in the lower half, usually not constricted at the septa, with up to six distal hila crowded at the apex, hila (1.2–)1.5–2(–2.5)

µm diam, apex often somewhat laterally enlarged or prolonged with hila crowded there, very pale or pale brown or olivaceous-brown, minutely verruculose to verruculose (granulate under SEM), walls unthickened or only slightly thickened, often slightly attenuated towards apex and base, protoplasm often guttulate or granular, hila protuberant, denticulate, (0.5–)0.8–2(–2.2) µm diam, thickened and darkened-refractive; microcyclic conidiogenesis occasionally observed.

*Culture characteristics*: Colonies on PDA attaining 24 mm diam after 14 d at 25 °C, grey-olivaceous to olivaceous, olivaceous-grey, iron-grey or olivaceous-black reverse, velvety, margin regular, entire edge, white or pale greenish olivaceous, glabrous to feathery, aerial mycelium sparse, only few areas with abundant mycelium, diffuse, growth regular, flat or with a raised and wrinkled colony centre, radially furrowed, effuse, usually without prominent exudates, with age several exudates formed, sporulation profuse, colonies consisting of two kinds of conidiophores, short and a few longer ones. Colonies on MEA reaching 25 mm diam after 14 d at 25 °C, greenish olivaceous to grey-olivaceous in the centre, olivaceous-grey to iron-grey reverse, velvety, margin entire edge, crenate or umbonate, narrow, pale greenish olivaceous, sometimes radially furrowed, aerial mycelium absent or sparse, growth low convex with distinctly wrinkled colony centre, without prominent exudates, abundantly sporulating. Colonies on OA attaining 25 mm diam after 14 d at 25 °C, dark grey-olivaceous to olivaceous due to profuse sporulation, iron-grey reverse, sometimes releasing some olivaceous-buff pigments into the agar, velvety, margin regular, entire edge or crenate, narrow, colourless or white, glabrous or feathery, aerial mycelium sparse, growth flat with slightly raised colony centre, prominent exudates lacking, sporulation profuse.

*Substrate and distribution*: Plant material and hypersaline water; Europe (Slovenia), North America (USA).

*Additional specimens examined*: **Slovenia**, Sečovlje, isolated from hypersaline water from salterns (reserve pond), 2005, P. Zalar (CPC 12044 = EXF-462). **USA**, isolated from bing cherry fruits, F.M. Dugan (CBS 113753).

*Excluded strains within the subtilissimum complex*: **Argentina**, isolated from *Pinus ponderosa* (*Pinaceae*), 2005, A. Greslebin (CPC 12484, CPC 12485). **USA**, isolated from grape berry, F.M. Dugan (CBS 113741, CBS 113742); isolated from grape bud, F.M. Dugan (CBS 113744).

*Notes*: *Cladosporium subtilissimum* is a species of the *C. herbarum* complex but morphologically resembles *C. cladosporioides.* It deviates from *C. cladosporioides s. str.* by having verruculose to verrucose conidia. Schubert *et al.* (2007b) listed and discussed several isolates which are *in vitro* morphologically not distinguished from *C. subtilissimum* but genetically separated in various subclades, so that they can only be referred to as *Cladosporium* sp. or *C. subtilissimum s. lat.* used as morphological species.There are similar problems with regard to the identification of herbarium specimens that morphologically agree with *C. subtilissimum* [*e.g.*, Spain, Ceuda, on dead leaves of *Eucalyptus viminalis*, 26 Dec. 1925, Vidal y Lopes 7602 (MA 07502); Germany, Berlin, Grunewaldsee, on *Typha angustifolia*, 9 Oct. 1904, G. Lindau, Kabát & Bubák, Fungi Imperf. Exs. 242 (B 700006756); France, Loire, Veauches, on *T. latifolia*, Aug. 1883, Hernier, ex herb. G. Winter (B 700006750)].

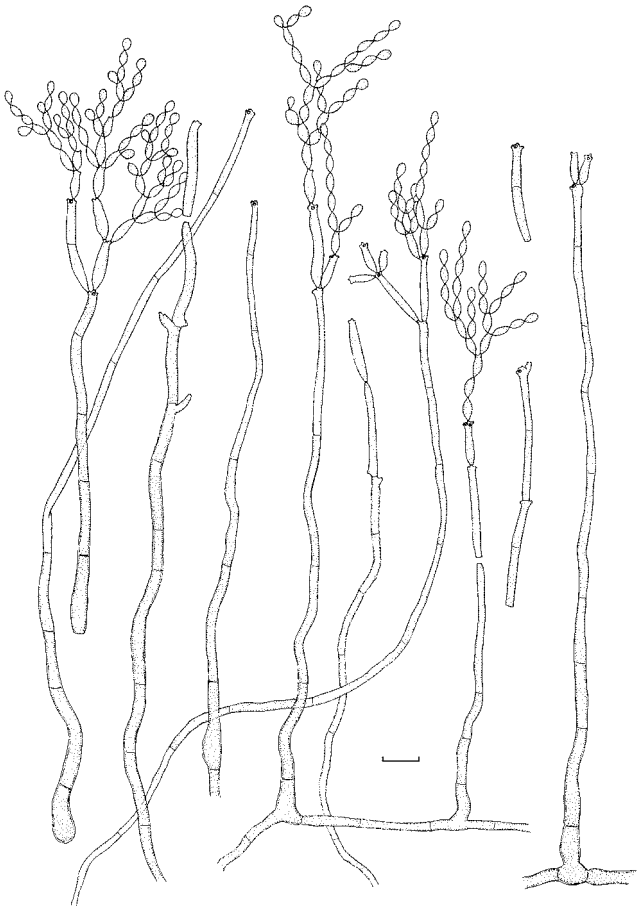


**Fig. 305.** *Cladosporium subuliforme* (CBS 126500). Subulate conidiophores, ramoconidia and conidial chains *in vitro*. Scale bar = 10 µm. K. Bensch *del*.

**152. *Cladosporium subuliforme*** Bensch, Crous & U. Braun, Stud. Mycol. 67: 77. 2010. Figs 305, 306.

*Holotype*: **Thailand**, Chiang Mai, Sansai, Mai Jo, palm nursery, isol. from *Chamaedorea metallica* (*Arecaceae*), 26 Dec. 2006, coll. I. Hidayat & J. Meeboon, FIH 401, isol. P.W. Crous (CBS H-20448). *Ex-type culture*: CBS 126500 = CPC 13735.

*Ill.*: Bensch *et al.* (2010: 78, figs 67–68).

*In vitro: Mycelium* internal and superficial; hyphae sparingly branched, 1–4 µm wide, septate, sometimes slightly constricted at the base of conidiophores, subhyaline to pale olivaceous-brown, smooth to minutely verruculose or verruculose, often somewhat swollen at the base of conidiophores, up to 6 µm wide, sometimes forming ropes. *Conidiophores* macro- to semimacronematous or micronematous, solitary or in pairs, arising terminally and laterally from hyphae, erect, straight to mostly flexuous, filiform to narrowly cylindrical-oblong, often slightly to distinctly attenuated towards the apex and wider at the base, not nodulose or geniculate, unbranched or branched, branches often only as short peg-like lateral outgrowth just below a septum bearing conidiogenous loci, branches occasionally longer, up to 20 µm, 9–330 × (1.5–)2–3(–3.5) µm, pluriseptate, usually not constricted at septa, pale to medium olivaceous-brown, smooth to sometimes minutely verruculose, parts of the stalk occasionally verrucose, basal cell sometimes swollen up to 8(–10) µm, walls unthickened or only slightly thickened, about 0.5 µm wide. *Conidiogenous cells* integrated, mainly terminal but also intercalary, narrowly cylindrical-oblong,

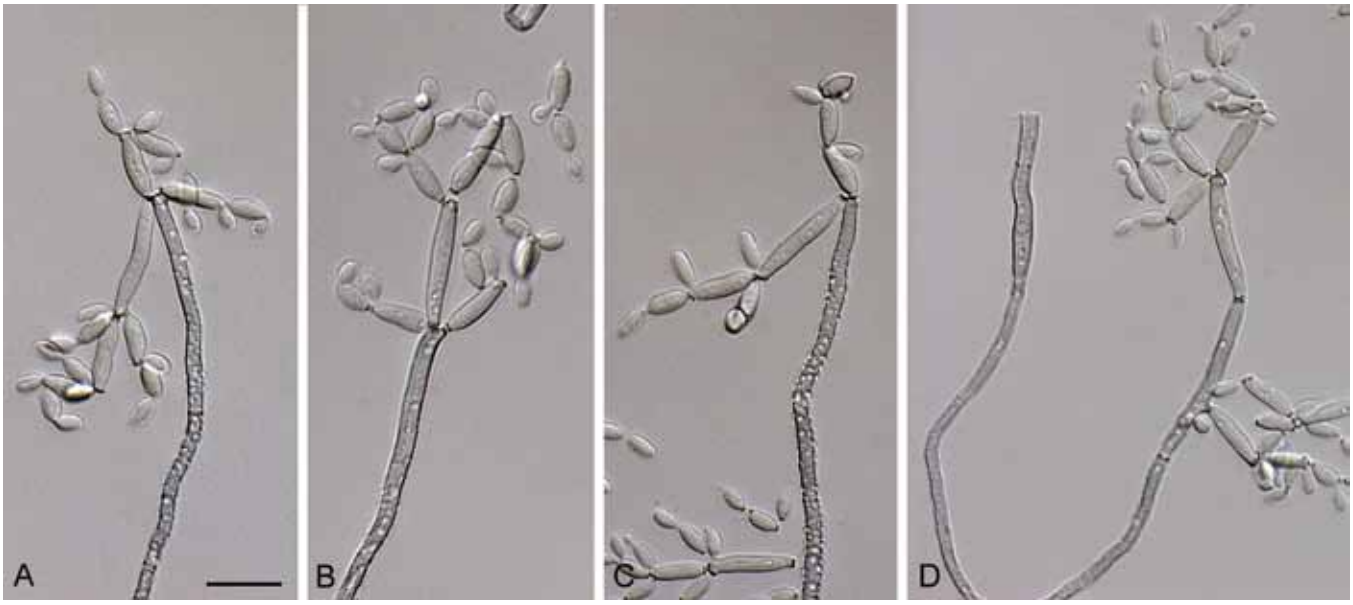



**Fig. 306.** *Cladosporium subuliforme* (CBS 126500). A–C. Tips of conidiophores with conidial chains. D. Subulate conidiophore with terminal and intercalary conidiogenous cell and conidia. Scale bar = 10 µm.

neither nodulose nor geniculate, 9−40 µm long, with up to five loci crowded at the uppermost apex, in intercalary cells loci often situated on small denticle- or peg-like lateral outgrowths just below a septum, loci conspicuous, subdenticulate, (0.8−)1−1.5(−1.8) µm diam, thickened and darkened-refractive. *Ramoconidia* commonly formed, cylindrical-oblong, differentiation between ramoconidia and secondary ramoconidia often quite difficult, (14−)17−35 × (1.5−)2−3 µm, 0(−1)-septate, pale olivaceous-brown, smooth, walls unthickened, not attenuated towards the base, base broadly truncate, 2−2.5 µm wide, unthickened, but often somewhat darkened or refractive. *Conidia* numerous, catenate, in branched chains, up to 5−6 conidia in the unbranched terminal part of the chain, branching in all directions, straight, small terminal conidia obovoid, subglobose, ovoid to limoniform or ellipsoid, 2.5−4.5(−5.5) × 2−2.5 µm (av. ± SD: 4.2 ± 0.9 × 2.2 ± 0.2), aseptate, rounded at the apex, attenuated towards the base, intercalary conidia ellipsoid to subcylindrical, 5.5−12(−13) × 2−3(−3.5) µm (av. ± SD: 8.3 ± 2.5 × 2.6 ± 0.4), aseptate, with up to four distal hila, attenuated towards apex and base, secondary ramoconidia ellipsoid to subcylindrical, sometimes cylindrical-oblong, (6−)8−25(−28) × 2−3(−3.5) µm (av. ± SD: 15.1 ± 7.3 × 2.7 ± 0.4), 0−1-septate, not constricted at septa, median or somewhat in the lower half, usually somewhat attenuated towards the base, (2−)3−4(−5) distal hila, pale olivaceous-brown, smooth or almost so, walls unthickened, hila conspicuous, subdenticulate to denticulate, (0.2−)0.5−1.5(−1.8) µm diam, somewhat thickened and darkened-refractive; microcyclic conidiogenesis not observed.

*Culture characteristics*: Colonies on PDA grey-olivaceous to mainly olivaceous-grey, reverse olivaceous-grey, velvety to floccose, fluffy, margins grey-olivaceous to white, feathery, regular or slightly undulate, aerial mycelium abundant, loose, fluffy, growth effuse to low convex, without exudates, sporulation profuse. Colonies on MEA greenish olivaceous to pale olivaceous-grey and olivaceous-buff, glaucous-grey at margins, reverse olivaceous-grey, floccose to fluffy, margins white, glabrous, regular to somewhat undulate, radially furrowed and wrinkled, effuse, aerial mycelium abundant, fluffy, mainly in colony centre, without exudates, sporulation profuse. Colonies on OA whitish to smoke-grey and pale olivaceous-grey, olivaceous-buff and dull green towards margins, somewhat zonate, grey-olivaceous due to sporulation, reverse leaden-grey, floccose to felty, margins dull green or colourless, regular, glabrous, aerial mycelium abundant, floccose to fluffy-felty, covering large parts of colony surface, growth effuse, without exudates, sporulating.

*Substrate and distribution*: Isolated from *Chamaedorea metallica*; Asia (Thailand).

*Notes*: *Cladosporium subuliforme* belongs to the *C. cladosporioides* complex, but deviates from allied species, above all *C. cladosporioides* and *C. tenuissimum*, by its long narrow subulate conidiophores with several loci crowded at the apex and its numerous ramoconidia with narrow loci and hila. *Cladosporium angustisporum* is phylogenetically close to this species (see Bensch *et al.* 2010, fig. 1, part c) but morphologically easily separable. The conidiophores are not subuliform and the terminal conidia are somewhat longer and narrower.

### 153. *Cladosporium syringicola* K. Schub. & U. Braun, Schlechtendalia 14: 80. 2006. Figs 307, 308.

*Holotype*: **Germany**, Sachsen-Anhalt, Halle (Saale), botanical garden, on *Syringa* ×*chinensis* (*Oleaceae*), 2 Aug. 2004, K. Schubert, mixed infection with *Erysiphe syringae-japonicae* (U. Braun) U. Braun & S. Takam. (HAL 1835 F). *Isotypes*: Braun, Fungi Sel. Exs. 52 (BPI, GZU, HMAS, IMI, KR, KUS, LE, M, PDD, VPIR).

*Lit.*: Schubert (2005b: 142–144).
*Ill.*: Schubert (2005b: 143, fig. 69, pl. 31, figs A–G), Schubert *et al.* (2006: 81, fig. 12, pl. 2, figs I–J).

*In vivo*: On living leaves, leaf spots amphigenous, distinct, at first punctiform, later extending, usually irregular in shape, 1–25 mm wide, pale to medium brown, occasionally somewhat zonate, surrounded by a narrow, dark brown margin, sometimes with a pale greenish halo, on the lower leaf surface somewhat paler, confluent. *Colonies* amphigenous, loosely scattered, in small tufts, dark brown

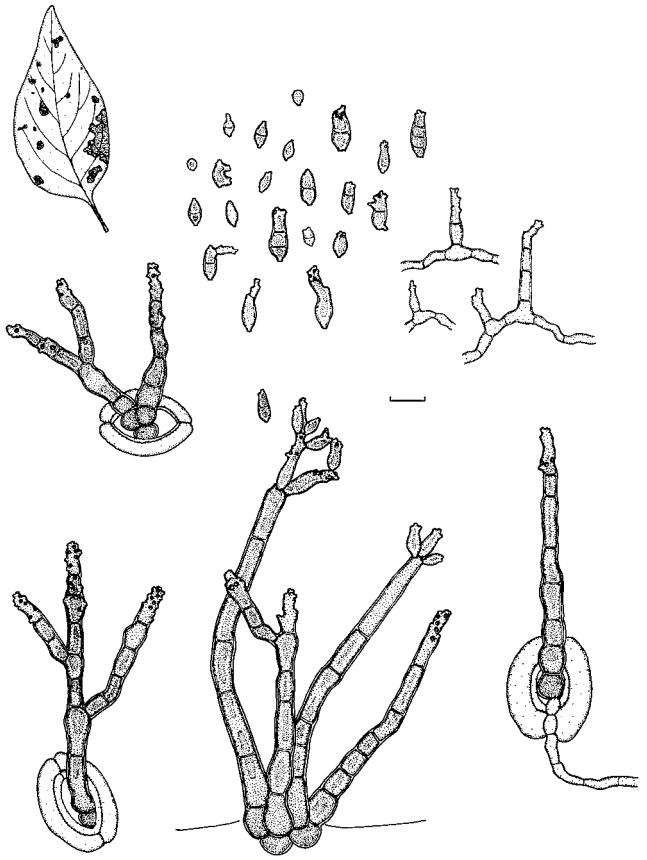


**Fig. 307.** *Cladosporium syringicola* (HAL 1835 F). Symptoms, dimorphic conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

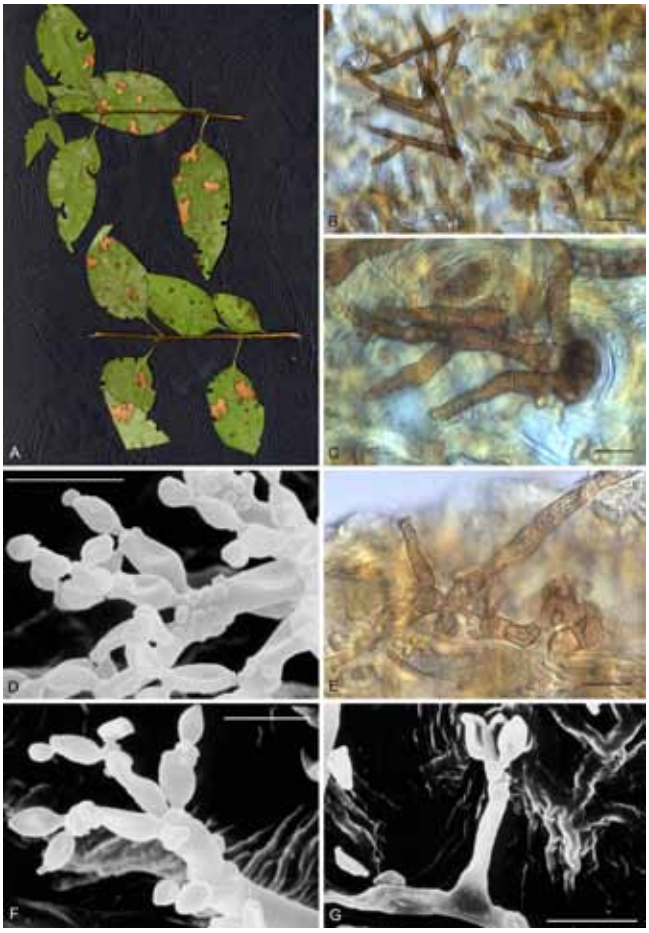


**Fig. 308.** *Cladosporium syringicola* (HAL 1835 F). A. Symptoms. B. Overview. C. Fascicle of conidiophores emerging through stomata. D. Tip of a conidiophore with numerous, conspicuous, crowded, coronate conidiogenous loci and conidia still attached. E, G. Dimorphic conidiophores, second type of conidiophores arising from external, creeping hyphae. F. Tip of a conidiophore with conidia still attached. Scale bars = 10 (C–F), 20 (B) µm.

to blackish, tips of sporulating conidiophores pale olivaceous. *Mycelium* internal and external, hyphae emerging through stomata and then growing superficially; hyphae loosely branched, 2–5 µm wide, septate, sometimes constricted at the septa, often with small swellings, subhyaline to pale olivaceous, smooth, walls thickened, cells occasionally with distinct, clearly delineated, somewhat granular lumen, forming stromatic hyphal aggregations. Stromatic hyphal aggregations absent to well-developed, composed of swollen hyphal cells, subcircular to somewhat angular, 6–15 µm wide, medium to dark olivaceous-brown, smooth, thick-walled. *Conidiophores* dimorphic, solitary or in small fascicles, usually emerging through stomata or erumpent through the cuticle, arising from swollen hyphal cells or stromatic hyphal aggregations, erect, straight to flexuous, unbranched or often branched, not to somewhat geniculate-sinuous, sometimes subnodulose, subcylindrical, attenuated towards the apex, 25–140 × 4–8 µm, pluriseptate, occasionally constricted at the septa, medium to dark olivaceous-brown or brown, smooth, walls thickened, often distinctly two-layered, up to 1(–1.25) µm thick, cells often with distinct, clearly delineated lumen, often swollen at the base, up to 14 µm wide; conidiophores of the second type shorter, narrower and paler, solitary, arising from superficial hyphae, erect, more or less straight, somewhat geniculate, unbranched, 9–35 × 2–4 µm, septate, not constricted at the septa, pale olivaceous, smooth, walls thickened, not distinctly two-layered, but sometimes with distinct, delineated lumen, slightly attenuated towards the apex, often somewhat swollen at the base. *Conidiogenous cells* integrated, terminal or intercalary, 7–25 µm long, proliferating sympodially, with numerous, subdenticulate conidiogenous loci, often crowded, apex appearing somewhat rugose (periconiella-like), 0.5–2 µm diam, somewhat thickened and darkened-refractive. *Ramoconidia* rarely occurring. *Conidia* catenate, in branched chains, straight to slightly curved, subglobose, obovoid, ellipsoid, subcylindrical to irregular, 2.5–18 × 2–5(–6.5) µm, 0–2(–3)-septate, not constricted at the septa, subhyaline, pale olivaceous to pale olivaceous-brown, smooth to sometimes minutely verruculose, walls thickened, often with distinct, clearly delineated lumen, apex rounded to somewhat attenuated, with numerous hila, 0.5–2 µm diam, somewhat thickened and darkened-refractive; microcyclic conidiogenesis often occurring.

*Substrate and distribution*: On *Syringa* ×*chinensis*; Germany.

*Additional specimen examined*: **Germany**, Saxony, Dresden, Leubnitz-Neuostra, on *Syringa vulgaris*, 12 Oct. 2010, E.G. Mahn (HAL 2421 F).

*Notes*: Based on frequently branched conidiophores and conidiogenous cells with numerous crowded conidiogenous loci, *Cladosporium syringicola* is morphologically close to and comparable with *C. gallicola*, but the latter species differs in having uniform, non-dimorphic conidiophores, somewhat wider conidiogenous loci (1–3 µm), and somewhat longer and wider conidia, 3–29 × 2–8 µm, with 0–3(–4) septa (Heuchert *et al*. 2005). Dimorphic conidiophores are also formed in *C. fusicladiiformis*, a leaf-spotting species known from Spain on *Eriobotrya japonica*, but the latter species is quite distinct in having much longer conidiophores, up to 300 µm, and usually 0–1-septate conidia without a distinct, clearly delineated lumen.

*Cladosporium fumago* var. *maculaeforme* (type: on *Syringa vulgaris*, Thüm., Mycoth. Univ. 673 M-0057646, examined) does not belong in *Cladosporium s. str*., since the conidiogenous loci and hila are non-cladosporioid; the generic affinity is not yet clear. *Cladosporium fumago* f. *syringae-vulgaris* (type: on *Syringa vulgaris*, Thüm., Herb. Mycol. Oecon. 393, M-0057668, examined) is a *Trimmatostroma*-like hyphomycete, which has to be excluded from *Cladosporium s. str*. *Cladosporium syringae* (type material not traced) was described to have fasciculate, unbranched conidiophores, 3–4 µm wide, and cylindrical conidia, 15–20 µm long (Saccardo 1931).

**154. *Cladosporium taphrinae*** Bubák, Bot. Közlem. 15(3–4): 81. 1915. Figs 309, 310.

*Holotype*: **Montenegro**, Šavnik, on *Taphrina coerulescens* (*Taphrinales*) on *Quercus cerris* (*Fagaceae*), 30 Sep. 1911, L. Vlach (BPI 427506).

*Lit*.: Saccardo (1931: 797), Heuchert *et al*. (2005: 40).
*Ill*.: Heuchert *et al*. (2005: 41, fig. 15, pl. 2, figs 10–11).

*In vivo*: *Colonies* olivaceous to dark brown, loose to dense, subcircular in outline, later extended, confluent, caespitose, velvety. *Mycelium* on, in and between asci; hyphae strongly branched, 2–6 µm wide, septate, usually not constricted at the septa, subhyaline, pale olivaceous to medium brown, forming dense hyphal nets, cells sometimes swollen, 4–10 µm diam, occasionally forming small stromata, pale brown, smooth, walls thickened. *Conidiophores* solitary, arising from hyphae, or in loose fascicles, arising from stromata, erumpent through asci, erect, straight to curved, subcylindrical, rarely slightly geniculate-sinuous, usually unbranched, rarely branched, 23–150(–200) × 3–5(–7) µm, occasionally longer and up to 8 µm wide, 1–7-septate, without any constrictions, medium brown, paler towards the apex, tips often subhyaline, smooth or almost so, faintly rough-walled at the base, walls somewhat thickened, but thinner towards the apex, occasionally enterogenously proliferating and monopodial. *Conidiogenous cells* integrated, terminal and intercalary, 9–48 µm long, polyblastic, proliferation sympodial, near the apex with numerous conspicuous conidiogenous loci (up to 14), numerous densely arranged loci often giving an impression to be slightly inflated and denticulate, conidiogenous loci protuberant, denticle-like, 1–1.5(–2) µm diam, thickened and darkened. *Conidia* mostly in branched chains, straight, subglobose, obovoid, ellipsoid, 4–20 × 2.5–6 µm, 0–2(–3)-septate, without any constrictions at the septa, pale olivaceous to olivaceous-brown, smooth or almost so, occasionally subechinulate, walls slightly thickened, small conidia

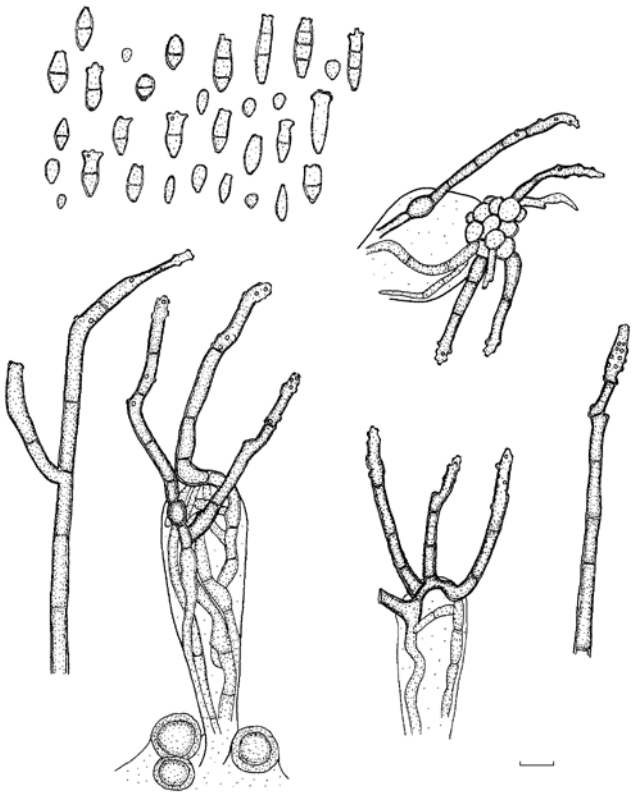


**Fig. 309.** *Cladosporium taphrinae* (BPI 427506). Conidiophores arising from stromata and conidiophores arising from hyphae, erumpent through asci and conidia *in vivo*. Scale bar = 10 µm. B. Heuchert *del*.

usually thin-walled, apex rounded to slightly attenuated, with up to 4 hila, base truncate to convex, occasionally somewhat attenuated, hila protuberant, 0.5–1.5(–2) µm diam, thickened and darkened, basal hilum of branched conidia convex, without a cladosporioid hilum, up to 2 µm wide; microcyclic conidiogenesis not observed.

*Substrate and distribution*: On *Taphrina* spp. (*Taphrinales*); Europe, North America – *Taphrina coerulescens* on *Quercus cerris* (Montenegro), *T. coerulescens* (USA, NV).

*Additional specimen examined*: **USA**, NV, Lincoln County, dirt road toward Highland Peak 5.6 miles from junction with Route 93, west of Pioche, 37°54'30" N 114°33'12" W, on *Taphrina coerulescens*, 17 Aug. 1993, C.T. Rogerson (Fungi of Nevada) (NY, as *C. exoasci*).

*Notes*: In contrast to *Cladosporium phyllophilum* (= *C. exoasci*), the second *Cladosporium* species on *Taphrina* spp., *C. taphrinae* grows on and between asci of *Taphrina coerulescens*. The conidiophores arise from hyphae, are minutely verruculose at the base and the tips are often somewhat swollen and appear coarsely

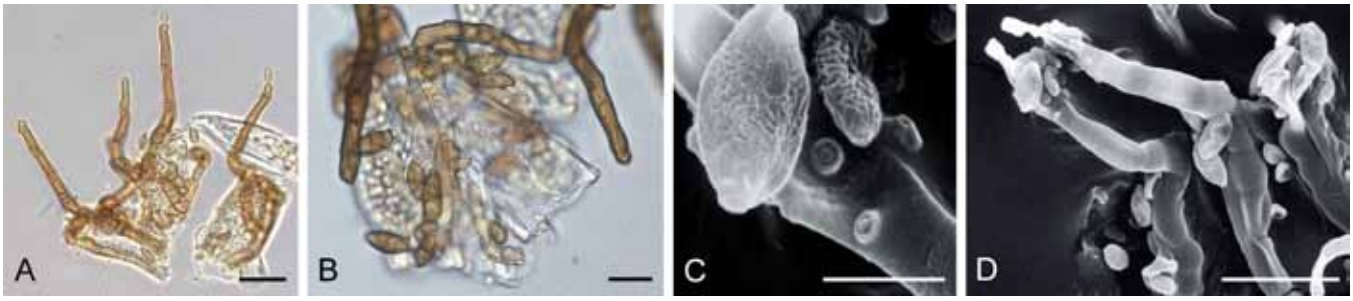



**Fig. 310.** *Cladosporium taphrinae* (BPI 427506). A, D. Overview showing conidiophores erumpent through asci and conidia. B. Conidiophores and conidia. C. Details of the coronate scar structure on conidiophores and conidia. D. Scale bars = 5 (C), 10 (B), 20 (A, D) µm.

verrucose by densely arranged denticle-like scars. Stromata are usually lacking, and the conidiogenous loci and conidial hila are smaller. The conidia are uniform, without obvious dimorphism. A collection on *Taphrina coerulescens* deposited at NY could be identified as *C. taphrinae* and represents the first record for North America (Heuchert *et al.* 2005).

**155. *Cladosporium tenellum*** K. Schub., Zalar, Crous & U. Braun, Stud. Mycol. 58: 149. 2007. Figs 311–313.

*Holotype*: **Israel**, Ein Bokek, Dead Sea, isolated from hypersaline water, 2004, M. Ota (CBS H-19866). *Isotype*: HAL 2029 F. *Ex-type culture*: CBS 121634 = CPC 12053 = EXF-1735.

*Ill.*: Schubert *et al.* (2007b: 148–149, figs 43–45).

*In vitro: Mycelium* sparingly branched, 1–3 µm wide, septate, septa often not very conspicuous, not constricted at the septa, sometimes slightly swollen, subhyaline, smooth, walls unthickened. *Conidiophores* macronematous and micronematous, solitary, arising terminally or laterally from plagiotropous or ascending hyphae, erect or subdecumbent, almost straight to more or less flexuous, cylindrical, sometimes geniculate towards the apex, but not nodulose, sometimes with short lateral prolongations at the apex, unbranched to once or twice branched (angle usually 30–45° degree, sometimes up to 90°), branches usually below a septum, 6–200 × (1–)2–4(–5) µm, septate, septa not very conspicuous, not constricted at the septa, subhyaline to pale brown, almost smooth to usually asperulate, walls unthickened or almost so. *Conidiogenous cells* integrated, terminal or intercalary, sometimes conidiophores reduced to conidiogenous cells, cylindrical, sometimes geniculate, non-nodulose, 6–40 µm long, proliferation sympodial, with several conidiogenous loci often crowded at the apex and sometimes also at a lower level, situated on small lateral shoulders, unilateral swellings or prolongations, with up to 6(–10) denticulate loci, forming sympodial clusters of pronounced scars, intercalar conidiogenous cells with short or somewhat long lateral outgrowths, short denticle-like or long branches with several scars at the apex, usually below a septum, loci protuberant, 1–1.5(–2) µm diam, thickened and darkened-refractive. *Ramoconidia* sometimes occurring, cylindrical, up to 32 µm long, 2.5–4 µm wide, with a broadly truncate, unthickened base, about 2 µm wide. *Conidia* catenate, formed in branched chains, straight, small terminal conidia globose, subglobose, ovoid, oval, 3–6 × 2.5–3.5 µm [av. ± SD, 4.5 (± 1.3) × 2.8 (± 0.4) µm], aseptate, asperulate, with 0–2 distal hila, intercalary conidia and secondary ramoconidia ellipsoid-ovoid, ellipsoid to subcylindrical, 3.5–20(–28) × (2.5–)3–5(–6) µm [av. ± SD, 12.4 (± 5.4) × 4.1 (± 0.7) µm], 0–1-septate, rarely with up to three septa, sometimes slightly constricted at the septa,

**Fig. 311.** *Cladosporium tenellum* (CPC 12053). Macro- and micronematous conidiophores and conidia *in vitro*. Scale bar = 10 µm. K. Bensch *del*.

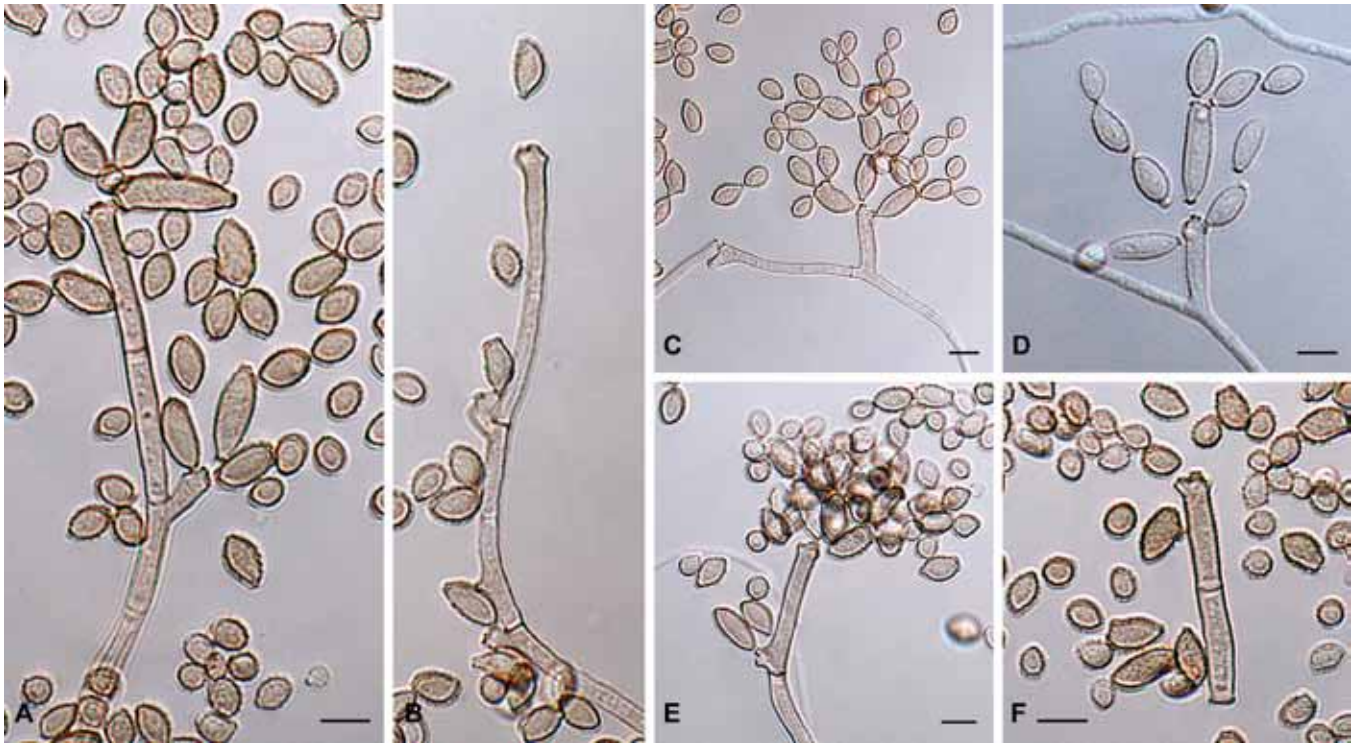



**Fig. 312.** *Cladosporium tenellum* (CPC 12053). A–C, E. Macronematous conidiophore. D. Micronematous conidiophore. F. Ramoconidium and conidia. Scale bars = 10 µm.

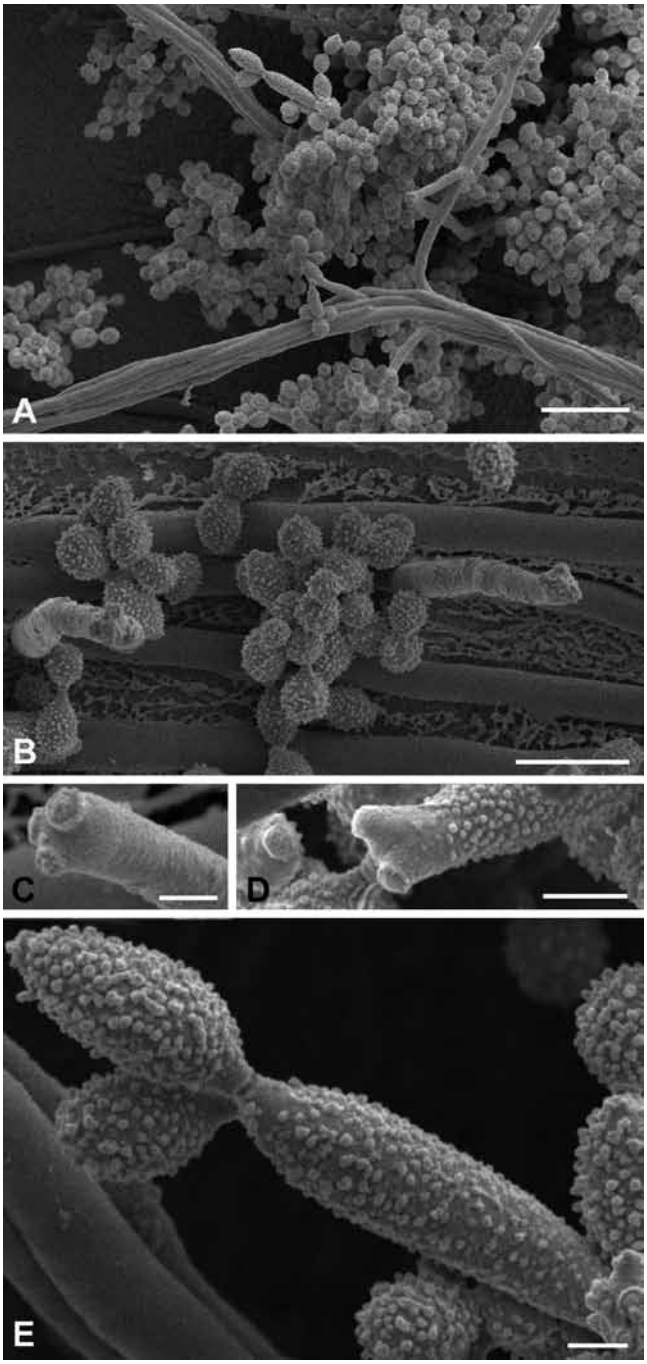



**Fig. 313.** *Cladosporium tenellum* (CPC 12053). A. A bird's eye view of a colony of *C. tenellum* with its very characteristic bundles of aerial hyphae. Numerous conidia are visible, formed on simple conidiophores. B. Hyphae that run on the agar surface give rise to conidiophores and numerous conidia that are relatively rounded. C. Conidiophore ends are rather simple and have large scars. D. Hila on a secondary ramoconidium with non-ornamented area. E. Detail of the prominent ornamentation on a secondary ramoconidium. Scale bars = 2 (C, E), 5 (D), 10 (B), 20 (A) µm.

subhyaline, pale brown to medium olivaceous-brown, asperulate or verruculose (muricate, granulate or colliculate under SEM), walls unthickened or slightly thickened, apex rounded or slightly to distinctly attenuated towards apex and base, often forming several apical hila, up to 7(–9), crowded, situated on small lateral outgrowths giving them a somewhat irregular appearance, hila protuberant, 0.5–1.5 µm diam, thickened and darkened-refractive; microcyclic conidiogenesis sometimes occurring.

*Culture characteristics*: Colonies on PDA reaching 27–34 mm diam after 14 d at 25 ºC, smoke-grey, grey-olivaceous to olivaceous-grey, olivaceous-grey to iron-grey reverse, velvety to powdery, margin regular, entire edge, narrow, colourless to white, aerial mycelium absent or sparingly formed, felty, whitish, growth regular, flat, radially furrowed, with folded and elevated colony centre, deep into the agar, with age forming few to numerous prominent exudates, sporulation profuse, few high conidiophores formed. Colonies on MEA reaching 25–44 mm diam after 14 d at 25 ºC, olivaceous-grey to olivaceous- or iron-grey due to abundant sporulation in the colony centre, velvety, margin regular, entire edge, narrow, colourless, white to pale olivaceous-grey, aerial mycelium loose, diffuse, growth convex with papillate surface, radially furrowed, wrinkled, without prominent exudates, sporulating. Colonies on OA reaching 23–32 mm diam after 14 d at 25 ºC, grey-olivaceous, olivaceous-grey to olivaceous due to abundant sporulation in the colony centre, olivaceous- or iron-grey reverse, velvety, margin regular, entire edge, narrow, colourless or white, aerial mycelium sparse, diffuse, floccose, growth flat to low convex, radially furrowed, wrinkled, without prominent exudates, sporulation profuse.

*Substrate and distribution*: Hypersaline water and plant material; Middle East (Israel), North America (USA).

*Additional specimens examined*: **Israel**, Eilat, isolated from hypersaline water from salterns, 2004, N. Gunde-Cimerman (CBS 121633 = CPC 12051 = EXF-1083). **USA**, Seattle, University of Washington campus, isolated from *Phyllactinia* sp. (*Erysiphaceae*) on leaves of *Corylus* sp. (*Corylaceae*), 16 Sep. 2004, D. Glawe (CPC 11813).

*Notes*: *Cladosporium tenellum* comprises characters of various species complexes of the genus *Cladosporium*. The formation of globose or subglobose terminal conidia is reminiscent of species in the *C. sphaerospermum* complex. Based on the general morphology and size of conidiophores and conidia *C. tenellum* is rather comparable with species of the *C. cladosporioides* complex, *e.g. C. cladosporioides s. str.* characterised by smooth conidiophores and conidia with only few conidiogenous loci and conidial hila crowded at the apex and somewhat wider conidiophores, 3–5(–6) µm. However, it belongs to the *C. herbarum* complex where it resembles *C. subtilissimum* and *C. ramotenellum* (Schubert *et al.* 2007b). In *C. subtilissimum* the small terminal conidia are not globose but rather narrowly obovoid to limoniform, the conidiogenous loci and conidial hila are somewhat wider, (0.5–)0.8–2(–2.2) µm, and at the apices of conidiophores and conidia only few scars are formed. *Cladosporium ramotenellum* possesses longer and narrower, 0–3-septate conidia, 2.5–35 × 2–4(–5) µm, but forms only few conidiogenous loci and conidial hila at the apices of conidiophores and conidia.

**156. *Cladosporium tenuissimum*** Cooke, Grevillea 6(40): 140. 1878. Figs 314–316.

*Lectotype* (designated by Heuchert *et al.* 2005): **USA**, South Carolina, Aiken, on leaf sheets of *Zea mays* (*Poaceae*), H.W. Ravenel, Ravenel, Fungi Amer. Exs. 160 (NY). *Isolectotypes*: Ravenel, Fungi Amer. Exs. 160 (*e.g.*, K, PH 01020427). *Topotype material*: Roumeguère, Fungi Sel. Gall. Exs. 5295 (*e.g.*, NY). *Epitype* (designated by Bensch *et al.* 2010): **USA**, Louisiana, Baton Rouge, isol. from fruits of *Lagerstroemia* sp. (*Lythraceae*), 8 Sep. 2007, P.W. Crous (CBS H-20449). *Ex-type culture*: CBS 125995 = CPC 14253

= *Cladosporium herbarum* var. *citricola* H.S. Fawc. & O.F. Burger, Phytopathology 1: 165. 1911 [lectotype, selected here: USA, Florida, Bayview, 26 Jul. 1909, H.S. Fawcett, FLAS, F 13144].

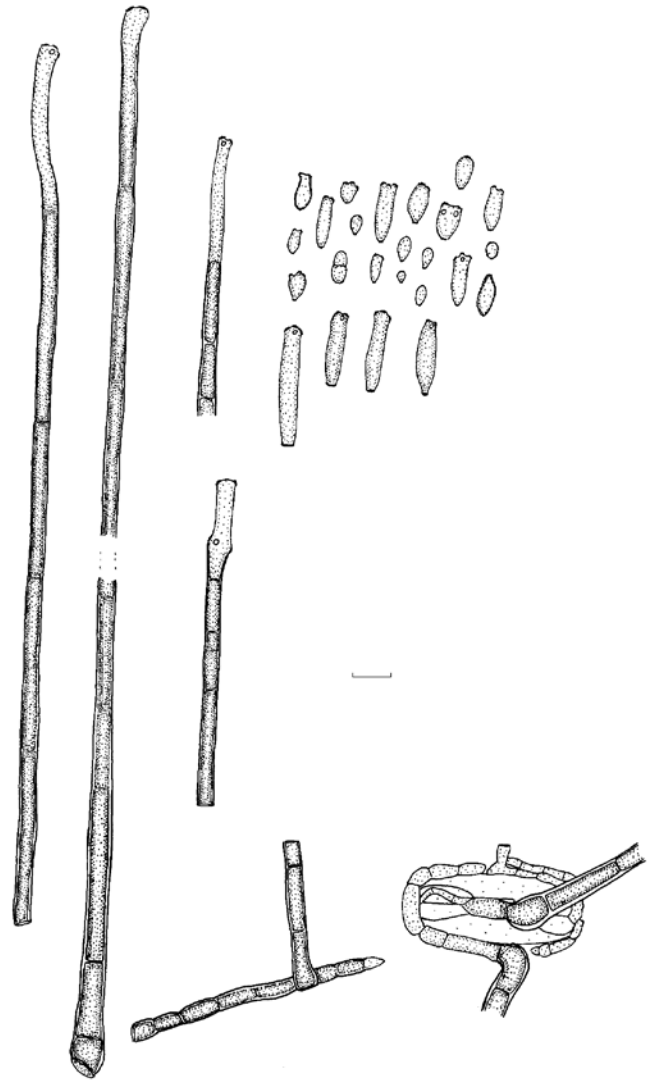


**Fig. 314.** *Cladosporium tenuissimum* (NY). Conidiophores emerging through stomata, tips of conidiophores and conidia *in vivo*. Scale bar = 10 µm. B. Heuchert *del*.

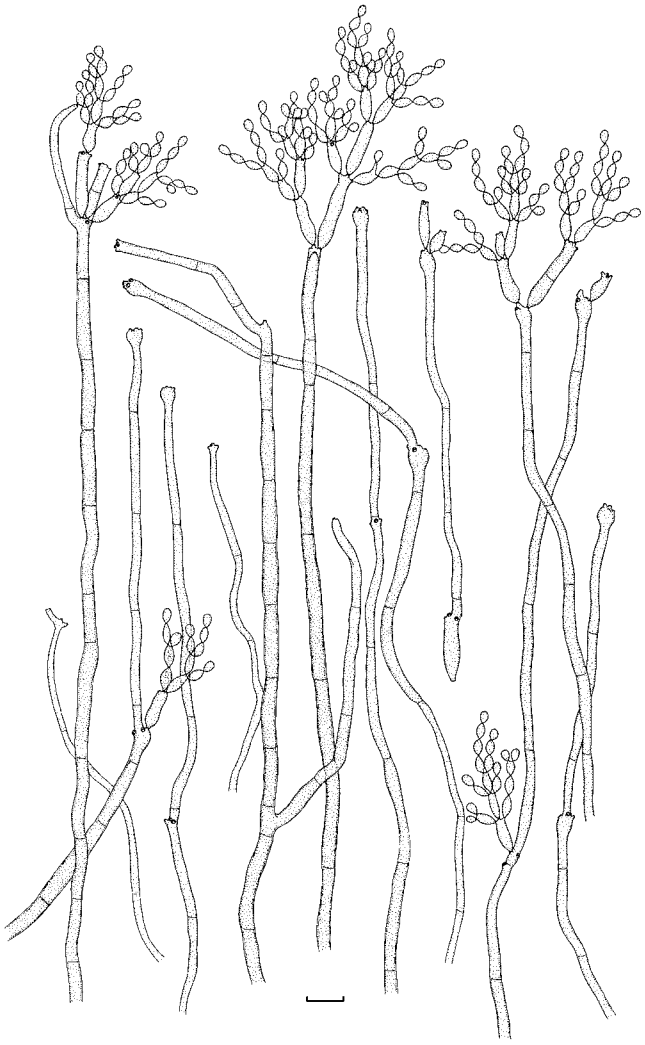


**Fig. 315.** *Cladosporium tenuissimum* (CBS 125995). Macro- and micronematous conidiophores usually with a head-like swollen apex and sometimes additional intercalary nodules, conidial chains and microcyclic conidiogenesis *in vitro*. Scale bar = 10 µm. K. Bensch *del*.

*Lit*.: Saccardo (1886: 365), Ellis (1976: 326), Ho *et al*. (1999: 140), Zhang *et al*. (2003: 166–168), Heuchert *et al*. (2005: 50–52), Bensch *et al*. (2010: 78–81).
*Ill*.: Ellis (1976: 327, fig. 245 A), Ho *et al*. (1999: 143, figs 46–47), Zhang *et al*. (2003: 166, fig. 115), Heuchert *et al*. (2005: 51, fig. 20), Bensch *et al*. (2010: 80–81, figs 69–70).
*Exs*.: Ellis, N. Amer. Fungi 651; Ravenel, Fungi Amer. Exs. 160; Roumeguère, Fungi Sel. Gall. Exs. 5295.

*In vivo*: *Colonies* greyish brown to dark brown, effuse, confluent, thickly felted to villose. *Mycelium* immersed; hyphae branched, 2–7 µm wide, septate, with constrictions at the septa, hyphal cells sometimes irregularly swollen, sometimes irregularly lobed, subhyaline to pale olivaceous-brown, hyphae giving rise to conidiophores often darker, medium to dark brown, and walls somewhat thickened. *Stromata* lacking. *Conidiophores* solitary or in loose groups, mostly two or three, but not distinctly fasciculate, arising from hyphae or somewhat swollen hyphal cells, on leaves and stems erumpent through the cuticle or emerging through stomata, erect, straight to slightly curved-sinuous, but not geniculate-sinuous, subcylindrical-filiform, unbranched, 50–550(–800) × 3–7(–8) µm, at the very base sometimes wider, somewhat inflated, often somewhat attenuated towards the tip, pluriseptate throughout, usually 3–18-septate, non-constricted at the septa, pale, medium to dark brown or olivaceous-brown, often paler towards the tip, smooth, occasionally faintly rough-walled, wall somewhat thickened, up to 1.5 µm, but tips usually unthickened, cells occasionally with distinct lumen, giving the impression that the walls are two-layered and thick, up to 2 µm wide, occasionally with unilateral slight swellings. *Conidiogenous cells* integrated, terminal, sometimes intercalary, cylindrical to subclavate, 15–40 µm long, occasionally longer, polyblastic, with 2–5 coronate conidiogenous loci, sympodially proliferating, terminal conidiogenous cells unswollen, tips subdenticulate, subgeniculate, slightly curved or often sligthly swollen, multilateral or often only unilateral, with a single or several conspicuous conidiogenous loci, somewhat protuberant, thickened and darkened, 1–2.5 µm diam. *Ramoconidia* abundant, with a truncate or obconically truncate base, 1.5–2.5 µm wide, up to 30 × 7 µm, (0–)1(–3)-septate. *Conidia* in branched chains, small terminal and intercalary conidia variable, subglobose, ellipsoid-ovoid, limoniform, 3–10(–13) × 2–5 µm, 0(–1)-septate, secondary ramoconidia subcylindrical, ellipsoid-ovoid, fusiform, 8–25 × 3–6 µm, 0–1-septate, slightly or not constricted at the septa, pale olivaceous to olivaceous-brown, smooth to rough-walled (smooth and verruculose conidia usually mixed), wall unthickened to slightly

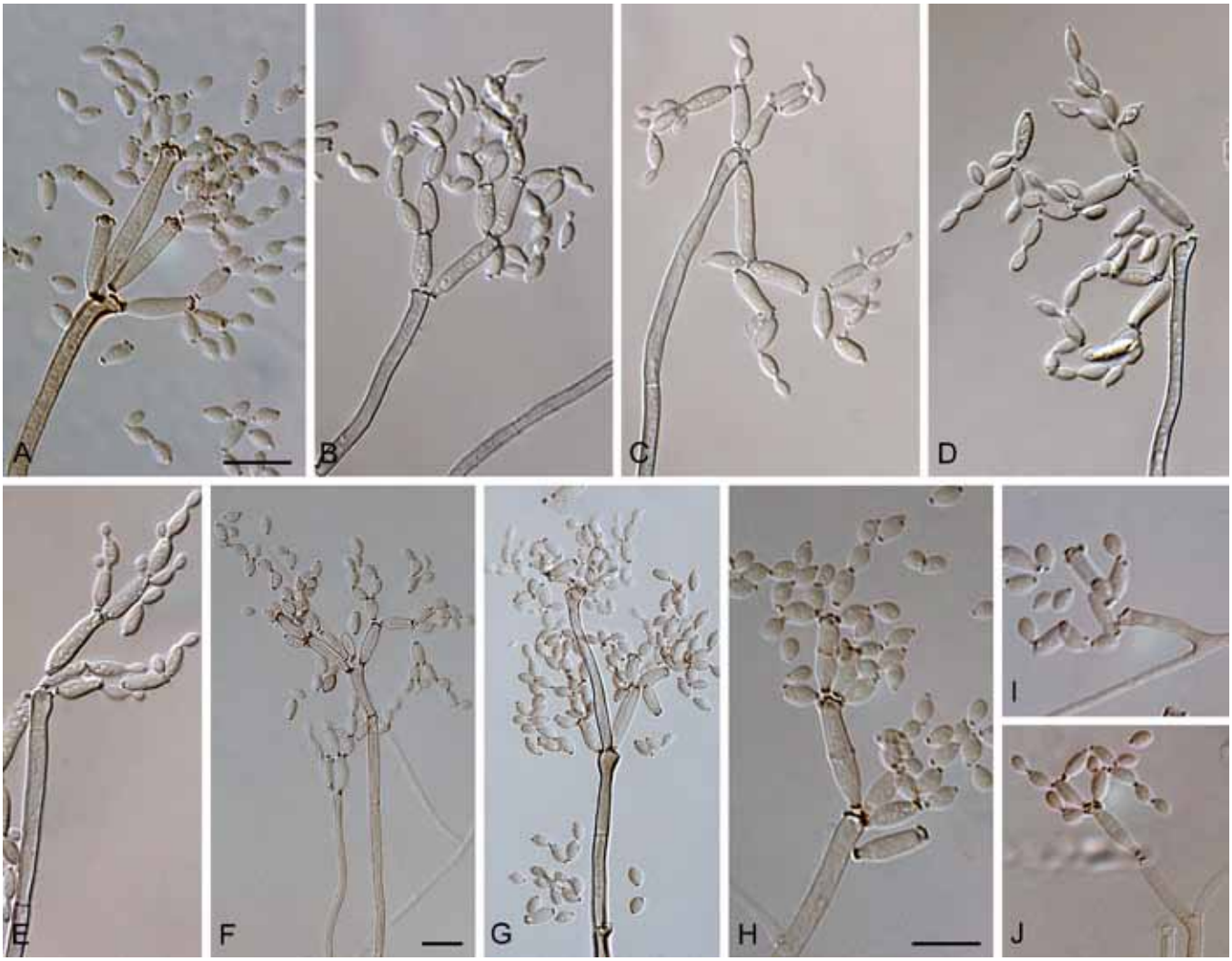



**Fig. 316.** *Cladosporium tenuissimum* (CBS 125995). A–E, G–H. Macronematous conidiophores and conidial chains. F, I–J. Micronematous conidiophores with conidia. Scale bars = 10 µm.

thickened (0.5–1 µm), apex rounded or somewhat irregular by having up to four protuberant hila, base truncate to convex or often somewhat attenuated, hila thickened, darkened, 0.5–1.5(–2) µm diam; microcyclic conidiogenesis not observed.

*In vitro: Mycelium* immersed and superficial, hyphae branched, (0.5−)1−5 µm wide, septate, sometimes constricted at septa, subhyaline to pale or medium brown, with swellings and constrictions, often irregular in outline, smooth to sometimes minutely verruculose, sometimes appearing rough-walled, walls unthickened or very slightly thickened, sometimes forming ropes. *Conidiophores* solitary, macronematous and micronematous, arising terminally and laterally from hyphae; macronematous conidiophores solitary, sometimes in groups of 2−3, erect, straight or slightly flexuous, cylindrical-oblong to almost filiform, sometimes slightly to distinctly geniculate towards the apex, often subnodulose or nodulose with an apical and sometimes a few additional swellings on a lower level, swellings quite distant from the apex and from each other, most conidiophores neither geniculate nor nodulose, unbranched or branched, branching often at an angle of 45−90°, just below the apex or at a lower level, branches sometimes only as short denticle-like prolongations just below a septum, occasionally long, conidiophores 30−310(−460) × 2.5−4 µm (on OA up to 900 µm long), septate, sometimes distinctly constricted at septa, pale to medium brown or olivaceous-brown, smooth, sometimes slightly rough-walled at the base, walls somewhat thickened, sometimes slightly attenuated towards the apex and distinctly swollen at the base, with age conidiophores becoming darker and more thick-walled; micronematous to semimacronematous conidiophores narrower, paler, filiform to narrowly cylindrical-oblong, non-nodulose or only slightly swollen at the apex, unbranched, 17−85 × (1−)2−2.5 µm, with few septa or reduced to conidiogenous cells, pale brown or subhyaline, smooth, walls unthickened or almost so, with a single or up to seven subdenticulate, pronounced loci crowded at the apex. *Conidiogenous cells* integrated, terminal and intercalary, cylindrical-oblong, sometimes short geniculate at the apex, often nodulose, swellings up to 5 µm wide, cells (4−)10−44 µm long, loci often situated on swellings but not restricted to them, mostly only a single swelling per cell, in terminal cells apex usually head-like uni- or multilaterally swollen with up to eight pronounced, subdenticulate to denticulate loci crowded at the tip, in intercalary conidiogenous cells loci often sitting at about the same level (arranged like a garland round about the stalk) or situated on small lateral shoulders, loci 1−1.5(−2) µm diam, thickened and darkened-refractive. *Ramoconidia* occasionally formed, subcylindrical or cylindrical-oblong, 22−41 × 3−4(−5) µm, 0(−1)-septate, base broadly truncate, 2−3.5 µm wide. *Conidia* catenate, in densely branched chains, 1−4(−6) conidia in the terminal unbranched part of the chain, branching in all

directions, straight, small terminal conidia subglobose, obovoid, limoniform, sometimes globose, (2−)2.5−5(−6) × (1.5−)2−3 µm (av. ± SD: 3.7 ± 1.0 × 2.2 ± 0.4), aseptate, apex broadly rounded, intercalary conidia ovoid, ellipsoid or subcylindrical, 4−12(−17) × (1−)2−3(−4.5) µm (av. ± SD: 8.1 ± 2.7 × 2.8 ± 0.6), aseptate, occasionally 1-septate, with up to 5(−7) distal hila, sometimes cell lumen distinct, secondary ramoconidia ellipsoid, fusiform to subcylindrical or cylindrical, (6−)7−25(−31) × (2−)2.5−4(−5) µm (av. ± SD: 15.0 ± 5.8 × 3.2 ± 0.5), with (1−)2−6(−7) distal hila, sometimes with 1−2 hila at the basal end, 0−1(−2)-septate, sometimes distinctly constricted at septa, with age more frequently septate, pale brown or pale olivaceous-brown, smooth, occasionally irregularly rough-walled, walls unthickened or almost so, attenuated towards apex and base, hila conspicuous, subdenticulate to denticulate, 0.5−1.8(−2) µm diam, thickened and darkened-refractive; microcyclic conidiogenesis occasionally occurring with conidia forming secondary conidiophores.

*Culture characteristics*: Colonies on PDA attaining up to 84 mm diam after 14 d, smoke-grey to grey-olivaceous or olivaceous-grey, reverse leaden-grey to olivaceous-black, woolly to fluffy, margin glabrous to feathery, grey-olivaceous to white, aerial mycelium abundant, high, fluffy, smoke-grey, dense, without prominent exudates, sporulating. Colonies on MEA reaching 70−80 mm diam after 14 d, smoke-grey to pale olivaceous-grey, pale olivaceous due to abundant sporulation, reverse olivaceous-grey, woolly, fluffy, margins narrow, glabrous to feathery, colourless to white, sometimes radially furrowed and wrinkled, aerial mycelium abundant, fluffy, dense, high, pale olivaceous-grey, covering large parts of the colony surface, growth low convex, few prominent exudates formed, sporulating. Colonies on OA attaining 65−73 mm diam after 14 d, smoke-grey, pale olivaceous-grey to whitish due to aerial mycelium, greenish grey towards margin, reverse olivaceous-grey to iron-grey or leaden-grey, woolly-fluffy to felty, margin colourless to white, narrow, glabrous, aerial mycelium high, abundantly formed, fluffy to felty, whitish, growth flat to low convex, mostly without prominent exudates, sporulating.

*Substrate and distribution*: On different host plants isolated from dead leaves, twigs, stems, wood and other organic matter, also isolated from air, bread, soil and water; cosmopolitan but especially common in the tropics.

*Additional specimens examined*: **Australia**, Cairns, isol. from *Callistemon viminalis* (*Myrtaceae*), 18 Aug. 2006, P.W. Crous (CPC 13222). **Brazil**, Fortaleza, isol. from a rust fungus, 30 Jul. 2005; U. Braun (CPC 12223); Pernambuco, isolated from *Carica papaya* (*Caricaceae*), 26 Nov. 1960, A.F. Vital 27 (IMI 83634). **Burundi**, isol. from a fruit, J. Rammelo, isol. by B.P.R. Vittal, ident. W. Gams (CBS 117.79). **Indonesia**, isol. from *Musa* sp. (*Musaceae*), 2004, M. Arzanlou (CPC 11612). **Iran**, isol. from *Citrus* ×*aurantium* (*Rutaceae*), 2004, W. Gams (CPC 11555). **Ivory Coast**, Abidjan, isol. from *Musa* sp., 10 Jan. 2005, Kone Daouda, CL1 ra (CBS 126501 = CPC 14410). **Mozambique**, isol. from *Musa* sp., coll. A. Viljoen, isol. P.W. Crous (CPC 10538, 10539). **Nigeria**, isol. from fruit (CBS 262.80). **Polynesia**, reserve Pun Kukui, in forest, isol. from banana, 2006, coll. I. Budenhagen, isol. P.W. Crous (CPC 12794, 12795). **Russia**, Novgorodskaya Oblast', Okulovskij Rajon, village Zarechnaya, on wood and bark of *Populus tremula* (*Salicaceae*), 22 Jul. 2006, D.A. Chabounin (HAL). **South Africa**, Durban, Durban Botanical Garden near Reunion, -29.85, 31.0167, isol. from *Strelitzia* sp. (*Strelitziaceae*), 2005, coll. W. Gams, isol. P.W. Crous (CPC 11805). **South Korea**, Jeju, N33≡ 27'25" E126°33'40", isol. from *Pseudognaphalium affine* (*Asteraceae*), 28 Oct. 2005, coll. H.-D. Shin, isol. P.W. Crous, preserved as "*Passalora* sp." (CPC 10882). **USA**, Delaware, Wilmington, on dead leaves of *Rosa* sp. (*Rosaceae*), 11 Dec. 1883, A. Commons (PH 01020444); Louisiana, Baton Rouge, isol. from *Magnolia* sp. (*Magnoliaceae*), 8 Sep. 2007, P.W. Crous (CPC 14250); Utah, Cache Co., Cache national Forest, Logan Canyon, isolated from *Penstemon cyananthus* (dried culture) (*Plantaginaceae*), 1 Sep. 1990, C.T. Rogerson (NY); Weber Co., Ogden, isolated from dead twigs of *Mahonia aquifolium* (dried culture) (*Berberidaceae*), 10 Apr. 1983, C.T. Rogerson (NY). **Yugoslavia**, isolated from Adriatic sea water, 4 Sep. 1974, M. Cvetkovic U-69 (IMI 187598, as *C. cladosporioides*).

*Cladosporium tenuissimum s. lat.* / Lineage 1 (see Bensch *et al*. 2010, Fig. 1c): **Australia**, Queensland, isol. from rock, Chillagoe Mungana Caves National Park, P.W. Crous (CPC 13252). **Bali**, bat cave, isol. from soil, 2000, coll. J.C. Frisvad, isol. B. Andersen (BA 1737 = CPC 14370). **India**, isol. from *Dalbergia* sp. (*Fabaceae*), 2004, coll. W. Gams, isol. P.W. Crous (CPC 11130); Chandigarh, 30.7372, 76.7872, isol. from *Citrus* sp. (*Rutaceae*), 3 Jan. 2004, W. Gams (CPC 11132). **Laos**, Vientiane Capital, Xaythany District, Xay Villiage, isol. from leaves of *Basella alba* [= *B. rubra*] (*Basellaceae*), 4 Jan. 2007, coll. P. Phengsintham, isol. P.W. Crous (CPC 14196); isol. from *Shorea siamensis* (*Dipterocarpaceae*), 22 Jan. 2007, coll. P. Phengsintham, isol. P.W. Crous (CPC 13732). **Thailand**, isol. from *Acacia mangium* (*Fabaceae*), coll. W. Himaman, isol. P.W. Crous (CPC 11521, 11929). **Venezuela**, Cabruta, Mochimo Bay, isol. from a decayed branch under water, 2007, coll. K. Lyhne, isol. B. Andersen (BA 1710 = CPC 14311); Rojo, Mochimo Bay, isol. from sediment, red mangrove, 2007, coll. K. Lyhne, isol. B. Andersen (BA 1711 = CPC 14312).

*Notes*: *Cladosporium tenuissimum* is a common saprobic hyphomycete comparable and confusable with *C. cladosporioides*, but genetically as well as morphologically distinct as demonstrated in Bensch *et al.* (2010) and discussed under "notes" of the latter species. Material distributed in Roumeguère, Fungi Sel. Gall. Exs. 5295, issued in 1890, seems to be topotype material rather than syntype material.

On SNA plates conidiophores of *C. tenuissimum* can become darker and more thick-walled with age and conidia more frequently septate. On OA and PDA the conidiophores are very long and darker, medium to dark olivaceous-brown, surprisingly forming several nodules quite distant from each other, as in the closely allied *C. oxysporum*, which are never formed *in vivo*. However, *C. oxysporum* does not form such characteristically nodose conidiophores on OA and PDA, but does so on SNA and *in vivo.* Therefore, the formation of such swellings in culture has to be cautiously taken into consideration as diagnostic character. Otherwise, the data given in the general descriptions of *C. cladosporioides* and *C. tenuissimum* in Ellis (1976) and Ho *et al.* (1999) could be confirmed.

*Cladosporium stanhopeae*, a species described on *Stanhopea* (*Orchidaceae*) from Germany (Schubert & Braun 2004, Schubert 2005b) resembles *C. tenuissimum* but is tentatively maintained as a separate species until isolates from that host can be included in molecular studies.

Various authors described and recorded *C. tenuissimum* collections isolated from and classified to be mycoparasitic on rust fungi (*e.g.* Sharma & Heather 1981, 1988, Moricca *et al*. 1999). Assante *et al*. (2004) used one strain of *C. tenuissimum* out of the material studied by Moricca *et al*. (1999), carried out detailed histological examinations by means of TEM, and found close interactions between *Cladosporium* hyphae and uredospores, indicating that the fungus examined was a true mycoparasite. However, the material concerned was not available and could not be proven. Therefore, it remains unclear if *C. tenuissimum* may occur as mycoparasite of rusts or if the authors concerned confused the examined material with *C. uredinicola*. Heuchert *et al.* (2005) re-examined several collections of "*C. tenuissimum*" on rusts, but all of them proved to be identical with *C. uredinicola*.

**157. *Cladosporium trillii*** Ellis & Everh., Proc. Acad. Nat. Sci. Philadelphia 47: 430. 1895. Figs 317, 318.

*Holotype*: **USA**, Washington, Pullman, on leaves of *Trillium petiolatum* (*Melanthiaceae*), Jun. 1894, C.V. Piper, no. 341, mixed infection with *Phyllosticta trillii* Ellis & Everh. (NY).

= *Heterosporium trillii* Ellis & Everh., Proc. Acad. Nat. Sci. Philadelphia 46: 382. 1894 [holotype: NY].
≡ *Cladosporium trillii* (Ellis & Everh.) J.C. David, Mycol. Pap. 172: 94. 1997. *nom. illeg*., non *C. trillii* Ellis & Everh., 1895.
≡ *Cladosporium trilliicola* J.C. David, Schlechtendalia 11: 88. 2004.

*Lit*.: David (1997: 94), Schubert (2005b: 144–146).
*Ill*.: David (1997: 89, fig. 22 C–F; 95, fig. 25), Schubert (2005b: 145, fig. 70, pl. 32, figs A–D).

*In vivo*: *Leaf spots* amphigenous, subcircular-elliptical, 2–7(–20) mm wide, with a whitish grey membranous centre, turning greyish brown with dense fructification, margin narrow, brown to reddish brown, sometimes surrounded by a yellowish brown halo. *Colonies* amphigenous, effuse, scattered, in small tufts, loose to somewhat dense, caespitose, brown. *Mycelium* internal, subcuticular to intraepidermal; hyphae branched, 2–7 µm wide, septate, sometimes slightly constricted at the septa, occasionally with small swellings, up to 10 µm wide, subhyaline to pale olivaceous or olivaceous-brown, smooth, walls slightly thickened. *Stromata* small, compact, 15–40 µm diam, composed of subglobose to somewhat angular cells, 5–10 µm wide, pale to medium olivaceous-brown, smooth, walls thickened. *Conidiophores* in small loose fascicles, arising from stromata, erumpent through the cuticle or emerging through stomata, erect, straight to somewhat flexuous, often geniculate-sinuous, subnodulose or slightly nodulose, unbranched or rarely once branched, 30–155 × 6–9(–10) µm, septate, with only few septa, septa sometimes not very conspicuous, pale brown to medium reddish brown, smooth,

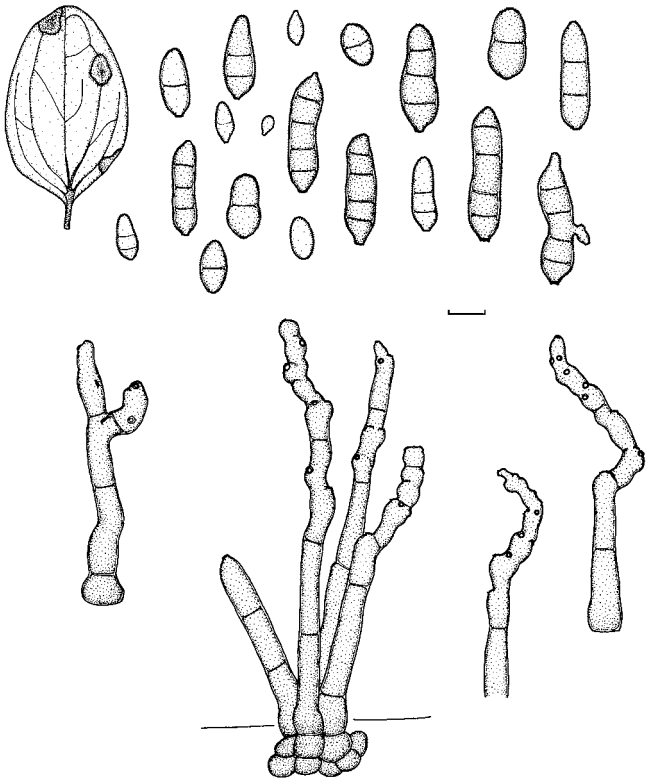


**Fig. 317.** *Cladosporium trillii* (NY). Symptoms, conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

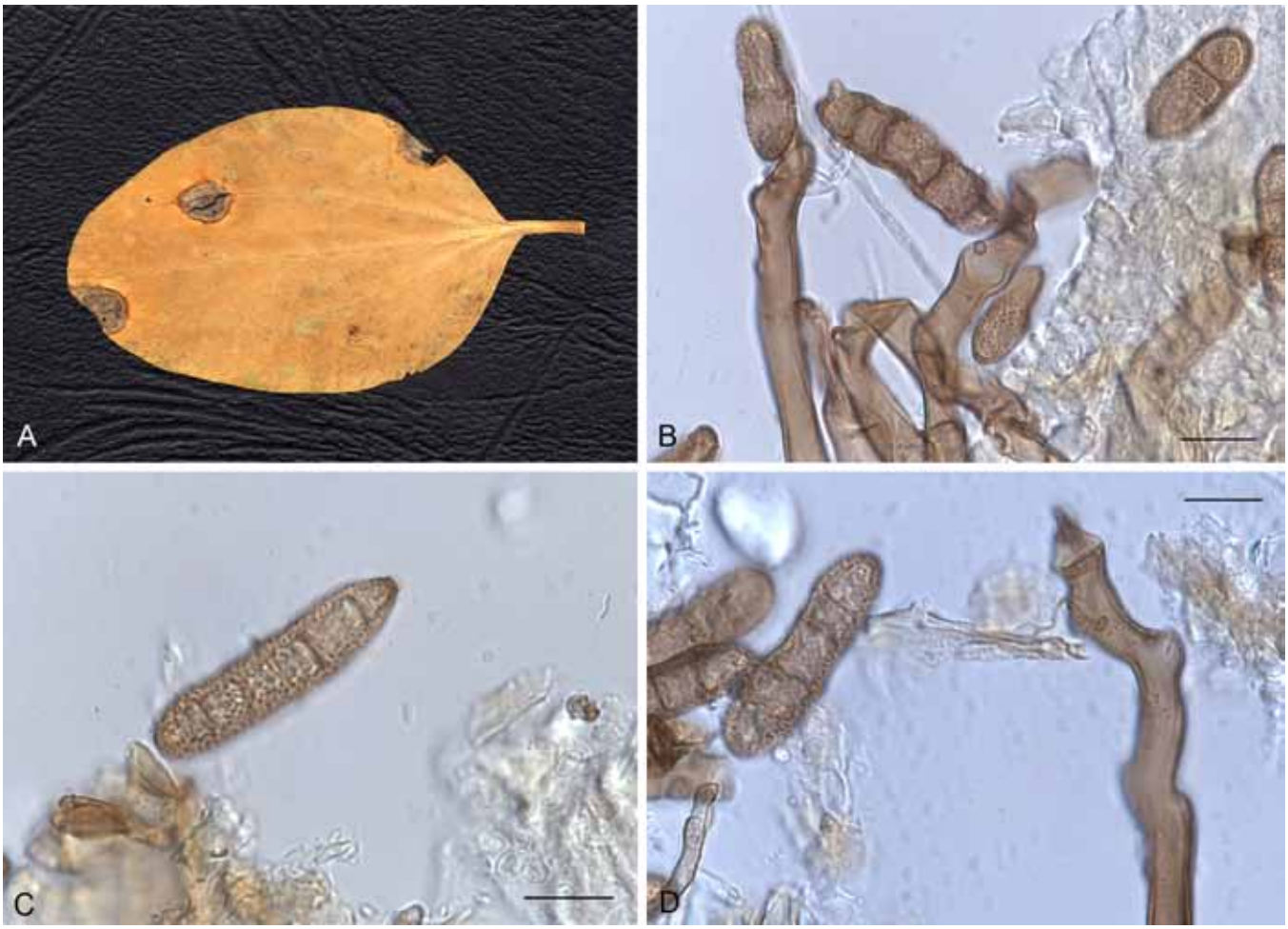



**Fig. 318.** *Cladosporium trillii* (NY). A. Symptoms. B. Conidiophores and conidia. C. Conidium. D. Geniculate, somewhat nodulose conidiophore and conidia. Scale bars = 10 (B–D) µm.

walls thickened but one-layered, up to 0.5 µm wide, often somewhat swollen at the base, up to 11 µm wide, slightly attenuated towards the apex, occasionally enteroblastically proliferating. *Conidiogenous cells* integrated, terminal and intercalary, 6–45 µm long, proliferation sympodial, often geniculate-sinuous, subnodulose or slightly nodulose, conidiogenous loci situated on small unilateral shoulders or multilateral swellings, protuberant, short cylindrical, 1.5–2(–2.5) µm diam, mostly 1 µm high, clearly differentiated in a somewhat raised central dome and a periclinal rim, thickened, somewhat darkened-refractive. *Conidia* catenate, in unbranched chains, more or less straight, obovoid, broadly ellipsoid to mostly cylindrical, (5–)11–36(–41) × (3.5–)6–11(–12) µm, (0–)1–4(–5)-septate, sometimes slightly constricted at the septa, pale olivaceous to olivaceous-brown, distinctly verruculose or verrucose, walls only slightly thickened, apex and base rounded or slightly attenuated, hila protuberant, 1–2(–2.5) µm diam, thickened, darkened-refractive; occasionally microcyclic conidiogenesis occurring.

*Substrate and distribution*: On *Trillium* spp.; North America – *Trillium ovatum* (USA, ID, MT, WA), *T. petiolatum* (USA, WA), *Trillium* sp. (USA, WA).

*Additional specimen examined*: **USA**, Idaho, Latah Co., on *Trillium ovatum*, 14 Jul. 1893, C.V. Piper 128 (NY, **holotype** of *Heterosporium trillii*).

*Notes*: In 1894, Ellis & Everhardt described the new species *Heterosporium trillii* as causing leaf spots on *Trillium ovatum*, eventually killing off the leaves. One year later they introduced *Phyllosticta trillii* on *Trillium petiolatum* and mentioned a *Cladosporium trillii* occurring on the same spots for which they gave a short description (Ellis & Everhardt 1895). David (1997), who revised the fungi previously referred to *Heterosporium*, examined the type material of *Heterosporium trillii* and assigned this species to *Cladosporium*, but failed to recognise that the name *Cladosporium trillii* already existed. Later, *C. trilliicola* was published as new name for this homonym (Dugan *et al*. 2004). However, a re-examination of type material of *Cladosporium trillii* revealed that both species are conspecific.

*Cladosporium ossifragi* and *C. variabile* are morphologically comparable with *C. trillii* but *C. ossifragi* differs in the somewhat narrower, longer conidiophores, generally shorter and somewhat narrower conidia and the degree of septation; and *C. variabile*, the causal agent of leafs spot of spinach, possesses tortuose, spirally twisted aerial hyphae, wider and somewhat longer conidia, (6.5–)10–45(–55) × (5–)7–14(–17) µm, and wider conidiogenous loci and hila, (1–)2–3(–3.5) µm diam.

**158. *Cladosporium uredinicola*** Speg., Anales Mus. Nac. Hist. Nat. Buenos Aires 23: 122–123. 1912. Figs 319–322.

*Holotype*: **Argentina**, Salta, near Calilegua, on sori of *Puccinia cestri* (*Pucciniaceae*) on *Cestrum pubescens* (*Solanaceae*), Nov. 1911, C. Spegazzini (LPS 13073). *Permanent slides*: AUA, IMI 87162a.

*Lit*.: Saccardo (1931: 798), Sutton (1973: 40), Ellis (1976: 330), Traquair *et al*. (1984), Ellis & Ellis (1985: 571, 1988), Morgan-Jones & McKemy (1990), Sheta (1996), Ho *et al*. (1999: 142), Zhang *et al*. (2003: 168–170), Heuchert *et al*. (2005: 41–46), Dugan & Glawe (2006), Bensch *et al.* (2010: 81–82).
*Ill*.: Sutton (1973: 41, fig. 19A), Ellis (1976: 331, fig. 249), Morgan-Jones & McKemy (1990: 189, pl. 1; 191, fig. 1; 193, fig. 2; 195, fig. 3; 197, pl. 2; 199, pl. 3), Ho *et al*. (1999: 143, fig. 49), Zhang *et al*. (2003: 169, fig. 117), Heuchert *et al*. (2005: 42–44, figs 16–18).
*Exs*.: Braun, Fungi Sel. Exs. 53.

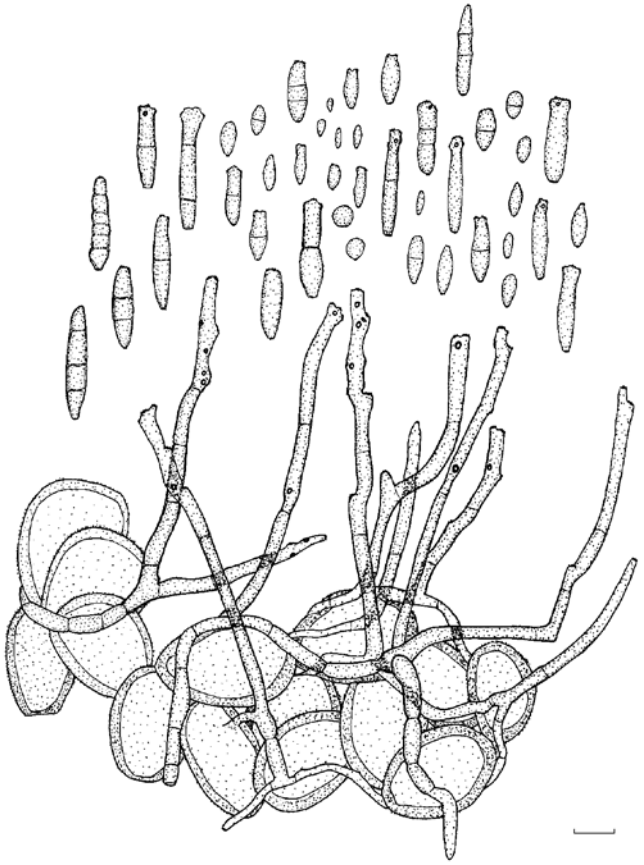


**Fig. 319.** *Cladosporium uredinicola* (IMI 254519). Conidiophores arising from hyphae and conidia *in vivo*. Scale bar = 10 µm. B. Heuchert *del*.

*In vivo*: *Colonies* on rust sori, pale olivaceous or olivaceous-grey, loose to dense, caespitose, floccose, effuse. *Mycelium* superficial, occasionally immersed; hyphae branched, 2–5(–7) µm wide, septate, often constricted at the septa, some cells swollen, up to 8 µm diam, sometimes aggregated, forming dense hyphal nets, pale olivaceous-brown, occasionally subhyaline, smooth or sometimes faintly rough-walled, walls unthickened to slightly thickened. *Stromata* lacking. *Conidiophores* solitary, arising from hyphae, lateral and terminal, or aggregated in loose groups, erect, rarely decumbent, straight to curved, often somewhat geniculate-sinuous, unbranched or occasionally branched (at an acute angle of about 30°), (5–)20–230(–300) × 2–5.5 µm, narrowed towards the apex, 0–8-septate, without any constrictions, pale to medium olivaceous-brown, paler towards the apex, sometimes even subhyaline at the tips, smooth to faintly verruculose, walls slightly thickened, 0.5–0.75 µm wide, tips unthickened. *Conidiogenous cells* integrated, terminal and intercalary, cylindrical or occasionally subclavate, 9–59(–75) µm long, polyblastic, proliferation sympodial, with up to 11 conidiogenous loci per cell, sometimes aggregated, slightly protuberant, often on small shoulders or swellings caused by sympodial proliferation, 1–2 µm diam. *Ramoconidia* rare. *Conidia* usually in branched chains, straight, rarely somewhat curved, subglobose, obovoid, limoniform, narrowly ellipsoid, fusiform, subcylindrical, subclavate, subhyaline, pale olivaceous to olivaceous-brown, smooth or almost so, walls uniformly thin or only very slightly thickened; *small terminal conidia* and *intercalary conidia* 3–18 × 2–5 µm, 0–1-septate; *secondary*

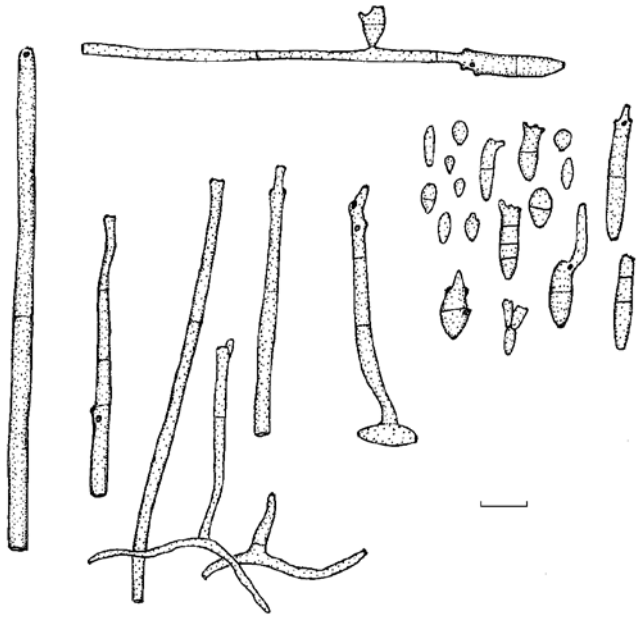


**Fig. 320.** *Cladosporium uredinicola* (IMI 171548, at the lower limit of the variability of the species). Conidiophores arising from hyphae, microcyclic conidiogenesis and conidia *in vivo*. Scale bar = 10 µm. B. Heuchert *del*.

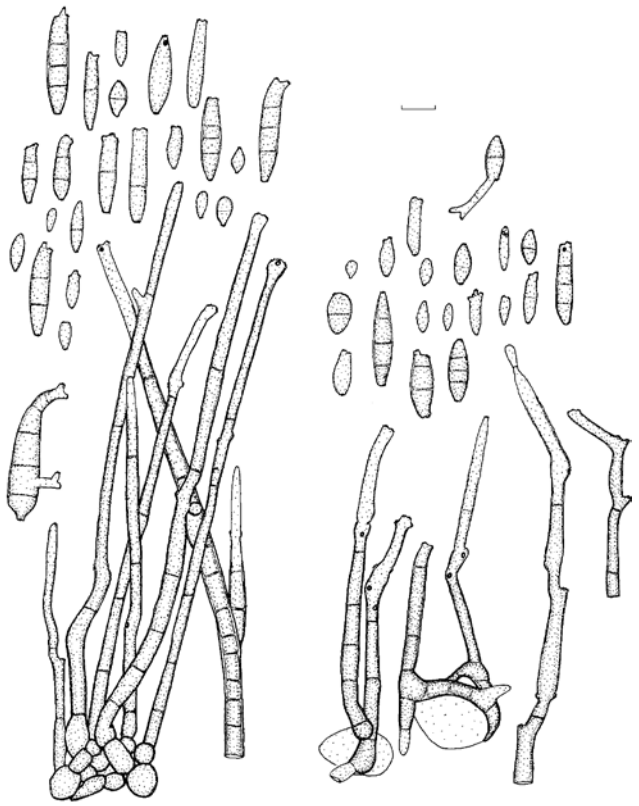


**Fig. 321.** *Cladosporium uredinicola* (IMI 183694 and IMI 183695). Conidiophores arising from hyphae or aggregated in loose groups, microcyclic conidiogenesis and conidia *in vivo*. Scale bar = 10 µm. B. Heuchert *del*.

*ramoconidia* 8–39 × 3–6.5(–8) µm, 0–3(–5)-septate, without any constrictions, occasionally subhyaline, apex and base rounded, occasionally somewhat wider at the apex, with up to seven hila; hila slightly protuberant, rarely denticle-like, darkened-refractive, 0.5–1.5 µm diam, basal hila of larger conidia usually somewhat wider, 2–3 µm diam; occasionally with microcyclic conidiogenesis.

*In vitro*: *Colonies on MEA* (Ho *et al.* 1999) attaining 50 mm diam at 25 °C in 2 w, greyish olivaceous to olivaceous, velvety, reverse greenish black. *Hyphae* septate, olivaceous-brown, smooth to verruculose, (2.5–)3.3–4(–5.6) µm wide. *Conidiophores* up to 290 µm long, but usually 120–170 µm, (2.5–)3.3–3.7(–4.1) µm wide, simple or occasionally branched, pluriseptate, smooth to verruculose, light to dark olivaceous. *Ramoconidia* and secondary ramoconidia oblong-cylindrical, (6–)9.9–12.2(–15.6) × (2.5–)3.3–3.6(–4.1) µm, 0–1-septate, pale olive. *Conidia* (small terminal and intercalary conidia) (5–)5.9–8.2(–16.5) × (2.9–)3.3–3.6(–3.8) µm. *Colonies on PDA* (Morgan-Jones & McKemy 2000) at 25 °C attaining 43–48 mm diam in two weeks, olive to dark green, evenly lanose or with outer perimeter (18–22 mm wide), smooth, velvety. *Hyphae* variable, of two main types, either thin-walled, 2–4 µm wide, not constricted at the widely spaced septa, or hyphae with somewhat thicker walls, up to 7 µm wide, constricted at the septa which occur at frequent intervals, with chlamydospore-like cells, 5–7.5 µm diam. *Conidiophores* up to 600 µm long and 3–5 µm wide, often with unilateral branches, up to 150 µm long. *Ramoconidia* subhyaline to pale olivaceous, up to 60 µm long, mostly 15–25 µm long, and 4–5 µm wide, up to 5-septate.

*Substrate and distribution*: Hyperparasitic on telia and uredia of rusts (*Pucciniales*), especially *Cronartium* and *Puccinia*, also on downy mildews (*Peronosporales*) and powdery mildew fungi (*Erysiphales*); Asia (Hong Kong, India, Iran, South Korea), Australasia (Australia, New Zealand), Caribbean, Europe (Czech Republic, Germany, Netherlands, UK), North America (Canada, USA) and South America (Argentina, Brazil) – *Chrysocyclus cestri* (South America), *Cronartium fusiforme* f. sp. *quercum* (USA, AL), *Cronartium ribicola* (UK), *Erysiphe euonymicola* on *Euonymus japonicus* (Iran), *E. kusanoi* on *Celtis* (Korea), *Gymnosporangium nelsonii* on *Amelanchier florida* (Canada, BC), *G. sabinae* on *Pyrus communis* (Germany), *Melampsora coleosporides* on *Salix babylonica* (Australia, NSW), *M. laricis-populina* on *Populus deltoides* (Australia, NSW), *M. laricis-populina* on *Populus* sp. (New Zealand), *M. laricis-populina* on *Populus gelrica* (Australia, NSW), *Peronospora arborescens* on *Papaver somniferum* (India, UP), *P. gaeumannii* on *Argemone mexicana* (India, UP), *Phragmidium* sp. on *Rubus allegheniensis* (USA, NY), *Phyllactinia angulata* on *Quercus* (USA, NY), *Phyllactinia guttata* on *Corylus avellana* (USA, WA), *Pleochaeta shiraiana* on *Celtis* (Korea), *Puccinia allii* on *Allium* sp. (UK), *P. artemisiicola* on *Artemisia campestris* (Germany), *P. cestri* on *Cestrum pubescens* (Argentina), *P. coprosmae* on *Coprosma macrocarpa* (New Zealand); *P. horiana* on *Chrysanthemum* ssp. (Brazil; USA, FL), *P. jaceae* on *Grossheimia macrocephala* (≡ *Centaurea macrocephala*) (Germany), *P. malvacearum* on *Alcea rosea* (Germany), *P. melanocephala* on *Saccharum officinarum* (Australia), *P. melanocephala* on *Saccharum* sp. (India), *P. recondita* on *Triticum* sp. (UK), *P. sessilis* on *Arum maculatum* (UK), *P. vincae* on *Vinca* sp. (Czech Republic), *P. violae* on *Viola odorata* (Canada), *Puccinia* sp. on *Carex acutiformis* (the Netherlands), *Tranzschelia pruni-spinosae* (Hong Kong), *Triphragmium ulmariae* (UK).

Records without particular rust fungi: *Pulsatilla dahurica* (China: Heilongjiang, Jilin). Records without any hosts: Cuba, New Zealand.

*Additional specimens examined*: **Australia**, Brisbane, BSES Eight Mile Plains Sugar Exp. Stn., on *Puccinia melanocephala* on *Saccharum officinarum*, 5 Nov. 1980, O.W. Sturgess (IMI 254519, permanent slide); NSW, 10 km N of Kyogle, on *Melampsora coleosporides* on *Salix babylonica*, 26 Feb. 1979, C.A. Nicholson (DAR 33593); Snowy Mountains Authority Plantation, Tumur, on *M. laricis-populina* on *Populus deltoides*, 4 Mar. 1974, R.C. Nielsen (DAR 24066); on *M. laricis-populina* on *Populus gelrica*, 5 Mar. 1974, R.C. Nielsen (DAR 24060). **Canada**, BC, Sarno, on *Gymnosporangium nelsonii* on *Amelanchier florida*, 11 Jul 1935, G.G. Hedgcock

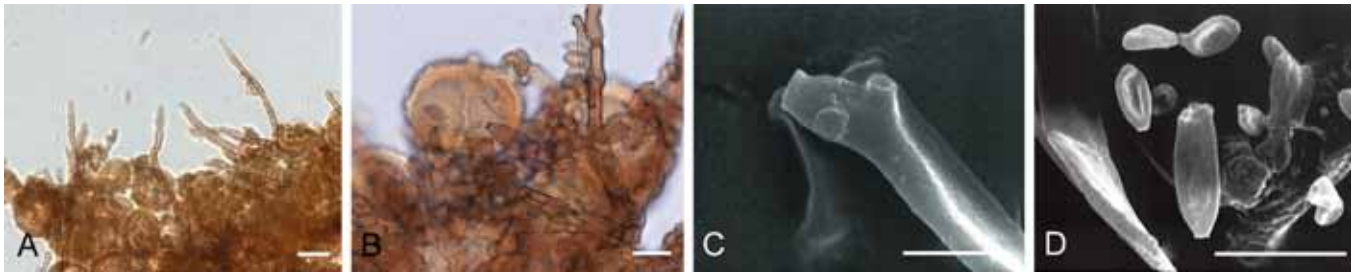



**Fig. 322.** *Cladosporium uredinicola* (IMI 254519). A–B. Conidiophores and conidia in vivo. C–D. Details of the coronate scar structure on conidia. Scale bars = 5 (C), 10 (B, D), 20 (A) µm.

(BPI 427380, as *C. peridermiicola*); W of Nellway, 24 Jul 1936, G.G. Hedgcock (BPI 427381, as *C. peridermiicola*). **Germany**, Brandenburg, Kr. Prignitz, Triglitz, on *Puccinia malvacearum* on *Alcea rosea*, 3 Oct. 1898, O. Jaap (HBG, as *C. aecidiicola*); Hessen, Frankfurt/Main, botanical garden, on *P. malvacearum* on *Alcea rosea*, 7 Oct. 2004, R. Kirschner 2221 (HAL); Schöneck near Frankfurt/Main, on *Gymnosporangium sabinae* on *Pyrus communis,* 11 Jul 2004, J. Gossmann (herb. R. Kirschner); Sachsen-Anhalt, Halle, botanical garden, on *Puccinia jaceae* on *Grossheimia macrocephala*, 16 Jul. 2004, U. Braun (HAL); on *P. malvacearum* on *Alcea rosea*, 22 Apr. 2004, B. Heuchert (HAL) and Braun, Fungi Sel. Exs. 53 (HAL); Kr. Wittenberg, Kemberg, on *Puccinia artemisiicola* on *Artemisia campestris*, 30 Aug. 2002, H. Jage (herb. Jage, Nr. 2690/02). **India**, Udaipur University, on *Puccinia melanocephala* on *Saccharum* sp., K.L. Kothari (IMI 245023); UP, Ghazipur, on *Peronospora arborescens* on *Papaver somniferum*, 10 Feb. 1974, S.L. Singh (IMI 183695); on *P. gaeumannii* on *Argemone mexicana*, 10 Feb. 1974, S.L. Singh (IMI 183694). **Iran**, Guilan, Rasht, on *Erysiphe euonymicola* on *Euonymus japonicus*, 25 Jul. 2004, S.A. Khodaparast (HAL). **New Zealand**, Auckland, Wattle Bay, on *Puccinia coprosmae* on *Coprosma macrocarpa*, 5 Jul. 1982, P.A. Maddison (PDD 43020, as *C. cladosporioides*). **South Korea**, Juju, Halla Arboretum, on *Erysiphe kusanoi* and *Pleochaeta shiraiana*, 11 Dec. 2006, H.D. Shin (KUS-F22520, HAL 2092 F). **UK**, on *Puccinia recondita* on *Triticum* sp., Dec. 1972, D.J. Allen (IMI 171548); Scotland, Dungairney Gdns., Bridge of Earn, Perthshire, on *Cronartium ribicola*, 1979, A.P. Bennell (IMI 252337). **USA**, Alabama, Lee County, Auburn, hyperparasitic on *Cronartium fusiforme* (*Cronartiaceae*, *Uredinales*) on leaves of *Quercus nigra* (*Fagaceae*), 20 May 1982, W.D. Kelley (ATCC 46649 = CPC 5390); New York, Bronx County, southwest of azalea plantings, The New York Botanical Garden, on *Phragmidium* sp. on *Rubus allegheniensis*, 28 Nov. 1979, C.T. Rogerson (NY, as *C. tenuissimum*); west of North Bridge, The New York Botanical Garden, on *Phyllactinia angulata* on *Quercus* sp., 6 Oct. 1986, C.T. Rogerson (NY, as *C. tenuissimum*).

*Notes*: A single strain of *C. uredinicola* (CPC 5390 = ATCC 46649) has been included in molecular studies within the *C. cladosporioides* complex by Bensch *et al.* (2010), but did not sporulate. Morgan-Jones & McKemy (1990), who examined this strain previously, confirmed its identity based on morphology, but mentioned that the conidiophores were somewhat longer and the conidia somewhat wider and more frequently septate as in other collections. Phylogenetically, the strain concerned is allied to *C. funiculosum* and *C. pseudocladosporioides* (see Bensch *et al.* 2010, fig. 1, part b).

The type material of *C. uredinicola* is in poor condition (Sutton 1973) and was, therefore, not re-examined. Sutton (*l.c.*) examined the holotype and deposited a permanent slide at IMI. Ho *et al*. (1999) und Morgan-Jones & McKemy (1990) examined *C. uredinicola* in culture and published detailed descriptions of its features *in vitro*. The latter authors showed that growths and morphology are dependent on the particular substrates and that the conidiophores are usually much shorter, less branched and darker in nature. The conidia are usually shorter and have only few septa.

In literature, various collections with slightly deviating characteristics have been discussed, *e.g.*, two samples from *Tranzschelia pruni-spinosae* which were only tentatively assigned to *C. uredinicola* by Sutton (1973) since most conidiophores were shorter than 100 µm and narrower than 3.5 µm, whereas Morgan-Jones & McKemy (1990) considered these collections to be conspecific with *C. uredinicola*, based on the morphology of the conidiophores and conidia. Our own examinations have shown that *C. uredinicola* is fairly variable, *i.e.*, some specimens are very delicate (colonies barely visible under stereomicroscopy), and then the conidiophores and conidia are often at the lower limit of the variability (see Heuchert *et al*. 2005, fig. 17), in which the collection on *Puccinia recondita* on *Triticum* sp. displays conidiophores simple in structure and conidia with a restricted range of size and septation. These results support the inclusion of the samples from *Tranzschelia pruni-spinosae* in *C. uredinicola*.

Two collections on downy mildews (*Peronospora* spp., deposited at IMI, see Heuchert *et al*. 2005, fig. 18) have been studied and proved to be morphologically indistinguishable from *C. uredinicola*, which is in agreement with Morgan-Jones & McKemy (1990), who examined these samples as well. Records of *C. uredinicola* on powdery mildew fungi, *viz.*, *Erysiphe euonymicola* on *Euonymus japonicus* (HAL) and *Phyllactinia angulata* on *Quercus* sp. (NY), are new and also surprising, but morphologically the collections concerned are not separable from collection on rust fungi. However, the true affinity of such collections has to be proven on the base of molecular sequence analyses. Some other isolates from powdery mildew fungi have been made and included in morphological and molecular studies such as *C. exile* and *C. phyllactiniicola*, but proved to represent phylogenetically distinct species with obvious morphological differences (see Bensch *et al.* 2010, discussion).

Strain CBS 306.84, isolated from urediniospores of *Puccinia allii* in the UK, and identified as *C. uredinicola* proved to be not conspecific with CPC 5390. Morphologically it belongs to the *C. cladosporioides s. lat.* complex but phylogenetically it is different from *C. cladosporioides s. str*. clustering apart from this clade (see Bensch *et al.* 2010, fig. 1, part b *vs.* c). Representative strains close to the type material with regard to host and geographical origin are not yet available. Therefore, an epitypification of *C. uredinicola* has not yet been proposed.

**159. *Cladosporium ushuwaiense*** Speg., Bol. Acad. Nac. Ci. 27(4): 399. 1924, as "*ushuwaiensis*". Figs 323, 324.

*Holotype*: **Argentina**, Tierra del Fuego, Ushuwaia, on dead leaves of *Berberis ilicifolia* (*Berberidaceae*), 18 Jan. 1924, C. Spegazzini (LPS 13.144).

*Lit.*: Saccardo (1972: 1340), Farr (1973), Schubert (2005b: 146–148).
*Ill.*: Schubert (2005b: 147, fig. 71, pl. 32, figs E–H).

*In vivo*: On the lower leaf surface as greyish or greyish brown discolorations, covering large areas or even the entire leaf surface.

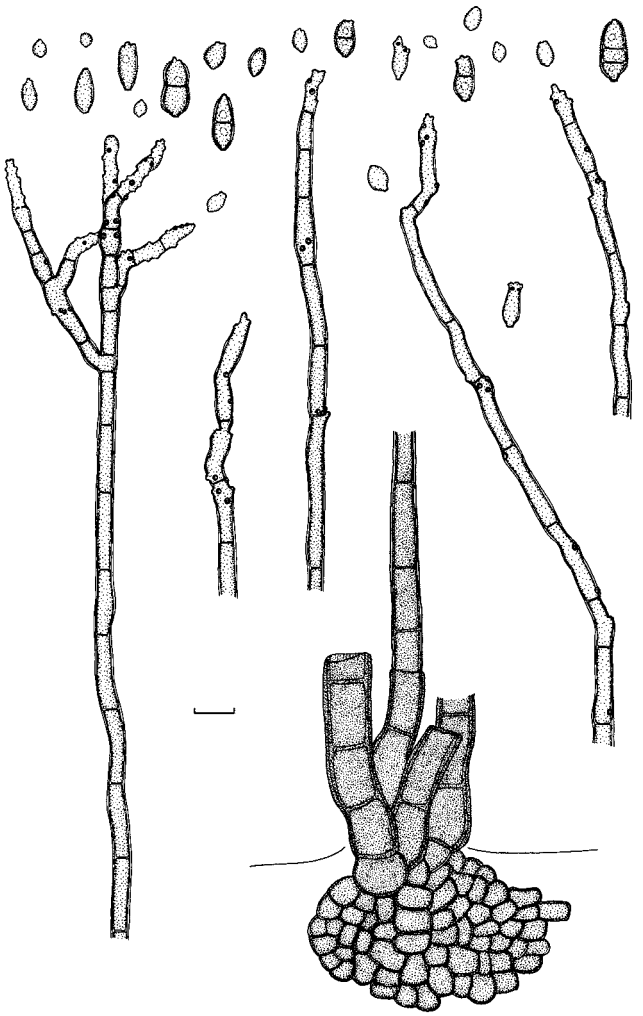


**Fig. 323.** *Cladosporium ushuwaiense* (LPS 13.144). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

*Colonies* hypophyllous, effuse, loosely scattered or somewhat denser, in tufts, dark brown, villose to bristle-like. *Mycelium* internal; hyphae branched, 2–4 µm wide, septate, sometimes slightly constricted at the septa, pale brown or pale olivaceous-brown, smooth, walls somewhat thickened. *Stromata* substomatal to intraepidermal, small to extended, several layers deep, compact, composed of more or less angular to irregularly polygonal cells, 5–13 µm wide, pale to medium brown or medium dark brown, smooth, thick-walled. *Conidiophores* solitary or mostly in small fascicles, 2–10 per fascicle, arising from stromata, emerging through stomata or erumpent through the cuticle, erect, straight to slightly flexuous, especially near the apex, cylindrical-oblong, mostly distinctly attenuated towards the apex, somewhat geniculate and subnodulose towards the apex (in connexion with conidiogenesis), unbranched or apically branched, once to several times, 80–310 µm long or even longer, 5–15 µm wide near the base, 3–5(–6) µm at the apex, pluriseptate, medium to mostly dark brown, paler towards the apex, almost smooth to asperulate or verruculose throughout, walls thickened, usually distinctly two-layered, 0.5–2(–3) µm wide, occasionally somewhat swollen at the base, sometimes enteroblastically proliferating. *Conidiogenous cells* integrated, terminal and intercalary, 6–36 µm long, proliferation sympodial, subnodulose and somewhat geniculate in connexion with conidiogenesis, with several conidiogenous loci often situated on small shoulders or swellings, often somewhat crowded, protuberant, subdenticulate, 1–1.5(–2) µm diam, thickened, somewhat darkened-refractive. *Conidia* catenate, in branched chains, subglo-bose, obovoid, narrowly to broadly ellipsoid or subcylindrical, 3–15(–20) × 3–7(–9) µm, 0–1(–2)-septate, sometimes slightly constricted at the septa, pale to medium brown or olivaceous-brown, almost smooth to verruculose, slightly to distinctly thick-walled, often two-layered, protoplasm often aggregated at the septa and walls appearing to be thickened and with a more or less large and paler cavity in the centre of the cells, apex and base more or less rounded or attenuated, with a single to several apical hila, protuberant, slightly convex to short cylindrical, 0.5–1.5(–2) µm diam, thickened, somewhat darkened-refractive; microcyclic conidiogenesis not observed.

**Fig. 324.** *Cladosporium ushuwaiense* (LPS 13.144). A. Symptoms. B. Conidiophores and conidia. C. Overview, fascicle of conidiophores. D. Conidiophore with percurrent, enteroblastic proliferation and distinctly thickened walls. Scale bars = 10 (B, D), 50 (C) µm.

*Substrate and distribution*: On *Berberis ilicifolia*; Argentina.

*Notes*: This species is morphologically comparable with *C. apicale*, known from Sri Lanka on *Cycas circinalis*, but the latter species is quite distinct in having 0–3-septate, usually smooth and somewhat narrower conidia with one-layered walls, somewhat wider conidiogenous loci and hila and more frequently branched conidiophores with somewhat thicker walls, 0.75–3 µm wide.

**160. *Cladosporium variabile*** (Cooke) G.A. de Vries, Contr. Knowl. Genus *Cladosporium*: 85. 1952. Figs 325–328.

*Basionym*: *Heterosporium variabile* Cooke, Grevillea 5: 123. 1877.
≡ *Helminthosporium variabile* Cooke, Fungi Brit. Exs. Ser. 1, No. 360. 1870. *nom. inval*.

*Holotype*: **UK**, Wales, Montgomeryshire, Welshpool, Forden Vicarage, on *Spinacia oleracea* (*Chenopodiaceae*), J.E. Vize, Cooke, Fungi Brit. Exs. Ser. I, No. 360 (K). *Epitype* (designated by Schubert *et al*. 2007b): **USA**, Washington, isolated from *Spinacia oleracea*, 1 Jan. 2003, L. Du Toit (CBS H-19867). *Ex-epitype culture*: CBS 121635 = CPC 12751, 12753.

= *Cladosporium subnodosum* Cooke, Grevillea 17(83): 67. 1889. [lectotype: Ravenel, Fungi Amer. Exs. 294, NY].
= *Davidiella variabilis* Crous, K. Schub. & U. Braun, Stud. Mycol. 58: 152. 2007, as "*variabile*".

*Lit*.: Ellis (1971: 315), Subramanian (1971: 295–296), Ellis & Ellis (1985: 429), David (1995c, 1997: 94), IMI Descriptions of Fungi and Bacteria 123, Sheet 1229 (1995), IMI Distribution Maps of Plant

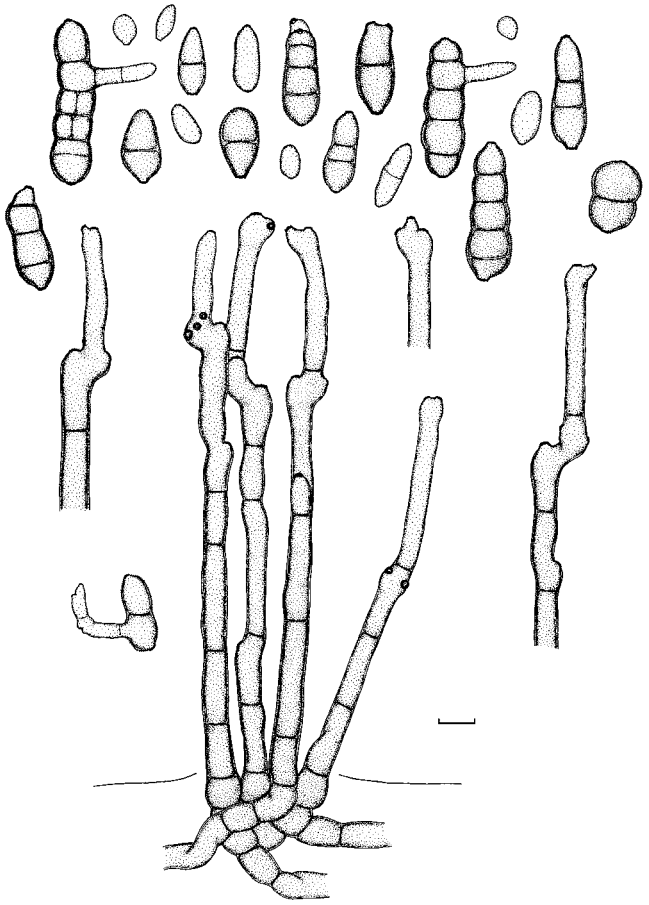


**Fig. 325.** *Cladosporium variabile* (NY, lectotype of *C. subnodosum*). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del.*

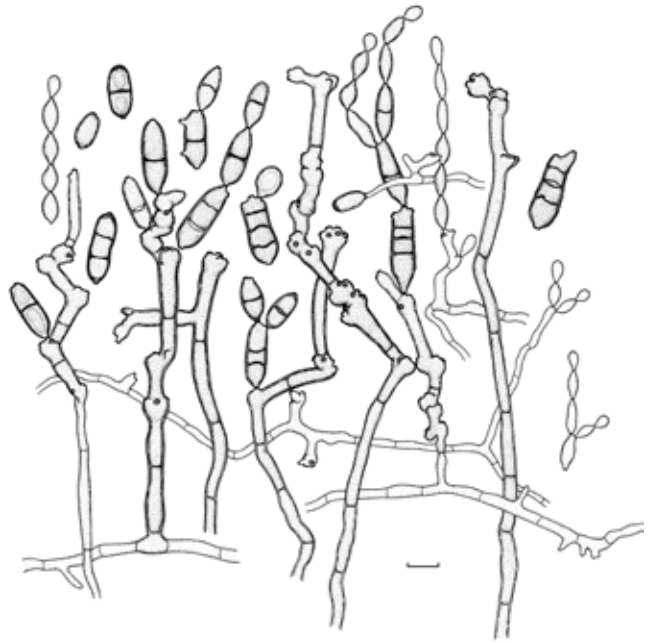


**Fig. 326.** *Cladosporium variabile* (CPC 12751). Macro- and micronematous conidiophores and conidia *in vitro*. Scale bar = 10 µm. K. Bensch *del*.

Diseases 1229 (1996), Ho *et al*. (1999: 144), Zhang *et al*. (2003: 170–172), Schubert (2005b: 160–161), Schubert *et al*. (2007b: 150–153).

*Ill*.: Minoura (1966: 141, fig. 5D), Ellis (1971: 314, fig. 217 B), David (1995c: 1, fig.; 1997: 97, fig. 26), Fuentes-Davila & Gabrielson (1996: 54–55, figs 1–2), Ho *et al*. (1999: 145, fig. 50), Zhang *et al*. (2003: 171, fig. 119), Schubert *et al*. (2007b: 150–152, figs 46–48).

*Exs*.: Cooke, Fungi Brit. Exs. Ser. I, No. 360; Poelt & Scheuer, Reliqu. Petrak. 2359; Ravenel, Fungi Amer. Exs. 294; Săvulescu, Herb. Mycol. Roman. 647; Winter, Fungi Eur. Extraeur. Exs. 3283; Zahlbruckner, Krypt. Exs. 1498.

*In vivo*: Leaf spots amphigenous, subcircular to oval, 1–4 µm diam, pale olivaceous-brown to olivaceous-brown or dark brown with dense fructification, somewhat raised, surrounded by a raised pale yellowish-ochraceous margin, later confluent. *Colonies* amphigenous, effuse, densely caespitose, pale brown to brown, velvety. *Mycelium* internal, subcuticular to intraepidermal; hyphae branched, 2.5–11 µm wide, septate, often with swellings and constrictions, sometimes appearing somewhat irregularly lobed, subhyaline, pale olivaceous to pale medium olivaceous-brown or somewhat reddish brown, smooth, walls somewhat thickened, forming loose hyphal plates or aggregations. *Stromata* substomatal or intraepidermal, composed of swollen hyphal cells, subglobose, 6–11 µm wide, walls somewhat thickened. *Conidiophores* fasciculate, in loose small to moderately large fascicles, rarely also solitary, arising from stromatic hyphal aggregations or swollen hyphal cells, emerging through stomata or erumpent through the cuticle, erect to subdecumbent, straight to often somewhat flexuous, cylindrical-oblong, geniculate-sinuous, subnodulose to nodulose, with lateral shoulders or multilateral swellings, unbranched, occasionally once branched, 20–200 µm long or even longer, (3.5–)5–8.5 µm wide, swellings 7–11 µm wide, septate, sometimes attenuated or constricted at the septa, pale olivaceous-green to pale medium olivaceous-brown or somewhat reddish-brown, paler towards the apex, sometimes subhyaline, smooth to slightly roughened, asperulate, walls more or less thickened, sometimes distinctly two-layered, up to 1 µm thick, apex often head-like swollen, base up to 11 µm wide. *Conidiogenous cells* integrated, terminal and intercalary, 20–68(–110) µm long, geniculate, subnodulose to nodulose, proliferation sympodial, with a single or several loci confined to unilateral shoulders or multilateral swellings, protuberant, short cylindrical, coronate, distinctly differentiated in dome and rim but dome not higher than the surrounding rim, (1–)2–3(–3.5) µm wide, about 1 µm high, thickened, somewhat darkened-refractive. *Conidia* in unbranched or branched chains, straight to curved, obovoid, broadly ovoid, ellipsoid, subcylindrical or cylindrical, sometimes slightly irregular or soleiform, (6.5–)10–45(–55) × (4.5–)6–14(–17) µm, 0–4(–5)-septate, sometimes constricted at one of the median septa, septa often appearing somewhat darkened, sometimes with a single longitudinal septum, pale to medium olivaceous-brown or somewhat reddish brown, verruculose to coarsely verrucose, occasionally almost smooth with only few warts, walls thickened, up to 2 µm thick, ends rounded or slightly attenuated, often with a bulbous base, hila protuberant, short cylindrical, (1–)2–3(–3.5) µm wide, about 1 µm high, thickened, somewhat darkened-refractive; microcyclic conidiogenesis often occurring.

*In vitro*: *Ascomata* pseudothecial, black, superficial, situated on a small stroma, globose, up to 250 µm diam, with 1–3 ostiolate necks; ostioles periphysate, with apical periphysoids present; wall consisting of 3–6 layers of dark brown *textura angularis*, *textura epidermoidea* in surface view. *Asci* fasciculate, bitunicate, subsessile, obovoid to broadly ellipsoid, straight to slightly curved, 8-spored, 70–95 × 18–28 µm; with pseudoparenchymatal cells of the hamathecium persistent. *Ascospores* tri- to multiseriate, overlapping, hyaline, with irregular lumina, thick-walled, straight to slightly curved, fusoid-ellipsoidal with obtuse ends, widest near the middle of the apical cell, medianly 1-septate, not to slightly

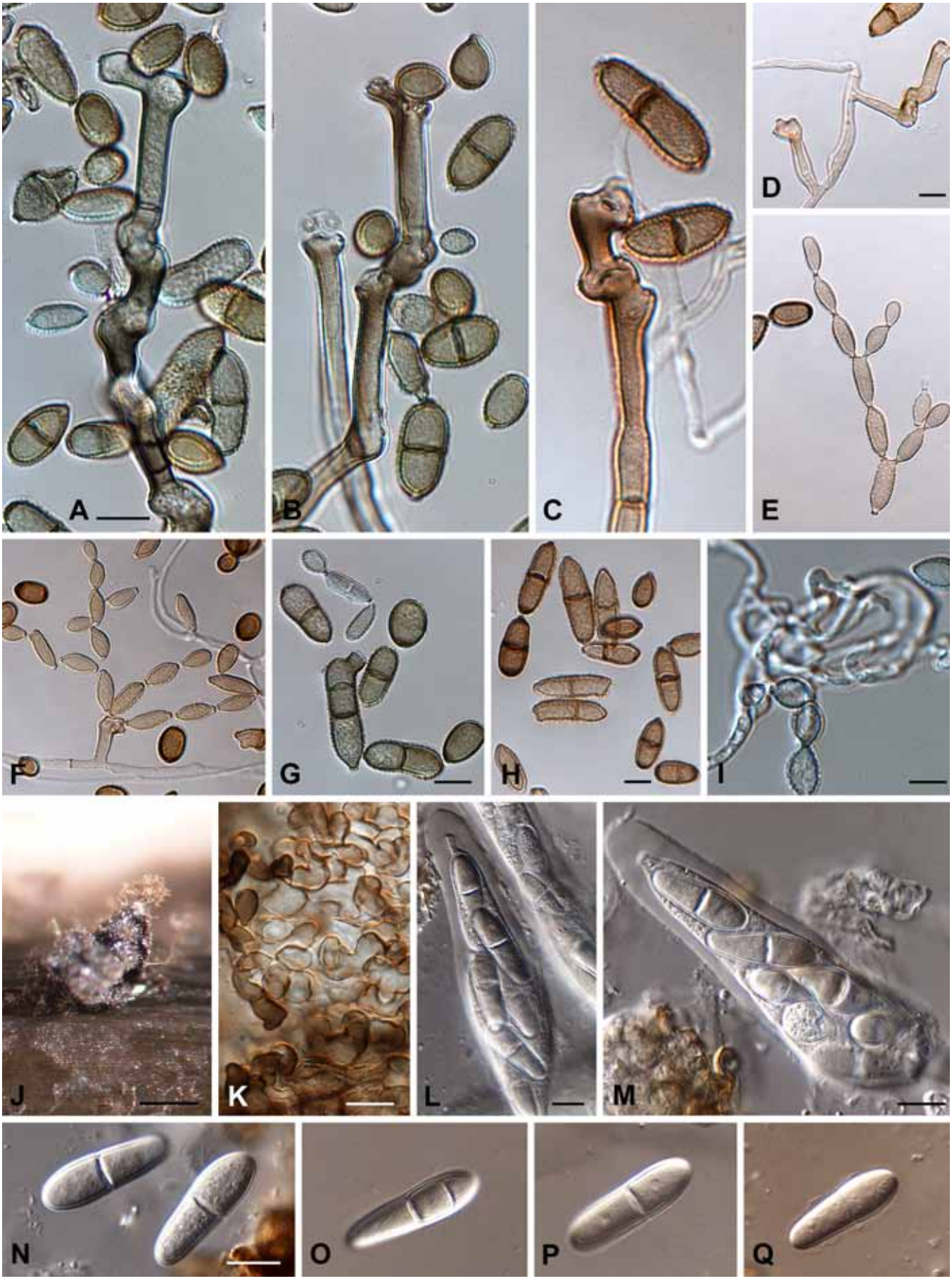



**Fig. 327.** *Cladosporium variabile* (CPC 12751), anamorphic and teleomorphic state. A–C. Macronematous conidiophores. D, F. Micronematous conidiophores. E, G–H. Conidia. I. Twisted aerial mycelium. J. Ascomata formed on nettle stem in culture. K. Surface view of ascomal wall of *textura epidermoidea*. L–M. Asci. N–P. Ascospores. Q. Ascus with a sheath. Scale bars = 10 (A, D, G–J, K–N), 250 (J) µm.

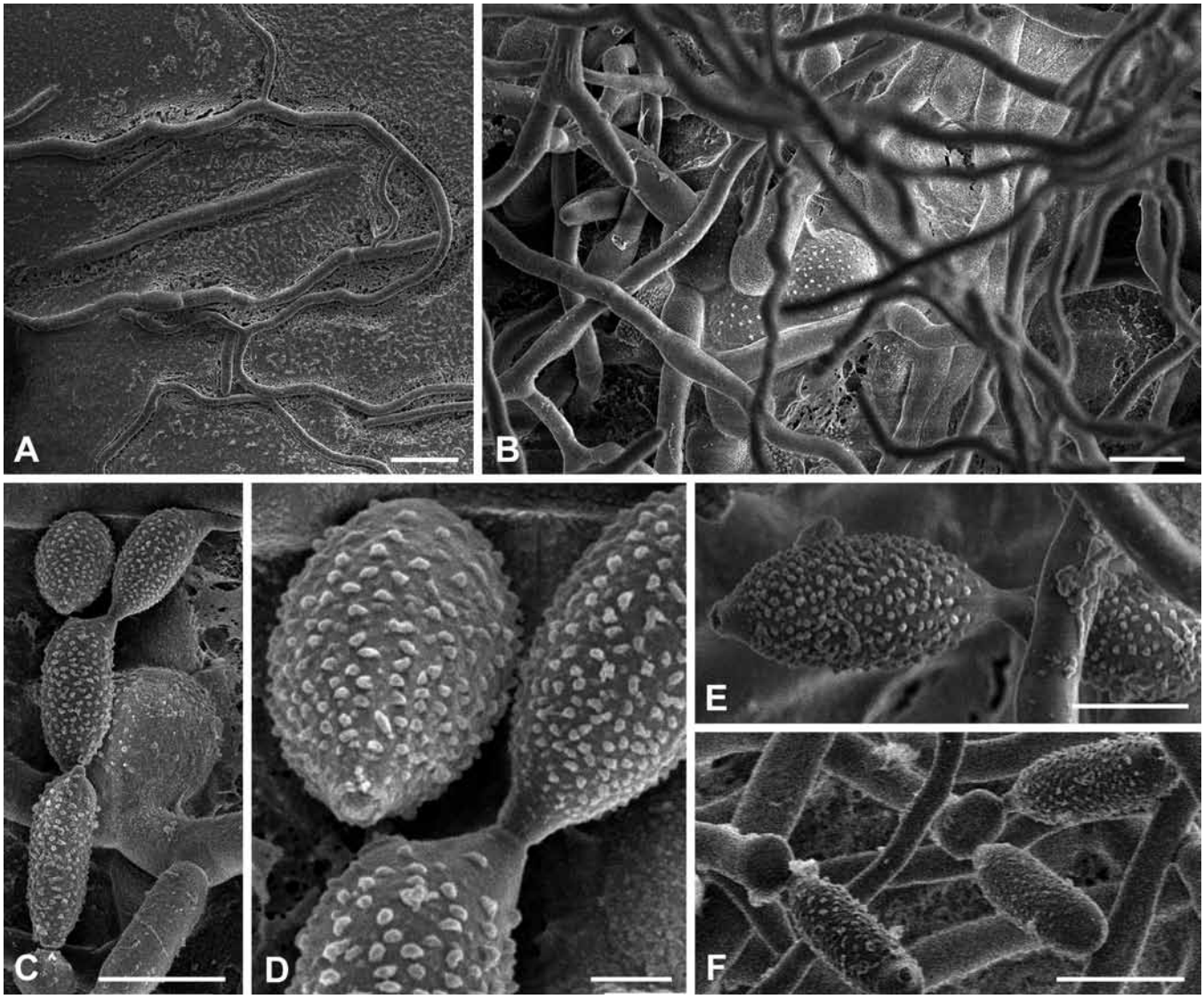



**Fig. 328.** *Cladosporium variabile* (CPC 12753). A. Survey of hyphae that grow on the agar surface. Some of the fungal cells have a swollen appearance and could develop into a "foot cell" that gives rise to a conidiophore. B. A number of aerial hyphae obstruct the swollen, large structures on the agar surface, which give rise to conidiophores. Some of them appear ornamented. C. A series of conidia formed on a conidiophore (bottom of the micrograph). D. Detail of the ornamented conidia. The ornamentations are isolated and dispersed. Note also the ornamentation-free scar zone and the hilum of the left cell. E. Two conidia behind an aerial hypha. F. Two conidiophores forming secondary ramoconidia. Note the bulbous shape of the spore-forming apparatus. This micrograph is from an uncoated sample. Scale bars = 2 (D), 5 (E), 10 (A–C, F) µm.

constricted at the septum, at times developing a second septum in each cell, several ascospores with persistent, irregular mucoid sheath, (22–)26–30(–35) × (7–)7.5–8(–9) µm.

*Mycelium* immersed and superficial, irregularly branched, aerial mycelium twisted and spirally coiled, 1–3 µm wide, septate, sometimes with swellings or small lateral outgrowths, hyaline to subhyaline, smooth, walls unthickened, hyphae which give rise to conidiophores somewhat wider, 3–4.5 µm, subhyaline to pale brown, almost smooth to minutely verruculose, sometimes enveloped by a polysaccharide-like cover. *Conidiophores* usually macronematous, but also micronematous, arising terminally from ascending hyphae or laterally from plagiotropous hyphae. *Macronematous conidiophores* erect, more or less straight to flexuous, often distinctly geniculate-sinuous forming lateral shoulders or unilateral swellings, sometimes zigzag-like or somewhat coralloid, nodulose, swellings at first terminal, then becoming lateral due to sympodial proliferation, often as distinct lateral shoulders, unbranched, sometimes once branched, 6–180 × (2.5–)3–6 µm, swellings (3–)6–11 µm wide, septate, not constricted at the septa, pale to medium olivaceous-brown or brown, usually verruculose, walls somewhat thickened, about 1 µm thick, sometimes appearing to be two-layered. *Conidiogenous cells* integrated, terminal and intercalary, cylindrical, nodulose to nodose, with a single or two swellings per cell, swellings apart from each other or formed in short succession, loci confined to swellings, up to six per node, protuberant, 1–2 µm diam, thickened and darkened-refractive. *Micronematous conidiophores* erect, straight to slightly flexuous, unbranched, usually without swellings, filiform to narrowly cylindrical, sometimes only as short lateral outgrowths of hyphae, often almost indistinguishable from hyphae, up to 50 µm long, 1.5–2.5(–3) µm wide, longer ones pluriseptate, septa appear to be somewhat more darkened, with very short cells, 4–12 µm long, subhyaline to pale brown, smooth, walls unthickened or almost so. *Conidiogenous cells* integrated, usually terminal, rarely intercalary, cylindrical, non-nodulose, with a single, two or few conidiogenous loci at the distal end, protuberant, up to 2 µm diam, thickened and darkened-refractive. *Conidia* catenate, in branched chains, straight, subglobose, obovoid, oval, broadly ellipsoid to cylindrical, sometimes clavate, 4–26(–30) × (3.5–)5–9(–10) µm [av. ± SD, 16.8 (± 6.9) × 6.5 (± 1.4) µm], 0–3-septate, usually not constricted at the septa, septa becoming sinuous with age, often appearing to

be darkened, pale to medium or even dark brown or olivaceous-brown, verruculose to densely verrucose or echinulate (granulate under SEM), walls slightly to distinctly thickened in larger conidia, apex and base broadly rounded, sometimes broadly truncate or somewhat attenuated, apex and base often appear to be darkened or at least refractive, hila protuberant to somewhat sessile (within the outer wall ornamentation), (0.8–)1–2 µm diam, thickened and darkened-refractive; microcyclic conidiogenesis occurring.

*Culture characteristics*: Colonies on PDA attaining 29 mm diam after 14 d at 25 ºC, olivaceous to olivaceous-grey or iron-grey, iron-grey or olivaceous-grey reverse, velvety to powdery, margin regular, entire edge to fimbriate, almost colourless, aerial mycelium whitish turning olivaceous-grey, sometimes reddish, greyish rose, woolly-felty, growth flat with elevated colony centre, somewhat folded or radially furrowed, with age forming several very small but prominent exudates, sporulation profuse. Colonies on MEA attaining 27 mm diam after 14 d at 25 ºC, olivaceous-grey to iron-grey, white to pale olivaceous-grey in the centre due to abundant aerial mycelium, velvety, margin very narrow, colourless, more or less entire edge, radially furrowed, aerial mycelium fluffy to floccose, dense, growth low convex with wrinkled and folded centre, without exudates, sporulation profuse. Colonies on OA attaining 25 mm diam after 14 d at 25 ºC, iron-grey or olivaceous, margin regular, entire edge, narrow, white, glabrous, aerial mycelium whitish, at first mainly in the colony centre, high, dense, floccose, growth flat, abundantly sporulating, no exudates.

*Substrate and distribution*: Leaf-spotting fungus on *Spinacia oleracea*; Africa (Morocco), Asia (China, India, Iran, Iraq, Pakistan, South Korea, Turkey), Europe (Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, France, Germany, Greece, Hungary, Italy, Montenegro, Netherlands, Norway, Romania, Spain, Switzerland, Turkey, UK), North America (Canada, USA, widespread).

*Additional specimens examined*: **Austria**, garden near Stadlau, on leaves of *Spinacia oleracea*, Jun., F. de Höhnel, Zahlbruckner, Krypt. Exs. 1498 (HBG). **Belgium**, Bruxelles, botanical garden, Jun. 1884, E. Marschal, Winter, Fungi Eur. Extraeur. Exs. 3283 (HBG, M, as *Heterosporium variabile*). **Czech Republic**, Mährisch-Weißkirchen (Hranice), in a garden, Mar. 1935, F. Petrak, Poelt & Scheuer, Rel. Petrak. 2359 (M-0057768, as *H. variabile*). **Germany**, Jun. 1949, Dr. v. Horn (B 700006608, as *C. macrocarpum*); Baden-Württemberg, Karlsruhe, Durlach, Oct. 1948, Dr. J. Hruby (B 700006612, as *C. macrocarpum*); Bavaria, Freising, garden, 25 May 1898, Prof. Dr. Weiss (M). **Italy**, Siena, botanical garden, Apr. 1896, leg.? (SIENA). **Romania**, Transilvania, distr. Alba-Aiud, 29 May 1932, T. Săvulescu & C. Sandu, Săvulescu, Herb. Mycol. Roman. 647 (M, as "*H. variabile*"). **Switzerland**, Graubünden, Fürstenach, Versuchsgarten, 1780 m, 22 Sep. 1901, A. Volkart (HBG, as *H. variabile*). **Turkey**, Ankara, 29 Apr. 1942, H. Bremer, Petrak Pilzherbarium (M). **USA**, Massachusetts, Amherst, May 1910, H.M. Jennison (M); South Carolina, Aiken, Rav., Fungi Amer. Exs. 294 (NY: lectotype of *C. subnodosum*; Ravenel, Fungi Amer. Exs. 294, *e.g.*, BPI 427478, NY, PH: isolectotypes).

*Notes*: *Cladosporium variabile* is a biotrophic, leaf-spotting species, morphologically belonging to the *C. herbarum* complex, in which it is superficially similar to the saprobic *C. macrocarpum*, but differs from the latter species in having distinctly larger and more frequently septate conidia *in vivo*, often with distinctly darkened septa, becoming sinuous with age and often with distinctly darkened apex and base, as well as in forming twisted and spirally coiled aerial mycelium in cultures, which have lower growth rates. *In vivo* the conidia are usually longer, somewhat wider and more frequently septate, (6.5–)10–45(–55) × (4.5–)6–14(–17) µm, 0–4(–5)-septate (Schubert 2005b).

**161. *Cladosporium varians*** U. Braun, Melnik & K. Schub., Mikol. Fitopatol. 42(3): 215. 2008. Figs 329–333.

*Holotype*: **Russia**, St. Petersburg, botanical garden of the V.L. Komarov Botanical Institute, Russian Academy of Sciences, on dead leaves of *Catalpa bungei* (*Bignoniaceae*), 15 Jan. 2007, V.A. Mel'nik (LE 232350). *Isotype*: HAL 2061 F. *Ex-type culture*: CBS 126362 = CPC 13658, CPC 13659, 13660 [dried ex-type cultures: HAL 2059 F (PDA), HAL 2060 F (SNA)].

= *Cladosporium phyllogenum* K. Schub., Mikol. Fitopatol. 42(3): 218. 2008. (HAL 1845 F, holotype; CBS H-19870, isotype).

*Lit.*: Schubert (2005b: 117–120).
*Ill.*: Schubert (2005b: 118–119, figs 54–55, pl. 24, figs A–J), Braun *et al*. (2008b: 216, fig. 1; 219–220, figs 2–3).

*In vivo*: *Colonies* on dead, still attached leaves, amphigenous, but mainly hypophyllous, forming small to moderately large blackish speckles or patches, fruiting often on and around leaf veins, dense to effuse, dark greyish olivaceous to blackish or on living leaves and petioles, hypophyllous, sometimes epiphyllous, at first occurring at the lower part of the leaves, especially near to or at leaf veins, then spreading along leaf veins, subcircular, later confluent, at first without symptoms or lesions almost inconspicuous, epiphyllous, irregular, paler green with small punctiform brown areas, which later becoming larger, up to 1.5 mm wide, without margin but surrounded by a pale greenish or yellowish green halo. *Colonies* mostly hypophyllous, rarely epiphyllous, punctiform to effuse, caespitose, loose to dense, pustule-like, medium to dark olivaceous-brown or even blackish, velvety. *Mycelium* immersed and external, superficial; *hyphae* branched, 2–7 µm wide, septate,

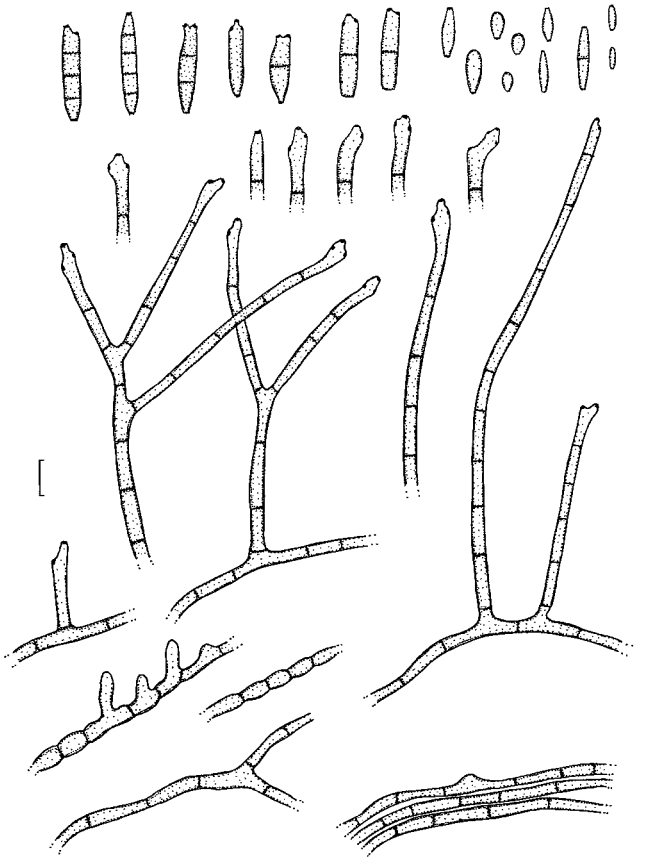


**Fig. 329.** *Cladosporium varians* (HAL 2061 F, isotype of *C. varians*). Mycelium, conidiophores, conidiogenous cells, ramoconidia and conidia *in vivo*. Scale bar = 10 µm. U. Braun *del*.

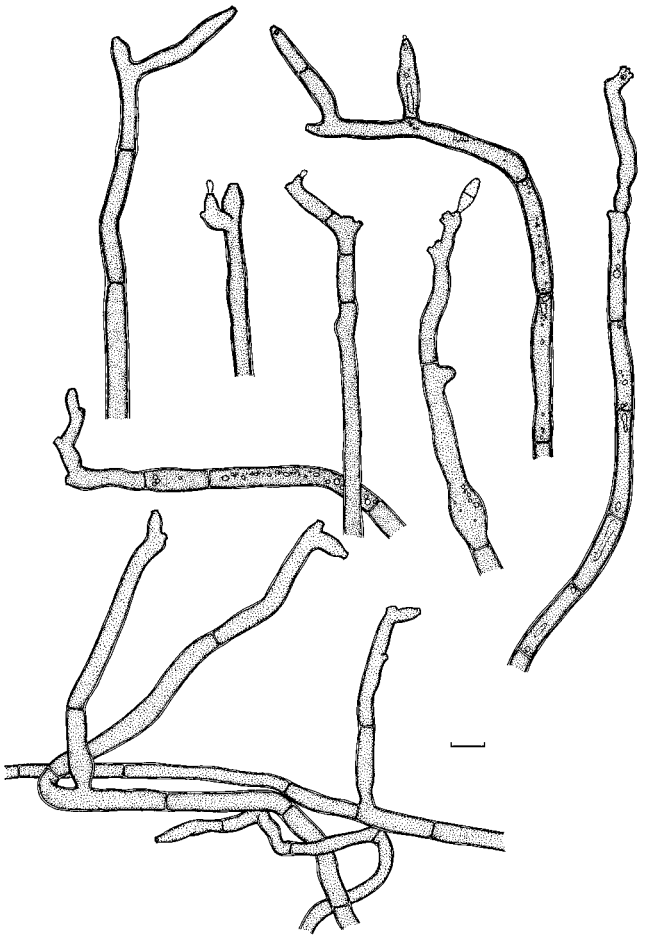


**Fig. 330.** *Cladosporium varians* (HAL 1845 F, holotype of *C. phyllogenum*). Conidiophores and conidiogenous cells *in vivo*. Scale bar = 10 µm. K. Bensch *del.*

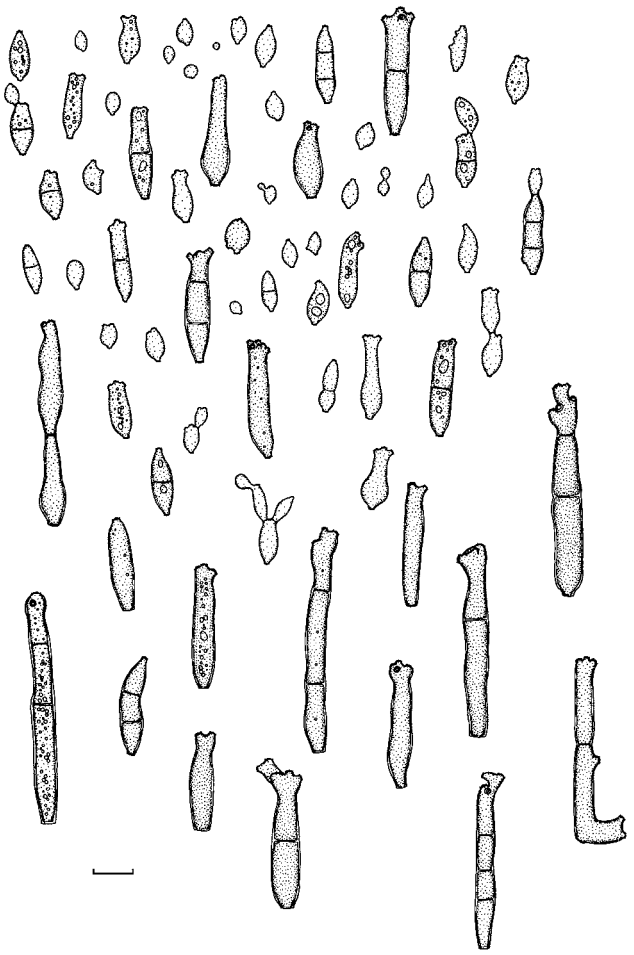


**Fig. 331.** *Cladosporium varians* (HAL 1845 F, holotype of *C. phyllogenum*). Ramoconidia, secondary ramoconidia and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del.*

occasionally with swellings, up to 9 µm diam, subhyaline, pale olivaceous to medium olivaceous-brown, smooth or almost so, wall thin, ≤ 1 µm. Stromata lacking, at most with diffuse aggregations of swollen hyphal cells. *Conidiophores* solitary, arising from swollen hyphal cells or superficial hyphae, lateral or terminal, erect to decumbent, 15–500 × 2.5–9(–11) µm, straight to often flexuous, cylindrical-filiform, subsetiform, barely geniculate to sometimes several times mildly to distinctly geniculate-sinuous, rarely subnodulose, intercalar swellings up to 11 µm wide, but swellings without conidiogenous loci, simple, branched to multibranched, often forming intricate aggregations of superficial hyphae and conidiophores, differentiation between hyphae and branched conidiophores often difficult or even impossible, pluriseptate throughout, pale olivaceous to medium olivaceous-brown, smooth or almost so, occasionally slightly rough-walled or rugose, thin-walled, ≤ 1 µm, or walls thickenend, often two-layered, lumen of the cells sometimes appearing to be granular. *Conidiogenous cells* integrated, usually terminal, cylindrical-oblong, 10–65 µm long, slightly geniculate towards the apex or tips somewhat swollen, unilaterally swollen or subdenticulate, with a single or several conidiogenous loci, protuberant, obconically truncate, distinctly coronate, 1.5–3 µm diam, thickened, somewhat darkened-refractive. *Ramoconidia* subcylindrical to cylindrical-oblong, 17–60 × 4.5–8 µm, 0–3(–5)-septate, dingy olivaceous to olivaceous-brown, smooth or almost so, walls thickened, sometimes even two-layered, base broadly truncate, unthickened, 2–4.5 µm wide, somewhat refractive or darkened, but not cladosporioid. *Conidia* polymorphous, very variable in shape and size, catenate, in branched chains, straight to curved, small terminal conidia subglobose, ovoid, obovoid, 2–13 × 2–4.5 µm, aseptate, subhyaline, pale olivaceous, smooth or almost so, hila 0.5–1 µm diam, intercalary conidia and secondary ramoconidia (with a single or several hila at the apex) subglobose, ovoid, obovoid, limoniform, ellipsoid, fusiform, subcylindrical or cylindrical, 4–32 × 3–7 µm, 0–3(–4)-septate, not constricted at septa, pale olivaceous to dingy olivaceous-brown, smooth or almost so, walls more or less thickened, lumen of the cells sometimes appearing to be granular, hila protuberant, short cylindrical, 0.5–2.5 µm diam, thickened, somewhat refractive to slightly darkened; microcyclic conidiogenesis sporadically occurring.

*In vitro*: *Mycelium* mainly immersed, rarely superficial; hyphae unbranched or branched, 1.5–7 µm wide, aerial hyphae narrower, 1.5–3 µm wide, septate, not constricted or slightly to distinctly constricted at septa, pale olivaceous, olivaceous-brown or brown, smooth or sometimes minutely verruculose or verruculose, thin-walled or almost so, sometimes hyphal cells distinctly swollen at the base of conidiophores, up to 8 µm wide. *Conidiophores* macronematous, sometimes also micronematous, terminally or laterally arising from ascending or plagiotropous hyphae, solitary, erect or ascending, straight to flexuous, cylindrical-oblong, non-nodulose, sometimes geniculate-sinuous towards the apex, unbranched or branched, branches often formed as short, denticle-like lateral prolongations just below or at a septum, 25–300(–530) × (2.5–)3.5–6(–7) µm, pluriseptate, upper septa just below potential ramoconidia appear somewhat darker, refractive and thickened, pale

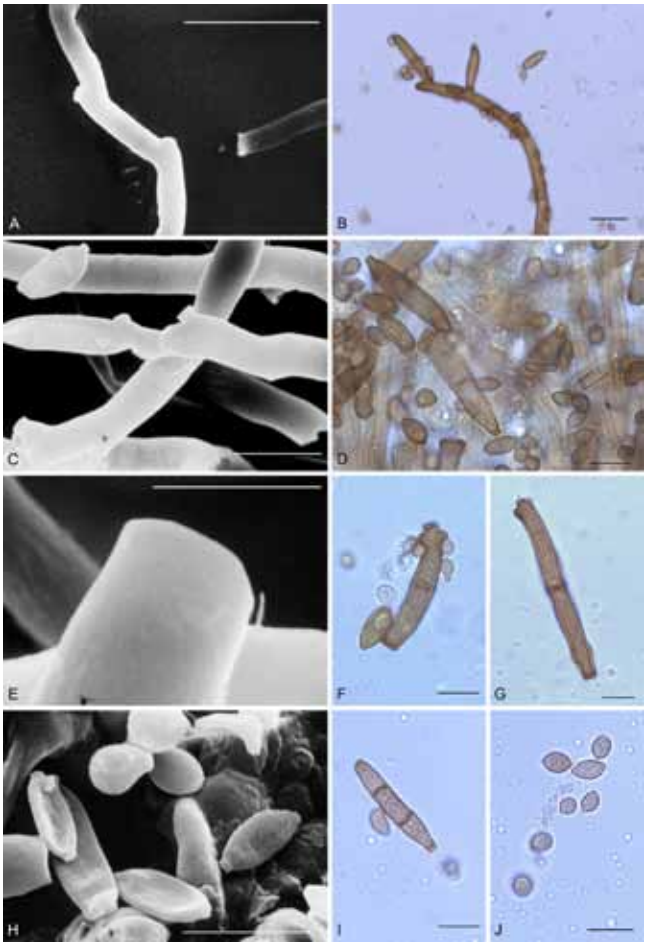


**Fig. 332.** *Cladosporium varians* (HAL 1845 F, holotype of *C. phyllogenum*). Conidiophores and conidia *in vivo*. A. Geniculate conidiophore. B. Branched conidiophore and conidia. C. Conidiophores with several conspicuous conidiogenous loci. D. Conidia and external mycelium. E. Truncate, unthickened base of a ramoconidium. F–G. Ramoconidia. H. Conidia showing coronate scar structure. I–J. Conidia. Scale bars = 5 (E), 10 (C–D, F–J), 20 (A, B) µm.

olivaceous or olivaceous-brown, smooth to somewhat asperulate, especially towards the base, walls somewhat thickened, 0.5 µm wide; micronematous conidiophores narrower, paler and shorter, flexuous, filiform, unbranched, 17–100 µm long or longer, 2–3(–3.5) µm wide, septate, not constricted at septa, pale olivaceous or pale brown, smooth or asperulate, walls unthickened. *Conidiogenous cells* integrated, mostly terminal, but also intercalary, cylindrical-oblong, non-nodulose, sometimes geniculate, 8–36(–96) µm long, with a single or often up to three loci at the apex, often situated on denticle-like prolongations, loci truncate or slightly convex, (1.5–)2–3 µm diam, somewhat thickened and darkened-refractive. *Ramoconidia* subcylindrical or cylindrical, 23–56(–64) × (3–)4–6(–7) µm, 0–2(–3)-septate, concolorous with tips of conidiophores, usually with up to three distal hila, not attenuated towards the base or only slightly so, base broadly truncate, 3–4.5 µm wide, unthickened and somewhat refractive. *Conidia* polymorphous, numerous, catenate, in branched chains, branching in all directions, up to five conidia in the terminal unbranched part of the chain, small terminal conidia globose, subglobose, ovoid to obovoid, 4–6(–8) × 2.5–3 µm (av. ± SD: 4.8 ± 1.0 × 2.8 ± 0.3), aseptate, intercalary conidia ovoid to ellipsoid, 6–15(–18) × (2.5–)3–4(–4.5) µm (av. ± SD: 9.9 ± 3.2 × 3.5 ± 0.4), 0–1-septate, with up to three distal scars, secondary ramoconidia ellipsoid to subcylindrical or cylindrical-oblong, (8–)11–33(–40) × (2.5–)3–6 µm (av. ± SD: 21.9 ± 7.8 × 4.3 ± 0.7), 0–2(–5)-septate, mainly 1-septate, sometimes slightly to distinctly constricted at septa, pale olivaceous to pale olivaceous-brown, smooth or almost so, walls unthickened or slightly thickened, slightly attenuated towards apex and base, hila 0.8–3 µm diam; microcyclic conidiogenesis not observed.

*Culture characteristics*: Colonies on PDA attaining 26–32 mm diam after 14 d, dark green-olivaceous to dark grey-olivaceous, olivaceous or iron-grey, sometimes slightly zonate, reverse grey-olivaceous to olivaceous-grey or leaden-grey, velvety to powdery or floccose, margin white, narrow or broad, regular, entire edge, glabrous to somewhat feathery; aerial mycelium sparse, only at few spots or diffuse, high, hairy to fluffy, pale olivaceous-grey; growth regular, flat to low convex with slightly elevated colony centre, prominent exudates not formed, sporulation profuse, two kinds of conidiophores formed, low and high ones. Colonies on MEA reaching 17–22 mm diam after 14 d, olivaceous-grey, grey-olivaceous to iron-grey surface and reverse, some colonies glaucous-grey at margins, velvety to powdery, margins colourless or white, regular, feathery, narrow to broad, aerial mycelium sparse, diffuse, loosely floccose, growth low convex, radially furrowed, sometimes wrinkled and folded in colony centre, without prominent exudates, sporulation profuse. Colonies on OA attaining 20–22 mm diam after 14 d, olivaceous-grey to iron-grey, grey-olivaceous due to sporulation and pale olivaceous-grey due to aerial mycelium, reverse iron-grey to leaden-grey or olivaceous-grey, surface somewhat zonate, floccose or fluffy, margin white, narrow, glabrous, aerial mycelium sparse, loosely to densely floccose or fluffy, growth flat or low convex, regular, without prominent exudates, sporulating.

*Substrate and distribution*: On plant material, sometimes also endophytic; Asia (India), Europe (Germany, Russia, Slovenia).

*Additional specimens examined*: **Germany**, Sachsen-Anhalt, Halle (Saale), Botanical Garden, on living leaves of *Ulmus laevis* (*Ulmaceae*), 9 Jul. 2004, K. Schubert [HAL 1845 F, **holotype** of *C. phyllogenum*, isotype CBS H-19870 (dried SNA plate); ex-type culture CBS 126360 = CPC 11327]. **India**, Habingirii, isol. from leaf debris, 2004, W. Gams (CBS 126361 = CPC 11134). **Slovenia**, Gabrovka, isol. from a fruit of *Rosa canina* (*Rosaceae*) attached to shrub, 3 Jan. 2008, H.-J. Schroers (HJS 1038 = CPC 14975B).

*Notes*: *Cladosporium varians* belongs to the *C. cladosporioides* complex, but differs from *C. cladosporioides s. str.* by its long, frequently branched conidiophores, arising on the natural hosts from superficial hyphae. Furthermore, the tips of the conidiogenous cells are often somewhat swollen or unilaterally swollen, and the ramoconidia have up to four septa, and subglobose conidia are not abundant. *Cladosporium tenuissimum* is another comparable species, which is, however, easily distinguishable by its setiform, usually unbranched conidiophores, often with darker and thicker walls, only 0–1-septate ramoconidia, and conidia ranging from smooth to verruculose. Phylogenetically this species is closely allied to *C. paracladosporioides* clustering as a sister to the latter species (see Bensch *et al.* 2010, fig. 1, part a), but morphologically quite distinct. Due to slighty morphological differences and distinct habits, *C. varians* and *C. phyllogenum* have been described as two distinct species. However, molecular sequence analyses clearly showed that the two species are identical. The morphological differences are within the range of intraspecific variation.The ecology of *C. varians* is not yeat clear. It has been collected as a saprobic fungus on dead, but still attached leaves of *Catalpa bungei*, but possibly lives also as an endophyte, only growing and sporulating superficially under favourable external conditions with fructification

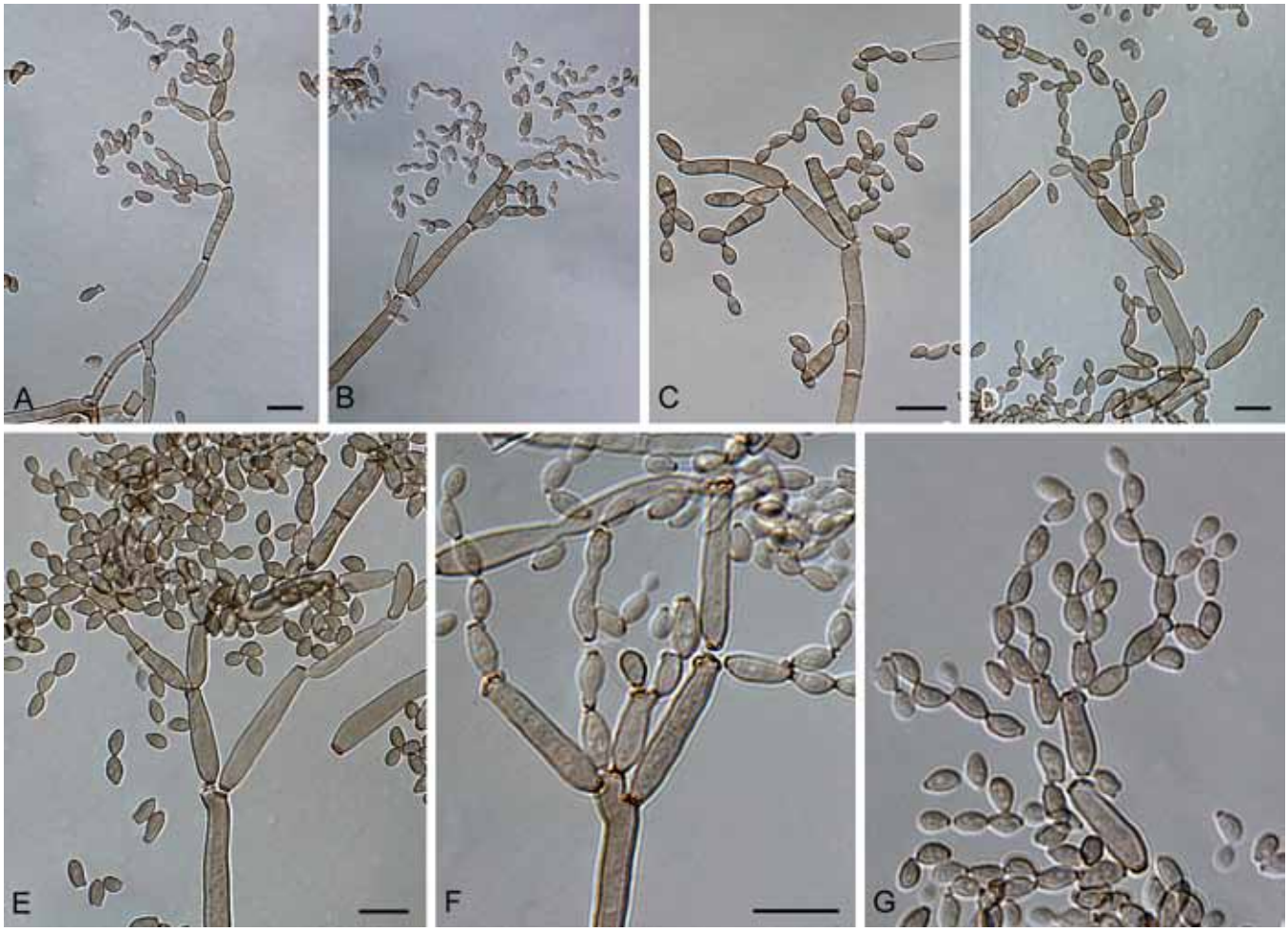



**Fig. 333.** *Cladosporium varians* (CBS 126362). A–F. Macronematous conidiophores and conidial chains *in vitro*. G. Conidia. Scale bars = 10 µm.

mainly confined to and spread on veins, as demonstrated for the type collection of *C. phyllogenum*.

**162. *Cladosporium velox*** Zalar, de Hoog & Gunde-Cimerman, Stud. Mycol. 58: 181. 2007. Fig. 334.

*Holotype*: **India**, Charidij, isolated from *Bambusa* sp. (*Poaceae*), W. Gams (CBS H-19735). *Ex-type culture*: CBS 119417.

*Ill.*: Zalar *et al.* (2007: 166, fig. 5 i, 180, fig. 14).

*In vitro*: *Mycelium* partly superficial partly submerged; hyphae branched, 2–4 µm wide, septate, often with swellings and constrictions, therefore appearing irregular in outline, pale brown to pale olivaceous-brown, smooth, walls unthickened to slightly thickened, often somewhat swollen at the base of conidiophores, without extracellular polysaccharide-like material. *Conidiophores* arising laterally or terminally from plagiotropous or ascending hyphae, erect, straight to slightly flexuous, filiform to narrowly cylindrical-oblong, sometimes slightly geniculate, due to this geniculation slightly subnodulose, occasionally nodulose, (10–)25–150(–250) × (2–)2.5–4(–4.5) µm, unbranched or branched, branches often only as short denticle-like prolongation below a septum, later branches longer, dichotomously branched in an angle of 30–45°, 0–7-septate, not constricted at septa, pale to medium olivaceous-brown, smooth, walls somewhat thickened, often slightly attenuated towards the apex. *Conidiogenous cells* integrated, mainly terminal but also intercalary, sometimes conidiophores reduced to conidiogenous cells, filiform to narrowly cylindrical-oblong, 20–42 µm long, proliferation sympodial, with a single or several conidiogenous loci, often somewhat crowded at the apex, subdenticulate, protuberant, 0.8–1.5 µm diam, thickened and darkened-refractive. *Ramoconidia* rarely formed. *Conidia* catenate, in branched chains, branching in all directions, terminal chains with up to five conidia, straight, small terminal conidia globose, subglobose, ovoid, 2.5–4 × (1.5–)2–2.5 µm [av. (± SD) 3.3 (± 0.5) × 2.2 (± 0.3)], aseptate, apex rounded, intercalary conidia limoniform to narrowly ellipsoid, 3.5–10 × 2–3 µm [av. (± SD) 6.3 (± 2.0) × 2.4 (± 0.4)], aseptate, with up to 3(–4) distal hila, attenuated towards apex and base, secondary ramoconidia narrowly ellipsoid to cylindrical-oblong, straight to slightly curved, (7–)10–34(–42) × 2–3.5(–4.5) µm [av. (± SD) 20.9 (± 9.1) × 2.7 (± 0.8)], 0–1-septate, not constricted at septa, with up to 4(–5) distal hila, pale brown, smooth or almost so to very finely verruculose, walls unthickened or almost so, slightly attenuated towards apex and base, hila conspicuous, subdenticulate to denticulate, 0.8–1.5 µm diam, thickened and darkened-refractive; microcyclic conidiogenesis not observed.

*Culture characteristics*: Colonies on PDA reaching 35–45 mm diam, grey-olivaceous to olivaceous, towards margins somewhat zonate, becoming olivaceous-buff and dull green, reverse olivaceous-black, velvety to powdery, margin broad, white, regular, glabrous to feathery, aerial mycelium absent or sparse, growth regular, low convex, with numerous prominent exudates, sporulation profuse.

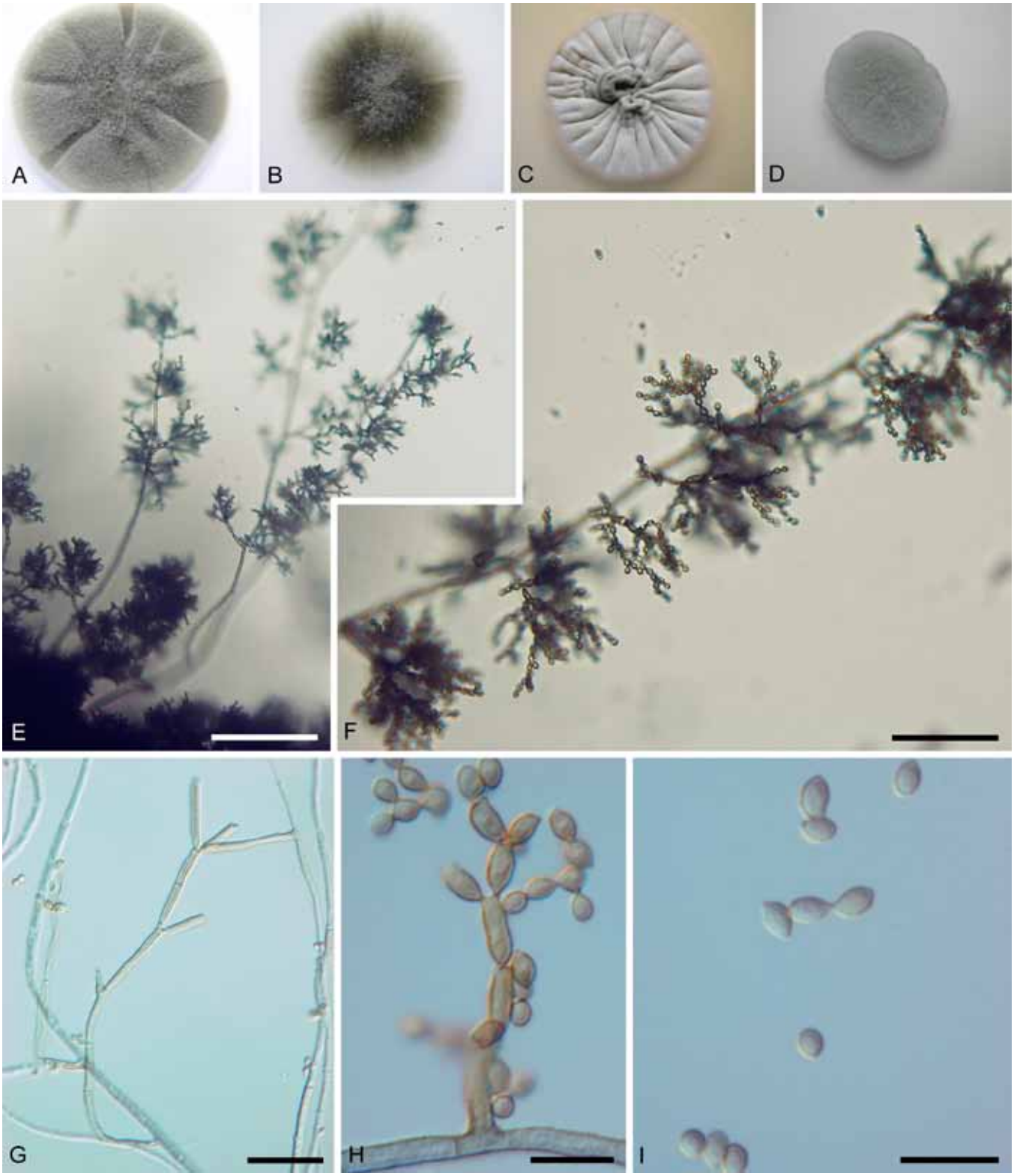



**Fig. 334.** *Cladosporium velox* (CBS 119417) (from Zalar *et al.* 2007). A–D. Colony surface grown on PDA (A), OA (B), MEA (C) and MEA plus 5 % NaCl (D) of strains incubated for 14 d at 25 ºC in darkness. E–F. Habit of conidiophores. G. Conidiophore. H–I. Secondary ramoconidia and conidia. E–I. All from 7-d-old SNA slide cultures. A–D, G, from CBS 119417 (ex-type strain); E–F, H–I, from EXF-466. Scale bars = 10 (H–I), 30 (G), 50 (F), 100 (E) µm.

Colonies on OA reaching 30–43 mm diam, pale olivaceous to brownish, reverse iron-grey, velvety to powdery, margin regular, aerial mycelium sparse, growth flat with papillate surface, without prominent exudates, sporulation profuse. Colonies on MEA reaching 30–42 mm diam, pale green, radially furrowed, with raised, crater-shaped central part, with white, undulate, submerged margin. Sporulation poor. Colonies on MEA with 5 % NaCl reaching 35–45 mm diam, pale green, velvety, flat with regular margin. Reverse pale green. Sporulation poor. *Maximum tolerated salt concentration*: 20 % NaCl after 14 d. *Cardinal temperatures*: Minimum at 10 °C (9 mm diam), optimum at 25 °C (30–42 mm diam) and maximum at 30 °C (5–18 mm diam).

*Substrates and distribution*: Hypersaline water and bamboo; Europe (Slovenia), Asia (India).

*Additional specimen examined*: **Slovenia**, Sečovlje salterns, isolated from hypersaline water (EXF-466, 471).

*Notes*: *Cladosporium velox* is a species of the *C. sphaerospermum* complex. The small terminal conidia are, however, more ovoid and almost smooth (light microscopy).

**163. *Cladosporium verrucocladosporioides*** Bensch, H.-D. Shin, Crous & U. Braun, Stud. Mycol. 67: 83. 2010. Figs 335–337.

*Holotype*: **South Korea**, Hongcheon, N37°48'17'' E127°51'13'', isol. from leaves of *Rhus javanica* (= *R. chinensis*) (*Anacardiaceae*), 11 Sep. 2005, coll. H.-D. Shin, isol. P.W. Crous as "*Pseudocercospora rhoina*" (CBS H-20450). *Ex-type culture*: CBS 126363 = CPC 12300.

*Ill.*: Bensch *et al.* (2010: 84−86, figs 72−74).

*In vitro: Mycelium* immersed and superficial; loosely branched, 1−4.5 µm wide, septate, mostly not constricted at septa, sometimes distinctly constricted and due to swellings and intercalary constrictions irregular in outline, subhyaline to pale or medium olivaceous-brown, smooth to minutely verruculose or verruculose, walls unthickened or almost so, at the base of conidiophores sometimes wider, up to 5 µm, sometimes anastomosing and forming ropes of few hyphae. *Conidiophores* macro-, sometimes also micronematous, arising terminally and laterally from hyphae, solitary, erect, straight to flexuous, cylindrical-oblong, sometimes once distinctly geniculate-sinuous, non-nodulose, unbranched, 18−130(−175) × (2.5−)3−4 µm, pluriseptate, septa often in short succession and darkened, especially just below potential ramoconidia, sometimes distinctly

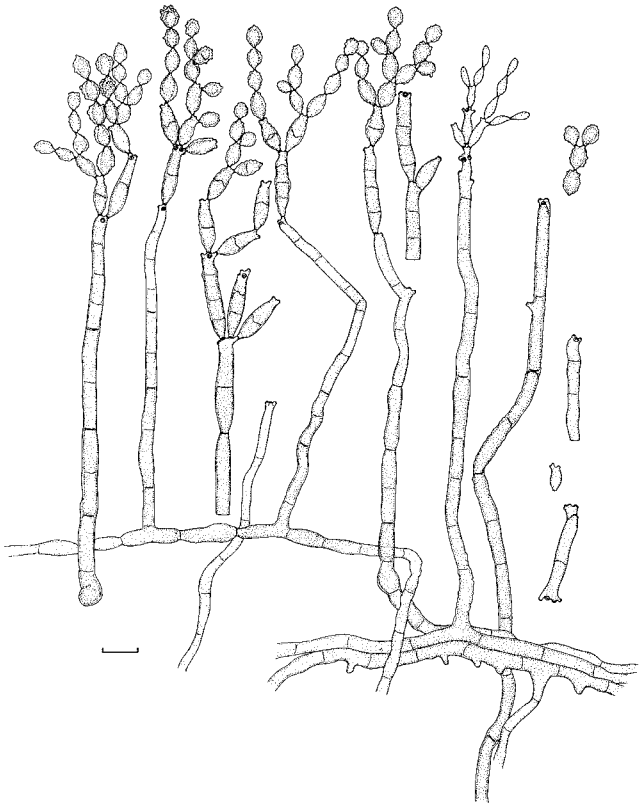


**Fig. 335.** *Cladosporium verrucocladosporioides* (CBS 126363). Macro- and micronematous conidiophores, mycelium sometimes formed in ropes, ramoconidia and conidial chains *in vitro*. Scale bar = 10 µm. K. Bensch *del*.

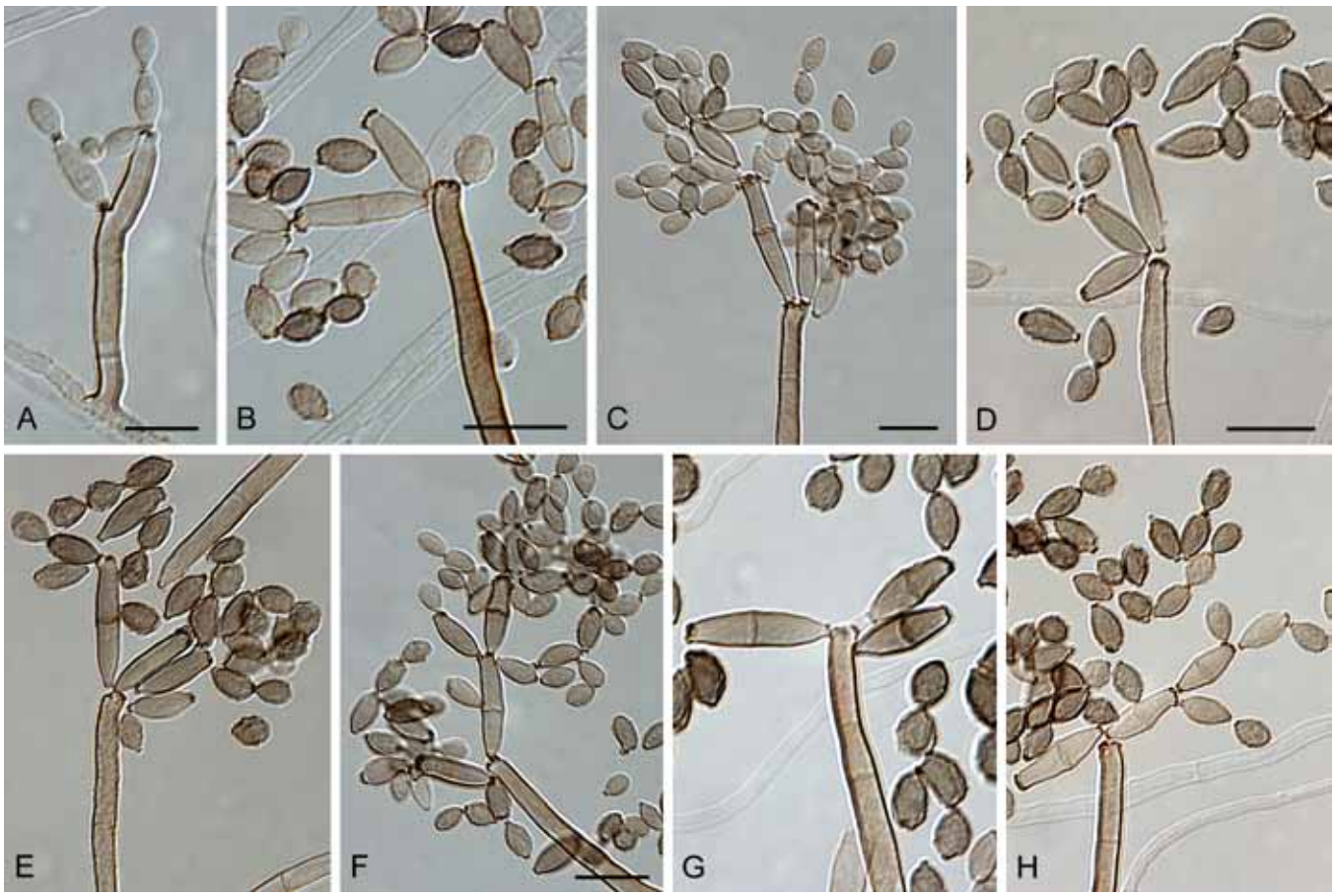



**Fig. 336.** *Cladosporium verrucocladosporioides* (CBS 126363). A–H. Macronematous conidiophores and conidial chains. Scale bars = 10 µm.

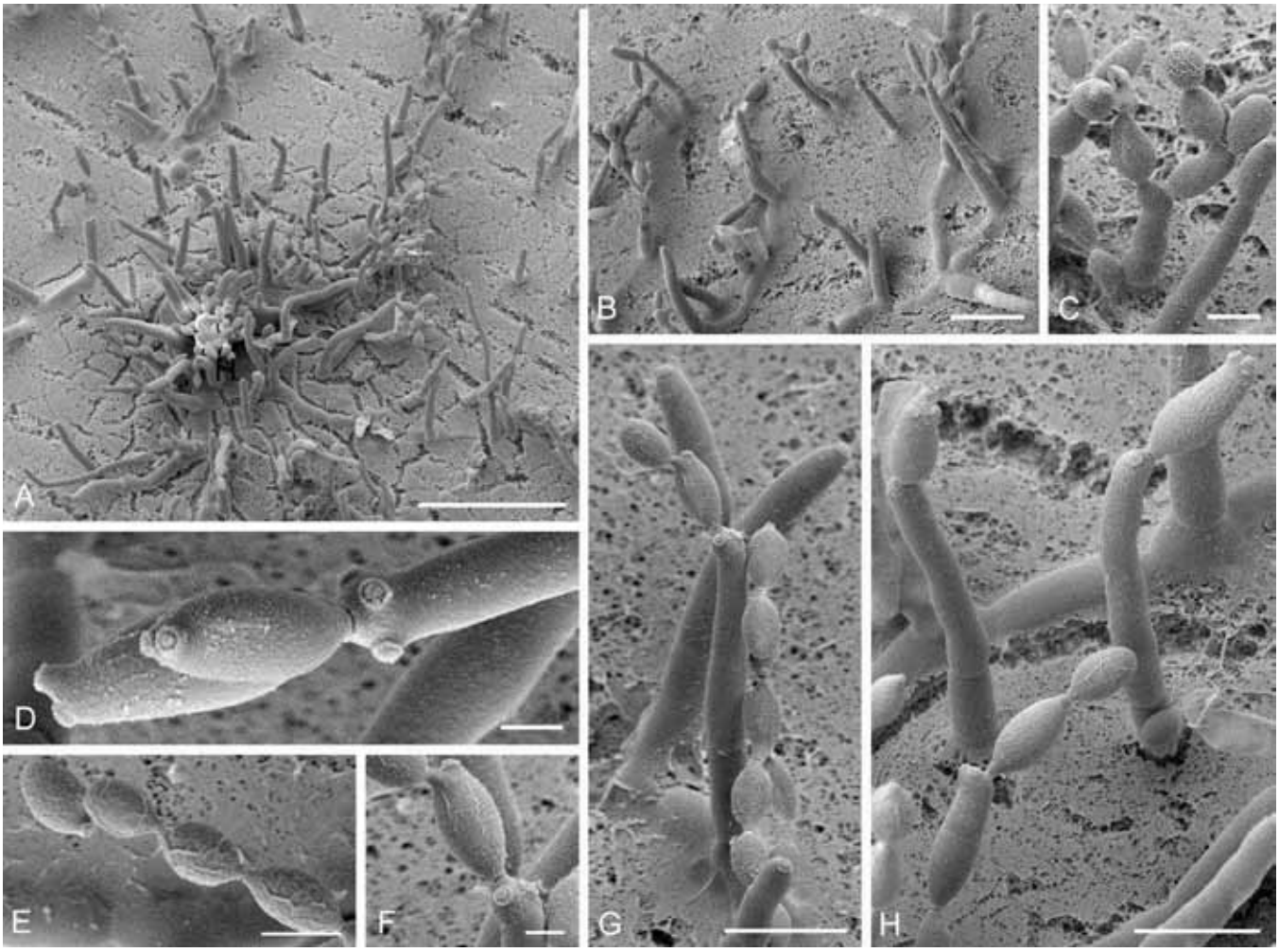



**Fig. 337.** *Cladosporium verrucocladosporioides* (CBS 126363). A. CryoSEM of a small colony illustrating the dense middle part with many young conidiophores and some disconnected masses of conidia. B. Stout erect conidiophores sprouting from rounded linearly oriented cells. C, G–H. Details of the fungal colony containing the structures on which conidiophores are formed and the different types of conidia. Note the ornamented conidia and the more or less smooth or only slightly ornamented conidiophores. D. Conidiophore, secondary ramoconidia and scars. E. Rounded conidia in a chain showing the reticulate surface ornamentation. F. Secondary ramoconidium and scars. Note the reduced ornamentation on this cell in comparison with the conidia. Scale bars = 2 (D, F), 5 (C, E), 10 (G–H), 20 (B), 50 (A) µm.

constricted at septa, pale to medium olivaceous-brown, smooth to verruculose-verrucose or irregularly rough-walled, at the apex or the whole conidiophore with surface ornamentation, walls only slightly thickened, base often somewhat swollen, up to 5(−7) µm wide, sometimes slightly attenuated towards the apex. *Conidiogenous cells* integrated, mostly terminal, sometimes also intercalary, cylindrical-oblong, sometimes once geniculate, 7−30 µm long, with 1−3(−4) loci at the apex, occasionally up to eight loci crowded at the apex, sometimes situated on small lateral prolongations, subdenticulate, protuberant, 1−1.8 µm diam, thickened and darkened-refractive. *Ramoconidia* occasionally formed, cylindrical-oblong, 19−36(−45) × 3−4(−5) µm, 0−2(−3)-septate, not constricted at septa, base unthickened, broadly truncate, 2−3.5 µm wide. *Conidia* catenate, in branched chains, branching in all directions, up to 4(−5) conidia in the unbranched terminal part of the chain, small terminal conidia obovoid, subglobose, 3−6.5(−7.5) × 2.5−4.5(−5.5) µm (av. ± SD: 5.0 ± 1.4 × 3.4 ± 1.0), aseptate, rarely 1-septate, apex usually broadly rounded, intercalary conidia ovoid, limoniform to ellipsoid-ovoid, 6−13.5(−15) × 3−6 µm (av. ± SD: 9.5 ± 3.0 × 4.2 ± 0.8), 0−1(−2)-septate, not constricted at septa, with 1−3 distal hila, apex and base often rounded or attenuated, secondary ramoconidia ellipsoid-ovoid, subcylindrical to cylindrical-oblong or somewhat irregular, (7−)8.5−30 × (2.8−)3−4(−5) µm (av. ± SD: 18.9 ± 6.0 × 3.7 ± 0.5), 0−3-septate, not constricted at septa, with 2−6 distal hila crowded at the apex and situated on small lateral prolongations at the apex giving conidia an irregular appearance, younger ones pale olivaceous, later usually medium, sometimes dark olivaceous-brown, almost smooth (younger conidia) to mostly irregularly rough-walled, surface ornamentation variable, coarsely verruculose-rugose to verrucose (LM), irregular in outline, coarse verrucae up to 1 µm high, sometimes outer wall with surface ornamentation seemingly detaching, under SEM surface with irregularly reticulate structure or embossed stripes probably caused by diminishing turgor and shriveling of tender conidia, walls almost unthickened or often appear to be distinctly thickened, up to 1 µm wide, hila more or less conspicuous (sometimes not very conspicuous due to surface ornamentation), subdenticulate to denticulate, 0.5−1.8 µm diam, thickened and darkened-refractive; sometimes germinating, occasionally microcyclic conidiogenesis occurring.

*Culture characteristics*: Colonies on PDA attaining 47−57 mm diam after 14 d, olivaceous-grey to iron-grey, reverse olivaceous-black, grey-olivaceous towards margins, felty-floccose to fluffy, margin white, regular, glabrous, aerial mycelium abundant, loose to dense, without prominent exudates, sporulation profuse. Colonies on MEA reaching 52−73 mm diam after 14 d, pale olivaceous-grey to olivaceous-grey or whitish, reverse iron-grey, velvety to floccose, margins white, glabrous to feathery, regular, aerial mycelium loose to dense, low, growth effuse, radially furrowed, with wrinkled and

folded colony centre, often somewhat immersed, without prominent exudates, sporulating. Colonies on OA attaining 47−54 mm diam after 14 d, smoke-grey to grey-olivaceous or olivaceous-grey, reverse pale mouse-grey to leaden-grey, floccose to fluffy-felty, margin colourless, glabrous, regular, aerial mycelium fluffy to felty-floccose, abundant, covering large parts of the colony, growth effuse to low convex, without exudates, sporulation profuse.

*Substrate and distribution*: On *Rhus javanica*; Asia (South Korea).

*Notes*: *Cladosporium verrucocladosporioides* is well-distinguished from other *Cladosporium* species by its unusual conidial surface ornamentation, which is characterized by being *Verrucocladosporium*-like, *i.e.* coarsely verruculose-rugose. The genus *Verrucocladosporium* (Crous *et al.* 2007b), which is a sister taxon to *Cladosporium s. str.*, has recently been introduced, but differs from species of the latter genus in having ± planate, non-coronate conidiogenous loci and hila. There are several other *Cladosporium* species with verruculose or irregularly rough-walled conidia, *e.g. C. acalyphae*, *C. exasperatum* and *C. pini-ponderosae*, but all of them are phylogenetically (see Bensch *et al.* 2010, fig. 1, part b *vs.* a) as well as morphologically distinct.

**164. *Cladosporium victorialis*** (Thüm.) U. Braun & H.D. Shin, Proc. Komarov Bot. Inst. (St. Petersburg) 20: 101. 1997. Figs 338, 339.
*Basionym*: *Cercospora victorialis* Thüm., Hedwigia 21: 172. 1882.

*Lectotype* (designated by Braun, in Braun & Mel'nik 1997): **Russia**, West Siberia, Mt. Kerlygan, on *Allium victorialis* (*Amaryllidaceae*), Martjanov (LE 40451). *Isolectotype*: LE 40452.

= *Cladosporium alliicola* H.D. Shin & U. Braun, Korean J. Mycol. 23(2): 141. 1995. [KUS 12597, holotype; isotype: HAL 1533 F].

*Lit.*: Crous & Braun (2003: 422), Schubert (2005b: 148–149).
*Ill.*: Shin & Braun (1995: 140–141, figs 1–2), Braun & Mel'nik (1997: fig. 71), Schubert (2005b: 149, fig. 72, pl. 33, figs A–D).

*In vivo*: Leaf spots amphigenous, subcircular to irregular, up to 5 cm wide, without definite margin, at first discoloured, yellowish, later becoming greyish brown, also on inflorescences, causing severe flower rot. *Colonies* hypophyllous, loosely scattered, often not very conspicuous, pale to medium grey-brown, on inflorescences loosely to densely caespitose, greyish brown, velvety. *Mycelium* internal, subcuticular to intraepidermal; hyphae branched, 1–8 µm wide, septate, often slightly constricted at the septa, pale yellowish to medium brown, smooth, walls somewhat thickened, forming stromatic hyphal aggregations. Stromata substomatal, small to moderately large, well-developed, cells somewhat angular, often cylindrical-oblong, medium brown or yellowish brown, walls smooth and somewhat thickened. *Conidiophores* usually densely fasciculate, 3–20 in a divergent fascicle, arising from stromata, emerging through stomata, sometimes solitary, formed as lateral branches of internal hyphae, erect, straight, cylindrical, often geniculate near the apex, 10–50(–68) × 4–7(–10) µm, 0–1(–2)-septate, yellowish, olivaceous-brown to medium brown, paler towards the apex, smooth, walls unthickened or only very slightly thickened. *Conidiogenous cells* integrated, terminal or conidiophores often reduced to conidiogenous cells, proliferation sympodial, 0–3 times mildly geniculate, conidiogenous loci often on small lateral shoulders, protuberant, obconically truncate to slightly convex, 2–3(–4) µm wide, up to 1 µm high, conspicuously thickened and darkened-refractive. *Conidia* solitary or in short unbranched or branched chains, more or less straight, subcylindrical-fusiform to often cylindrical, 10–45(–68) × (3–)4.5–8(–9) µm, occasionally up to 180 µm in length, 0–4(–7)-septate, not constricted at the septa, occasionally slightly constricted at the septa, yellowish, pale olivaceous to pale olivaceous-brown, smooth or almost so, walls unthickened or only very slightly thickened, apex rounded or somewhat attenuated, hila protuberant, often short cylindrical, (1–)1.5–3(–4) µm wide, 0.5–1 µm high, dome often somewhat higher than the surrounding rim, thickened and darkened-refractive; occasionally microcyclic conidiogenesis occurring.

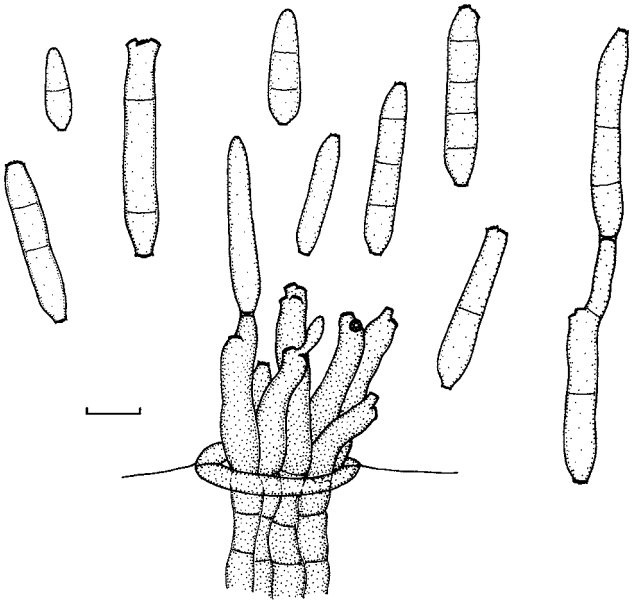


**Fig. 338.** *Cladosporium victorialis* (HAL 1533 F, isotype of *C. alliicola*). Fascicle of conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

*Substrate and distribution*: On *Allium* spp.; Asia – *A. victorialis* (= *A. ochotense*) (Russia, Far East, West Siberia, South Korea).

*Additional specimen examined*: **South Korea**, Suwon, on *Allium victorialis* var. *platyphyllum*, 3 Sep. 1993, H.D. Shin (HAL 1533 F, isotype of *C. alliicola*).

*Notes*: *Cladosporium victorialis* differs from *C. allii* and *C. allii-cepae* in having catenate, smooth, pluriseptate, narrower conidia. Records of this species from Brazil on *Allium cepa* and *A. sativum* by Mendes *et al*. (1998) are doubtful and unproven.

**165. *Cladosporium vignae*** M.W. Gardner, Phytopathology 15(8): 457. 1925. Figs 340, 341.

*Lectotype* (designated in Bensch *et al.* 2010): **USA**, Indiana, LaFayette, on *Vigna unguiculata* (= *V. sinensis)* (*Fabaceae*), M.W. Gardner (BPI 427608). *Isolectotype*: Sep. 1924, M.W. Gardner (BPI 427604). *Topotype*: 25 Aug. 1925, M.W. Gardner (BPI 427602). *Authentic strain*: CBS 121.25 = ATCC 200933 = MUCL 10110.

*Lit.*: De Vries (1952: 99), Morgan-Jones & McKemy (1992), McKemy *et al*. (1993), Ho *et al*. (1999: 144), Schubert (2005b: 149–152).
*Ill.*: Morgan-Jones & McKemy (1992: 13, fig. 1; 15, pl. 1; 17, fig. 2), Ho *et al*. (1999: 145, fig. 51), Schubert (2005b: 150, fig. 73, pl. 33, figs E–F).

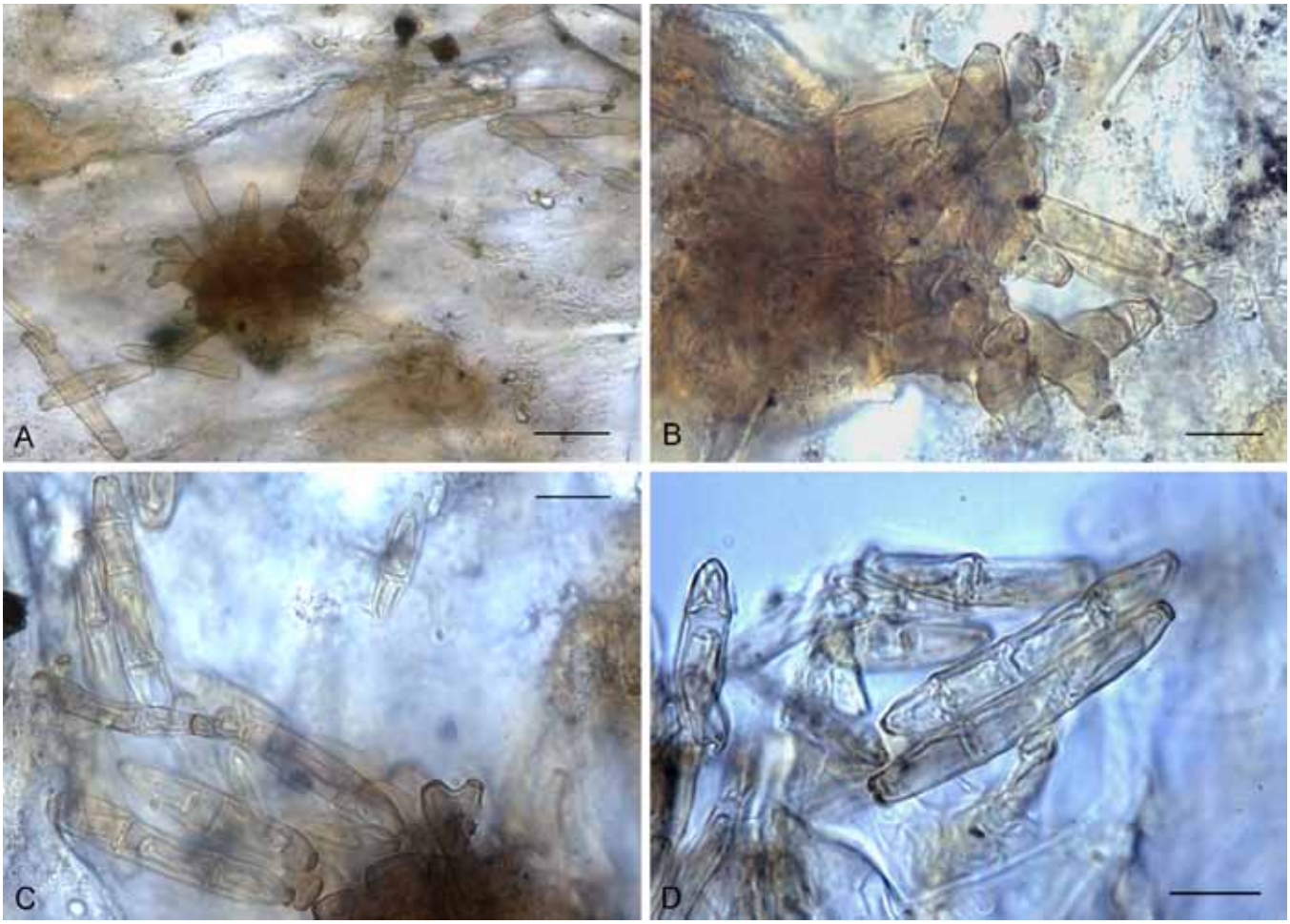



**Fig. 339.** *Cladosporium victorialis* (HAL 1533 F, isotype of *C. alliicola*). A. Overview. B. Fascicle of conidiophores. C. Conidiophores and conidia. D. Conidia. Scale bar = 10 (B–D), 20 (A) µm.

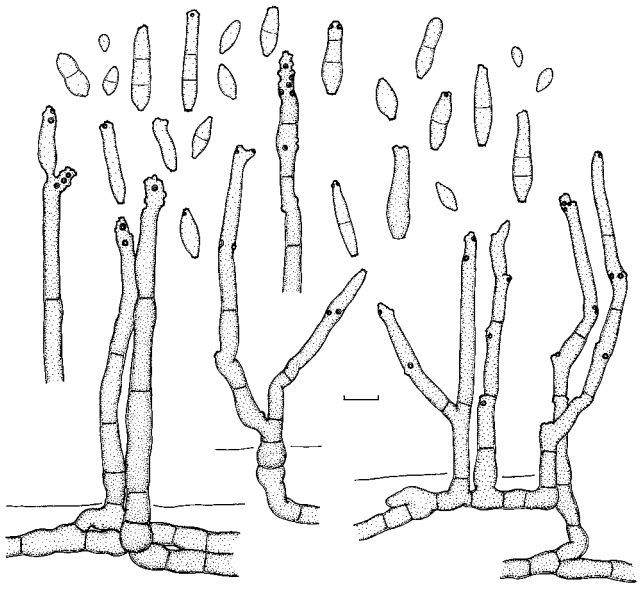


**Fig. 340.** *Cladosporium vignae* (BPI 427608). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

*In vivo*: On pods, peduncles, stems, petioles and leaves, causing scab, leaf and pod blight, leaf spots amphigenous, irregular in shape, 1–3 mm wide, with a pale yellowish centre, surrounded by a more or less broad, irregular, reddish brown margin; on pods at first punctiform, subcircular, later effuse, oblong-irregular, up to 6 mm diam, red-brown turning blackish, scab-like, sometimes corky and cracked, often somewhat raised; on stems and petioles red-brown to dark brown, somewhat sunken, covering large areas of the host tissue. *Colonies* caespitose, loose to dense, effuse, greyish brown to dark brown, velvety, confined to necrotic areas. *Mycelium* immersed, subcuticular; hyphae branched, 2–7 µm wide, septate, subhyaline to pale yellowish brown, smooth or almost so, often swollen and aggregated, swollen hyphal cells subglobose to somewhat angular, 7–13 µm wide, yellowish brown, smooth, thick-walled. *Stromata* lacking. *Conidiophores* solitary or in small groups, arising from hyphae or swollen hyphal cells, terminal or lateral, or from swollen hyphal cells, erumpent through the cuticle, sometimes emerging through stomata, erect, straight to slightly flexuous, cylindrical, somewhat geniculate-sinuous, unbranched, rarely branched near the apex, 12–132 × 3–7(–8) µm, septate, septa not very conspicuous, pale to medium yellowish brown or almost dark brown, smooth, with age somewhat asperulate, walls at first only slightly thickened, later thickened, sometimes even two-layered, often wider or somewhat swollen at the base, up to 13 µm wide. *Conidiogenous cells* integrated, terminal to intercalary, cylindrical, 10–52 µm long, proliferation sympodial, with a single to numerous, apically often somewhat crowded conidiogenous loci, protuberant, more or less subdenticulate, short cylindrical, slightly convex, 1–2 µm diam, thickened, refractive or only somewhat darkened. *Ramoconidia* occasionally formed, cylindrical, base truncate, unthickened, up to 3.5 µm wide. *Conidia* catenate, frequently in branched chains, straight, small terminal conidia subglobose to obovoid, 3–6 × 2–3(–4.5) µm, aseptate, pale brown, intercalary

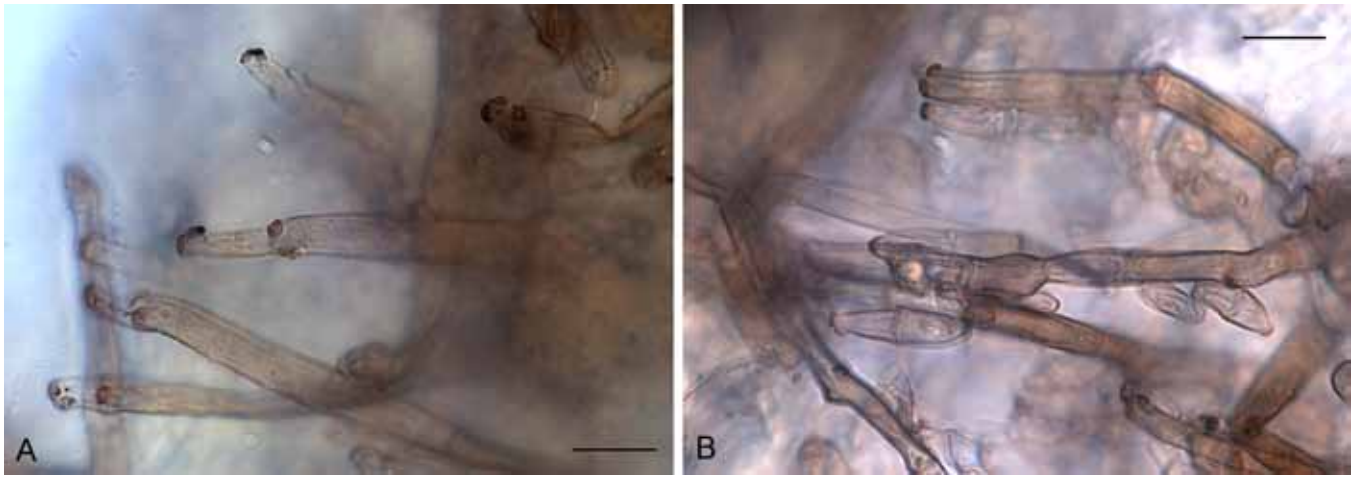



**Fig. 341.** *Cladosporium vignae* (BPI 427608). A. Conidiophores. B. Conidiophores and conidia. Scale bars = 10 µm.

conidia limoniform, ellipsoid, 5–12 × 3–5 µm, 0(–1)-septate, pale yellowish brown, secondary ramoconidia ellipsoid, cylindrical, 10–22(–29) × 3–6 µm, 0–1(–2)-septate, not constricted at the septa, pale yellowish brown, smooth, rarely minutely verruculose, walls unthickened or slightly thickened, often somewhat attenuated towards the apex and base, hila truncate to slightly convex, 0.5–2 µm diam, thickened, darkened-refractive; occasionally microcyclic conidiogenesis occurring.

*In vitro* (MEA, Ho *et al.* 1999): *Colonies* attaining 65 mm diam at 25 °C in 2 wk, pale olivaceous-grey, flocculose, velvety, reverse dark brick. *Hyphae* septate, pale olive, smooth or verruculose, (2.5–)2.9–3.7(–4.3) µm wide. *Conidiophores* pale to mid-olivaceous or olivaceous, straight or slightly flexuous, usually simple, smooth or sometimes verruculose towards the base, septate, up to 250 µm long, usually 75–135 µm, (3.3–)3.6–4.1(–5.0) µm wide. *Conidiogenous cells* integrated, usually terminal, with limited sympodial growth, with several conidiogenous loci. *Ramoconidia* present. *Conidia* in branched chains, subglobose, limoniform, fusiform, ellipsoid, oblong, light olive to olive, 0–1-septate, smooth, with prominent, protuberant, dark hila. *Terminal conidia* and *intercalary conidia* (6–)7.4–11.1(–20.6) × (2.5–)3.3–3.9(–4.6) µm. *Ramoconidia* and *secondary ramoconidia* (6.3–)10.6–18.8(–23.8) × (3.1–)3.7–4.2(–4.8) µm, 1–2(–3)-septate.

*Substrates and distribution*: On *Lespedeza* and *Vigna* spp.; widely distributed, Africa (South Africa, Zimbabwe), Asia (China), Australasia (Australia), North America (USA), South America (Brazil) – *Lespedeza bicolor* (USA, AL), *Lespedeza thunbergii* (USA, AL), *Vigna unguiculata* (Australia, NSW, Queensland; China, Henan; South Africa; USA, AL, CA, FL, GA, IN, MD, MS, NC, TX), *V. unguiculata* ssp. *cylindrica* (= *V. catjang*) (Brazil), *V. unguiculata* ssp. *dekindtiana* (Zimbabwe), *V. unguiculata* ssp. *sesquipedalis* (USA, IN).

*Additional specimens examined*: **USA**, Alabama, Grady, on *Vigna unguiculata*, 13 Jul. 1926, S.A. Wingard (BPI 427603); near Oneonta, on *Vigna unguiculata*, Jul. 1926, L.E. Miles (BPI 427607); Florida, Fort Meade, on *Vigna unguiculata*, 25 May 1938, K.O. Varn (BPI 427605); Gainesville, on *Vigna unguiculata*, 1 Jun. 1935, Erdman West. (NY); Wauchula, on *Vigna unguiculata*, 23 Apr. 1935, G.F. Weber (NY); Maryland, Beltsville, on *Vigna unguiculata*, 25 Apr. 1949, C.L. Lefebvre (BPI 427606); Mississippi, Nesly, on *Vigna unguiculata*, 26 Jun. 1930, Fungi of Mississippi 1386 (NY); North Carolina, Chadburn, on *Vigna unguiculata*, 6 Jul. 1934, G.A. Mackstroth (BPI 427609).

*Notes*: This species, which is a seed-borne parasite, is the causal agent of scab, leaf and pod blight on *Vigna unguiculata* and *Lespedeza bicolor*. Gardner (1925), who introduced this species, stated that only young growing tissues are susceptible. Inoculation experiments were carried out to prove the pathogenicity of *C. vignae*. Under favourable conditions infections occurred with great rapidity and virulence, and visible lesions already causing crinkling of the leaves may be present within 48 h of inoculation. Attempts to infect field pea seedlings (*Pisum sativum*) with the cowpea fungus have been unsuccessful. Records of *C. vignae* on *Pisum* spp. (*e.g.*, Winstead *et al.* 1960) are, therefore, doubtful and probably misidentifications. Da Silva & Minter (1995) recorded this species from Brazil on *Vigna unguiculata* subsp. *cylindrica* [= *V. catjang* ("*Vigna cajanga*")]. Ogundero (1986) recorded "*C. vignae*" as pathogen on grains of *Sorghum guineense* from Nigeria, which is very doubtful and probably wrong.

De Vries (1952) examined an isolate of *C. vignae* sent to the CBS by M.W. Gardner in 1925, but found sporulation to be poor. On the basis of what could be observed, he concluded that this species was similar to *C. cladosporioides* and that it would probably have to be considered as a *forma specialis* of that species once better isolates were studied. The same isolate examined by de Vries is still preserved in the CBS culture collection but forms only sterile mycelium. Morgan-Jones & McKemy (1992) and Ho *et al.* (1999) examined *C. vignae* in culture, provided detailed descriptions of its features *in vitro* and discussed its morphological similarity with *C. cladosporioides* treating them as two separate species. Besides its pathogenicity to *Vigna* and *Lespedeza* spp. and its very characteristic symptoms, *C. vignae* is distinguished from *C. cladosporioides* in having somewhat wider conidiophores with several to numerous often somewhat crowded conidiogenous loci. *Cladosporium cucumerinum*, causal agent of crown blight and scab or gummosis disease of *Cucurbitaceae*, is morphologically also close to *C. vignae* but separated by its mostly longer conidiophores, its somewhat longer and wider ramoconidia and its immersed hyphae often possessing a slime coat. Phylogenetically *C. vignae* is quite distinct from the morphologically similar *C. cladosporioides* and *C. cucumerinum* (see Bensch *et al.* 2010, fig. 1, part c).

*Cladosporium psoraleae* on *Cullen corylifolium* [≡ *Psoralea corylifolia*] (*Fabaceae*, tribus *Phoraleae*) is tentatively maintained as a separate species since the conidiogenous loci are somewhat wider and the conidia are usually somewhat longer and wider, subglobose and obovoid terminal conidia are usually lacking

(Schubert 2005b). Additional collections, cultures and molecular data are needed to clarify whether this species is distinct from *C. vignae* or not.

**166. *Cladosporium vincicola*** U. Braun & K. Schub., Mycotaxon 103: 209. 2008. Fig. 342.

≡ *Cladosporium vincae* Moesz, Bot. Közlem. 23: 123. 1926, *nom. illeg.*, homonym, non *C. vincae* Fairm., 1911.

*Lectotype* (designated by Braun *et al*. 2008a): **Hungary**, near Budapest, on living leaves of *Vinca herbacea* (*Apocynaceae*) infected by *Puccinia vincae* (DC.) Plowr., 25 Apr. 1926, W. Moesz (W 10216).

*Ill*.: Braun *et al*. (2008a: 210, fig. 1).

*In vivo*: Leaf spots usually terminally or laterally initiated, later spreading, covering large leaf segments, often more than 50 % of the leaf blade, finally entire leaves turning necrotic, shape and size of the lesions variable, dark brown to pale grayish brown, later dingy gray to grayish white, margin indefinite or with a narrow to moderately wide dark brown to blackish border or halo, sometimes with rather diffuse discolorations. *Colonies* amphigenous, mainly hypophyllous, punctiform, scattered, dark brown. *Mycelium* internal, forming immersed stromatic aggregations, 10–80 µm diam, composed of swollen hyphal cells, pigmented, thick-walled, up to 12 µm diam. *Conidiophores* in small to moderately large fascicles, loose to moderately dense, occasionally solitary, arising from substomatal stromatic hyphal aggregations, emerging through stomata, erect, straight, subcylindrical to moderately geniculate-sinuous, rarely subnodulose, unbranched, 15–100 × 3–7.5 µm, at the very base sometimes up to 10 µm wide, 0–4(–6)-septate, pale to medium olivaceous or olivaceous-brown, wall 0.5–1 µm thick, one-layered, smooth to faintly rough-walled. *Conidiogenous cells* integrated, terminal or intercalary, 10–35 µm long, conidiogenous loci distinctly coronate, somewhat protuberant, 1.5–2.5 µm wide and *ca.* 1 µm high. *Ramoconidia* lacking. *Conidia* in simple or branched chains, ellipsoid-ovoid, obovoid, fusiform, rarely subcylindrical, (4.5–)6–25(–33) × (3–)4–8(–9) µm, 0–3(–4)-septate, pale olivaceous to olivaceous-brown, wall thin, *ca.* 0.5 µm, sometimes distinctly two-layered and up to 1 µm thick, distinctly verruculose, apex rounded in conidia formed singly, attenuated in catenate conidia, base rounded, with an abruptly protuberant hilum or attenuated, 1–2 µm diam, occasionally with microcyclic conidiogenesis.

*Substrates and distribution*: On *Vinca* spp.; Europe – *Vinca herbacea* (Hungary), *V. minor* (Russia).

*Additional specimens examined*: **Russia**, St. Petersburg, Botanical Garden of the Komarov Botanical Institute, on living leaves of *Vinca minor*, 7 May 2007, V.A. Mel'nik (HAL 2069 F, LE 232293).

*Notes*: Morphologically this species resembles *C. aecidiicola*. However, *C. vincicola* is undoubtedly biotrophic, forming distinct leaf lesions, with fasciculate conidiophores emerging through stomata, and is not associated with rust aecia. The fascicles of conidiophores arise from well-developed, large stromata. The conidia of *C. vincicola* agree well with those of *C. herbarum s. str.*, but the conidiophores and the arrangement of the conidiogenous loci

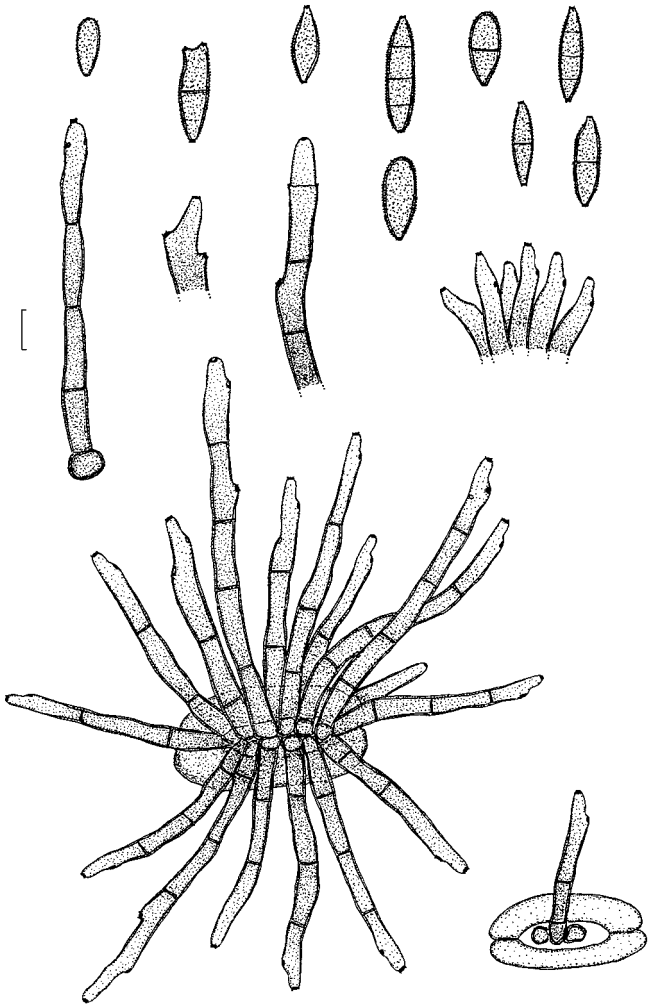


**Fig. 342.** *Cladosporium vincicola* (W 10216). Fascicle of conidiophores emerging through stomata, conidiophores, conidiogenous cells and conidia *in vivo*. Scale bar = 10 µm. U. Braun *del*.

are different. The conidiophores in *C. vincicola* are non-nodulose, *i.e.*, the conidiogenous loci are not confined to nodulose swellings as in *C. herbarum*. *Cladosporium vincae* Fairm. is identical with *C. macrocarpum*, *i.e.*, the conidiophores are distinctly nodulose with conidiogenous loci confined to swellings, and the conidia are rather broad, 5.5–11 µm, mostly 8–10 µm.

**167. *Cladosporium xylophilum*** Bensch, Shabunin, Crous & U. Braun, Stud. Mycol. 67: 87. 2010. Figs 343–345.

*Holotype*: **Russia**, Leningrad Oblast, Vyborg District, Roshchino, Pionerskoje Forestry, isol. from dead wood of *Picea abies* (*Pinaceae*), 2005, D.A. Shabunin (CBS H-20452). *Ex-type cultures*: CBS 125997 = CPC 12403.

= ? *Cladosporium indigoferae* Sawada, Special Publ. Coll. Agric. Natl. Taiwan Univ. 8: 196. 1959, *nom. inval*. [BPI 427230, PPMH, syntypes], **syn. nov.**

*Lit*.: Braun *et al.* (2008a: 214–215).
*Ill*.: Sawada (1959: pl. 3, figs 8–9), Braun *et al.* (2008a: 215, fig. 4), Bensch *et al.* (2010: 88, figs 75–76).

*In vitro: Mycelium* immersed and superficial; hyphae unbranched or loosely branched, (0.5−)1−4(−5) µm wide, septate, not constricted at

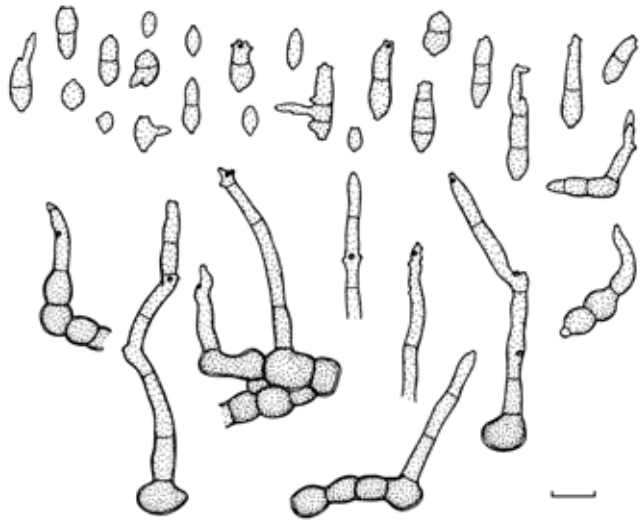


**Fig. 343.** *Cladosporium xylophilum* (BPI 427230, PPMH, syntypes of *C. indigoferae*). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch del.

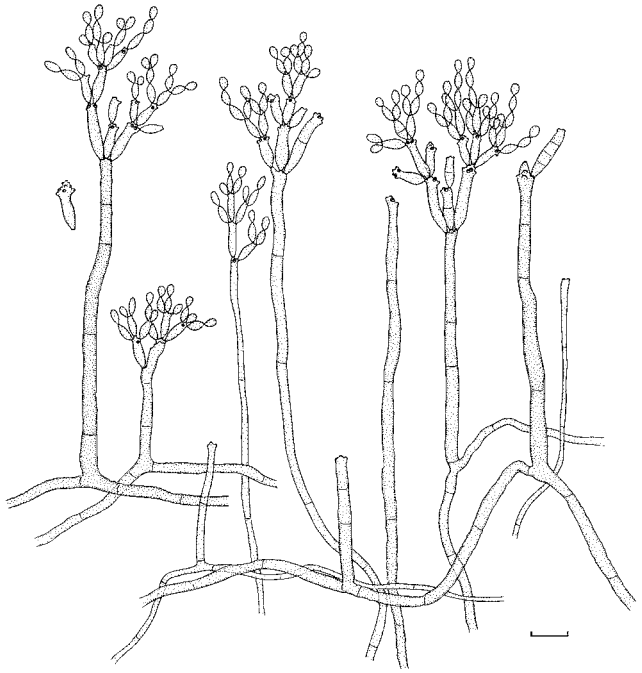


**Fig. 344.** *Cladosporium xylophilum* (CBS 125997). Macro- and micronematous conidiophores, mycelium sometimes formed in ropes and conidial chains *in vitro*. Scale bar = 10 µm. K. Bensch *del.*

septa, sometimes with irregular swellings and outgrowths, subhyaline to pale or medium olivaceous-brown, smooth to asperulate, minutely verruculose or irregularly verrucose and rough-walled, sometimes with wart-like structures on the surface, walls unthickened or almost so, occasionally swollen at the base of conidiophores, up to 8 µm wide, sometimes forming ropes or rhizoids, branched at the base of conidiophores. *Conidiophores* macro-, semimacro- to sometimes micronematous, solitary, arising terminally and laterally from hyphae, erect, straight to slightly flexuous, cylindrical-oblong, usually neither nodulose nor geniculate, sometimes subnodulose at the uppermost apex, occasionally once geniculate-sinuous, unbranched, sometimes once branched, 7−155(−190) × 2−4(−5) µm, 0−6-septate, sometimes slightly constricted at septa, pale to medium olivaceous-brown, smooth or almost so, sometimes somewhat irregularly rough-walled or verruculose, especially towards the base, sometimes wider at the base, up to 5.5 µm wide, or slightly attenuated towards the apex, walls unthickened or slightly thickened; micronematous conidiophores paler, subhyaline to pale olivaceous-brown, smooth or almost so. *Conidiogenous cells* integrated, usually terminal, cylindrical-oblong, usually neither nodulose nor geniculate, sometimes subnodulose at the uppermost apex with loci situated on small lateral shoulders due to sympodial proliferation, 6−36 µm long, with (1−)2−4(−6) apically crowded loci forming clusters of pronounced scars, sometimes with few additional loci at a slightly lower level, protuberant, subdenticulate to denticulate, (0.8−)1−2 µm diam, thickened and darkened-refractive. *Ramoconidia* occasionally formed, cylindrical-oblong, 19−35 µm long, 0(−1)-septate, smooth, base broadly truncate, 2.5−3 µm wide. *Conidia* numerous, catenate in densely branched chains, branching in all directions, mostly 2−4(−5) conidia in the unbranched terminal part of the chains, straight, small terminal conidia subglobose, obovoid, sometimes globose, 2−5(−6) × 2−2.5 µm (av. ± SD: 3.9 ± 0.9 × 2.3 ± 0.3), aseptate, slightly attenuated towards apex and base, apex broadly rounded, intercalary conidia ovoid, limoniform to ellipsoid or subcylindrical, sometimes irregular in outline especially towards the distal end due to numerous hila arranged in sympodial clusters of pronounced scars, 5−11(−13) × (2−)2.5−3 µm (av. ± SD: 7.7 ± 2.2 × 2.6 ± 0.3), 0−1-septate, septum median, not constricted, with 2−7(−10) distal hila, crowded at the apex, sometimes situated on small lateral prolongations, small terminal conidia and intercalary conidia almost smooth to often irregularly rough-walled, loosely verruculose to verrucose, attenuated towards apex and base, secondary ramoconidia ellipsoid, subcylindrical to cylindrical-oblong or irregular in outline, (5.5−)7−23(−32) × (2−)2.5−4(−5) µm (av. ± SD: 14.5 ± 5.1 × 3.1 ± 0.5), 0−1(−3)-septate, septum median or somewhat in the upper half, not constricted, with (2−)3−7(−10) distal hila, crowded at the apex or situated on small lateral prolongations, pale olivaceous to pale medium olivaceous-brown, smooth or almost so, walls unthickened or almost so, hila conspicuous, subdenticulate to denticulate, 0.5−2 µm diam, somewhat thickened and darkened-refractive; microcyclic conidiogenesis occasionally occurring with conidia forming secondary conidiophores.

*Culture characteristics*: Colonies on PDA attaining 52−74 mm diam after 14 d, olivaceous-grey to grey-olivaceous, reverse iron-grey to olivaceous-black, floccose to fluffy, margins grey-olivaceous, feathery, aerial mycelium abundant, floccose to fluffy, loose to dense, growth effuse, without exudates, sporulation profuse. Colonies on MEA reaching 47−74 mm diam after 14 d, olivaceous-grey, whitish due to aerial mycelium, reverse olivaceous to iron-grey, velvety to floccose-felty, margins feathery, aerial mycelium felty, whitish to pale olivaceous-grey, loose to dense, growth effuse with sometimes papillate surface, sometimes with numerous small prominent exudates, sporulation profuse. Colonies on OA reaching 47−58 mm diam after 14 d, pale olivaceous-grey to olivaceous-grey, olivaceous-buff, greenish olivaceous to grey-olivaceous due to sporulation, reverse pale olivaceous-grey to olivaceous-grey, velvety, floccose to fluffy-felty, margins grey-olivaceous, glabrous to feathery, regular, aerial mycelium abundant, fluffy to floccose, felty, low to high, loose to dense, growth effuse, without exudates, sporulation profuse.

*Substrates and distribution*: On wood and plant material; Asia (Taiwan), Europe (France, Italy, Russia), North America (Canada, USA).


**Fig. 345.** *Cladosporium xylophilum* (CBS 125997). A–G. Macronematous conidiophores and conidial chains *in vitro*. Scale bar = 10 µm.

*Additional specimens examined*: **Canada**, Ontario, isol. from galls of *Apiosporina morbosa* (*Venturiaceae*) on twigs of *Prunus* sp. (*Rosaceae*), 2005, coll. K.A. Seifert, isol. P.W. Crous (CPC 12101). **France**, caves de Madelaine, isol. from leaves, 21 Aug. 2007, P.W. Crous (CPC 14281). **Italy**, isol. from twigs of *Salix viminalis* (*Salicaceae*), Sep. 2006, coll. W. Gams, isol. P.W. Crous (CBS 126588 = CPC 13512, CPC 13513, 13514). ?**Taiwan**, Pref. Taipei, Taipei, on dead stems of *Indigofera tinctoria* (*Fabaceae*), 18 Aug. 1909, K. Sawada (BPI 427230, **syntype** of *C. indigoferae*); 18 Aug. 1942, K. Sawada (PPMH, authentic material of *C. indigoferae*). **USA**, Washington, isol. from bing cherry fruits (*Rosaceae*), isol. by F.M. Dugan (CBS 113749 = cv 10-53 sci1, CBS 113756 = st5-25 sci 1).

*Notes*: *Cladosporium xylophilum*, which inhabits woody plants, belongs to the *C. cladosporioides* complex. Strains of this species formed a separate subclade in phylogenetic analyses (see Bensch *et al.* 2010, fig. 1, part b). Based on the formation of numerous subglobose, globose to broadly ovoid, verruculose or verrucose terminal conidia, this species seems to be allied to *C. sphaerospermum*, but differs in having usually 0–1(–2)-septate ramoconidia and conidia. Furthermore, the two species are genetically quite distinct, *i.e.*, *C. xylophilum* does not cluser within the *C. sphaerospermum* complex. Strain CPC 14364, isolated from indoor air in Denmark, clustered with other isolates of *C. xylophilum* but differs in having smooth terminal and intercalary conidia, shorter secondary ramoconidia (6–17(–19) µm) and slightly narrower conidiogenous loci and hila (0.5–1.5(–1.8) µm diam). Based on ACT sequence data this single strain clusters outside the *C. xylophilum* subclade, but with TEF data it sits within these isolates (see Bensch *et al.* 2010, fig. 1, part b). Strains of this species are in general characterised by a certain degree of intraspecific variation. However, the question if cryptic species are involved cannot yet be answered, but must be based on a broader sampling.

*Cladosporium indigoferae* is an invalid name, published without Latin description. The type material examined is rather sparse, but some fruiting has been found. In Braun *et al.* (2008a) this species was excluded from the genus *Cladosporium* and its morphological similarity with the features of *Fusicladium* and *Cladophialophora* was discussed. However, SEM photographs of conidiophores and conidia from type material showed typical cladosporioid scars with a central dome and raised rim (not shown here, please see www.mycobank.org). Therefore, the species has to be treated as a true member of the genus *Cladosporium*. Morphologically it agrees with the recently introduced species *C. xylophilum*. Both species are described from dead wood. Conidiophores of *C. indigoferae* are 15–100(–145) × 3–4.5(–5) µm, the smooth and 0–1(–3)-septate conidia are 4–26 × 3–5(–7) µm and conidiogenous loci and hila 1–2 µm diam. However, the material examined is in too poor condition for a final treatment, which should be based on culture characteristics supported by molecular DNA sequence analyses.

**168. *Cladosporium xyridis*** Tracy & Earle, Bull. Torrey Bot. Club 23(5): 206. 1896, as "*Gladisporium* (*sic*) *xyridis*". Figs 346, 347.

*Lectotype* (designated here): **USA**, Mississippi, Ocean Springs, on petals of *Xyris fimbriata* (*Xyridaceae*), 29 Sep. 1895, F.S. Earle (NY). *Isolectotypes*: BPI 427627–427628, NY.

*Lit.*: Saccardo (1899: 1081), Schubert (2005b: 152–154).
*Ill.*: Schubert (2005b: 153, fig. 74, pl. 33, figs G–H).

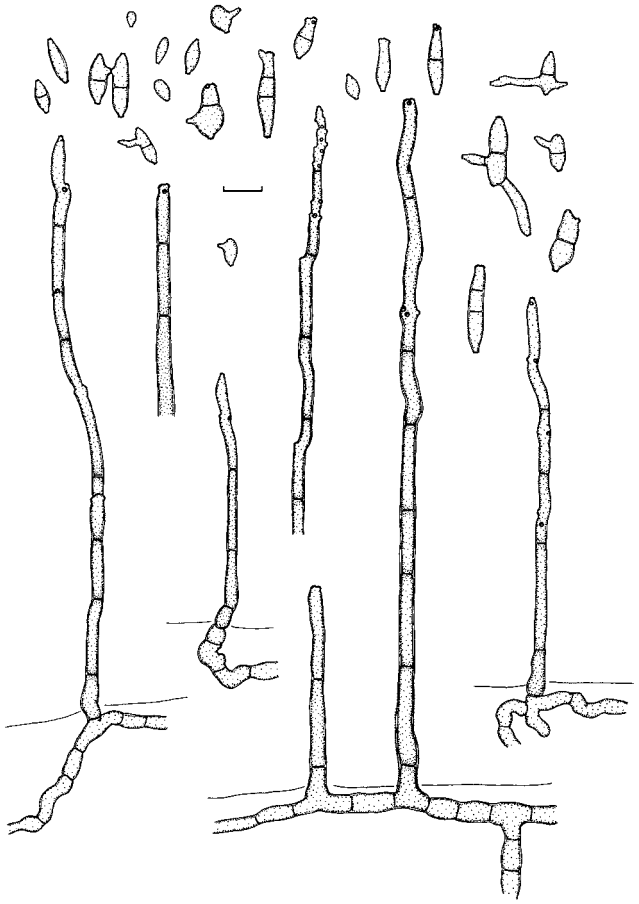


**Fig. 346.** *Cladosporium xyridis* (NY). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

*In vivo*: Blackening the persistent withering petals. *Colonies* stretching petals, effuse, loosely caespitose, pale brown, villose. *Mycelium* internal, subcuticular to often intraepidermal; hyphae branched, 2.5–9 µm wide, septate, often with swellings and constrictions, subhyaline or even hyaline to pale medium brown, smooth, walls thickened, cells occasionally with a distinct lumen clearly separated from the thickened wall, often appearing to be granular, hyphae forming a loose network, sometimes aggregated. *Stromata* lacking. *Conidiophores* solitary or arranged in small loose groups, arising from internal hyphae, erumpent, erect, more or less straight or only very slightly flexuous, filiform, sometimes slightly geniculate-sinuous, mostly non-nodulose, unbranched, 25–275 × 2–4.5 µm, slightly swollen at the base, up to 6 µm wide, pluriseptate, pale to medium brown, often paler towards the apex, sometimes subhyaline at the apex, smooth or almost so, often faintly verruculose near the base, thick-walled, 0.5–1 µm thick, often more or less distinctly two-layered, protoplasm sometimes aggregated at the septa, appearing to be thickened, sporadically enteroblastically proliferating. *Conidiogenous cells* integrated, terminal and intercalary, narrowly cylindrical-oblong, sometimes somewhat geniculate-sinuous, 10–48 µm long, proliferation sympodial, with a single or several conidiogenous loci, often somewhat crowded at the same level, protuberant, subdenticulate, short cylindrical, 1–1.5(–2) µm diam, thickened, somewhat darkened-refractive. *Conidia* catenate, in branched chains, more or less straight, subglobose, obovoid, ellipsoid, somewhat fusiform, subcylindrical to cylindrical or irregular, 3.5–23(–31) × 2–5(–7) µm, 0–2(–3)-septate, not or only slightly constricted at the septa, subhyaline or even hyaline to very pale brown, smooth or almost so, walls more or less thickened, apex rounded or often slightly attenuated towards apex and base, apex often with 1–5 hila, protuberant, 0.5–1.5(–2) µm diam, clearly differentiated in a central dome and a periclinal rim, thickened, somewhat darkened-refractive; microcyclic conidiogenesis often occurring.

*Substrates and distribution*: On *Xyris* spp.; Caribbean, North America – *Xyris fimbriata* (USA, MS), *X. jupicai* (Cuba), *Xyris* spp. (USA, AL).

*Additional specimens examined*: **Cuba**, Herradura, on *Xyris jupicai* (= *X. communis*), 30 Oct. 1917, F.S. Earle No. 803 (NY). **USA**, Alabama, Tuskegee (?), on *Xyris* sp., 12 Jul. 1897, G.W. Carren (?) (NY); Lee Co., Auburn, on *Xyris* sp., 8 Sep. 1897, F.S. Earle & C.F. Baker (NY).

*Notes*: Branched conidiophores as described in the original diagnosis (Tracy & Earle 1896) could not be observed in the collections examined. On the web site of the herbarium BPI the name of this species was given as “hyridis”, which is very probably a spelling error.

*Cladosporium xyridis* is the only species known to occur on a host belonging to the *Xyridaceae*. It could morphologically be compared with *C. uredinicola* and *C. cladosporioides* but the latter species differs, however, in having wider conidiogenous loci and hila, usually 0–1-septate conidia and conidiophores with a single or only few conidiogenous loci. The conidia of the fungicolous *C. uredinicola* are often much longer and somewhat wider, 3–39 × 2–6.5(–8) µm, the walls of the conidiophores are

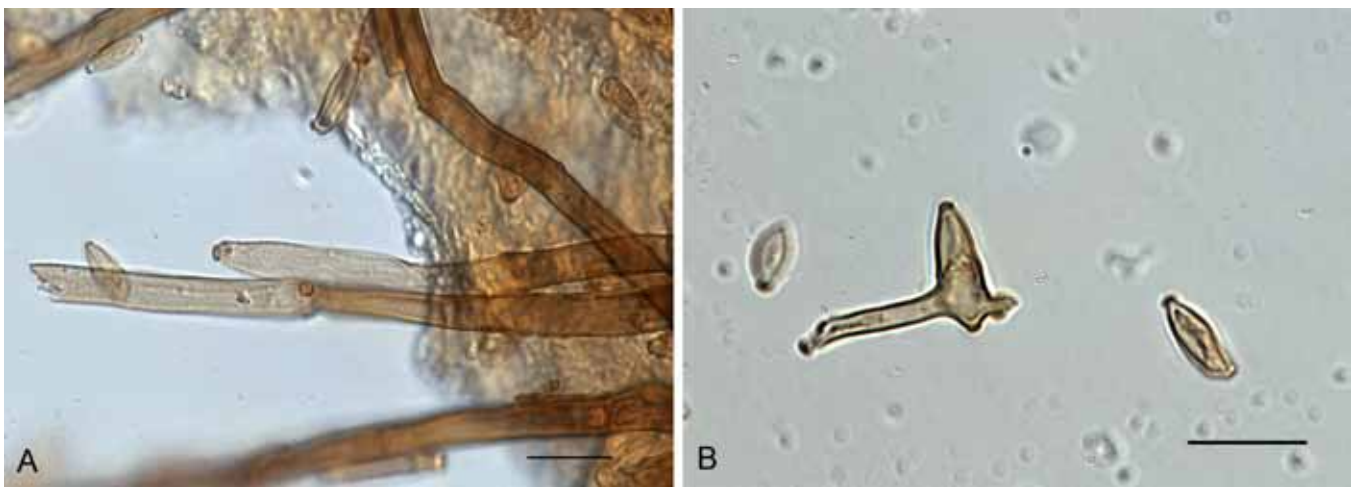



**Fig. 347.** *Cladosporium xyridis* (NY). A–B. Conidiophores, conidia and microcyclic conidiogenesis *in vivo*. Scale bars = 10 µm.

one-layered and somewhat narrower, the conidiogenous loci are somewhat wider, and sometimes ramoconidia are formed (Heuchert *et al*. 2005).

**169. *Cladosporium yuccae*** U. Braun, Schlechtendalia 19: 65. 2009. Fig. 348.

*Holotype*: **Italy**, South Tyrol, Neumarkt, Fontane frede, on faded leaves oft *Yucca* sp. (*Asparagaceae*), 8 Sep. 1902, P. Magnus (HBG).

*Ill*.: Braun (2009: 66, fig. 2).

*In vivo*: *Colonies* on large necrotic lesions, punctiform, scattered to gregarious, darl brown to blackish. *Mycelium* internal. *Stromatic hyphal aggregations* immersed, 10–100 µm diam, occasionally confluent, dark brown, composed of swollen hyphal cells, 2–8 µm diam. *Conidiophores* in small to very large, loose to dense fascicles, arising from stromatic hyphal aggregations, erumpent, erect, straight, subcylindrical to usually strongly irregularly sinuous to subnodulose by constrictions at the septa, occasionally geniculate, simple or often branched, 20–80 × 3–8 µm, pluriseptate throughout, pale to medium dark brown or olivaceous-brown, often paler towards the apex, tips occasionally very pale or subhyaline, smooth or almost so, wall thin, ≤ 1 µm, conidiophores occasionally with monopodial rejuvenation leaving simple annellate structures. *Conidiogenous cells* integrated, terminal and intercalary, 10–20 µm long, subcylindrical to geniculate, with a single to usually several, often crowded conidiogenous loci, distinctly coronate, but only slightly protuberant, (1–)1.5–2 µm diam, somewhat darkened-refractive. *Ramoconidia* occasionally formed, base truncate, 2–2.5(–3) µm wide, without coronate hilum. *Conidia* catenate, in branched acropetal chains, ellipsoid-ovoid, obovoid, fusiform, 4–18 × 3–7 µm, 0–1-septate, pale olivaceous to olivaceous-brown, thin-walled, almost smooth to usually distinctly, but minutely verruculose, ends rounded to somewhat attenuated, small terminal conidia pale, 4–8 × 3–4 µm, septate conidia and secondary ramoconidia 10–18 × 4–7 µm, hila somewhat protuberant, distinctly coronate, 1–2 µm diam, refractive; microcyclic conidiogenesis not occurring.

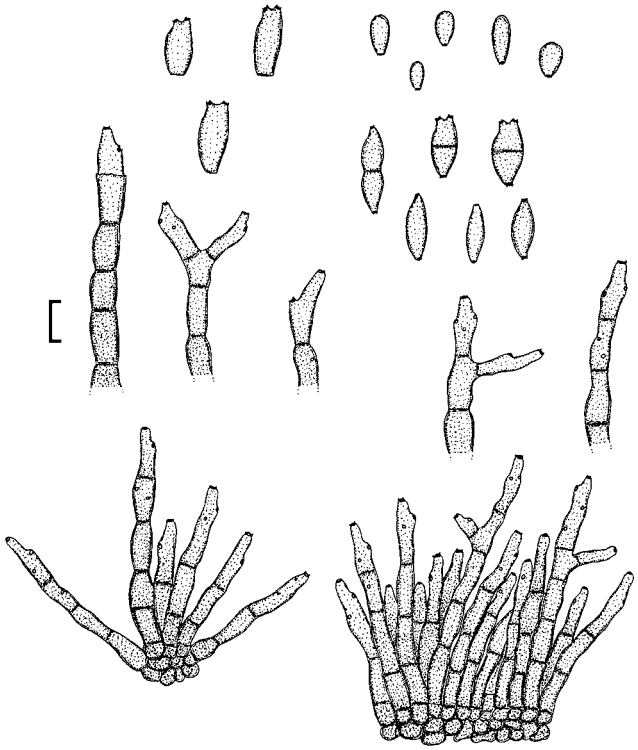


**Fig. 348.** *Cladosporium yuccae* (HBG). Fascicles of conidiophores, tips of conidiophores, ramoconidia and conidia. Scale bar = 10 µm. U. Braun *del*.

*Substrates and distribution*: On *Yucca*; Italy.

*Notes*: This species is morphologically close to *C. chamaeropis*, but the latter species differs from *C. yuccae* in having usually unbranched conidiophores without distinct constrictions and longer conidiogenous cells, up to 35 µm in length. Furthermore, ramoconidia have not been observed in *C. chamaeropis*. The ecology of *C. yuccae* is unclear and cannot be verified on the base on the old herbarium material. The colonies of *C. yuccae* occur on large necrotic lesions, but it is unclear if they have been caused by the latter fungus. New fresh collections are needed to elucidate the true biology of this species.

## EXCLUDED TAXA OF *CLADOSPORIUM S. STR.*

Species and other taxa excluded from *Cladosporium s. str.* are listed alphabetically. In the first line of each entry, the particular epithets used under *Cladosporium* are given, but the generic name *Cladosporium* is dropped. As far as known, synonyms are given, including the currently accepted name, which is marked in bold. References to type collections are given for the particular taxa and their synonyms. Furthermore, important literature references (Lit.), above all those dealing with nomenclature and taxonomy, and selected illustrations (Ill.) are cited.

### *Cladosporium*

*abietinum* (Pers.) Link, Ges. Naturf. Freunde Berlin Mag. Neuesten Entdeck. Gesammten Naturk. 7: 37. 1816.
*Type*: On bark of *Pinus abies* (*Pinaceae*).
*Basionym*: *Dematium abietinum* Pers., Neues Mag. Bot. 1: 121. 1794.
≡ *Sporotrichum abietinum* (Pers.) Link, Ges. Naturf. Freunde Berlin Mag. Neuesten Entdeck. Gesammten Naturk. 3: 13. 1809.
*Lit*.: de Vries (1952: 89).
*Notes*: According to Hughes (1958), this species has to be reduced to synonymy with *Trentepohlia abietina* (Flot.) Hansg. Hughes examined material deposited at B (No. 700006134) as "*Cladosporium abietinum* Link" (label without any further details). It is not clear if this material was part of Link's herbarium.

*abietinum* Zukal, Verh. K. K. Zool.-Bot. Ges. Wien 37: 44–45. 1887, *nom. illeg*., homonym, non *C. abietinum* (Pers.) Link, 1816.
*Type*: **Austria**, on moist tuber skins of *Solanum tuberosum* (*Solanaceae*), 1885, associated with *Chaetomium crispatum*.
≡ *Spondylocladium abietinum* Sacc., Syll. fung. 10: 662. 1892, as "(Zukal) Sacc.".
*Lit*.: Lindau (1910: 142, as synonym of "*Spondylocladium atrovirens* Harz").
*Ill*.: Zukal (1887: tab. 1, fig. 8).
*Notes*: Zukal's type, originally housed at GZU, could not be located there (personal communication with Christian Scheuer). Based on Zukal's (1887) drawing, this species has to be excluded from *Cladosporium s. str.*

*acaciae* Panwar → *acaciicola*.

*acaciicola* M.B. Ellis, More Dematiaceous Hyphomycetes: 342. 1976.
*Type*: **India**, Rajastan, Jodhpur, sand dunes of Masuria, from rhizosphere of *Acacia nilotica* subsp. *indica* (*Fabaceae*) (IMI 104172).
*Basionym*: *Cladosporium acaciae* Panwar, Curr. Sci. 39(18): 422. 1970, non *C. acaciae* Reichert, 1921.
*Ill*.: Ellis (1976: 343, fig. 260 A).
*Notes*: Excluded, a black yeast-like fungus.

*adianticola* R.F. Castañeda, Fungi Cubenses II: 3. 1987, as "*adianticolum*".
*Holotype*: **Cuba**, prov. Matanzas, San Miguel de los Baños, on living leaves of *Adiantum* sp. (*Pteridaceae*), 23 Jan. 1987, R.F. Castañeda (INIFAT C87/40).
*Lit*.: Crous *et al.* (2006, 2007c).

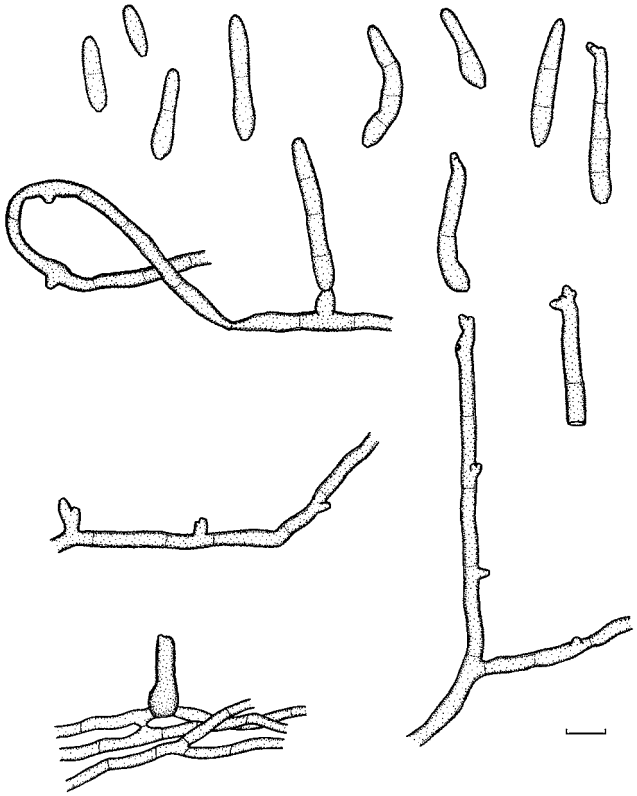


**Fig. 349.** *Parastenella aequatoriensis* (M-0057478, syntype of *C. aequatoriense*). Conidiophores and conidia. Scale bar = 10 µm. K. Bensch *del*.

*Ill*.: Castañeda (1987: figs 3, 5).
*Notes*: Excluded, generic affinity not yet settled. Using DNA sequence data, Crous *et al.* (2006, 2007c) demonstrated that this species clusters within the *Herpotrichiellaceae*, close to species of the genus *Metulocladosporiella.*

*aequatoriense* Petr., Sydowia 2: 380. 1948. Fig. 349.
*Syntype*: **Ecuador**, prov. Pichincha, Guarumos near Nono, on living leaves of *Mikania* sp. (*Asteraceae*), 17 Oct. 1937 (M-57478).
≡ ***Parastenella aequatoriensis*** (Petr.) K. Schub. & U. Braun, Mycol. Progr. 4(2): 103. 2005.
*Ill*.: Schubert & Braun (2005a: 104, fig. 3).

*albicans* Hallier, Parasitologische Untersuchungen bezüglich auf die pflanzlichen Organismen bei Masern, Hungertyphus, Darmtyphus, Blattern, Kuhpocken, Schafpocken, Cholera Nostra *etc.*: 27. 1868.
*Type*: From man, causing parasitic stomatitis (location unknown).
≡ *Cladosporium albicans* Hallier, Flora, Neue Reihe, 26(19): 293. 1868, *nom. prov*.
*Ill*.: Hallier (1868b: pl. II, fig. 2).
*Notes*: Considered to be a state (morph) of *Oidium albicans* C.P. Robin [≡ *Candida albicans* (C.P. Robin) Berkhout] by Hallier (1868b: 27); human pathogenic, undoubtedly not belonging to *Cladosporium s. str.* Hallier (1866: 86) discussed this fungus under "*Stempylium polymophum* ? (*Oidium albicans* auct.)".

*album* Dowson, J. Roy. Hort. Soc. 49(2): 211. 1924.
*Type*: **UK**, on living leaves of *Lathyrus odoratus* (*Fabaceae*).
≡ *Hyalodendron album* (Dowson) Diddens, Zentralbl. Bakteriol., 2. Abt., 90: 316. 1934.
≡ *Ramularia alba* (Dowson) Nannf., in Lundell & Nannfeldt, Fungi Exs. Suec., Fasc. XXXIX–XL, No. 17. 1950.
= *Ramularia galegae* f. *lathyri* Ferraris, Malphigia 20: 153. 1906.
≡ *Ramularia lathyri* Ferraris, Flora Ital. Crypt., Pars I, Fungi: 812. 1913.

≡ *Ramularia lathyri* (Ferraris) Bubák, Ann. Mycol. 14: 350. 1916.
= *Ramularia lathyri* Hollós, Bot. Közlem. 1910, 2: 112. 1910.
= *Ramularia deusta* f. *odorati* W.C. Snyder & W.H. Davis, Mycologia 42: 417. 1950.
= ***Ramularia deusta*** (Fuckel) Karak. var. ***alba*** U. Braun, Nova Hedwigia 56: 429. 1993.

*Lit.*: Braun (1998: 157).

*algeriense* (Montpell. & Catanei) Vuill., Champ. paras.: 78. 1931.
*Type*: Isol. from man (location unknown).
*Basionym*: *Hormodendrum algeriense* Montpell. & Catanei, Ann. Dermatol. Syphiligr., Sér. 6, 8: 626. 1927.
*Lit.*: Dodge (1935: 845), de Hoog *et al.* (2000: 1014).
*Notes*: De Hoog *et al.* (2000) described it as a doubtful species close to or identical with *Fonsecaea pedrosoi* (Brumpt) Negroni [current name *Phialophora pedrosoi* (Brumpt) Redaelli & Cif.].

*alternicoloratum* R.F. Castañeda & W.B. Kendr., Univ. Waterloo Biol. Ser. 35: 20. 1991.
*Holotype*: **Cuba**, Pinar del Río, Cuchillas de San Simón, on leaves and stems of *Cyperus alternifolius* (= *C. involucratus*) (*Cyperaceae*), 24 Mar. 1990, R.F. Castañeda (INIFAT C90/129).
*Ill.*: Castañeda & Kendrick (1991: 21, fig. 10).
*Notes*: Excluded, generic affinity unclear.

*americanum* H.C. Greene, Amer. Midl. Naturalist 41(3): 723. 1949.
*Lectotype* (**designated here**): **USA**, Wisconsin, Dane Co., Madison, University of Wisconsin Arboretum, on living leaves of *Prunus americana* (*Rosaceae*), 18 Sep. 1944, H.C. Greene (WIS). *Isolectotype*: BPI 426105.
= ***Fusicladium carpophilum*** (Thüm.) Oudem., Verh. Kon. Ned. Akad. Wetensch., Afd. Natuurk. 1900: 388. 1900.
*Lit.*: Braun (2001: 53), Schubert (2005a: 56–57).
*Ill.*: Schubert (2005a: 57, fig. 1).

*amoenum* R.F. Castañeda, BCCM MUCL Agro-industrial fungi-yeasts, 1998. *nom. nud*.
*Iconotype*: **Cuba**, Santiago de Cuba, La Gran Piedra, on fallen leaves of *Eucalyptus* sp. (*Myrtaceae*), 2 Nov. 1994, R.F. Castañeda (Ho *et al.* 1999: 117, Figs 2–3). *Ex-type culture*: ATCC 200947, CBS 254.95, INIFAT C94/155, IMI 367525, MUCL 39143.
≡ *Anungitopsis amoena* R.F. Castañeda & Dugan, Mycotaxon 72: 118. 1999.
≡ ***Fusicladium amoenum*** (R.F. Castañeda & Dugan) Crous, K. Schub. & U. Braun, Stud. Mycol. 58: 207. 2007.
*Ill.*: Ho *et al.* (1999: 117, figs 2–3), Crous *et al.* (2007d: 206, fig. 20).
*Notes*: Crous *et al.* (2007d), using molecular sequence analyses, showed that *Anungitopsis amoena* is not congeneric with the type species of *Anungitopsis* and has to be transferred to *Fusicladium* (*Venturiaceae*).

*amorphae* Thüm., Rev. Mycol. (Toulouse) 1: 59. 1879.
*Syntypes*: **USA**, South Carolina, Aiken, on dead stems of *Amorpha herbacea* (*Fabaceae*), H.W. Ravenel, Thümen, Mycoth. Univ. 1572 (*e.g.*, B 700006157, BPI 426106, BR-MYC 81368,82, HAL, HBG, M, NY).
*Lit.*: Saccardo (1886: 362).
*Notes*: Excluded species. Status unclear (conidiogenesis probably tretic). The original description is repeated in Thümen, Mycoth. Univ., Cent. XVI, No. 1572, 1880.

*ampelinum* Pass., in Baglietto, Cesati & Notaris, Erb. Critt. Ital., Ser. II, No. 595. 1872.
*Syntypes*: **Italy**, on leaves of *Vitis* sp. (*Vitaceae*), Baglietto, Cesati & Notaris, Erb. Critt. Ital. 595 (*e.g.*, E, IMI 112146).
= ***Pseudocercospora vitis*** (Lév.) Speg., Anales Mus. Nac. Buenos Aires 20: 438. 1910.
*Lit.*: Saccardo (1886: 458), Lindau (1910: 116), Oudemans (1921), Sivanesan (1984: 210), Crous & Braun (2003: 427).
*Notes*: See *C. vitis* (Lév.) Sacc.

*anomalum* Berk. & M.A. Curtis, J. Linn. Soc., Bot. 10: 362. 1869.
*Type*: Cuba, on the underside of leaves of a *Malvaceae*, C. Wright, Fungi cubensis wrightiani, No. 639 (K).
≡ ***Pseudocercospora anomala*** (Berk. & M.A. Curtis) de Hoog, Persoonia 15(1): 68. 1992.
*Lit.*: Saccardo (1886: 363).
*Notes*: Authentic material is also deposited at PC (C. Wright collection, 1870, North Pacific Expedition 1853–56).

*antillanum* R.F. Castañeda, Fungi Cubensis II: 3. 1987.
*Holotype*: **Cuba**, prov. Guantánamo, Imias, on fallen leaves of *Clusia rosea* (*Clusiaceae*), 3 May 1986, Mayra Camino (INIFAT C86/128).
*Ill.*: Castañeda (1987: fig. 6).
*Notes*: Excluded, no *Cladosporium s. str.*, but generic affinity not yet clear.

*araguatum* (Syd.) Arx, Genera Fungi Sporul. Pure Cult., Ed. 2: 224. 1974.
*Lectotype* (selected by Crous *et al.* 2007c): **Venezuela**, Aragua, La Victoria, between La Victoria and Suata, on living leaves of *Pithecellobium lanceolatum* (*Fabaceae*), Jan. 1928, H. Sydow [IMI 15728(a)]. *Isolectotypes*: BPI 443420, 443421, 443422, IMI 34905.
≡ ***Stenella araguata*** Syd., Ann. Mycol. 28: 205. 1930.
= *Cladosporium castellanii* Borelli & Marcano, Castellania 1(5): 154. 1973. [Type: IMI 183818, ex-type culture: CBS 105.75].
*Lit.*: McGinnis & Padhye (1978), Crous *et al.* (2007c: 43–45).
*Ill.*: Crous *et al.* (2007c: 44–45, figs 7–8).
*Notes*: This is the type species of the genus *Stenella*. Crous *et al.* (2007c) examined this species in detail, and based on morphology and DNA sequence data, showed that it clusters in the *Teratosphaeriaceae* (*Capnodiales*).

*araliae* Sawada, Rep. Gov. Res. Inst. Formosa 85: 91. 1943, *nom. inval*. Fig. 350.
*Holotype*: **Taiwan**, on *Aralia decaisneana* (*Araliaceae*), 26 Nov. 1928, K. Sawada (BPI 426122). *Isotype*: PPMH.
≡ *Stenella araliae* Sawada ex K. Schub. & U. Braun, Nova Hedwigia 84: 202. 2007.
≡ ***Zasmidium araliae*** (Sawada ex K. Schub. & U. Braun) K. Schub. & U. Braun, Schlechtendalia 20: 100. 2010.
*Ill.*: Schubert & Braun (2007: 203, fig. 7).

*argillaceum* Minoura, J. Ferment. Technol. 44: 140. 1966.
*Type*: **Japan**, Yaku, isol. from a decaying myxomycete, 21 Oct. 1961, K. Tubaki (Dept. Fermentation Technology, Faculty Engineering, Osaka, Japan [IFO]). *Ex-type culture*: CBS 241.67.
≡ ***Rhizocladosporium argillaceum*** (Minoura) Crous & U. Braun, Stud. Mycol. 58: 50. 2007.
*Lit.*: Heuchert *et al.* (2005: 53), Crous *et al.* (2007c: 50–51).
*Ill.*: Minoura (1966: 142, fig. 6 E), Crous *et al.* (2007c: 50, fig. 12).

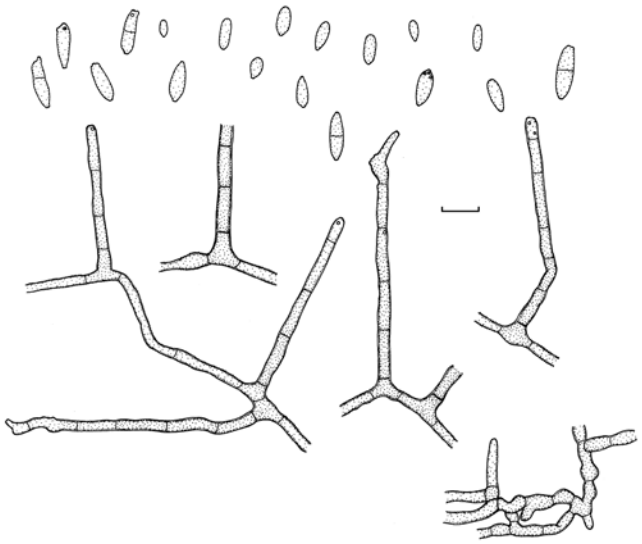


**Fig. 350.** *Zasmidium araliae* (BPI 426122, holotype of *C. araliae*). Conidiophores and conidia. Scale bar = 10 µm. K. Bensch *del*.

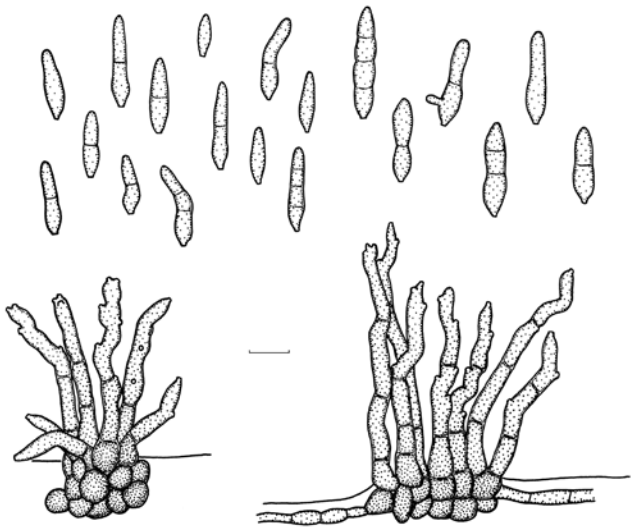


**Fig. 352.** *Fusicladium artemisiae* (WIS, lectotype of *C. artemisiae*). Conidiophores and conidia. Scale bar = 10 µm. K. Bensch *del*.

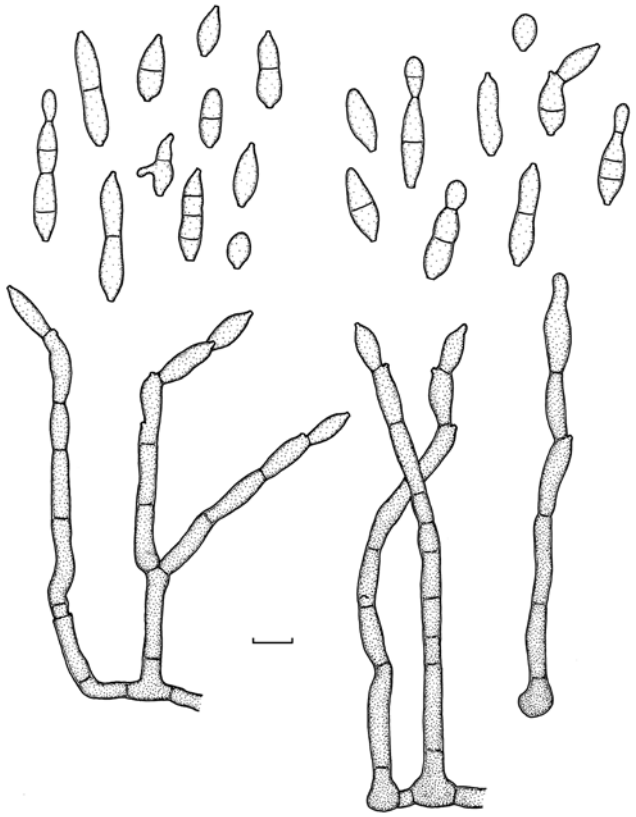


**Fig. 351.** *Fusicladium aromaticum* (BPI 426124, lectotype of *C. aromaticum*). Conidiophores arising from superficial hyphae and conidia. Scale bar = 10 µm. K. Bensch *del*.

*aromaticum* Ellis & Everh., Proc. Acad. Nat. Sci. Philadelphia 47(3): 439. 1895. Fig. 351.
*Lectotype* (**designated here**): **USA**, California, Pasadena, on living leaves of *Rhus aromatica* (*Anacardiaceae*), Aug. 1894, A.J. McClatchie (BPI 426124). *Isolectotype*: NY.

≡ ***Fusicladium aromaticum*** (Ellis & Everh.) K. Schub. & U. Braun, Fungal Diversity 20: 192. 2005.

= *Cladosporium nervale* Ellis & Dearn., in Bartholomew, Fungi Columb., Cent. XXI, No. 2010. 1905.

*Lit.*: Saccardo (1899: 1079), Cash (1952: 69).
*Ill.*: Schubert & Braun (2005b: 193, fig. 2).

*artemisiae* H.C. Greene, Amer. Midl. Naturalist 48(3): 757. 1952. Fig. 352.
*Lectotype* (**designated here**): **USA**, Wisconsin, Dane Co., Madison, University of Wisconsin Arboretum, sandy slope, on living leaves of *Artemisia caudata* (= *A. campestris* spp. *caudata*) (*Asteraceae*), 7 Jul. 1951, H.C. Greene (WIS). *Isolectotype*: BPI 426134. *Topotype*: WIS, selected at the same locality at the 23 Jul. 1951.

≡ ***Fusicladium artemisiae*** (H.C. Greene) K. Schub. & U. Braun, Mycotaxon 92: 57. 2005.

*Ill.*: Schubert (2005a: 58, fig. 2).

*arthoniae* M.S. Christ. & D. Hawksw., Bull. Brit. Mus. (Nat. Hist.), Bot. 6(3): 210. 1979.
*Holotype*: **Sweden**, Skåne, Genarp, Häckeberga, on apothecia of *Arthonia impolita* (*Arthoniaceae*) on *Quercus* (*Fagaceae*), 24 Apr. 1946, M. Skytte Christiansen (herb. Christiansen 570).
*Lit.*: Heuchert *et al.* (2005: 58).
*Ill.*: Hawksworth (1979: 211, fig. 10).
*Notes*: Excluded, not *Cladosporium s. str.* (rather *Taeniolella*-like).

*arundinaceum* P. Karst. – Oudemans (1924).
*Notes*: An error; *Clasterosporium* was intended.

*astericola* Davis, Trans. Wisconsin Acad. Sci. 20: 428. 1922. Fig. 353.
*Lectotype* (**designated here**): **USA**, Wisconsin, Mellen, on upper leaves and upper portions of stems of *Doellingeria umbellata* (≡ *Aster umbellatus*) (*Asteraceae*), 4 Aug. 1919, J.J. Davis (WIS). *Isolectotype*: BPI 426143.

≡ ***Fusicladium astericola*** (Davis) K. Schub. & U. Braun, Mycotaxon 92: 59. 2005.

*Ill.*: Schubert (2005a: 60, fig. 3).

*asterinae* Deighton, Mycol. Pap. 118: 30. 1969. Fig. 354.
*Holotype*: **Sierra Leone**, Kenema (Nongowa), on colonies of *Asterina contigua* (*Asterinaceae*) on leaves of *Dialium dinklagei* (*Fabaceae)*, 6 Dec. 1937, F.C. Deighton (IMI 11851b).

≡ ***Parapericoniella asterinae*** (Deighton) U. Braun, Heuchert & K. Schub., Schlechtendalia 13: 59. 2005.

*Lit.*: Ellis (1976: 331), Khan & Shamsi (1986: 111–112).

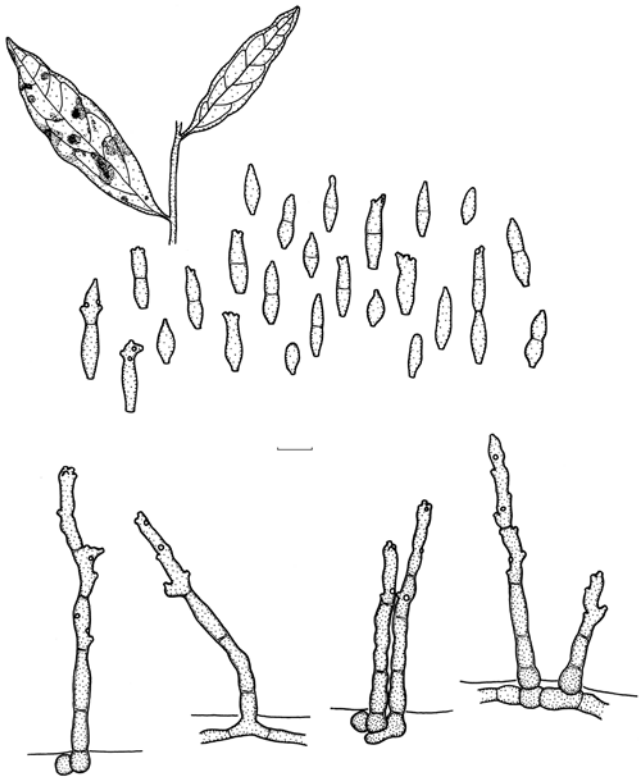


**Fig. 353.** *Fusicladium astericola* (WIS, lectotype of *C. astericola*). Infected leaves (original size), conidiophores and conidia. Scale bar = 10 µm. K. Bensch *del.*

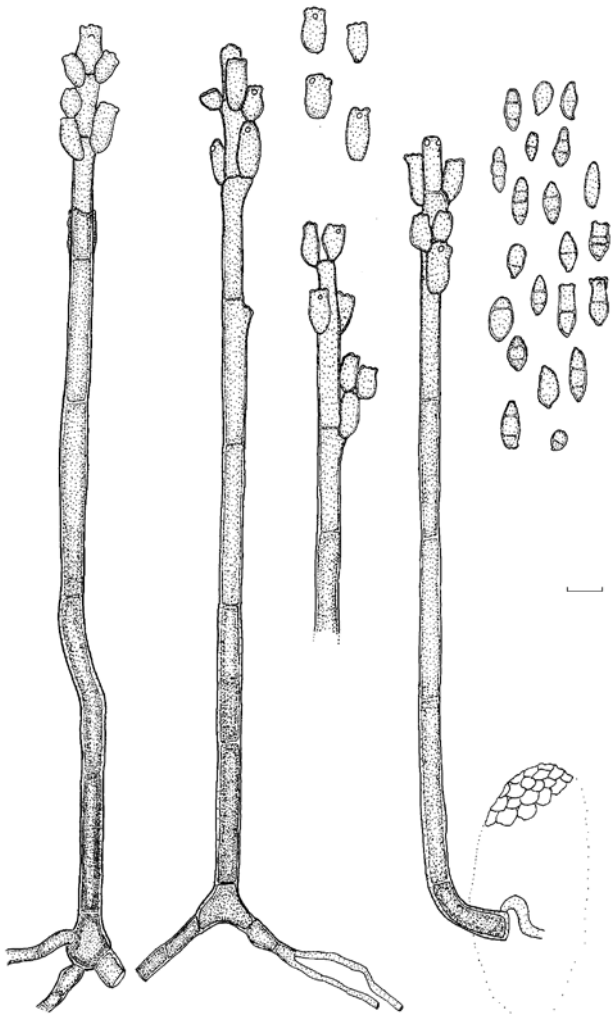


**Fig. 354.** *Parapericoniella asterinae* (IMI 11851b, holotype of *C. asterinae*). Conidiophores with branched apices and lateral branchlets, detached 'branchlets' and conidia. Scale bar = 10 µm. B. Heuchert *del.*

*Ill.*: Deighton (1969: 31, fig. 17), Ellis (1976: 332, fig. 250 A), Khan & Shamsi (1986: 112, fig. 1), Heuchert *et al.* (2005: 60, fig. 23).

*asteroma* Fuckel, Jahrb. Nassauischen Vereins Naturk. 23–24: 355. "1869", 1870.

*Syntypes*: **Germany**, between Hamburg and Wehrheim, on living leaves of *Populus tremula* (*Salicaceae*), Fuckel, Fungi Rhen. Exs. 2208 (*e.g.*, HAL).

≡ *Napicladium asteroma* (Fuckel) Allesch., Ber. Bayer. Bot. Ges. 5: 25. 1897.

≡ *Napicladium asteroma* (Fuckel) Sacc., Malphigia 17: 421. 1902.

= *Oidium radiosum* Lib., Pl. Crypt. Arduenna, Fasc. 3, 285. 1834. [Types: BR, Libert, Pl. Crypt. Arduenna 285].

≡ ***Fusicladium radiosum*** (Lib.) Lind var. ***radiosum***, Ann. Mycol. 3: 430. 1905.

≡ *Fusicladium radiosum* (Lib.) Lindau, Krypt.-Fl., ed. 2, 1(8): 777. 1907.

≡ *Stigmina radiosa* (Lib.) Goid., Ann. Bot. (Rome) 21: 11. 1936.

≡ *Pollaccia radiosa* (Lib.) E. Bald. & Cif., Atti Ist. Bot. "Giovanni Briosi" 10: 61. 1937.

≡ *Venturia radiosa* (Lib.) Ferd. & C. A. Jørg., Skovtraeernes Sygdomme 1: 125. 1938. (*nom. anamorph.*).

= *Cladosporium ramulosum* Roberge ex Desm., Ann. Sci. Nat. Bot., Sér. 2, 18: 361. 1852, non Reissek, 1851. [Type: PC].

≡ *Fusicladium ramulosum* Rostr., Tidsskr. Skovbr. 6: 294. 1883, *nom. nov.*, as "(Roberge, in Desm.) Rostr. ".

≡ *Pollaccia ramulosa* (Rostr.) Ondřej, Eur. J. Forest Pathol. 2: 143. 1972, *nom. nov.*, as "(Desm.) Ondřej".

= ? *Cladosporium asteroma* Fuckel var. *macrosporum* Sacc., Michelia 2(6): 126. 1882.

= *Fusicladium tremulae* A.B. Frank, Hedwigia 22: 127. 1883. [Type: B].

≡ *Napicladium tremulae* (A. B. Frank) Sacc., Syll. fung. 4: 482. 1886.

= ? *Cladosporium asteroma* Fuckel var. *microsporum* Sacc., Syll. fung. 4: 357. 1886.

≡ *Fusicladium radiosum* (Lib.) Lindau var. *microsporum* (Sacc.) Lindau, in Rabenhorst, Krypt.-Fl., ed. 2, 1(8): 777. 1907.

= *Venturia tremulae* Aderh., Hedwigia 36: 81. 1897 var. *tremulae*.

= *Fusariella populi* Garb., Bull. Soc. Mycol. France 33: 89. 1917.

*Lit.*: Saccardo (1886: 357, 1913a: 1376), Lindau (1907: 777), Lind (1913: 520), Baldacci & Ciferri (1937: 61), Sivanesan (1984: 618), Schubert *et al.* (2003: 85).

*asteroma* var. *macrosporum* Sacc., Michelia 2(6): 126. 1880.

*Type*: **France**, on leaves of *Populus alba* (*Salicaceae*).

= ? *Fusicladium radiosum* (Lib.) Lind, Ann. Mycol. 3: 430. 1905.

*Lit.*: Schubert *et al.* (2003: 85).

*asteroma* var. *microsporum* Sacc., Syll. fung. 4: 357. 1886.

*Type*: **Italy**, Conegliano, on leaves of *Populus tremula* (*Salicaceae*).

= ? *Fusicladium radiosum* (Lib.) Lind, Ann. Mycol. 3: 430. 1905.

*Lit.*: Lindau (1907: 777), Baldacci & Ciferri (1937: 61), Sivanesan (1984: 618), Schubert *et al.* (2003: 85).

*aterrimum* Ellis & Everh., Proc. Acad. Nat. Sci. Philadelphia 1894: 378. 1895.

*Syntypes*: **USA**, Kansas, Rockport, on rotten wood, Nov. 1893, E. Bartholomew, No. 1256 (BPI 426152, NY 313201).

= *Helminthosporium binum* Corda, Icon. fung. 6: 9. 1854, as "*Helmisporium*". [Type: PRM].

≡ *Scolicotrichum binum* (Corda) Sacc., Syll. fung. 4: 349. 1886.

≡ ***Spadicoides bina*** (Corda) S. Hughes, Canad. J. Bot. 36: 806. 1958, as "*binum*".

= *Virgaria uniseptata* Berk. & M.A. Curtis, Grevillea 3(28): 145. 1875. [Syntypes: K, NYS].

≡ *Cladotrichum uniseptatum* (Berk. & M.A. Curtis) Sacc., Syll. fung. 4: 373. 1886.

≡ *Scolicotrichum uniseptatum* (Berk. & M.A. Curtis) Cooke, Grevillea 17(82): 41. 1888.

≡ *Diplococcium uniseptatum* (Berk. & M.A. Curtis) S. Hughes, Canad. J. Bot. 31: 634. 1953.

= *Cladotrichum simplex* Sacc., Ann. Mycol. 4: 278. 1906. [Type: PAD].

= *Cladotrichum tapesiae* Sacc., Ann. Mycol. 6: 565. 1908.

*Lit*.: Saccardo (1895: 620), Cash (1952: 68), Hughes (1953: 634), Ellis (1963: 8–9).

*atrum* Link, Ges. Naturf. Freunde Berlin Mag. Neuesten Entdeck. Naturk. 7: 38. 1816 : Fr., Syst. mycol. 3(2): 371. 1832.

*Type*: **Germany**, Berlin, on dry stems of a herbaceous plant, Link.

= *Dematium herbarum* δ *lignorum* Alb. & Schwein., Consp. fung. lusat.: 368. 1805.

*Lit*.: Saccardo (1886: 362), Lindau (1907: 831), Hughes (1958: *Mycelia sterilia*).

*Notes*: The material examined by Hughes (B 700006195) is a sample on wood without any detailed information on the label. If this material was part of Link's herbarium is unclear. It contains sterile mycelium as stated by Hughes (1958). All old collections of *C. atrum* examined belonged to various wood-inhabiting hyphomycetes, often to *Torula herbarum* (*e.g.* M-0057458).

*aureum* Link, Ges. Naturf. Freunde Berlin Mag. Neuesten Entdeck. Gesammten Naturk. 7: 38. 1816.

*Type*: On rocks, sent by Nees von Esenbeck.

= ? *Trentepohlia aurea* (L.) Mart., Fl. crypt. erlang.: 351. 1817.

*Notes*: Nees (1817): "*Cladosporium aureum* Link ... bildet mit *Dematium petraeum* und *strigosum* Pers. eine eigene, den Lichenen beizuordnende Gattung, die ich *Amphiconium* nenne.". The genus *Amphiconium* Nees is synonymous with *Trentepohlia* Mart.

*avellaneum* G.A. de Vries, Contr. Knowl. Genus *Cladosporium*: 56. 1952 (f. *avellaneum*).

*Ex-type culture*: **Netherlands**, Utrecht, isol. from "Nivea" ointment, 19 May 1947 (ATCC 11273 = CBS 186.54 = IMI 49620).

≡ *Cladosporium resinae* f. *avellaneum* (G.A. de Vries) G.A. de Vries, Antonie van Leeuwenhoek J. Microbiol. Serol. 21: 167. 1955.

= ***Amorphotheca resinae*** Parbery anamorph.

*Lit*.: David & Kelley (1995), Ho *et al.* (1999: 150), Partridge & Morgan-Jones (2002: 344-348), Seifert *et al.* (2007).

*Ill*.: Partridge & Morgan-Jones (2002: 347, fig. 4), Seifert *et al.* (2007: 236, fig. 1).

*Notes*: Seifert *et al.* (2007) examined and discussed this species, the creosote fungus, in detail, including molecular data. *Cladosporium avellaneum* is the oldest valid name for the anamorph of *A. resinae*, but has often been confused with *Hormodendrum resinae* Lindau (≡ *Hormoconis resinae*), the mononematous state of *Sorocybe resinae*, the resin fungus.

*avellaneum* f. *albidum* G.A. de Vries, Contr. Knowl. Genus *Cladosporium*: 56. 1952.

*Ex-type culture*: **Netherlands**, Utrecht, isol. from "Nivea" ointment, 19 May 1947 (CBS 185.54).

≡ *Cladosporium resinae* f. *albidum* (G.A. de Vries) G.A. de Vries, Antonie van Leeuwenhoek J. Microbiol. Serol. 21: 167. 1955.

= ***Amorphotheca resinae*** Parbery anamorph.

*Notes*: See *C. avellaneum* f. *avellaneum*. Monosporous isolate from the parent culture (de Vries 1952).

*avellaneum* f. *sterile* G.A. de Vries, Contr. Knowl. Genus *Cladosporium*: 56. 1952.

*Type*: **Netherlands**, Utrecht, isol. from "Nivea" ointment, 19 May 1947.

≡ *Cladosporium resinae* f. *sterile* (G.A. de Vries) G.A. de Vries, Antonie van Leeuwenhoek J. Microbiol. Serol. 21: 167. 1955.

= ***Amorphotheca resinae*** Parbery anamorph.

*Notes*: See *C. avellaneum* f. *avellaneum*. Monosporous isolate from the parent culture (de Vries 1952).

*avellaneum* f. *viride* G.A. de Vries, Contr. Knowl. Genus *Cladosporium*: 56. 1952.

*Type*: **Netherlands**, Utrecht, isol. from "Nivea" ointment, 19 May 1947. Ex-type culture: ATCC 11274 = CBS 187.54 = IMI 49621.

= ***Amorphotheca resinae*** Parbery anamorph.

*Lit*.: de Vries (1955: 167).

*Notes*: See *C. avellaneum* f. *avellaneum*. Monosporous isolate from the parent culture (de Vries 1952).

*bacilligerum* Mont. & Fr., Ann. Sci. Nat. Bot., Sér. 2, 6: 31. 1836.

*Type*: **France**, Lyons, Rochecardon near "Lugdunum", on *Alnus glutinosa* (*Betulaceae*).

≡ ***Passalora bacilligera*** (Mont. & Fr.) Mont. & Fr., in Montagne, Syll. gen. sp. crypt.: 305. 1856.

≡ *Scolecotrichum bacilligerum* (Mont. & Fr.) J. Schröt., in Cohn, Krypt.-Fl. Schlesien, Bd. 3(2), Heft 4: 498. 1897.

*Lit*.: Cooke (1871: 584), Deighton (1967: 5–8), Crous & Braun (2003: 440).

*balladynae* Deighton, Mycol. Pap. 118: 32. 1969. Fig. 355.

*Holotype*: **Uganda**, near Masaka, on *Balladyna magnifica* (*Parodiopsidaceae*) on leaves of *Canthium vulgare* (*Rubiaceae*), May 1962, C.L.A. Leakey (IMI 98798i).

*Lit*.: Ellis (1976: 331), Heuchert *et al.* (2005: 61–62).

*Ill*.: Deighton (1969: 33, fig. 18), Ellis (1976: 332, fig. 250 B), Heuchert *et al.* (2005: 62, fig. 24).

*Notes*: This species has to be excluded from *Cladosporium s. str.* and seems to be congeneric with *C. asterinae*, which has been assigned to the new genus *Parapericoniella*, but the type material is too meagre for a final conclusion (Heuchert *et al.* 2005).

*bantianum* (Sacc.) Borelli, Riv. Anat. Patol. Oncol. 17: 618. 1960.

*Type*: **Italy**, Florenz, isol. from cerebral granulomata, 1912 (PAD: photomicrographs prepared by Saccardo).

*Basionym*: *Torula bantiana* Sacc., Ann. Mycol. 10: 320. 1912.

≡ *Xylohypha bantiana* (Sacc.) McGinnis, A.A. Padhye, Borelli & Ajello, J. Clin. Microbiol. 23: 1150. 1986.

≡ ***Cladophialophora bantiana*** (Sacc.) de Hoog, Kwon-Chung & McGinnis, J. Med. Veterin. Mycol. 33: 343. 1995.

= *Cladosporium trichoides* C.W. Emmons, Amer. J. Clin. Pathol. 22: 541. 1952.

= *Cladosporium trichoides* C.W. Emmons var. *chlamydosporum* Kwon-Chung, Mycologia 75(2): 320. 1983.

*Lit*.: Matsushima (1975), McGinnis & Borelli (1981), Kwon-Chung & Bennett (1992: 639), Ho *et al.* (1999: 146), de Hoog *et al.* (2000: 564), Schell (2003: 577).

*Notes*: *Xylohypha emmonsii*, formerly reduced to synonymy with *Cladophialophora bantiana*, was re-established as a separate species despite high nDNA homology values, as *Cladophialophora emmonsii*, in Gerrits van den Ende & de Hoog, Stud. Mycol. 43: 160, 1999.

*baptisiae* H.C. Greene, Amer. Midl. Naturalist 39(2): 456. 1948. Fig. 356.

*Lectotype* (**designated here**): **USA**, Wisconsin, Dane Co., Madison, University of Wisconsin Arboretum, on living leaves of *Baptisia leucophaea* (= *B. bracteata* var. *glabrescens*) (*Fabaceae*), 14 Jul. 1947, H.C. Greene (WIS). *Isolectotype*: BPI 426163.

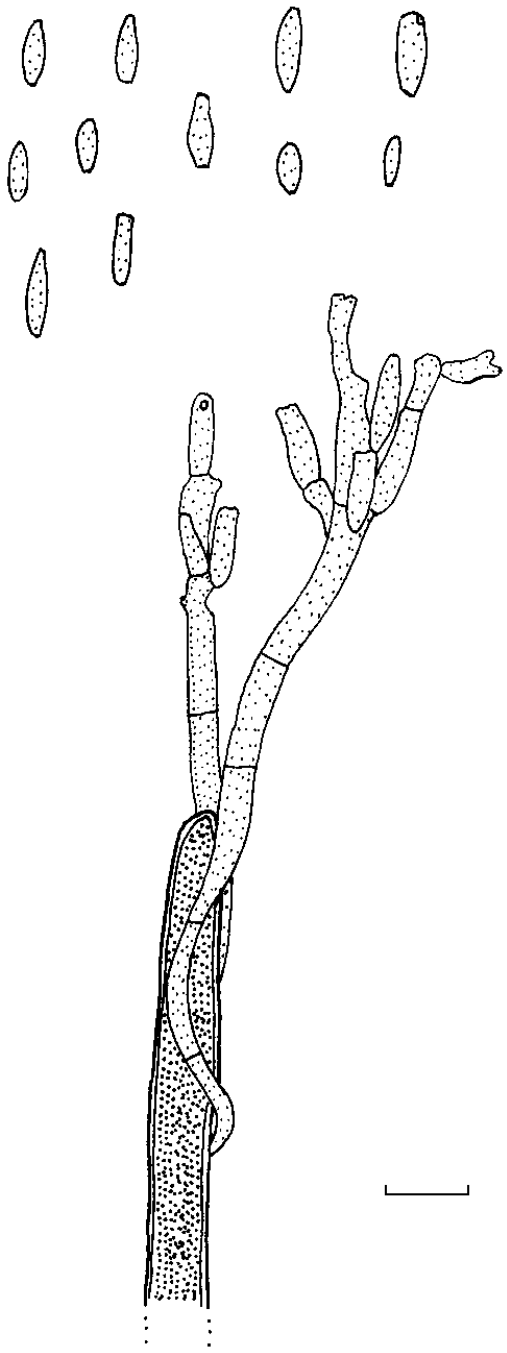


**Fig. 355.** *Cladosporium balladynae* (IMI 98798i). Conidia and conidiophores. Scale bar = 10 µm. B. Heuchert *del*.

≡ ***Fusicladium baptisiae*** (H.C. Greene) K. Schub. & U. Braun, Mycotaxon 92: 62. 2005.

*Ill*.: Schubert (2005a: 62, Fig. 4).

*beijerinckii* Oudem., on www.indexfungorum.org, Kirk *et al.* (n. d.).

*Notes*: An error, *Coryneum beyerinckii* Oudem., Hedwigia 22: 115. 1883 [= *Stigmina carpophila* (Lév.) M.B. Ellis, Mycol. Pap. 72: 56. 1959] was intended.

*bellynckii* Westend., Bull. Acad. Roy. Sci. Belgique 21(8): 240. 1854.

*Holotype*: **Belgium**, Bois de Dave, near Namur, on faded leaves of *Cynanchum vincetoxicum* (= *Vincetoxicum hirundinaria*) (*Apocynaceae*), Prof. Bellynck (BR).

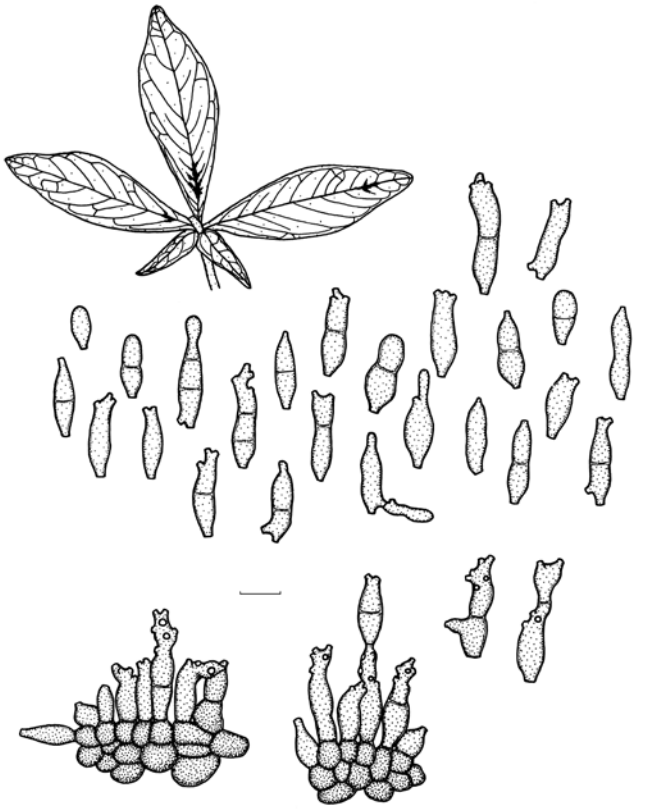


**Fig. 356.** *Fusicladium baptisiae* (WIS, lectotype of *C. baptisiae*). Symptoms (original size), conidia, conidiogenous cells and fascicles of conidiophores. Scale bar = 10 µm. K. Bensch *del*.

≡ *Cercospora bellynckii* (Westend.) Niessl, Hedwigia 15: 1. 1876.

≡ *Cercospora bellynckii* (Westend.) Sacc., Nuovo Giorn. Bot. Ital. 8: 818. 1876.

≡ *Cercosporidium bellynckii* (Westend.) X.J. Liu & Y.L. Guo, Acta Mycol. Sin. 1(2): 93. 1982.

≡ *Mycovellosiella bellynckii* (Westend.) Constant., Cryptog. Mycol. 3(1): 67. 1982.

≡ ***Passalora bellynckii*** (Westend.) U. Braun, Mycotaxon 55: 228. 1995.

= *Cercospora vincetoxici* Sacc., Syll. fung. 15: 85. 1901.

*Lit*.: Saccardo (1886: 450), Lindau (1910: 129), Chupp (1954: 69), Crous & Braun (2003: 78).

*berkheyae* Syd., Ann. Mycol. 12: 267. 1914.

*Holotype*: **South Africa**, Kwa-Zulu Natal, Cramond, on leaves of *Berkheya* sp. (*Asteraceae*), 2 Dec. 1913, No. 6852 (S).

≡ *Fulvia berkheyae* (Syd.) M.B. Ellis, More Dematiaceous Hyphomycetes: 315. 1976.

≡ *Mycovellosiella berkheyae* (Syd.) U. Braun & Crous, Mycol. Res. 99(1): 32. 1995.

≡ ***Passalora berkheyae*** (Syd.) U. Braun & Crous, *Mycosphaerella* and its anamorphs: 1. Names published in *Cercospora* and *Passalora*, CBS Biodiversity Ser. 1: 441. 2003.

*Lit*.: Saccardo (1931: 789), Crous & Braun (1996: 250).

*betuligenum* Ellis & Galloway, *in herb*. Fig. 357.

*Specimen*: **USA**, Washington District of Columbia, on *Betula nigra* (*Betulaceae*), 2 Oct. 1887, B.T. Galloway (BPI 426165).

≡ ***Fusicladium betuligenum*** K. Schub. & U. Braun, Nova Hedwigia 84: 190. 2007.

*Ill*.: Schubert & Braun (2007: 192, fig. 2).

*bisporum* Matsush., Icones Microfungorum a Matsushima Lectorum: 33. 1975.

*Holotype*: **Japan**, Iriomote Island, Okinawa, on a dead leaf of *Musa* ×*paradisiaca* (*Musaceae*), Mar. 1974 (Matsushima herb. 4861).

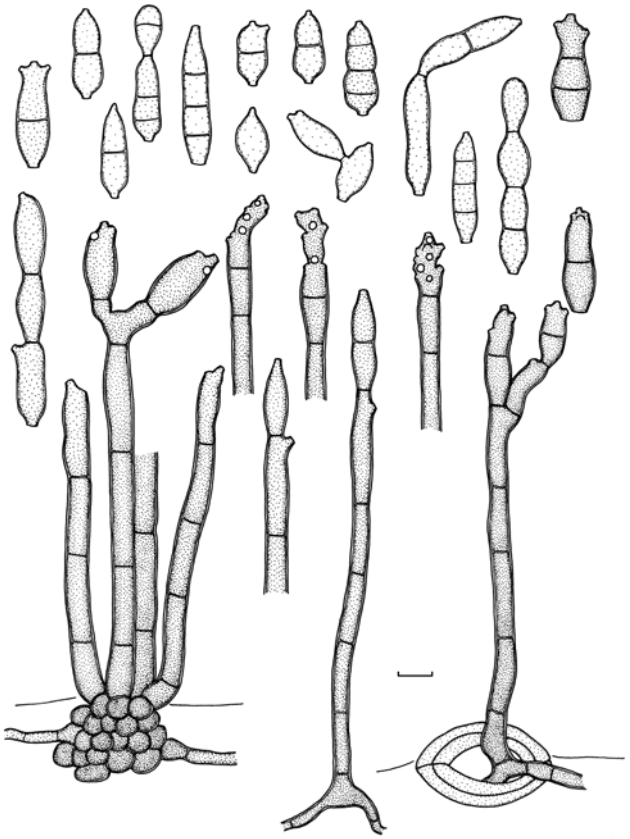


**Fig. 357.** *Fusicladium betuligenum* (BPI 426165, holotype material). Conidiophores, conidiogenous cells and conidia. Scale bar = 10 µm. K. Bensch *del*.

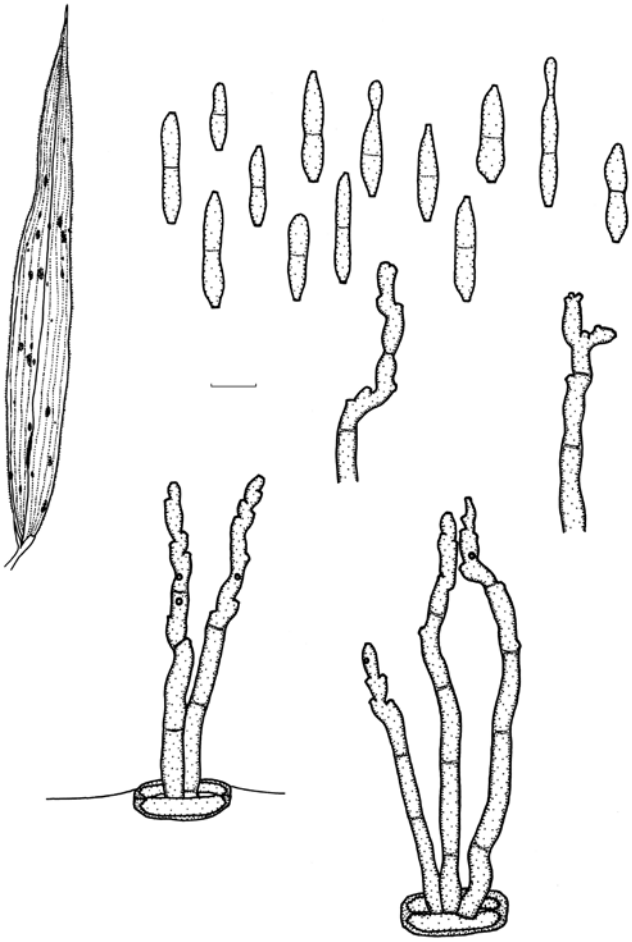


**Fig. 358.** *Passalora barretoana* (lectotype of *C. brachyelytri*). Infected leaves, conidia, conidiogenous cells and small fascicles of conidiophores emerging through stomata. Scale bar = 10 µm. K. Bensch *del*.

≡ ***Beejadwaya bispora*** (Matsush.) Subram., Kavaka 5: 97. 1977.

*Ill*.: Matsushima (1975: pl. 188, figs 1–2).

*Notes*: Subramanian (1977) transferred the species into a new genus because of the characteristically shaped, 1-celled conidia consistently formed in chains of two.

*brachyelytri* H.C. Greene, Trans. Wisconsin Acad. Sci. 53: 214. 1964. Fig. 358.

*Lectotype* (**designated here**): **USA**, Wisconsin, Sawyer Co., Flambeau State Forest near Oxbow, on living leaves of *Brachyelytrum erectum* (*Poaceae*), 22 Jul. 1964, H.C. Greene (WIS). *Isolectotype*: BPI 426166.

= *Passalora fusimaculans* (G.F. Atk.) U. Braun & Crous var. *barretoana* U. Braun & Crous, *Mycosphaerella* and its anamorphs: 1. Names published in *Cercospora* and *Passalora*. CBS Biodiversity Ser. 1: 453. 2003.

≡ ***Passalora barretoana*** (U. Braun & Crous) D.J. Soares, U. Braun & R.W. Barreto, Australas. Pl. Pathol. 35(3): 348. 2006.

*Lit*.: Schubert (2005a: 63–65).

*Ill*.: Schubert (2005a: 64, fig. 5).

*brachytrichum* Corda, Icon. fung. 1: 14. 1837.

*Syntypes*: **Czech Republic**, near Reichenberg, on the inner side of the bark of *Fagus* sp. (*Fagaceae*), Corda (PRM 155419, 155420).

≡ *Didymotrichum brachytrichum* (Corda) Bonord., Handb. Mykol.: 89. 1851.

*Lit*.: Saccardo (1886: 354), Lindau (1907: 821).

*Ill*.: Corda (1837: tab. 4, fig. 209).

*Notes*: Excluded, not *Cladosporium s. str.* This species is *Cladosporium*-like, but the conidiogenous loci and conidial hila are subdenticulate and not cladosporioid (coronate). The pale conidia remind one of those of "*Cladosporium elatum*".

*brevipes* Ellis & Barthol. → *subsessile*.

*brevipes* House, Bull. New York State Mus. Nat. Hist. 219/220: 62. 1919–1920.

*Notes*: This appears to be an error by Petrak. Although page 62 of vol 219/220 reads "CLADOSPORIUM BREVIPES, N. sp." this portion of vol. 219/220 is actually a reprint of Peck's report of 1886 (1887), reproduced in vol. 219/220 for reasons stated on page 36. Homer D. House authored in 1921 "Notes on Fungi, IV…from New York State Museum Bulletins 219, 220" but House's notes make no reference to *C. brevipes* or any other *Cladosporium*. It seems that Petrak's reference to *C. brevipes* House is an error. *Cladosporium letiferum* House was likely created via the same error. Both actually pertain to Peck's fungi of the same name.

*brevipes* Peck, Rep. (Annual) New York State Mus. Nat. Hist. 40: 64. 1887.

*Holotype*: **USA**, New York, Menands, on living leaves of *Quercus alba* (*Fagaceae*), July, C.H. Peck (NYS 523).

*Lit*.: Saccardo (1892: 604).

*Notes*: Excluded, not *Cladosporium s. str.*, but taxonomic status unclear.

*breviramosum* Morgan-Jones, Mycotaxon 32(1): 228. 1988.

*Holotype*: **USA**, Georgia, St. Simon's Island, King and Prince Hotel, on discoloured wallpaper, Dec. 1987, B.J. Jacobsen (AUA). *Ex-type culture*: ATCC 64696 = ATCC 76215.

*Lit*.: Ho *et al.* (1999: 119).

*Ill*.: Morgan-Jones & Jacobsen (1988: 229, fig. 2; 231, pl. 1), Ho *et al.* (1999: 117, figs 4–5).

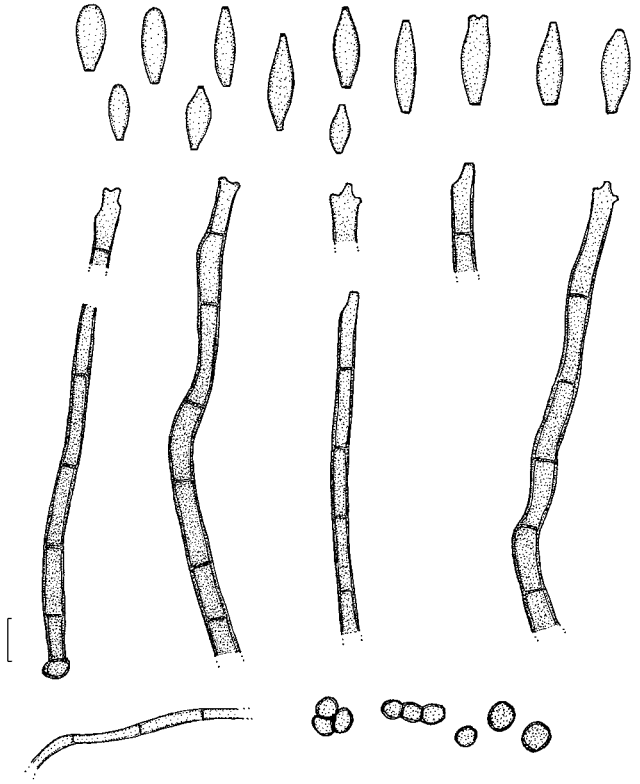


**Fig. 359.** *Fusicladium britannicum* (IMI 175936, holotype of *C. britannicum*). Conidiophores, conidia, hyphae and swollen hyphal cells. Scale bar = 10 µm. U. Braun *del.*

*Notes*: Not *Cladosporium s. str.*, this species clusters together with *Amorphotheca resinae* and not within the large *Cladosporium* clade (Braun *et al.* 2003, Seifert *et al.* 2007).

*britannicum* M.B. Ellis, More Dematiaceous Hyphomycetes: 328. 1976. Fig. 359.
*Holotype*: **UK**, Wales, Pwee-y-Faeda Estate, on dead wood of *Quercus* sp. (*Fagaceae*), 13 May 1973 (IMI 175936).
≡ ***Fusicladium britannicum*** (M.B. Ellis) U. Braun & K. Schub., Mycotaxon 103: 211. 2008.
*Ill.*: Ellis (1976: 327, fig. 245 C), Braun *et al.* (2008a: 212, fig. 2).

*brunneoatrum* McAlpine, Fungus Dis. Citrus Trees Austral.: 15, 78. 1899.
*Holotype*: **Australia**, New South Wales, Sydney, on fruits of *Citrus* ×*aurantium* (*Rutaceae*), Jul. 1898 (VPRI).
*Lit.*: Saccardo (1902: 1057).
*Ill.*: McAlpine (1899: pl. 1, figs 17–18).
*Notes*: Excluded, not *Cladosporium s. str.*, but status still unclear; type material very sparse.

*butyri* O. Jensen, Centralbl. Bakteriol., 2. Abth., 8: 311–312. 1902.
*Type*: On butter (location unknown).
= *Monilia nigra* Burri & W. Staub, Landw. Jahrb. Schweiz 23: 479. 1909.
*Notes*: A separate, yeast-like form and other characters do not enable this species to be placed in *Cladosporium* (de Vries 1952: 90). Material from BPI (Transfer on C.M.A. and Malt, received from Dr. Westerdijk, May 5, 1911, BPI 426174) has been examined. This is probably from the culture that had also been examined by de Vries. De Vries (1952) cited this species as published in "Landw. Jahrb. Schweiz 15: 329. 1901", but that reference did not contain a description of this species. The whole paper of Burri & Staub (1909: 479–513) dealt with *Monilia nigra*, but on page 479 the new name appeared for the first time.

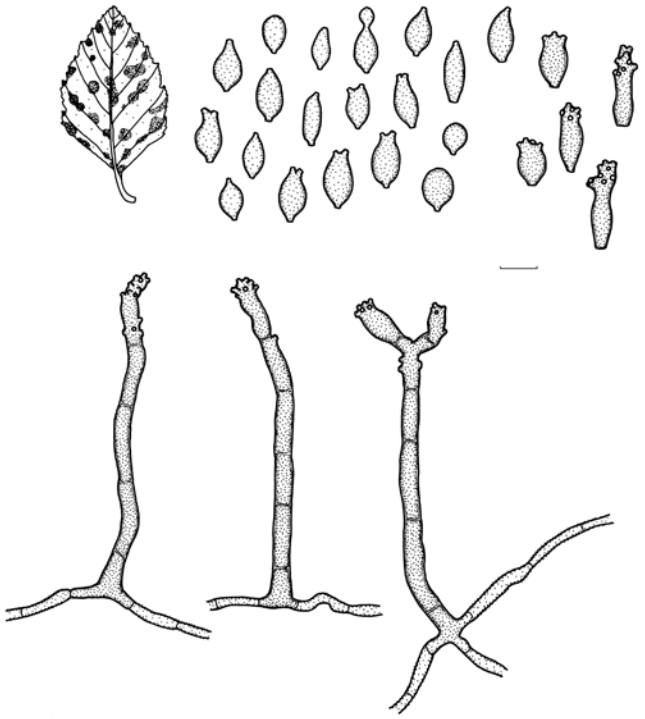


**Fig. 360.** *Fusicladium caducum* (WIS, lectotype of *C. caducum*). Symptoms (original size), conidia, detached conidiogenous cells (ramoconidia) and conidiophores arising from superficial hyphae. Scale bar = 10 µm. K. Bensch *del.*

*caducum* Davis, Trans. Wisconsin Acad. Sci. 21: 298. 1924. Fig. 360.
*Lectotype* (**designated here**): **USA**, Wisconsin, along the Wisconsin river, on leaves of *Betula nigra* (*Betulaceae*), 21 Jul. 1922, J.J. Davis (WIS). *Isolectotype*: BPI 426179.
≡ ***Fusicladium caducum*** (Davis) K. Schub. & U. Braun, Mycotaxon 92: 65. 2005.
*Ill.*: Schubert (2005a: 66, Fig. 6).

*caesalpiniae* Sawada, Rep. Gov. Res. Inst. Formosa 85: 91. 1943, *nom. inval*. Fig. 361.
*Holotype*: **Taiwan**, Kaohsiung Prov., on *Caesalpinia crista* (= *C. nuga*) (*Fabaceae*), 24 Mar. 1930, K. Sawada (BPI 426182). *Isotype*: PPMH.
≡ ***Fusicladium caesalpiniae*** K. Schub. & U. Braun, Fungal Diversity 20: 196. 2005.
*Ill.*: Schubert & Braun (2005b: 195, fig. 3).

*caespitosa* (*Byssus*) Roth, Catal. Bot. 1: 215. 1797.
*Notes*: This name was sometimes cited as possible synonym of *C. herbarum*. This is, however, very doubtful and unproven. Roth published a very brief description and cited Dillenius (Hist. Mus.: 4, tab. 1, fig. 7, 1741). His description as well as the illustration in Dillenius, only showing some filamentose structures, are not interpretable. Furthermore, in Berlin (herb. B) no material is deposited under the name *Byssus caespitosa*.

*calamigenum* Berk. & Broome, J. Linn. Soc., Bot. 14: 99. 1873, 1875, as "*calamigena*".
*Isotype*: **India**, Ceylon [Sri Lanka], south of the island, on the fruit of *Calamus* sp. (*Arecaceae*), Jul. 1868, G.H.K. Thwaites (K 121549).

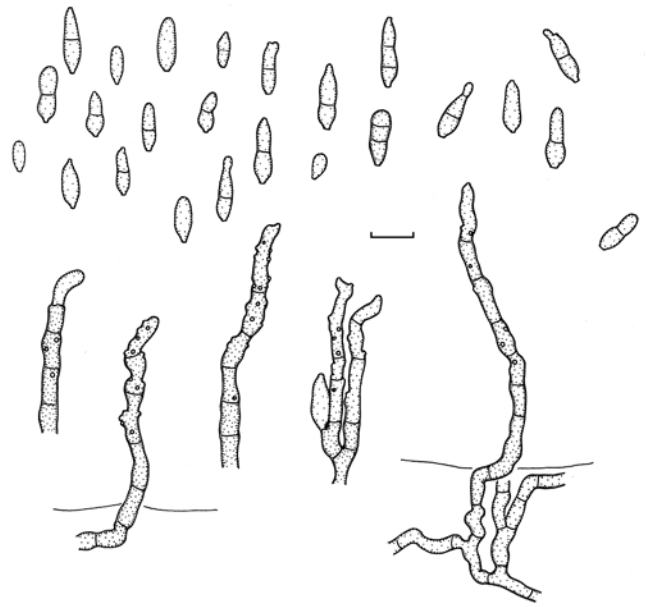


**Fig. 361.** *Fusicladium caesalpiniae* (BPI 426182, holotype of *C. caesalpiniae*). Conidiophores and conidia. Scale bar = 10 µm. K. Bensch *del*.

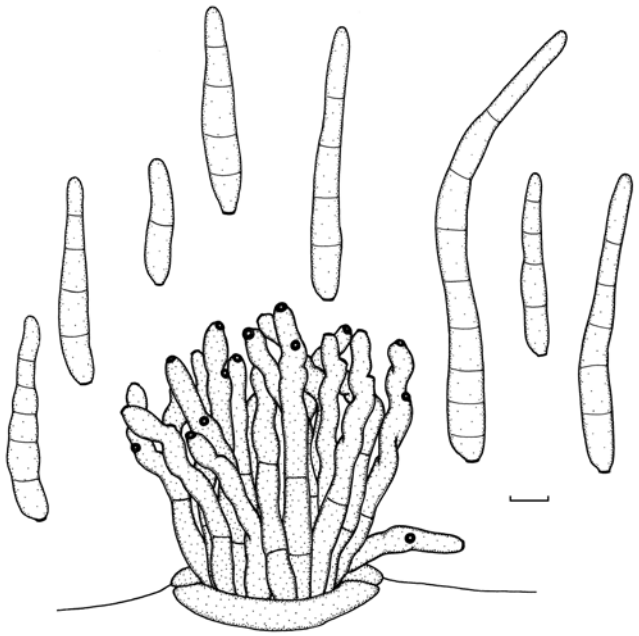


**Fig. 362.** *Cercospora callae* (BPI 426184, syntype). Conidiophores and conidia. Scale bar = 10 µm. K. Bensch *del*.

*Lit*.: Saccardo (1886: 367).
*Notes*: Excluded, probably galls.

*callae* Peck & Clinton, *in herb*. Fig. 362.
*Specimen*: **USA**, New York, Buffalo, on leaves of *Calla* sp. (*Araceae*), G.W. Clinton (BPI 426184: syntype material of *Cercospora callae* Peck & Clinton).

≡ ***Cercospora callae*** Peck & Clinton, Rep. (Annual) New York State Mus. Nat. Hist. 29: 52. 1876.

*Lit*.: Chupp (1954: 57), Schubert & Braun (2007: 190).
*Ill*.: Schubert & Braun (2007: 191, fig. 1).

*calotropidis* F. Stevens, Trans. Illinois State Acad. Sci. 10: 207. 1917.
*Syntypes*: **Puerto Rico**, on leaves of *Calotropis procera* (*Apocynaceae*), Jul. 1915 (ILL 15842, IMI 19791, K, MICH, PC).

= *Cercospora calotropidis* Ellis & Everh., Rep. (Annual) Missouri Bot. Gard. 9: 120. 1898. [Types: BPI 433953, 433956, IMI 7752 (slide), NY].

≡ *Phaeoramularia calotropidis* (Ellis & Everh.) Kamal, A.S. Moses & R. Chaudhary, Mycol. Res. 94: 716. 1990.

≡ ***Passalora calotropidis*** (Ellis & Everh.) U. Braun, Schlechtendalia 5: 60. 2000.

= *Cercospora microsora* Pat., in R.P. Duss, Champignons de la Guadeloupe, 3e Sér.: 91. 1902, *nom. illeg*., homonym, non *C. microsora* Sacc., 1880.

≡ *Cercospora patouillardii* Sacc., Syll. fung. 18: 608. 1906.

= *Cercospora calotropidis* Lingelsh., Bot. Jahrb. Syst. 39: 605. 1907, *nom. illeg*., homonym, non *C. calotropidis* Ellis & Everh., 1898.

≡ *Cercospora lingelsheimii* Săvul. & Rayss, Ann. Cryptog. Exot. 8: 49. 1935.

= *Cercospora inconspicua* Pat. & Har., Bull. Soc. Mycol. France 24: 16. 1909. [Type: FH 7807].

= *Napicladium calotropidis* H. Morstatt, Ann. Mycol. 10: 451. 1912.

= *Cercospora calotropidis* Speg., Anales Mus. Nac. Hist. Nat. Buenos Aires 26: 132. 1914, *nom. illeg*., homonym, non C. *calotropidis* Ellis & Everh., 1898.

≡ *Cercosporina calotropidis* Sacc., Syll. fung. 25: 897. 1931, as "(Speg.) Sacc.".

= *Cercospora domingensis* Gonz. Frag. & Cif., Bol. Soc. Esp. Hist. Nat. 26: 339. 1926. [Types: BPI 435826, MA].

*Lit*.: Saccardo (1931: 789, 869, 897), Subramanian (1971: 293), Crous & Braun (2003: 96).

"*cancerogenes* von Niessen, Canceromyces Auct. 1894" (no reference to an original description has been found).
*Type*: Isol. from a cancer of uterus.

*Lit*.: Vuillemin (1931: 77), Nannizzi (1934).
*Notes*: "Wartmann credette di identificarlo con il *C. herbarum* o con una specie vicina, cioè con un saprofita banale" (Nannizzi 1934).

*capsici* Kovatsch., Z. Pflanzenkrankh. Pflanzenschutz 48(7): 335. 1938, *nom. nov*., as "(É.J. Marchal & Steyaert) Kovatsch.".
*Type*: **Democratic Republic of the Congo**, Prov. di l'Equateur, on *Capsicum frutescens* (*Solanaceae*).

≡ *Cercospora capsici* É.J. Marchal & Steyaert, Bull. Soc. Roy. Bot. Belgique 61: 167. 1929, *nom. illeg*., homonym, non *C. capsici* Heald & F.A. Wolf, 1911.

= *Cercospora capsici* Unamuno, Bol. Soc. Esp. Hist. Nat. 32: 161. 1932, *nom. illeg*., homonym, non *C. capsici* Heald & F.A. Wolf, 1911.

≡ *Cercospora unamunoi* Castell., Rivista Agric. Subtrop. Trop. 42: 20. 1948.

≡ *Phaeoramularia unamunoi* (Castell.) Munt.-Cvetk., Lilloa 30: 183. 1960, *nom. inval*.

= *Cercospora capsicicola* Vassiljevsky, Parazitnye nesovershennye griby, Ch. I, Gifomitsety: 344. 1937.

≡ *Phaeoramularia capsicicola* (Vassiljevsky) Deighton, More Dematiaceous Hyphomycetes: 323. 1976.

≡ *Phaeoramularia capsicicola* (Vassiljevsky) Deighton, Trans. Brit. Mycol. Soc. 67: 140. 1976, *comb. superfl*.

≡ ***Passalora capsicicola*** (Vassiljevsky) U. Braun & F. Freire, Cryptog. Mycol. 23: 299. 2002.

*Lit*.: Chupp (1954: 553), Saccardo (1972: 1336), Crous & Braun (2003: 103).

*carpophilum* Thüm., Oesterr. Bot. Z. 27: 12. 1877. Fig. 363.
*Neotype*: **Austria**, Klosterneuburg, on fruits of *Prunus persica* (*Rosaceae*), Aug. 1877, Thümen (PAD).

≡ ***Fusicladium carpophilum*** (Thüm.) Oudem., Verh. Kon. Ned. Akad. Wetensch., Afd. Natuurk., Tweede Sect. 1900: 388. 1900.

≡ *Megacladosporium carpophilum* (Thüm.) Vienn.-Bourg., Les champignons parasite des plantes cultivées 1: 489. 1949.

≡ *Fusicladosporium carpophilum* (Thüm.) Partridge & Morgan-Jones, Mycotaxon 85: 362. 2003.

= *Fusicladium pruni* Ducomet, Thèse Fac. Sci. Paris: 137. 1907.

= *Fusicladium amygdali* Ducomet, Ann. École, Natl. Agric. Rennes 4: 11. 1911.

= *Cladosporium americanum* H.C. Greene, Amer. Midl. Naturalist 41(3): 723. 1949.

= *Venturia carpophila* E.E. Fisher, Trans. Brit. Mycol. Soc. 44: 339. 1961.

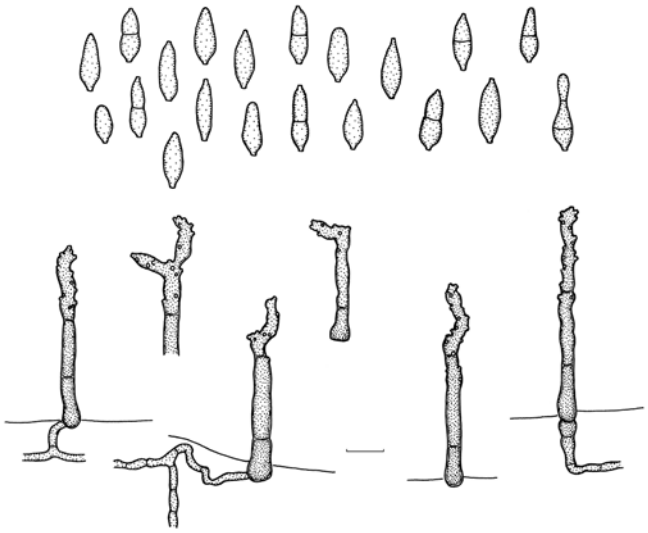


**Fig. 363.** *Fusicladium carpophilum* (WIS, lectotype of *C. americanum*). Conidia and conidiophores. Scale bar = 10 µm. K. Bensch *del*.

*Lit.*: Saccardo (1886: 353), Lind (1913), Ellis (1971: 317), Sivanesan (1974: 75, 1984: 609), Schubert *et al.* (2003: 26, 28–30), Schubert (2005a: 56–57).
*Notes*: "Herb. Mycol. Oecon. 599, Wien, 1877 (LE: syntype)" was cited in error as type by Schubert *et al.* (2003).

*carrionii* Trejos, Revista Biol. Trop. 2: 106. 1954.
*Type*: **Australia** and **Venezuela**, isol. from a case of chromoblastomycosis, (location unknown).
≡ ***Cladophialophora carrionii*** (Trejos) de Hoog, Kwon-Chung & McGinnis, J. Med. Veterin. Mycol. 33: 345. 1995.
= *Cladophialophora ajelloi* Borelli, Pan-Amer. Health Organ. Sci. Publ. 396: 335. 1980.
*Lit.*: Kwon-Chung & Bennett (1992: 350), Ho *et al.* (1999: 147), de Hoog *et al.* (2000: 570), Schell (2003: 578).

*caryigenum* (Ellis & Langl.) Gottwald, Mycologia 74(3): 388. 1982.
*Lectotype* (selected by Schubert *et al.*, 2003): **USA**, Louisiana, St. Martin, on leaves of *Carya illinoensis* (*Juglandaceae*), 3 Sep. 1888, A.B. Langlois, Fl. Ludov. 1499 (NY). *Isolectotypes*: **USA**, Louisiana, St. Martinsville, on leaves of *Carya illinoensis* (*C. olivaeformis*), Sep. 1888, A.B. Langlois (BPI 426315, 426333, M).
≡ ***Fusicladium caryigenum*** Ellis & Langl., J. Mycol. 4: 124. 1888.
= *Fusicladium effusum* G. Winter, J. Mycol. 1: 101. 1885.
*Lit.*: Ho *et al.* (1999), Schubert & Braun (2002a).

*caryigenum* var. *carpineum* (Ellis & Everh.) Gottwald, Mycologia 74(3): 389. 1982, as "*carpinum*", *comb. inval*.
*Lectotype* (selected by Schubert *et al.* 2003): **Canada**, London, on *Carpinus americana* (*Betulaceae*), Oct. 1889, J. Dearness (NY). *Isolectotypes*: DAOM, M.
*Basionym*: *Fusicladium effusum* var. *carpineum* Ellis & Everh., Proc. Acad. Nat. Sci. Philadelphia 1891: 91. 1891.
≡ ***Fusicladium carpineum*** (Ellis & Everh.) U. Braun & K. Schub., IMI Descriptions of Fungi and Bacteria 152, No. 1512. 2002.

*casei* (Johan-Olsen) Sacc. & Traverso, Syll. fung. 19: 296. 1910.
*Type*: **Norway**, in cheese, (location unknown).
*Basionym*: *Dematium casei* Johan-Olsen, Centralbl. Bakteriol., 2. Abth., 3: 280. 1897.
*Lit.*: Saccardo (1913a: 1371).
*Ill.*: Johan-Olsen (1897: tab. 4–5, figs 7–13).
*Notes*: Excluded. A yeast-like fungus, not allied to *Cladosporium*.

*castellanii* Borelli & Marcano, Castellania 1(5): 154. 1973.
*Type*: **Venezuela**, isol. from a patient with "tinea nigra" (IMI 183818).
= ***Stenella araguata*** Syd., Ann. Mycol. 28: 205. 1930.
*Lit.*: McGinnis & Padhye (1978: 415), Crous *et al.* (2007c: 43–45).
*Ill.*: Crous *et al.* (2007c: 44–45, figs 7–8).

*catamarcense* Speg., Anales Soc. Ci. Argent. 10: 63. 1880, as "*catamarcensis*".
*Holotype*: **Argentina**, "in arenosis alpinis de Catamarca", on wilting leaves of *Pachylaena atriplicifolia* (*Asteraceae*) (LPS 13.129).
*Lit.*: Saccardo (1886: 363), Farr (1973).
*Notes*: Excluded, but taxonomic status remains unclear. Type material very sparse.

*cattleyae* Verpl., Meded. Landbouwhoogeschool Opzoekingsstat. Staat Gent 3: 103. 1935.
*Holotype*: **Belgium**, Antwerpen, botanical garden, on dead leaves of *Cattleya mossia* (*Orchidaceae*), 12 Mar. 1935 (GENT).
= ***Dendryphiella vinosa*** (Berk. & M.A. Curtis) Reisinger, Bull. Soc. Mycol. France 84(1): 27. 1968.
*Lit.*: Schubert & Braun (2004: 313–314).

*cellare* (Pers.) Schanderl, Zentralbl. Bakteriol., 2. Abt., 94: 117. 1936.
*Type*: From a wine vault.
*Basionym*: *Racodium cellare* Pers., Neues Mag. Bot. 1: 123. 1794.
≡ ***Zasmidium cellare*** (Pers.) Fr., Summa veg. Scand. 2: 407. 1849.
≡ *Rhinocladiella cellaris* (Pers.) M.B. Ellis, Dematiaceous Hyphomycetes: 248. 1971.
= *Byssus septica* Roth, Fl. Germ. 1: 516. 1788.
= *Byssus mollissima* Ehrh., Pl. Crypt. Linn., No. 217. 1790.
= *Byssus cryptarum* DC., Fl. franç. 2: 67. 1805.
= *Antennaria cellaris* Fr., Syst. mycol. 3: 229. 1832.
= *Rhinocladiella ellisii* Hawksw., Taxon 26(2–3): 208. 1977.
*Lit.*: Gonzáles-Fragoso (1927: 249), de Vries (1952), Barron (1968: 266), Arzanlou *et al.* (2007).
*Notes*: The well-known wine-cellar fungus does not belong in *Cladosporium s. str.* Using molecular approaches, Arzanlou *et al.* (2007) showed that this fungus clusters within the *Mycosphaerellaceae* clade (*Capnodiales*). Morphologically it is close to *Stenella*. The type species of *Stenella* (*S. araguata*) clusters, however, within *Teratosphaeriaceae* (*Capnodiales*) (Crous *et al.* 2007c). Based on phylogenetic as well as phenotypic characters, *Zasmidium* proved to be the oldest genus name for *Stenella*-like anamorphs belonging to *Mycosphaerellaceae* (Arzanlou *et al.* 2007). Although taxa with a *Zasmidium*-like morphology appear to be paraphyletic within the *Mycosphaerellaceae* (Crous *et al.* 2009a, b), these taxa should be separated from *Stenella*, which has a different scar structure (pileate conidiogenous loci versus planate, cercosporoid loci in *Zasmidium*) and belongs to the *Teratosphaeriaceae*.

*cerasi* (Rabenh.) Aderh., Centralbl. Bakteriol., 2. Abth., 7: 656. 1901.
*Iconotype*: **Germany**, Borussia, on fruits of *Prunus cerasus* (*Rosaceae*) (Braun 1853: Tab. 1, B, 1–2).
*Basionym*: *Acrosporium cerasi* Rabenh., Verh. Vereins Beförd. Gartenbaues Königl. Preuss. Staaten 1: 176. 1853.
≡ ***Fusicladium cerasi*** (Rabenh.) Erikss., Meddeland. Kongl. Lantbruksakad. Exp.-fält 1: 73. 1885.

≡ *Fusicladium cerasi* (Rabenh.) Sacc., Syll. fung. 4: 346. 1886. *comb. superfl.*
≡ *Fusicladiopsis cerasi* (Rabenh.) Karak. & Vassiljevsky, Parazitnye nesovershennye griby, Ch. I. Gifomitsety: 210. 1937.
≡ *Megacladosporium cerasi* (Rabenh.) Vienn.-Bourg., Les champignons parasites des plantes cultivées 1: 537. 1949.
≡ *Karakulinia cerasi* (Rabenh.) N.P. Golovina, Novosti Sist. Nizsh. Rast. 1: 213. 1964.
= *Venturia cerasi* Aderh., Landw. Jahrb. 29: 541. 1900.

*Lit.*: Sivanesan & Holliday (1981), Sivanesan (1984), Schubert *et al.* (2003: 33–35).

*cercestidis* Deighton, Mycol. Res. 94(4): 570. 1990, non *Zasmidium cercestidis* (J.M. Yen & Gilles) U. Braun, 2010.
*Holotype*: **Sierra Leone**, Njala (Kori), on living leaves of *Cercestis congensis* (*Araceae*), 25 Apr. 1934, F.C. Deighton (IMI 7735).
≡ *Stenella cercestidis* (Deighton) U. Braun, Schlechtendalia 5: 54. 2000, as "*cercestis*", *nom. illeg.*, non *S. cercestidis* (J.M. Yen & Gilles) Deighton, 1979.
≡ *Stenella deightoniana* U. Braun, Mycotaxon 92: 404. 2005.
≡ ***Zasmidium deightonianum*** (U. Braun) U. Braun, Schlechtendalia 20: 100. 2010.

*cerophilum* (Tubaki) Matsush., Icones Microfungorum a Matsushima Lectorum: 34. 1975.
*Type*: **Japan**, on the blackened (originally white), powdery wax layer under the leaf sheathes of *Sasa* sp. (*Poaceae*), May 1955 (preserved in Nagao Institute).
*Basionym*: *Acrotheca cerophila* Tubaki, J. Hattori Bot. Lab. 20: 143. 1958.
≡ ***Ramichloridium cerophilum*** (Tubaki) de Hoog, Stud. Mycol. 15: 74. 1977.

*chaetomium* Cooke, Grevillea 17(83): 66. 1889.
*Type*: **USA**, New Jersey, Newfield, on leaves of *Euphorbia* sp. (*Euphorbiaceae*), J.B. Ellis, No. 2289 (K).
≡ *Cercosporidium chaetomium* (Cooke) Deighton, Mycol. Pap. 112: 27. 1967.
≡ ***Passalora chaetomium*** (Cooke) Arx, Proc. Kon. Ned. Akad. Wetensch. C, 86(1): 44. 1983.
≡ *Passalora chaetomium* (Cooke) Poonam Srivast., J. Liv. World 1(2): 114. 1994, *comb. inval.*
= *Scolecotrichum* ? *euphorbiae* Tracy & Earle, Bull. Torrey Bot. Club 23: 209. 1896. [Type: NY].
≡ *Pyricularia euphorbiae* (Tracy & Earle), G.F. Atk., Cornell Univ. Sci. Bull. 3(1): 40. 1897.

*Lit.*: Saccardo (1892: 602), Ellis (1971: 281), Crous & Braun (2003: 445).

*chlamydeum* Cif. & Redaelli, Mycopathol. Mycol. Appl. 8: 18. 1957.
*Type*: From skin of *Canis*.
*Notes*: "Material probably lost; judging from the description this was *Moniliella suaveolens*" (de Hoog *et al.* 2000).

*chlamydospora* Matsush., Icones Microfungorum a Matsushima Lectorum: 34. 1975, as "*chlamydosporis*".
*Holotype*: **Japan**, Osaka, Ibaraki City, from garden soil, May 1967 (Herb. Osaka 1047).
≡ ***Devriesia chlamydospora*** (Matsush.) Seifert & N.L. Nickerson, Canad. J. Bot. 82: 922. 2004.

Ill.: Matsushima (1975: Pl. 55, fig. 3).

*chlorocephalum* (Fresen.) E.W. Mason & M.B. Ellis, Mycol. Pap. 56: 123. 1953. Figs 364, 365.
*Holotype*: On dead stems of *Paeonia* sp. (*Paeoniaceae*) (not preserved).

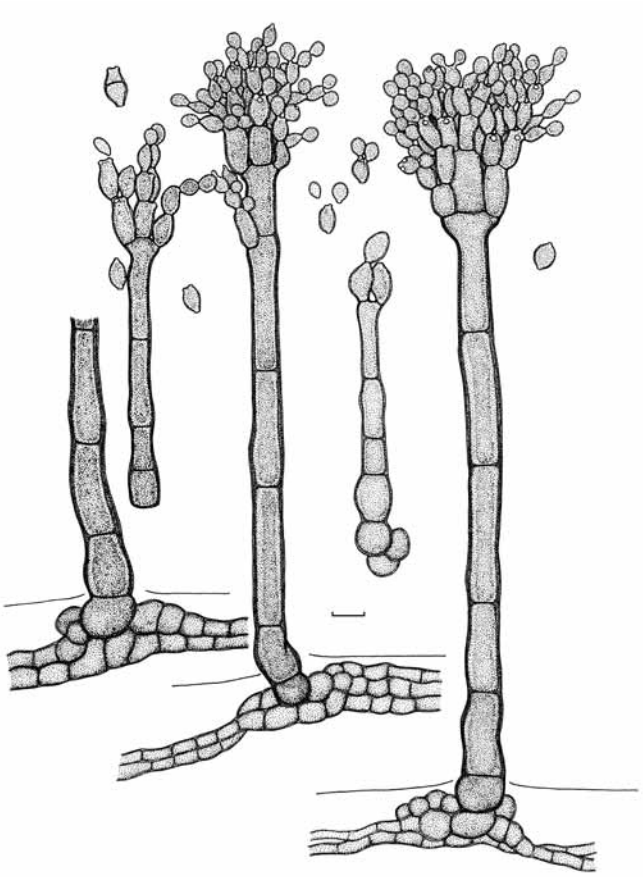


**Fig. 364.** *Graphiopsis chlorocephalum* (HAL 1924 F). Periconioid, stem rotting morph. Conidiophores and conidia. Scale bar = 10 µm. K. Bensch *del.*

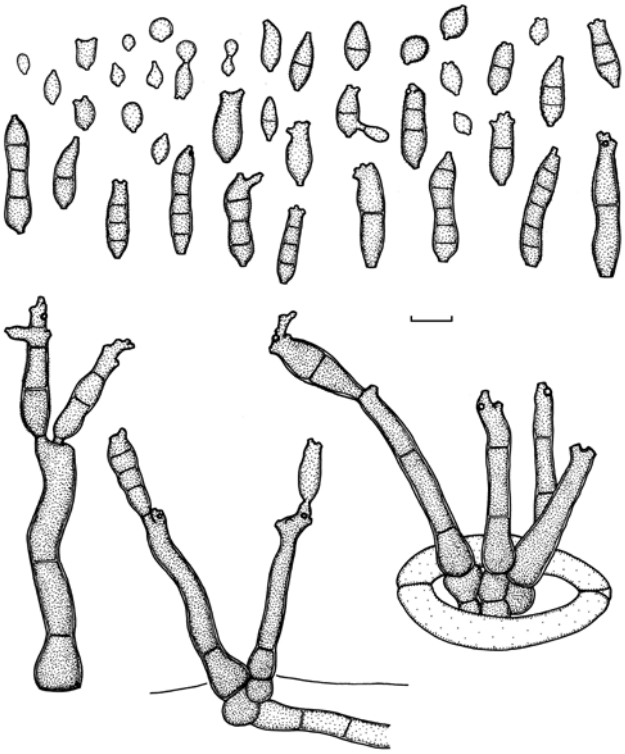


**Fig. 365.** *Graphiopsis chlorocephalum* (HAL 2011 F). Cladosporioid, leaf-spotting morph. Conidiophores and conidia. Scale bar = 10 µm. K. Bensch *del.*

*Neotype*: **Germany**, Sachsen-Anhalt, Halle (Saale), Botanical Garden, on dead stems of *Paeonia officinalis*, 22 Jun. 2005, K. Schubert (HAL 1924 F). *Isoneotype*: CBS H-19869. *Ex-type culture*: CBS 121523.

*Basionym*: *Periconia chlorocephala* Fresen., Beitr. Mykol. 1: 21. 1850.

≡ *Haplographium chlorocephalum* (Fresen.) Grove, Sci. Gossip 21: 198. 1885.

≡ ***Graphiopsis chlorocephala*** (Fresen.) Trail, Scott. Naturalist (Perth) 10: 75. 1889.

≡ *Dichocladosporium chlorocephalum* (Fresen.) K. Schub., U. Braun & Crous, Stud. Mycol. 58: 96. 2007.

= *Cladosporium paeoniae* Pass., in Thümen, Herb. Mycol. Oecon., Fasc. IX, No. 416. 1876 and Just's Bot. Jahresber. 4: 235. 1876.

= *Periconia ellipsospora* Penz. & Sacc., Atti Reale Ist. Veneto Sci. Lett. Arti, Ser. 6, 2: 596. 1883–1884.

= *Cladosporium paeoniae* Pass. var. *paeoniae-anomalae* Sacc., Syll. fung. 4: 362. 1886.

= *Haplographium chlorocephalum* (Fresen.) Grove var. *ovalisporum* Ferraris, Flora Ital. Crypt., Pars I, Fungi, Fasc. 13: 875. 1914.

*Lit.*: Saccardo (1886: 362), Lindau (1907: 822), Ferraris (1912: 348), Lind (1913: 524), de Vries (1952: 94), Ellis (1971: 309), Subramanian (1971: 296–297), Ellis & Ellis (1985: 395), McKemy & Morgan-Jones (1991a), Ho *et al.* (1999: 120), Schubert *et al.* (2007a), Braun *et al.* (2008a: 208–209).

*Ill.*: Fresenius (1850: tab. 4, figs 10–15), Mason & Ellis (1953: 124–125, figs 42–43), Ellis (1971: 310, fig. 214 B), McKemy & Morgan-Jones (1991a: 137, fig. 1; 139, pl. 1; 141, fig. 2; 143, pl. 2), Ho *et al.* (1999: 122, fig. 7), Schubert *et al.* (2007a: 98–100, figs 2–4).

*chodatii* (Nechitsch) Sacc. & D. Sacc., Syll. fung. 18: 577. 1906.

*Type*: On fermentated rice (*Oryza*, *Poaceae*).

*Basionym*: *Dematium chodatii* Nechitsch, Inst. Bot. Univ. Genève, Ser. 6, 5: 22. 1904, as "*chodati*".

≡ ***Candida chodatii*** (Nechitsch) Berkhout, Die schimmelgeschlachten *Monilia*, *Oidium*, *Oospora* en *Torula*: 54. 1923.

= *Pullularia pullulans* (de Bary) Berkhout, Die schimmelgeschlachten *Monilia*, *Oidium*, *Oospora* en Torula: 55. 1923.

*Lit.*: Bilgrami *et al.* (1991).

*Ill.*: Nechitsch (1904: 23–25, figs 4–6).

*Notes*: Type material could not be traced and is probably not preserved. A collection from BPI ("Transfer on Malt. Received from Dr. Westerdijk, May 5, 1911", BPI 426369), on which the combination *Candida chodatii* had probably been based, was examined. Subramanian (1971) cited the species as possible synonym of *Aureobasidium oleae*, now regarded as *A. pullulans* var. *pullulans*. The close affinity to *Aureobasidium* can be confirmed. Brummitt & Powell (1992) cited the name of this author as "Nechitsche", but in the original publication from 1904 his name is given as "Nechitsch".

*cinnamomeum* → *cinnamomi*

*cinnamomi* (Racib.) Höhn., in Kabát & Bubák, Fungi Imperf. Exs., Fasc. XIII, No. 643. 1910, as "*cinnamomeum*".

*Syntype*: **Indonesia**, Java, Buitenzorg, Tjenkumeh, on *Cinnamomum* sp. (*Lauraceae*), 1908, F. v. Höhnel, Kabát & Bubák, Fungi Imperf. Exs. 643 (*e.g.*, PC).

*Basionym*: *Scolecotrichum cinnamomi* Racib., Paras. Alg. Pilz. Javas: 40. 1900, as "*cinnamomeum*".

≡ *Stenella cinnamomi* (Racib.) U. Braun, Schlechtendalia 8: 37. 2002, as "*cinnamomea*".

≡ ***Zasmidium cinnamomi*** (Racib.) Kamal & U. Braun, *Cercosporoid fungi of India*: 240. 2010.

= *Stenella cinnamomi* Hosag. & U. Braun, Indian Phytopathol. 48: 261. 1995.

*circinalis* Grüss, Wochenschr. Brauerei 48(7): 67. 1931.

*Type*: On the surface of wort (location unknown).

*Notes*: From Grüss (1931): "Die Sporen entstehen am Ende der Hyphen in Kettenform oder durch Verschiebung in kleine Häufchen." This collapse of chains into heads does not sound like *Cladosporium*.

*citri* Briosi & Farneti, Atti Ist. Bot. Univ. Pavia, Ser. 2, 10: 19. 1907, *nom. illeg.*, homonym, non *C. citri* Massee, 1899.

*Type*: **Italy**, Sicily, on fruits of *Citrus medica* (= *C.* ×*limon*) (*Rutaceae*).

≡ *Cladosporium farnetianum* Sacc., Syll. fung. 22: 1366. 1913.

≡ *Kurosawaia citri* Hara, List of Japanese Fungi, ed. 4: 172. 1954, *nom. nov.*, as "(Briosi & Farneti) Hara".

*Lit.*: Ferraris (1912: 347).

*Notes*: It is not a *Cladosporium*, but maybe *Sphaceloma fawcetii*.

*citri* Penz. – an error. See Fawcett (1910 and 1936: 536).

*cladrastidis* Naumov, Bull. Soc. Mycol. France 30: 80. 1914.

*Holotype*: **Russia**, Far East, Yuzhno-Ussurijskij Kraj, on leaves of *Maackia amurensis* (= *Cladrastis amurensis*) (*Fabaceae*), 24 Jul. 1912, No. 10, N. Naumov (PC).

= *Cercospora cladrastidis* Jacz., Hedwigia 39: 123. 1900. [Types: HBG, LE 40382].

≡ ***Pseudocercospora cladrastidis*** (Jacz.) J.K. Bai & M.Y. Cheng, Acta Mycol. Sin. 11: 121. 1992.

*Lit.*: Saccardo (1931: 792), Crous & Braun (2003: 126).

*clappieri* – listed in Unesco (1955).

*Notes*: Uncertain species, type material could not be traced.

*coelosporum* Spreng., Syst. veg. 4(1): 553. 1827, *nom. superfl.*

*Type*: **Germany**, on stems of *Gramineae* (*Poaceae*), (location unknown).

= *Dematium articulatum* Pers., Neues Mag. Bot. 1: 121. 1794.

= *Helminthosporium carispermum* Link, ?, as "*Helmisporium*".

*Notes*: This is a superfluous name since *Dematium articulatum* was cited as synonym. The latter name was also cited as synonym of *C. fasciculare*. A sample deposited in the herbarium of Fresenius as *C. coelosporum* has been examined (on old pods, "Fl. Fr. no. 963", J. Becker, FR), and proved to be *C. herbarum*.

*compactum* Berk. & M.A. Curtis, Grevillea 3(27): 106. 1875.

*Types*: **North America**, on leaves of *Arundinaria* sp. (*Poaceae*), No. 3767 (IMI 69771, K, STR).

≡ *Cercosporidium compactum* (Berk. & M.A. Curtis) Deighton, Mycol. Pap. 112: 59. 1967.

≡ ***Passalora compacta*** (Berk. & M.A. Curtis) U. Braun & Crous, *Mycosphaerella* and its anamorphs: 1. Names published in *Cercospora* and *Passalora*, CBS Biodiversity Ser. 1: 133. 2003.

= *Cercospora scolecotrichoides* G.F. Atk., Cornell Univ. Sci. Bull. 3(1): 46. 1897. [Types: CUP, IMI 95405].

*Lit.*: Saccardo (1886: 364), Lindau (1907: 833).

*confusum* Matsush., Matsushima Mycol. Mem. 3: 4. 1983.

*Type*: **Canada**, Ontario, on bark of *Acer saccharum* (*Sapindaceae*).

*Ill.*: Matsushima (1983: 28–29, figs 145–147).

*Notes*: Matsushima (1983) depicts phialosporous form.

*congestum* Berk. & Broome, J. Linn. Soc., Bot. 14: 99. 1873, 1875.

*Types*: **India**, Ceylon, on leaves of *Litsea* (*Lauraceae*) (K 115280, PC).

= ***Spiropes scopiformis*** (Berk.) M.B. Ellis, Mycol. Pap. 114: 30. 1968.

*Lit*.: Saccardo (1886: 359).
*Notes*: See *C. scopiforme*. The material from PC reads: in Litzoa, Ceylon [Sri Lanka], *Dothidea*, Berkeley.

*coralloides* W. Yamam., Sci. Rep. Hyogo Univ. Agric., Ser. Agric. 4(1): 5. 1959, *nom. inval*.
*Type*: **Japan**, isol. from *Ficus carica* (*Moraceae*) and *Oryza sativa* (*Poaceae*).
*Lit*.: Ho *et al.* (1999: 125), Bensch *et al.* (2010).
*Ill*.: Yamamoto (1959: 6, figs 17–20), Ho *et al.* (1999: 124, figs 12–13).
*Notes*: This species was not validly published, because the author did not designate a type. The "lectotype" chosen in Ho *et al.* (1999) is also incorrect since it is not an element from the protologue of the original description. Hence, a formal validation of this name is necessary, which will be proposed in a separate paper based on a re-examination of this fungus. Excluded, but generic affinity not yet clear.

*coreopsidis* H.C. Greene, Trans. Wisconsin Acad. Sci. 45: 190. 1956. Fig. 366.
*Lectotype* (**designated here**): **USA**, Wisconsin, Dane Co., Madison, University of Wisconsin Arboretum, on living leaves of *Coreopsis palmata* (*Asteraceae*), 27 Jun. 1955 (WIS). *Isolectotype*: BPI 426392.
≡ ***Fusicladium coreopsidis*** (H.C. Greene) K. Schub. & U. Braun, Mycotaxon 92: 67. 2005.
*Ill*.: Schubert (2005a: 68, fig. 7).

*cornigenum* Bubák, Ann. K.K. Naturhist. Hofmus. 23: 106. 1909.
*Holotype*: **Turkey**, Stephanos, near Trapezunt, on living leaves of *Cornus australis* (= *C. sanguinea* ssp. *australis*, *Swida australis*) (*Cornaceae*), 7 Jul. 1907, Handel-Mazzetti, No. 214 (BPI 426393).
*Lit*.: Saccardo (1913a: 1367).
*Notes*: Excluded, conidiogenous cells probably monophialidic.

*cubense* R.F. Castañeda, Fungi Cubensis II: 4. 1987.
*Holotype*: **Cuba**, prov. Guantánamo, Maisí, on fallen leaves of *Ficus* sp. (*Moraceae*), 24 Apr. 1986, Mayra Camino (INIFAT C86/134). *Isotype*: HAL 2019 F.
≡ ***Penidiella cubensis*** (R.F. Castañeda) U. Braun, Crous & R.F. Castañeda, Stud. Mycol. 58: 19. 2007.
*Ill*.: Castañeda (1987: fig. 8), Crous *et al.* (2007b: 21, fig. 10).

*cubisporum* Berk. & M.A. Curtis, Grevillea 3(27): 107. 1875.
*Type*: **USA**, Maine, on *Ribes* sp. (*Grossulariaceae*), Rev. J. Blake, No. 6318 (K).
≡ *Coremiella cubispora* (Berk. & M.A. Curtis) M.B. Ellis, Dematiaceous Hyphomycetes: 33. 1971.
≡ ***Briosia cubispora*** (Berk. & M.A. Curtis) Arx, Antonie van Leeuwenhoek J. Microbiol. Serol. 38(3): 293. 1972.
*Lit*.: Saccardo (1886: 355).

*cumulus* Preuss, Linnaea 25: 726. 1851, as "*cumulum*".
*Holotype*: **Germany**, Hoyerswerda, on fallen branches, C.G.T. Preuss 382 (B 700006229).
*Lit*.: Saccardo (1886: 356), Lindau (1907: 810).
*Notes*: Excluded. This is a dictyosporous, *Stempylium*-like hyphomycete.

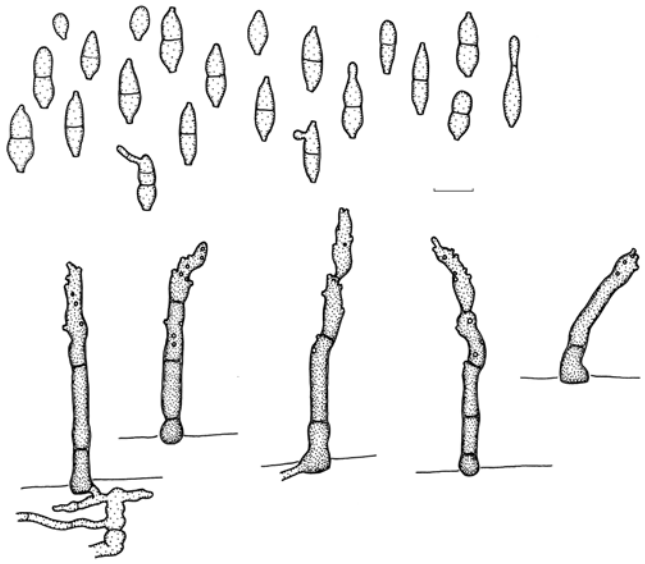


**Fig. 366.** *Fusicladium coreopsidis* (WIS, lectotype of *C. coreopsidis*). Conidia and conidiophores. Scale bar = 10 µm. K. Bensch *del.*

*cyclaminis* Massey & Tilford, Phytopathology 22(1): 19. 1932.
*Lectotype*: **USA**, on *Cyclamen* sp. (*Primulaceae*), "received Aug. 1932 from L.M. Massey" (BPI 426434, part of type culture).
= ***Ramularia cyclaminicola*** Trel., Trans. Illinois State Acad. Sci. 9: 145. 1916. [Type: ILL 14246: holotype].
*Lit*.: Baker *et al.* (1950), Braun (1998: 226), Zhang *et al*. (1999b: 38).
*Notes*: This species, previously only known from North America, has recently been reported from Asia (China) by Zhang *et al.* (1999b).

*cyttariicola* Speg., Physis (Buenos Aires) 7(23): 20. 1923, as "*cyttariicolum*".
*Holotype*: **Argentina**, Tierra del Fuego, Puerto Garibaldi, on *Cyttaria harioti* (*Cyttariaceae*, *Ascomycetes*) (LPS 13.078).
*Lit*.: Farr (1973: 251, as "*cyttariicolum*"), Heuchert *et al.* (2005: 63).
*Notes*: Excluded, no *Cladosporium s. str.*, but status unclear.

*daphniphylli* Sawada, Rep. Gov. Res. Inst. Formosa 85: 91. 1943, *nom. inval*.
*Holotype*: **Taiwan**, on *Daphniphyllum glaucescens* (*Daphniphyllaceae*), 8 Feb. 1931, K. Sawada (PPMH).
*Notes*: Diagnosis only in Japanese, not validly published. Excluded, but generic affinity not yet clear.

*decolorans* McAlpine, *in herb*.
*Specimen*: **Australia**, on *Cynosurus cristatus* (*Poaceae*) (VPRI).

*dematiosum* Ellis & Langl., *in herb*.
*Specimen*: **USA**, Louisiana, St. Martin, on rotten stems of oak (*Quercus* sp., *Fagaceae*), 23 Mar. 1888, A.B. Langlois, Fl. Ludoviciana 1264 (NY).
*Notes*: Excluded, not *Cladosporium*. Status unclear. Specimen in Myc. Coll. (Cash 1952: 68).

*dendriticum* Desm. – Gola (1930).

*dendriticum* Wallr., Fl. crypt. Germ. 2: 169. 1833.
*Syntypes*: **Germany**, Thuringia, on leaves of *Pyrus sylvestris* (= *Malus malus*) (*Rosaceae*) (B, STR).
≡ *Fusicladium dendriticum* (Wallr.) Fuckel, Jahrb. Nassauischen Vereins

Naturk. 23–24: 357. “1869”, 1870.
≡ *Passalora dendritica* (Wallr.) Sacc., Mycoth. Ven., Cent. XII, No. 1246. 1876. [*Michelia* 1(2): 265. 1878].
= *Venturia inaequalis* (Cooke) G. Winter, Hedwigia 36: 81. 1897.
= ***Fusicladium pomi*** (Fr.) Lind, Dan. fung.: 521. 1913.

*Lit.*: Cooke (1871: 583), Saccardo (1886: 345), Lindau (1907: 779), Sivanesan (1984: 616, as *Spilocaea pomi*), Ritschel (2001), Crous & Braun (2003: 485), Schubert *et al.* (2003: 76).
*Notes*: Further synonyms are given in Schubert *et al.* (2003).

*dendriticum* Wallr. var. ß *orbiculatum* Berk., Gard. Chron. 1848: 716. 1848 (?).
*Lit.*: Cooke (1871: 583).
*Notes*: “Gard. Chron. 1848: 716 (1848)” has been checked, but the name “var. *orbiculatum*” is not present.

*dendriticum* Wallr. var. *heteromeles* Harkn., 1881, *in herb*.
*Specimen*: **USA**, California, on *Heteromeles arbutifolia* (*Rosaceae*), Jun. 1881 (BPI 426448).
= ***Fusicladium pomi*** (Fr.) Lind, Dan. fung.: 521. 1913.
*Lit.*: Ritschel (2001), Schubert *et al.* (2003: 76).

*dendryphioides* Ellis, *in herb*.
*Specimen*: **USA**, New Jersey, on *Phytolacca* sp. (*Phytolaccaceae*).
*Notes*: Specimen in Myc. Coll. (Cash 1952).

*depressum* Berk. & Broome, Ann. Mag. Nat. Hist., Ser. 2, 7: 99. 1851.
*Type*: **UK**, on *Angelica sylvestris* (*Apiaceae*) (K).
≡ ***Passalora depressa*** (Berk. & Broome) Sacc., Nuovo Giorn. Bot. Ital. 8: 187. 1876.
≡ *Fusicladium depressum* (Berk. & Broome) Roum., Fungi Sel. Gall. Exs., No. 86. 1879.
≡ *Scolecotrichum depressum* (Berk. & Broome) J. Schröt., Krypt.-Fl. Schlesien, Bd. 3(2), Heft 4: 497. 1897.
≡ *Cercospora depressa* (Berk. & Broome) Vassiljevsky, Parazitnye nesovershennye griby, Ch. I, Gifomicety: 385. 1937.
≡ *Megacladosporium depressum* (Berk. & Broome) Vienn.-Bourg., Les champignons parasites des plantes cultivées 2: 1488. 1949, *comb. inval.*
≡ *Cercosporidium depressum* (Berk. & Broome) Deighton, Mycol. Pap. 112: 37. 1967.
≡ *Passalora depressa* (Berk. & Broome) Poonam Srivast., J. Liv. World 1(2): 114. 1994, *comb. inval.*
= *Passalora polythrincioides* Fuckel, Jahrb. Nassauischen Vereins Naturk. 23–24: 353. “1869”, 1870. [Type: Fuckel, Fungi Rhen. Exs. 103, *e.g.*, HAL].
= *Fusicladium peucedani* Syd. & P. Syd., Ann. Mycol. 5: 340. 1907, *nom. illeg.*, homonym, non *F. peucedani* Ellis & Holw., 1895. [Type: B, S].
= ? *Mycosphaerella angelicae* Woron., Věstn. Tiflissk. Bot. Sada 28: 17. 1913.
= ? *Cercospora depressa* f. *angelicae* Dzhanuz., Trudy Vsesoyuzn. Inst. Zashch. Rast. 19: 9. “1963”, 1964.
*Lit.*: Cooke (1871: 584), Lindau (1907: 786), Oudemans (1923), Crous & Braun (2003: 157).

*devriesii* A.A. Padhye & Ajello, Sabouraudia 22(5): 430. 1984.
*Type*: **Cayman Islands**, from breast of *Homo sapiens*. *Ex-type culture*: ATCC 56280 = CBS 147.84.
≡ ***Cladophialophora devriesii*** (A.A. Padhye & Ajello) de Hoog, Kwon-Chung & McGinnis, J. Med. Veterin. Mycol. 33: 344. 1995.
*Lit.*: Kwon-Chung & Bennett (1992: 645), Ho *et al.* (1999: 147), de Hoog *et al.* (2000: 573), Schell (2003: 578).

*effusum* Berk. & M.A. Curtis, Grevillea 3(27): 106. 1875.
*Lectotype*: **USA**, South Carolina, Society Hill, on *Persicaria punctata* (≡ *Polygonum punctatum*) (*Polygonaceae*), No. 3775 (K). *Isolectotype*: IMI 104922.
≡ *Cercospora effusa* (Berk. & M.A. Curtis) Ellis, J. Mycol. 1: 53. 1885.
≡ *Didymaria effusa* (Berk. & M.A. Curtis) Solheim, Illinois Biol. Monogr. 12: 65. 1930.
≡ ***Passalora effusa*** (Berk. & M.A. Curtis) U. Braun, Mycotaxon 55: 231. 1995.
= *Cercospora polygonorum* Cooke, Hedwigia 17: 39. 1878. [Type: K].
≡ *Pseudocercospora polygonorum* (Cooke) Y.L. Guo & X.J. Liu, Mycosystema 4: 110. 1991.
= *Helminthosporium hydropiperis* Thüm., Rev. Mycol. (Toulouse) 1: 60. 1879. [Types: Thümen, Mycoth. Univ. 1087, *e.g.*, HAL].
≡ *Cercospora hydropiperis* (Thüm.) Speg., Bol. Acad. Nac. Ci. 9: 191. 1880.
*Lit.*: Saccardo (1886: 362, 447), Chupp (1954: 451, as *Cercospora polygonorum*), Deighton (1986: 637), Crous & Braun (2003: 170).
*Notes*: In the original diagnosis three collections on different hosts were mentioned, Deighton (1986) designated the collection on *Polygonum* as lectotype. The specimens on *Lobelia* species refer to a similar, but distinct *Passalora*.

*effusum* (G. Winter) Demaree, J. Agric. Res. 37: 186. 1928, *nom. illeg.*, homonym, non *C. effusum* Berk. & M.A. Curtis, 1875.
*Holotype*: **USA**, Illinois, Cobden Zels., on *Carya tomentosa* (= *Carya alba*) (*Juglandaceae*), 1 Oct. 1882, F.S. Earle (B).
≡ ***Fusicladium effusum*** G. Winter, J. Mycol. 1: 101. 1885.
≡ *Fusicladosporium effusum* (G. Winter) Partridge & Morgan-Jones, Mycotaxon 85: 364. 2003.
= *Fusicladium caryigenum* Ellis & Langl., J. Mycol. 4: 124. 1888. [Types: BPI, M, NY].
≡ *Cladosporium caryigenum* (Ellis & Langl.) Gottwald, Mycologia 74(3): 388. 1982.
*Lit.*: Schubert & Braun (2002a), Schubert *et al.* (2003: 41–43).

*elaeagnus* Gapon., Uzbekistan Biol. Zurn. ?, 1964.
*Type*: **Uzbekistan**, Bucharskaya Oblast, on *Elaeagnus* (*Elaeagnaceae*).
*Lit.*: Sagdullaeva *et al.* (1990: 47).
*Ill.*: Sagdullaeva *et al.* (1990: 48).
*Notes*: This name and incomplete reference was cited in Sagdullaeva *et al.* (1990: 47). The name is not listed in Index fungorum and MycoBank. V.A. Mel’nik checked the volumes of this journal for several years before and after 1964, but failed to find this name, which has undoubtedly never been published.

*elatum* (Harz) Nannf., Svenska Skogsvardsfoereren Tidskr. 32(3–4): 397. 1934.
*Type*: **Germany**, on an old stump (location unknown).
*Basionym*: *Hormodendrum elatum* Harz, Bull. Soc. Imp. Naturalistes Moscou 44(1): 140. 1871.
≡ *Cadophora elatum* (Harz) Nannf., Svenska Skogsvardsfoereren Tidskr. 32(3–4): 422. 1934.
≡ ***Ochrocladosporium elatum*** (Harz) Crous & U. Braun, Stud. Mycol. 58: 46. 2007.
*Lit.*: de Vries (1952: 67), Ellis (1976: 326), Matsushima (1983: 4), Ho *et al.* (1999: 127), de Hoog *et al.* (2000: 585).
*Ill.*: de Vries (1952: 67, fig. 14), Minoura (1966: 141, fig. 4A), Ellis (1976: 327, fig. 245 B), Matsushima (1983: 26–27, figs 143–144), Ho *et al.* (1999: 126, fig. 17), de Hoog *et al.* (2000: 585–586, figs), Crous *et al.* (2007c: 48, fig. 10).

*elegans* Matsush., Icones Microfungorum a Matsushima Lectorum: 35. 1975, *nom. illeg.*, homonym, non *C. elegans* Penzig, 1882.
*Type*: **Japan**, Yaku Island, Kagoshima, isol. from garden soil, Jul. 1971 (Matsush. herb. 4109).
*Ill.*: Matsushima (1975: pl. 43).
*Notes*: Excluded, no true *Cladosporium*, but generic affinity not yet clear. Zhang *et al.* (2003) reduced *C. elegans* Matsush. to

synonymy with *C. elegans* Penz., but the latter species proved to be a synonym of *C. herbarum* and is therefore quite distinct.

*elegans* var. *singaporense* Sacc., Bull. Orto. Bot. Regia Univ. Napoli 6: 60. 1921.
*Holotype*: **Singapore**, Botanical Garden, on leaves of *Citrus acida* (*Rutaceae*), Aug. 1917, Baker, No. 4985 (PAD).
= *Helminthosporium guareicola* F. Stevens, Bot. Gaz. 65: 241. 1918.
≡ ***Spiropes guareicola*** (F. Stevens) Cif., Sydowia 9: 303. 1955.
≡ *Pleurophragmium guareicola* (F. Stevens) S. Hughes, Canad. J. Bot. 36: 797. 1958.
*Lit*.: Saccardo (1931: 795), Schubert & Braun (2005a: 107).

*elsinoës* H.C. Greene, Trans. Wisconsin Acad. Sci. 47: 127. 1958.
*Lectotype* (selected by Heuchert *et al.* 2005): **USA**, Wisconsin, Lafayette Co., Ipswich near Platteville, on fructifications of *Elsinoë wisconsinensis* (*Elsinoaceae*) on *Desmodium illinoense* (*Fabaceae*), 16 Aug. 1951, H.C. Greene (WIS). *Isotypes*: BPI 426465A, BPI 426465B.
= ***Dendryphiella infuscans*** (Thüm.) M.B. Ellis, Dematiaceous Hyphomycetes: 500. 1971.
*Lit*.: Heuchert *et al.* (2005: 63–64).
*Ill*.: Heuchert *et al.* (2005: 64, fig. 25).

*entoxylinum* Corda, Icon. fung. 1: 14. 1837.
*Holotype*: **Czech Republic**, Reichenberg, on wood of *Pinus* sp. (*Pinaceae*), Corda (PRM 155726).
*Lit*.: Saccardo (1886: 353), Lindau (1907: 811, 1910: 796), Oudemans (1919, 1923).
*Ill*.: Corda (1837: tab. 3, fig. 202).
*Notes*: Excluded, no *Cladosporium s. str.* The conidiogenous cells are unilocal, determinate or occasionally percurrent, the conidiogenous loci and conidial hila are unthickened and non-coronate. This species is rather *Taeniolella/Xylohypha*-like. Several collections under "*Cladosporium entoxylinum*" proved to be *C. herbarum s. lat.* (*e.g.*, on wood of *Abies excelsa*, Bohemia, Krypt. Exs. 2837, PRM 481966; on wood of *Carpinus betulus*, Austria, Wiener Wald, May 1936, K. Keissler, PRM 657474). The fungus described and illustrated from China by Zhang *et al.* (2003) as "*Cladosporium entoxylinum*" is quite distinct and the name is misapplied. Oudemans (1923) listed *C. entoxylinum* as pathogen of *Sambucus racemosa* (*Caprifoliaceae*).

*epacridis* McAlpine, Victoria Naturalist 17(10): 186. 1901.
*Holotype*: **Australia**, Victoria, Caulfield, on living leaves of *Epacris impressa* (*Ericaceae*), Aug. 1900, C. French (VPRI).
*Lit*.: Saccardo (1902: 1058).
*Notes*: Excluded, not *Cladosporium s. str.*, but taxonomic status not yet clear.

*episphaerium* Schwein., Trans. Amer. Philos. Soc., N.S., 4(2): 278. 1832, as "*episphaeria*".
*Syntypes*: **USA**, Pennsylvania, Bethlehem, on *Sphaeria* species, No. 2607 (PH 01020420, 01020421).
= ? *Dematium episphaerium* Alb. & Schwein., Consp. fung. lusat.: 369. 1805.
*Lit*.: Saccardo (1886: 369), Oudemans (1919, 1920: on *Hypoxylon rubiginosum*, 1924).
*Notes*: Status unclear, no *Cladosporium* found in the type material.

*epixilinum* Corda – Gola (1930: 20).
*Notes*: See *C. herbarum* Link var. *epixylinum* Corda.

*erianthi* Thüm., Rev. Mycol. (Toulouse) 1: 59. 1879.
*Syntypes*: **USA**, South Carolina, Aiken, on dry culms and leaves of *Saccharum giganteum* (= *Erianthus saccharoides*) (*Poaceae*), H.W. Ravenel, Thümen, Mycoth. Univ. 1766 (*e.g.*, B, BPI 426532, BR-MYC 81373,87, HAL, M, NY). *Syntype or topotype material*: Roumeguère, Fungi Sel. Gall. Exs. 4690 (*e.g.*, NY), issued in 1888.
*Lit*.: Saccardo (1886: 364).
*Notes*: Excluded, not *Cladosporium s. str.* This is a fungus with *Colletotrichum*-like setae, large stromata and small, ovoid-subglobose to fusiform, pale brown conidia. Status unclear.

*eriolobi* Thaung, Trans. Brit. Mycol. Soc. 63(3): 620. 1974. Fig. 367.
*Holotype*: **Myanmar** (Burma), Maymyo, Botanical Garden, on living leaves of *Eriolobus "indica"* (*Rosaceae*), 28 Dec. 1972, Mya Thaung (IMI 175732).
≡ *Stenella eriolobi* (Thaung) K. Schub. & U. Braun, Nova Hedwigia 84: 203. 2007.
≡ ***Zasmidium eriolobi*** (Thaung) K. Schub. & U. Braun, Schlechtendalia 20: 101. 2010.
*Ill*.: Thaung (1974: 621, fig. 2), Schubert & Braun (2007: 204, fig. 8).

*eschscholtziae* (Harkn.) Dingley, *nom. ined*.
*Holotype*: **USA**, California, San Francisco, on leaves of *Eschscholtzia californica* (*Papaveraceae*), Jan. [1884], Harkness, No. 3116 (destroyed).
*Basionym*: *Heterosporium eschscholtziae* Harkn., Bull. Calif. Acad. Sci. 1: 38. 1884.
≡ ***Acroconidiella eschscholtziae*** (Harkn.) M.B. Ellis, More Dematiaceous Hyphomycetes: 407. 1976.
*Lit*.: David (1997: 111).

*eucalypticola* M.B. Ellis, on www.indexfungorum.org, *in herb*.?, Kirk *et al.* (n. d.).

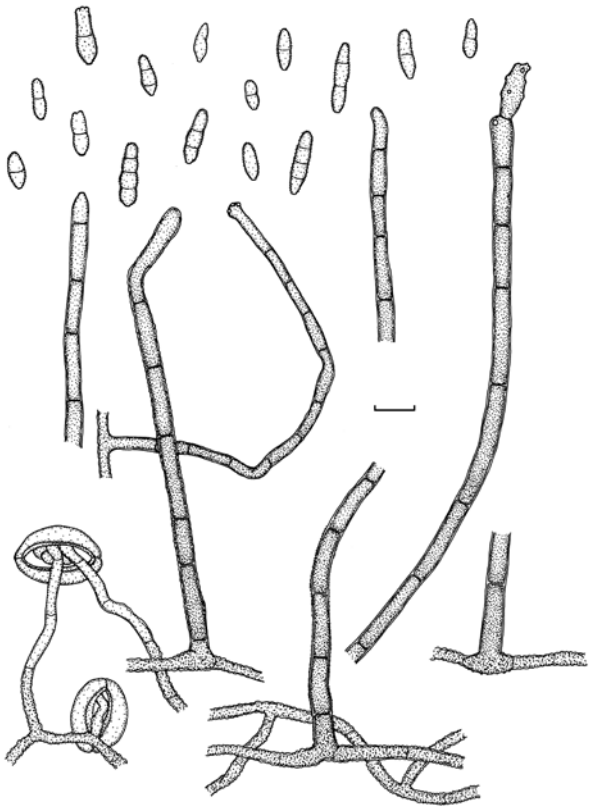


**Fig. 367.** *Zasmidium eriolobi* (IMI 175732, holotype of *C. eriolobi*). Conidiophores and conidia. Scale bar = 10 µm. K. Bensch *del*.

*extoma* Sacc. – Gola (1930: 20) listed the type at PAD.
*Notes*: Maybe this is an error in Gola (1930) and *C. extorre* was intended.

*extorre* Sacc., Nuovo Giorn. Bot. Ital., N.S., 27: 86. 1920.
*Holotype*: **USA**, Wyoming, Tonington, on the bark of young twigs of Whitney Crab Apple (= *Pyrus coronaria*) (*Rosaceae*), 12 Jun. 1917, V. Simmons, No. 10335 (PAD). *Isotype*: BPI 426542.
*Lit.*: Saccardo (1931: 795).
*Notes*: This species has to be excluded from *Cladosporium s. str.*; status unclear.

*fasciculare* f. *asparagi-officinalis* Thüm., Mycoth. Univ., Fasc. 1, No. 2066. 1881, *nom. nud*.
*Type*: **USA**, Carolina australis, on *Asparagus officinalis* (*Asparagaceae*), Aiken, 1877, H.W. Ravenel, Thümen, Mycoth. Univ. 2066 (*e.g.* M-0057602).
*Notes*: In the original material from M, only an alternarioid hyphomycete has been found.

*fermentans* Goto, Yamak. & Yokots., J. Agric. Chem. Soc. Japan 49(7): 380. 1975.
*Type*: **Japan**, Kofu, from olive fruit waste, 12 Jun. 1968, S. Goto (RIFY 0587).
= *Pichia burtonii* Boidin, Pignal, Lehodey, Vey & Abadie, Bull. Soc. Mycol. France 80: 437. "1964", 1965.
≡ *Endomycopsis burtonii* (Boidin, Pignal, Lehodey, Vey & Abadie) Kreger, The Yeasts, Ed. 2: 174. 1970, *nom. inval*.
≡ ***Hyphopichia burtonii*** (Boidin, Pignal, Lehodey, Vey & Abadie) Arx & Van der Walt, Antonie van Leeuwenhoek J. Microbiol. Serol. 42(3): 310. 1976.

*ferrugineum* Allesch., Hedwigia 34: 116. 1895. Fig. 368.
*Lectotype* (selected in Schubert & Braun 2005a): **Brazil**, Minas Geraës, Paranahyba, on leaves of *Sweetia bijuga* (≡ *Acosmium bijugum*) (*Fabaceae*), Jul. 1892, E. Ule, No. 1905 (M-0057571). *Isolectotypes*: B 700006381, HBG, PC.
≡ ***Passalora sweetiae*** K. Schub. & U. Braun, Mycol. Progr. 4(2): 105. 2005.
*Lit.*: Saccardo (1895: 619).
*Ill.*: Schubert & Braun (2005a: 106, fig. 5).

*ferrugineum* R.F. Castañeda, Fungi Cubensis II: 4. 1987, *nom. illeg.*, homonym, non *C. ferrugineum* Allescher, 1895.
*Holotype*: **Cuba**, prov. Matanzas, Calimete, on living leaves of *Nectandra coriacea* (*Lauraceae*), 24 Jan. 1987, R.F. Castañeda (INIFAT C87/45). *Ex-type culture*: CBS 734.87, HAL 2018 F (dried culture).
≡ ***Penidiella nectandrae*** Crous, U. Braun & R.F. Castañeda, Stud. Mycol. 58: 20. 2007.
*Ill.*: Castañeda (1987: fig. 7), Crous *et al.* (2007b: 21, fig. 11).

*ferrugineum* Sacc. – Gola (1930: 20) listed the type at PAD.
*Notes*: Maybe an error in Gola (1930) and *C. fumagineum* was intended.

*flueggeae* Thüm., *ad. int.*, in Rabenhorst, Fungi Eur. Exs., Cent. XVI, No. 1571. 1872, *nom. nud.*
*Syntypes*: **Greece**, Athina, on leaves of *Ophiopogon japonicus* (≡ *Flueggea japonica*) (*Asparagaceae*), 20 Sep. 1869, de Heldreich, Rabenhorst, Fungi Eur. Exs. 1571 (*e.g.*, HAL, HBG).
*Notes*: Excluded, mixed infection with *Alternaria* sp., *Colletotrichum* sp. and an unknown phialidic hyphomycete.

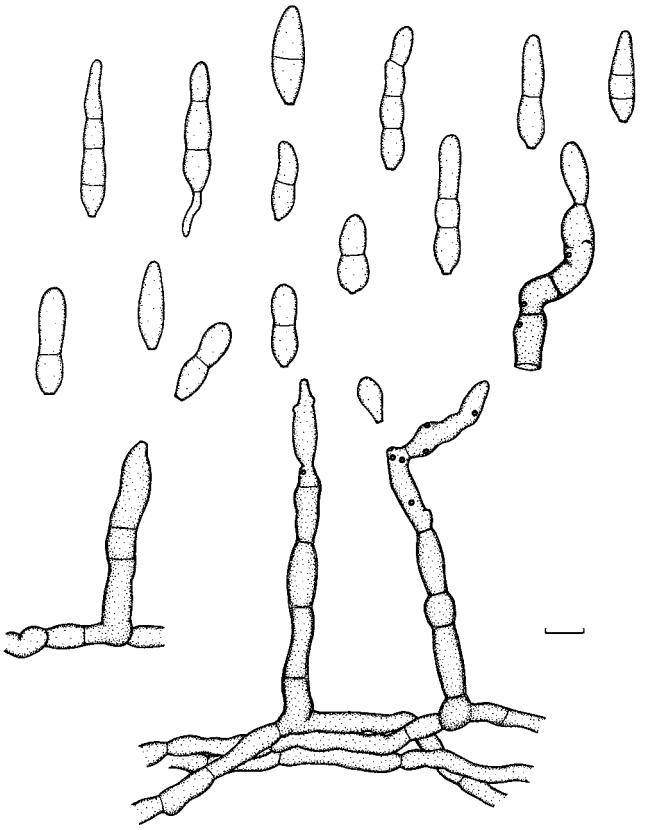


**Fig. 368.** *Passalora sweetiae* (M-0057571, lectotype of *C. ferrugineum*). Conidiophores and conidia. Scale bar = 10 µm. K. Bensch *del*.

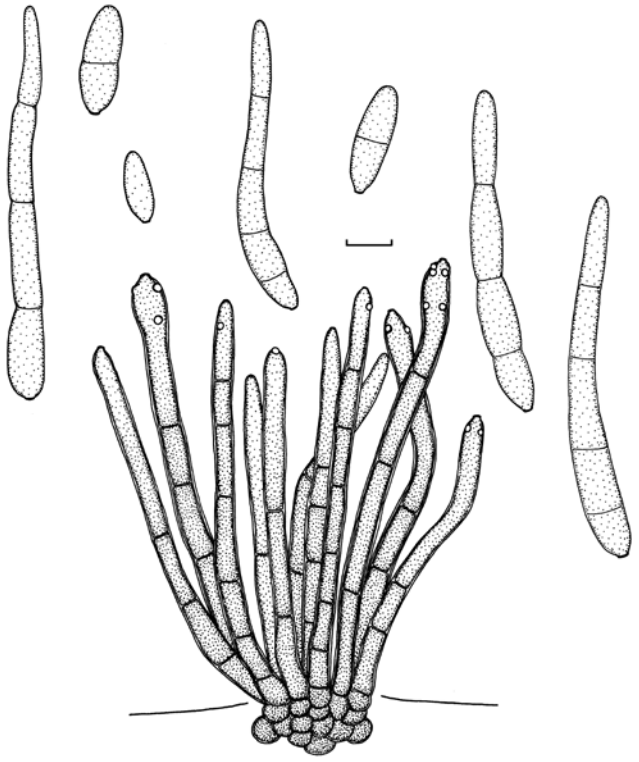


**Fig. 369.** *Passalora foveolicola* (LPS 13.136, holotype of *C. foveolicola*). Conidiophores and conidia. Scale bar = 10 µm. K. Bensch *del*.

*foveolicola* Speg., Anales Mus. Nac. Buenos Aires 20: 437. 1910. Fig. 369.
*Holotype*: **Argentina**, near San Javier, Misiones, on living leaves of *Campovassouria cruciata* (= *Eupatorium bupleurifolium)* (*Asteraceae*), Aug. 1909 (LPS 13.136).

= ***Passalora foveolicola*** (Speg.) K. Schub. & U. Braun, Nova Hedwigia 84: 195. 2007.

*Lit*.: Saccardo (1913a: 1369), Farr (1973).

*Ill*.: Schubert & Braun (2007: 196, fig. 4).

*fuligineum* f. *racemosum* Bubák, *in herb*., as "*racemosa*".

*Specimen*: **Czech Republic**, Bohemia, Kokocko, near Plzen, on a fungal fruit body (holothecium), 10 Oct. 1910, F. Bubák (BPI 426582).

*Notes*: Not *Cladosporium*, but identity unclear.

*fulvum* (Arx) K. Bhalla & A.K. Sarbhoy → *fulvum* Cooke.

*fulvum* Cooke, Grevillea 12(61): 32. 1883.

*Syntype*: **USA**, South Carolina, on leaves of tomato (= *Solanum lycopersicum*) (*Solanaceae*), Ravenel, Fungi Amer. Exs. 599 (*e.g.*, K).

≡ *Fulvia fulva* (Cooke) Cif., Atti Ist. Bot. Lab. Crittog. Univ. Pavia 10(1): 245. 1954.

≡ *Mycovellosiella fulva* (Cooke) Arx, Proc. Kon. Ned. Akad. Wetensch. C, 86(1): 48. 1983.

≡ *Cladosporium fulvum* "(Arx)" K. Bhalla & A.K. Sarbhoy, Indian Phytopathol. 53(3): 262. 2000, *nom. illeg.*

≡ ***Passalora fulva*** (Cooke) U. Braun & Crous, *Mycosphaerella* and its anamorphs: 1. Names published in *Cercospora* and *Passalora*, CBS Biodiversity Ser. 1: 453. 2003.

*Lit*.: Saccardo (1886: 363), Lindau (1907: 829, 1910: 797), Ferraris (1912: 349, 1914: 885), de Vries (1952: 70), Ellis (1971: 306–307), Holiday & Mulder (1976), von Arx (1987: 195), Ho *et al.* (1999: 128).

*fulvum* Cooke var. *violaceum* Voglino, Ann. Reale Accad. Agric. Torino 55: 381. "1912" 1913.

*Type*: **Italy**, Liguria, Albenga, on leaves of *Solanum lycopersicum* (= *Lycopersicon esculentum*) (*Solanaceae*) (location unknown).

*Lit*.: Saccardo (1931: 794).

*Notes*: Very probably synonymous with *Passalora fulva*.

*fumago* Link, Sp. pl. 6(1): 40–41. 1824 : Fr., Syst. mycol. 3(2): 372. 1832.

*Type*: **Europe**, on leaves of various plant species.

≡ *Torula fumago* (Link) Chevall., Fl. gén. env. Paris 1: 34. 1826.

≡ *Caldariomyces fumago* (Link) Woron., Ann. Mycol. 25: 261. 1926.

≡ *Leptoxyphium fumago* (Link) R.C. Srivast., Arch. Protistenk. 125(1–4): 333. 1982, as "(Woron.) R.C. Srivast.", *nom. inval.*

= ? *Fumago vagans* Pers., Mycol. eur. 1: 9. 1822.

≡ *Cladosporium vagans* (Pers.) Desm., Pl. Crypt. N. France, Ed. 1, Fasc. I, No. 6. 1825, as "Pers.".

= *Syncollesia foliorum* C. Agardh, Syst. alg.: 32. 1824.

*Lit*.: Fries (1832: 372), Saccardo (1886: 547), Lindau (1910: 267), Lind (1913: 166), Oudemans (1919–1924).

*Notes*: See *Cladosporium vagans*. Link (1824) mentioned *Fumago* ("*Fumago* Pers. ex hoc *Cladosporio* saepe oritur"), but did not refer to *Fumago vagans*, so that Link's species was not based on the latter name.

*fumago* f. *artemisiae abrotani* Thüm., Herb. Mycol. Oecon., Fasc. XIV, No. 657. 1879, *nom. nud*.

*Syntype*: **Austria**, near Kalksburg, on *Artemisia abrotanum* (*Asteraceae*), Sep. 1879, von Thümen, Thümen, Herb. Mycol. Oecon. 657 (*e.g.*, B).

*fumago* f. *carpini betuli* Thüm., Herb. Mycol. Oecon., Fasc. VII, No. 339. 1875, *nom. nud*.

*Syntype*: **Czech Republic**, Bohemia, near Teplitz-Schönau, on living leaves of *Carpinus betulus* (*Betulaceae*), Aug. 1873, Thümen, Herb. Mycol. Oecon. 339 (*e.g.*, B).

*fumago* f. *corticicola* Rabenh., Herb. Viv. Mycol., Ed. Nova, Ser. Prima, Cent. IV, No. 330. 1856 and Flora 15(9): 134. 1857, *nom. nud*.

*Syntype*: **Germany**, Giessen, on *Salix* twigs (*Salicaceae*), Hoffmann, Rabenhorst, Herb. Viv. Mycol. 330 (*e.g.*, HAL).

*fumago* f. *coryli* Thüm., Herb. Mycol. Oecon., Fasc. III, No. 131. 1873, *nom. nud*.

*Syntype*: **Czech Republic**, Bohemia, near Teplitz-Schönau, on leaves and twigs of *Corylus avellana* (*Betulaceae*), Jul. 1873, Thümen, Herb. Mycol. Oecon. 131 (*e.g.*, B).

*fumago* f. *fragariae-vescae* Thüm., Fungi Austr. Exs., Cent. XI, No. 1085. 1874 and Herb. Mycol. Oecon., Fasc. IV, No. 169. 1874, *nom. nud*.

*Syntypes*: **Czech Republic**, Teplitz-Schönau, on living leaves of *Fragaria vesca* (*Rosaceae*), summer 1873, Thümen, Fungi Austr. Exs. 1085, Thümen, Herb. Mycol. Oecon.169 (*e.g.*, B, HAL).

*fumago* f. *fraxini* Thüm., Herb. Mycol. Oecon., Fasc. VIII, No. 375. 1875, *nom. nud.*

*Syntype*: **Czech Republic**, Bohemia, near Teplitz-Schönau, on living leaves of *Fraxinus excelsior* (*Oleaceae*), Aug. 1873, Thümen, Herb. Mycol. Oecon. 375 (*e.g.*, B 700006422).

*Notes*: Excluded, several hyphomycetes, incl. *Aureobasidium pullulans* and *C. herbarum* (see *C. vagans*).

*fumago* f. *grossulariae* Thüm., Herb. Mycol. Oecon., Fasc. III, No. 130. 1873, *nom. nud*.

*Syntype*: **Czech Republic**, Bohemia, near Teplitz-Schönau, on leaves and twigs of *Ribes grossularia* (*Grossulariaceae*), Jul. 1873, Thümen, Herb. Mycol. Oecon. 130 (*e.g.*, B).

*fumago* f. *humuli-lupuli* Thüm., Herb. Mycol. Oecon., Fasc. XIII, No. 606. 1878, *nom. nud.*

*Syntype*: **Austria**, near Klosterneuburg, on living leaves of *Humulus lupulus* (*Cannabaceae*), Aug. 1878, Thümen, Herb. Mycol. Oecon. 606 (*e.g.*, B).

*fumago* f. *poae-pratensis* Thüm., Herb. Mycol. Oecon., Fasc. IV, No. 160. 1874, *nom. nud*.

*Syntype*: **Czech Republic**, Bohemia, near Teplitz-Schönau, on *Poa pratensis* (*Poaceae*), summer 1873, Thümen, Herb. Mycol. Oecon. 160 (*e.g.*, B).

*fumago* f. *quercus* A. Walther, *in herb*.

*Specimen*: **Germany**, Bavaria, Bayreuth, on leaves of *Quercus robur* (*Fagaceae*), Aug. 1877, A. Walther (BPI 426739).

*Notes*: Typical "*Fumago vagans*" (*Aureobasidium pullulans* and *Cladosporium* sp.). See *C. vagans*.

*fumago* f. *rosae-acutifoliae* A. Walther, *in herb*.

*Specimen*: **Germany**, Bavaria, Bayreuth, on *Rosa* sp. (*Rosaceae*), Sep. 1877, A. Walther (BPI 426751).

*Notes*: Typical "*Fumago vagans*" (*Aureobasidium pullulans*, *Cladosporium macrocarpum* and other hyphomycetes. See *C. vagans*).

*fumago* f. *rosae-albae* Thüm., Herb. Mycol. Oecon., Fasc. IX, No. 418. 1876, *nom. nud*.

*Syntype*: **Germany**, Bavaria, near Bayreuth, on leaves and twigs of *Rosa* ×*alba* (*Rosaceae*), Sep. 1874, Thümen, Herb. Mycol. Oecon. 418 (*e.g.*, B).

*fumago* f. *syringae-vulgaris* Thüm., Herb. Mycol. Oecon., Fasc. VIII, No. 393. 1875, *nom. nud.*
*Syntypes*: **Czech Republic**, Bohemia, near Teplitz-Schönau, on living leaves of *Syringa vulgaris* (*Oleaceae*), Aug. 1873, Thümen, Herb. Mycol. Oecon. 393 (*e.g.*, B, M-0057668).
*Notes*: Excluded, *Trimmatostroma*-like hyphomycete.

*fumago* f. *ulmi* Rabenh., Herb. Viv. Mycol., Ed. Nova, Ser. Prima, No. 329. 1856 and Flora 15(9): 134. 1857, *nom. nud*.
*Syntype*: **Germany**, Dresden, on *Ulmus campestris* (*Ulmaceae*), 1856, Rabenhorst, Herb. Viv. Mycol. 329 (*e.g.*, HAL).

*fumago* f. *ulmi-effusae* Thüm., Herb. Mycol. Oecon., Fasc. V, No. 237. 1874, *nom. nud*.
*Syntype*: **Czech Republic**, Bohemia, near Bilina, on leaves and young twigs of *Ulmus* sp. (*Ulmaceae*), Jul. 1873, Thümen, Herb. Mycol. Oecon. 237 (*e.g.*, B 700006428).

*fumago* f. *vitis* Thüm., Herb. Mycol. Oecon., Fasc. II, No. 76. 1872, *nom. nud*.
*Syntype*: **Germany**, Lübeck, near Travemünde, on *Vitis vinifera* (*Vitaceae*), Oct. 1872, Behrens, Thümen, Herb. Mycol. Oecon. 76 (*e.g.*, B).

*fumago* var. *betulae* L.A. Kirchn., Lotos 6: 183. 1856, *nom. nud*.
*Type*: **Czech Republic**, Haasmüllnerberg near Kaplitz, on living leaves of *Betula pubescens* (= *B. alba*) (*Betulaceae*) (location unknown).

*fumago* "var. *corticola* Hoffm.", Herb. Viv. Mycol., Ed. Nova, Ser. Prima, No. 330. 1857, *nom. nud*. [see Oudemans 1920: 189].
*Notes*: Oudemans (l.c.) spelled the name differently, namely *C. fumago* f. *corticicola* Rabenh., changed "f." to "var." and attributed this name to "Hoffm." although the exsiccatus has the same number. Correct quotation → *C. fumago* f. *corticicola*.

*fumago* var. *elongatum* Mont., Flora Fernandesiana: 53. 1835.
*Type*: **Chile**, Juan Fernandez, on leaves, especially of ferns (location unknown).
≡ *Antennaria robinsonii* Berk. & Mont., London J. Bot. 2: 641. 1843.
*Lit.*: Berkeley (1843: 640–641), Saccardo (1882: 81).
*Notes*: Berkeley (1843) discussed *C. fumago* var. *elongatum* and reduced it to synonymy with *Antennaria robinsonii*.

*fumago* var. *epiphyllum* Rabenh. – Exsiccatus (68), specified in Kohlmeyer (1962: 39).

*fumago* var. *maculaeforme* Thüm., Mycoth. Univ., Cent. VII, No. 673. 1877 and Herb. Mycol. Oecon., Fasc. 10, No. 583. 1877 and Flora 61(7): 108. 1878.
*Syntypes*: **Germany**, Bavaria, Bayreuth, on living leaves of *Syringa vulgaris* (*Oleaceae*), autumn 1875, Thümen, Mycoth. Univ. 673 (*e.g.*, B, HAL, MICH).
*Notes*: Excluded, not *Cladosporium*, generic affinity not yet clear.

*fumago* var. *padi* L.A. Kirchn., Lotos 6: 184. 1856, *nom. nud*.
*Type*: **Czech Republic**, Kaplitz, on living leaves of *Padus* "*vulgaris*" (= ?*Prunus padus*) (*Rosaceae*) (location unknown).

*fumago* var. *rubi* L.A. Kirchn., Lotos 6: 184. 1856, *nom. nud*.
*Type*: **Czech Republic**, Dreisesselberg, on leaves and stems of *Rubus idaeus* (*Rosaceae*), Jac. Jungbauer (location unknown).

*fumago* Mont., in Gay, Fl. chil. 8(1): 32. 1852, *nom. illeg*., homonym, non *C. fumago* Link, 1824.
*Type*: **Chile**, on living leaves of *Eugenia* (*Myrtaceae*) (location unknown).
= ? *Napicladium fumago* Speg., Revista Fac. Agron. Vet. La Plata, Ser. 2, 6: 190. 1910.
≡ *Hyphosoma fumago* (Speg.) M.B. Ellis, *in herb*.
*Lit.*: Saccardo (1913a: 1396).
*Notes*: Status unknown.

"*fungorum*" Sacc., Syll. fung. 2: 406. 1883.
*Type*: **USA**, Pennsylvania, Bethlehem, on *Polyporus* sp. (*Polyporales*).
*Notes*: Cited by Saccardo (1883) in the text under *Sphaeria cladosporiosa* Schwein., Trans. Amer. Philos. Soc., N.S., 4(2): 211, 1832. It is unclear if Saccardo intended to introduce a new name or if he referred to *Dematium herbarum* γ *fungorum*.

*fusiforme* (S.M. Reddy & Bilgrami) de Hoog & Morgan-Jones (unpublished).
*Basionym*: *Hyalodendron fusiforme* S.M. Reddy & Bilgrami, Curr. Sci. 40(24): 668. 1971.
≡ ***Retroconis fusiformis*** (S.M. Reddy & Bilgrami) de Hoog & Bat. Vegte, Stud. Mycol. 31: 99. 1989.

*fusisporum* Berk. & M.A. Curtis, *in herb*.
*Specimen*: **USA**, Alabama, on stems of *Chionanthus* sp. (*Oleaceae*), ex M.A. Curtis (NYS).
= ***Passalora chionanthi*** (Ellis & Everh.) U. Braun, Cryptog. Mycol. 20: 166. 1999.
*Lit.*: Braun & Schubert (2007: 65).

*geniculatum* Morgan-Jones, Mycotaxon 32(1): 226. 1988.
*Holotype*: **USA**, Florida, Jacksonville, Airport Holiday Inn, on discoloured wall plaster, Dec. 1987, B.J. Jacobsen (AUA).
*Ill.*: Morgan-Jones & Jacobsen (1988: 227, fig. 1).
*Notes*: Listed as *C. geniculatum* Morgan-Jones & B.J. Jacobsen by Kirk *et al.* (n.d.). Excluded, not a true *Cladosporium*, but status not yet clear.

*georginae* Fuss, Archiv Vereins Siebenb. Landesk., N.F., 14(2): 431. 1878, *nom. nud*.
*Type*: **Romania**, Giresau, on overwintered stems of *Dahlia pinnata* (= *Georgina variabilis*) (*Asteraceae*), Fuss (location unknown).
*Notes*: Classified by Fuss (1878) as a forma of *C. herbarum*.

*gloeosporioides* G.F. Atk., Cornell Univ. Sci. Bull. 3(1): 39. 1897. Fig. 370.
*Lectotype*: **USA**, Alabama, Lee Co., Auburn, on leaves and stems of *Hypericum mutilum* (*Hypericaceae*), 2 Sep. 1891, Duggar. (CUP-A 2170). *Syntype*: **USA**, Alabama, Lee Co., Auburn, on leaves of

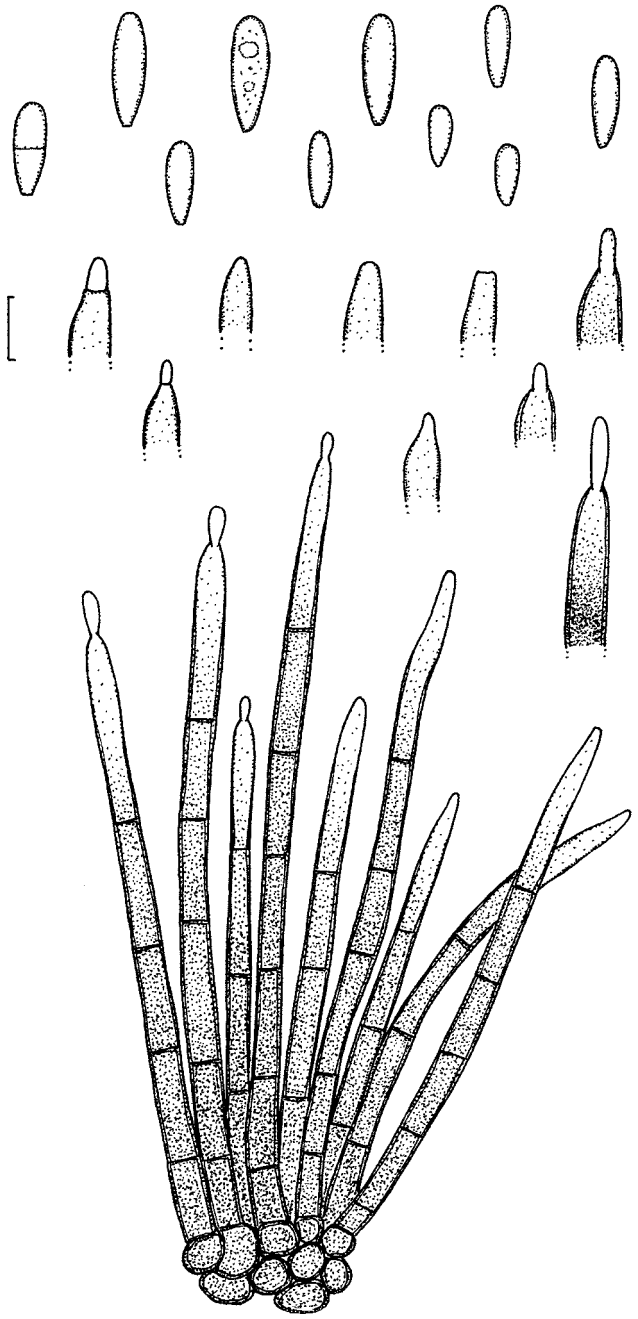


**Fig. 370.** *Dischloridium gloeosporioides* (CUP-A 2170, lectotype of *C. gloeosporioides*). Conidiophores and conidia. Scale bar = 10 µm. U. Braun *del.*

*Hypericum stans* (≡ *Ascyrum stans*), 29 Aug. 1891, G.F. Atkinson (CUP-A 2064).

≡ ***Dischloridium gloeosporioides*** (G.F. Atk.) U. Braun & K. Schub., Fungal Diversity 20: 189. 2005.

*Lit.*: Saccardo (1899: 1080).

*Ill.*: Schubert & Braun (2005b: 191, fig. 1).

*gonorrhoicum* Hallier, Flora, Neue Reihe, 26(19): 293. 1868.

*Type*: Isol. from man (gonorrhea) (location unknown).

≡ *Cladosporium coniothecii-gonorrhoici* Hallier, Flora, Neue Reihe, 26(19): 293. 1868 (alternative name).

*Ill.*: Hallier (1868a: tab. 3, figs 4, 5, 8, 9).

*Notes*: Undoubtedly not belonging to *Cladosporium s. str.* Described as state (morph) of *Coniothecium gonorrhoicum* Hallier (p. 294). "Forma penicillare. Hab. Associato a casidi gonorrhea"(Nannizzi 1934). "Species incertae" (Saccardo 1911).

*gossypii* Jacz., Khlopkovoe Delo 1929, No. 5–6: 564. 1929 and Trudy Byuro Prikl. Bot. 24(5): 181–182. 1931.

*Lectotype* (**designated here**): **Uzbekistan**, Bukhara, Experiment Station, on fibres of *Gossypium hirsutum* (*Malvaceae*), 1928, leg. V.S. Zelenetzki, det. A. Jaczewski (LEP). *Isolectotype*: LEP. *Other syntypes*: **Central Asia**, on fibres of *Gossypium* sp., 1927, V.S. Fedorov (LEP); *l.c.*, 1928 (LEP); **Uzbekistan**, Bukhara, Shafrikanskoje, on *Gossypium hirsutum*, 30 Aug. 1928, V.S. Zelenetzki (LEP).

≡ ***Chalastospora gossypii*** (Jacz.) U. Braun & Crous, Persoonia 22: 144. 2009.

*Lit.*: Braun *et al.* (2003).

*Ill.*: Jaczewski (1931: 181, fig. 16).

*Notes*: In the publication of 1929, Jaczewski introduced the name *Cladosporium gossypii* and provided a brief Russian description, including shape and size of conidia. This description, published before 1935, is, however, valid. In his paper from 1931, he re-introduced *C. gossypii* together with a Latin description and a micrograph of conidia. *Cladosporium gossypii* is older than *C. malorum*, the basionym of *Alternaria malorum*, which was published in 1931, but it cannot be transferred to *Alternaria* since this name is preoccupied in this genus by *Alternaria gossypii* (Jacz.) Y. Nisik. *et al.*, 1940. See *C. malorum*.

*gougerotii* (Matr.) G. Carrión & Marg. Silva, Arch. Inst. Pasteur Algérie 72: 532. 1955.

*Neotype* (selected by Borelli, 1955): **USA**, Memphis, isol. from cystic lesion of human patient, (CBS 526.76).

*Basionym*: *Sporotrichum gougerotii* Matr., Compt. Rend. Hebd. Séances Acad. Sci. 150: 545. 1910, as "*gougeroti*", *nom. ambig. et dub.*

≡ *Rhinocladium gougerotii* (Matr.) Verdun, Précis de Parasitologie Humaine, éd. 2: 677. 1913.

≡ *Dematium gougerotii* (Matr.) Grigoraki, Bull. Soc. Mycol. France 40: 274. 1924, as "*gougeroti*".

≡ *Torula gougerotii* (Matr.) Brumpt, Précis Parasitol., ed. 5: 1791. 1936.

≡ *Oospora gougerotii* (Matr.) D. Janke, Archiv Dermatol. Syph. 187: 693. 1949, as "*Gougeroti*".

≡ *Phialophora gougerotii* (Matr.) Borelli, Acta Ci. Venez. 6(2): 81. 1955.

*Lit.*: de Hoog & Hermanides-Nijhof (1977: 114), McGinnis & Ajello (1982).

*Notes*: Of *S. gougeroti*: "This name has been applied to different fungi and has therefore been abandoned." (de Hoog *et al.* 2000: 1022). McGinnis & Ajello (1982) cite a lack of type material and illustrations, and inadequate descriptions as reasons for considering *S. gougeroti* a dubious name. Carrión & Silva (1955) designate No. 1792 (Kennedy Hospital, Memphis), No. 7031 (NIH ← CBS) and No. 7028 (NIH) as specimens of *Cladosporium gougerotii*. They illustrate it in photomicrographs Nos. 1792 and 7028 as possessing phialides.

*gramineum* Link (Fries 1832) under "Species dubias".

*graminum* Cooke [A. Commons 30,2060 (Sumstine 1949: 19)].

*graminum* f. *poae-pratensis* Thüm., Mycoth. Univ., Cent. V, No. 490. 1876, *nom. nud.*

*Syntypes*: **Germany**, Bavaria, Bayreuth, on dry culms of *Poa pratensis* (*Poaceae*), summer 1874, Thümen, Mycoth. Univ. 490 (*e.g.*, B, HAL, HBG).

*Notes*: No *Cladosporium* found in several syntypes. Long conidiophores pertain to a dematiaceous hyphomycete of uncertain status.

*graminum* var. *scirpi* Harkn., *in herb*.
*Specimen*: **USA**, California, "Corle Madera"(?), on dead stems of *Scirpus* sp. (*Cyperaceae*), Apr. 1880, H.W. Harkness 1364 (BPI 426819).
*Notes*: *Cladosporium* sp. is present on the type material (but sporulation sparse).

*graminum* var. *sorghi* Rav., *in herb*.
*Specimen*: **USA**, South Carolina, on *Sorghum bicolor* (= *S. saccharatum*) (*Poaceae*), H.W. Ravenel (BPI 426822).
*Notes*: Status uncertain.

*griseum* (Berk. & Broome) S. Hughes, Canad. J. Bot. 31: 587. 1953.
*Isotype*: **UK**, Northamptonshire, Kings Cliff, on dead stems of *Urtica* sp. (*Urticaceae*), Mar. 1850 (K 121543).
*Basionym*: *Dendryphion griseum* Berk. & Broome, Ann. Mag. Nat. Hist., Ser. 2, 7: 177. 1851, as "*Dendryphium*", non *Polyscytalum griseum* Sacc., 1886.
≡ ***Polyscytalum berkeleyi*** M.B. Ellis, More Dematiaceous Hyphomycetes: 158. 1976, *nom. nov*.
*Notes*: Hughes (1953) apparently based his new combination and illustration on IMI 4333.

*guanicense* F. Stevens, Trans. Illinois Acad. Sci. 10: 207. 1917, as "*guanicensis*".
*Syntypes*: **Puerto Rico**, Guanica, on leaves of *Argemone mexicana* (*Papaveraceae*), 2 Mar. 1913, F.L. Stevens, Porto Rican Fungi 347 (a) (*e.g.*, BPI 426841, 426844, 426487, ILL 15873, MICH, PC).
≡ *Polythrincium guanicense* (F. Stevens) Cif., Ann. Mycol. 36: 233. 1938.
≡ *Cercosporidium guanicense* (F. Stevens) Deighton, Mycol. Pap. 112: 34. 1967.
≡ ***Passalora guanicensis*** (F. Stevens) U. Braun & R.F. Castañeda, Cryptog. Bot. 1(1): 46. 1989.
≡ *Passalora guanicensis* (F. Stevens) Poonam Srivast., J. Liv. World 1(2): 116. 1994, as "*guanicense*", *comb. inval*.
= *Cercospora whetzelii* Chupp, J. Dept. Agric. Porto Rico 15: 16. 1931. [Type: CUP].
≡ *Pyricularia whetzelii* (Chupp) Bat. & R. Garnier, Publ. Univ. Recife Inst. Micol. 278: 18. 1960.
*Lit.*: Saccardo (1931: 794), Crous & Braun (2003: 206).

*gynoxidicola* Petr., Sydowia 2: 381. 1948, as "*gynoxidicolum*". Fig. 371.
*Types*: **Ecuador**, Pichincha mountains near Quito, on living leaves of *Gynoxys* sp. (*Asteraceae*), 30 Nov. 1937 [IMI 88949 (slide), M-0057615].
≡ *Stenella gynoxidicola* (Petr.) J.L. Mulder, Trans. Brit. Mycol. Soc. 79(3): 478. 1982.
≡ ***Passalora gynoxidicola*** (Petr.) K. Schub. & U. Braun, Fungal Diversity 20: 200. 2005.
*Lit.*: Ellis (1976: 342).
*Ill.*: Schubert & Braun (2005b: 201, fig. 5).

*harknessii* (Peck) S. Hughes, Canad. J. Bot. 31: 586. 1953.
*Holotype*: **USA**, New York, Helderberg Mountains, on decaying wood, C.H. Peck (NYS 1443). *Isotype*: DAOM 31921 (slide).
≡ *Monilia harknessii* Peck, Rep. (Annual) New York State Mus. Nat. Hist. 34: 49. 1883.
*Ill.*: Hughes (1953: 586, fig. 7).
*Notes*: Hughes (1953) apparently based his new combination and illustration on DAOM 28997. Excluded, not *Cladosporium s. str.*, a wood-inhabiting hyphomycete, cf. *Parahaplotrichum idahoense*.

*helicosporum* R.F. Castañeda & W.B. Kendr., Mycotaxon 63: 183. 1997.

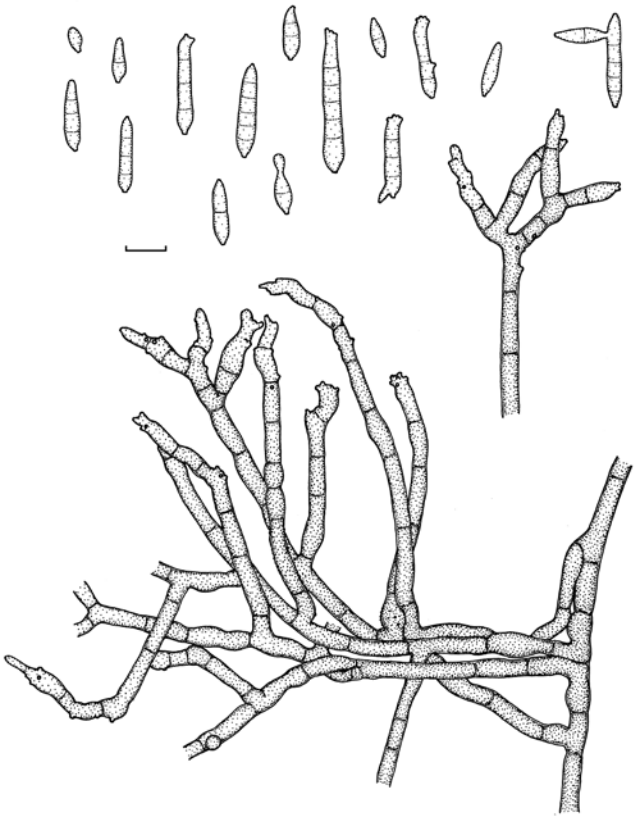


**Fig. 371.** *Passalora gynoxidicola* (M-0057615, type of *C. gynoxidixola*). Conidiophores and conidia. Scale bar = 10 µm. K. Bensch *del*.

*Holotype*: **Cuba**, La Habana, La Chorrera, on fallen leaves of *Laciasis ligulata* (= *L. divaricata*) from a rainforest, 14 Apr. 1992, R.F. Castañeda & B. Kendrick (INIFAT C92/207-1). *Isotype*: MUCL 39868.
*Ill.*: Castañeda *et al.* (1997: 184–185, figs 1–2).
*Notes*: Excluded, not belonging to *Cladosporium s. str.* Status unclear.

*hemileiae* Steyaert, Bull. Soc. Roy. Bot. Belgique 63(1): 47. 1930. Fig. 372.
*Holotype*: **Zaire**, Prov. Orientale, Biaro, near Kisangani (Stanleyville), on uredosoris of *Hemileia vastatrix* (*Uredinales*) on *Coffea robusta* (*Rubiaceae*), Oct. 1929, R.L. Steyaert (BPI 426854).
≡ ***Digitopodium hemileiae*** (Steyaert) U. Braun, Heuchert & K. Schub., Schlechtendalia 13: 65. 2005.
*Lit.*: Saccardo (1972: 1337), Sutton (1973: 40).
*Ill.*: Steyaert (1930: tab. 4–5), Heuchert *et al.* (2005: 65, fig. 26, pl. 1, figs 4, 7).

*herbarum* f. *petiolorum fraxini* Thüm., *in herb*.
*Specimen*: **Germany**, Bayern, Bayreuth, on petioles of *Fraxinus* sp. (*Oleaceae*), Apr. 1876, ex herb. Thümen (M).
*Notes*: Several hyphomycetes inclusive *C. herbarum* and a *Colletotrichum*-like species (dark seta-like conidiophores with paler apices).

*herbarum* f. *rubi* Gonz. Frag., Mem. Real Acad. Ci. Barcelona, Ser. 3, 15(17): 458 (32). 1920.
*Syntypes*: **Spain**, Barcelona, Bonanova and Vallvidrera, on leaves of *Rubus rusticanus* (= *R. ulmifolius* subsp. *rusticanus*) and *Rubus* sp. (*Rosaceae*), Sep. 1915 and Jul. 1918, Fr. Sennen (MA 06328, 06329).
= ***Pseudocercospora rubi*** (Sacc.) Deighton, Mycol. Pap. 140: 152. 1976.

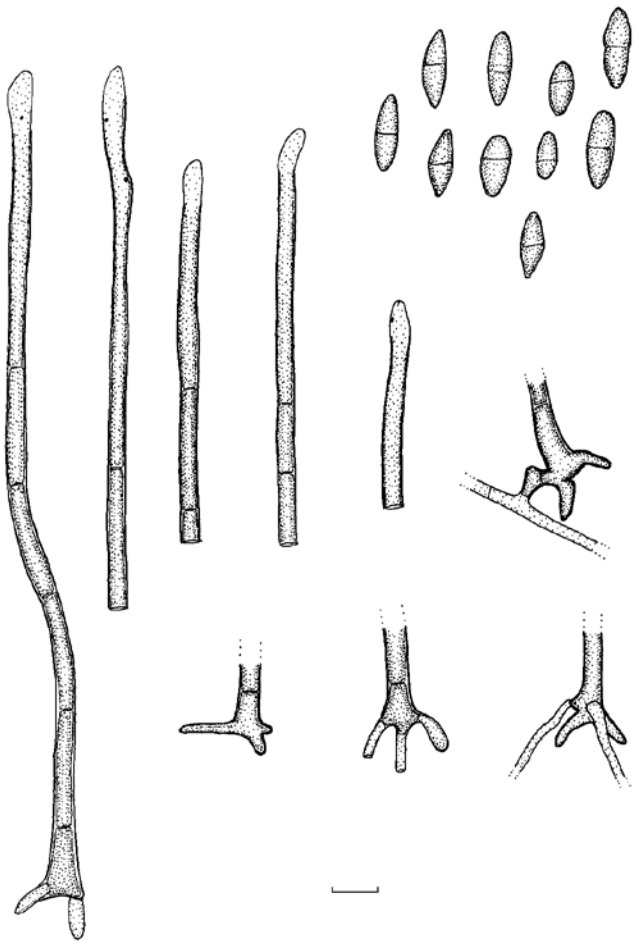


**Fig. 372.** *Digitopodium hemileiae* (BPI 426854, holotype of *C. hemileiae*). Conidiophores with digitate or rhizoid protuberances and conidia. Scale bar = 10 µm. B. Heuchert *del.*

*Lit.*: Saccardo (1931: 795), Prasil & de Hoog (1988: 53, as "var."), Schubert & Braun (2007: 200).

*herbarum* f. *sechii-edulis* Thüm., Herb. Mycol. Oecon., Fasc. X, No. 466. 1877, *nom. nud*.
*Syntype*: **USA**, South Carolina, Aiken, on faded leaves of *Sechium edule* (*Cucurbitaceae*), autumn 1876, H.W. Ravenel, ex herb. Thümen (M) and Thümen, Herb. Mycol. Oecon. 466 (*e.g.*, M).
= ***Cercospora apii*** Fresen. *s. lat.*
*Lit.*: Stevenson (1971).

*herbarum* var. *hypharum* (sic) Westend. & Van Haes., Lindau (1910 – in index).
*Notes*: An error. Refers to *C. herbarum* var. *typharum* Westend. & Van Haes., in Lindau (1907: 801).

*herbarum* var. *rubi* Gonz. Frag., Mem. Real Acad. Ci. Barcelona, Ser. 3, 15(17): 458 (32). 1920.
*Notes*: See *C. herbarum* f. *rubi* Gonz. Frag.

*heteronemum* (Desm.) Oudem., Arch. Néerl. Sci. Exact. Nat. 11: 363. 1876.
*Type*: France, on dead leaves of *Sagittaria sagittifolia* (*Alismataceae*), Desmazières, Pl. Crypt. N. France, Sér. 2, No. 7.
*Basionym*: *Macrosporium heteronemum* Desm., Ann. Sci. Nat. Bot., Sér. 3, 20: 216. 1853.
≡ *Helminthosporium heteronemum* (Desm.) Oudem. (*in herb.*? ).
= ? *Ascospora solidaginis* Fr., Summa veg. Scand. 2: 425. 1849.
= ? *Cercospora sagittariae* Ellis & Kellerm., J. Mycol. 2: 1. 1886.
*Notes*: Synonomy and exsiccati in Oudemans (1923). Examinations of several collections from HAL and M, all on *Sagittaria sagittifolia* (*e.g.*, Thümen, Mycoth. Univ. 1167 and Rabenhorst, Fungi. Eur. Exs. 1468) always contained *Cercospora sagittariae*.

*heterosporium*, *in herb*.
*Specimen*: **USA**, New York, Buffalo, on an unidentified host plant, G.W. Clinton (BPI 427204).
*Notes*: Excluded, conidiophores with tretic conidiogenous loci. Taxonomic affinity remains unclear.

*hoveae* Syd. & P. Syd., Ann. Mycol. 15: 148. 1917. Fig. 373.
*Holotype*: **Australia**, Brisbane River, on leaves of *Hovea* sp. ("*longifolia* var. *pannosa*") (*Fabaceae*), 1863–1865, A. Dietrich, comm. J. Bornmüller (S).
≡ ***Pseudocercospora hoveae*** (Syd. & P. Syd.) K. Schub. & U. Braun, Mycol. Progr. 4(2): 106. 2005.
*Lit.*: Saccardo (1931: 792).
*Ill.*: Schubert & Braun (2005a: 106, fig. 6).

*humile* Davis, Trans. Wisconsin Acad. Sci. 19: 702. 1919.
*Lectotype*: **USA**, Wisconsin, Luck, on leaves of *Acer rubrum* (*Sapindaceae*), 25 Aug. 1916, J.J. Davis (WIS). *Isolectotype*: BPI 427214.
≡ ***Fusicladium humile*** (Davis) K. Schub. & U. Braun, IMI Descriptions of Fungi and Bacteria 152, No. 1520. 2002.

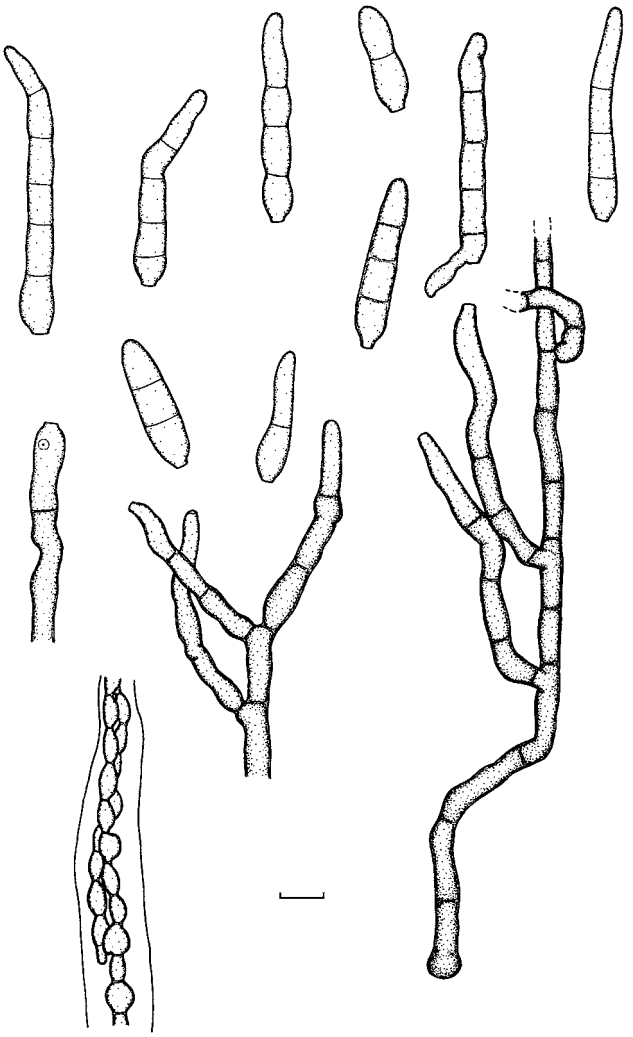


**Fig. 373.** *Pseudocercospora hoveae* (S, holotype of *C. hoveae*). Conidiophores and conidia. Scale bar = 10 µm. K. Bensch *del.*

≡ *Fusicladosporium humile* (Davis) Partridge & Morgan-Jones, Mycotaxon 85: 366. 2003.

= *Venturia acerina* Plakidas ex M.E. Barr, Canad. J. Bot. 46: 814. 1968.

*Lit.*: Saccardo (1931: 788), Ellis (1976: 340), Sivanesan (1984: 607, as *Cladosporium* state of *Venturia acerina*), Schubert *et al.* (2003: 57).

*inaequiseptatum* Matsush., Icones Microfungorum a Matsushima Lectorum: 35. 1975.

*Holotype*: **Japan**, Miyajima, Hiroshima, on a dead leaf of *Quercus phillyraeoides* (*Fagaceae*), May 1972 (Matsush. Herb. 4428).

≡ ***Parapleurotheciopsis inaequiseptata*** (Matsush.) P.M. Kirk, Trans. Brit. Mycol. Soc. 78(1): 65. 1982.

*infuscans* Thüm., Rev. Mycol. (Toulouse) 1: 59. 1879. Fig. 374.

*Syntypes*: **USA**, South Carolina, Aiken, on living stems of *Desmodium strictum* (*Fabaceae*), H.W. Ravenel, Thümen, Mycoth. Univ. 1573 (*e.g.*, BPI 427232, 427231, HAL, M, NY); Ravenel, Fungi Amer. Exs. 598 (*e.g.*, NY, PH 01020439). *Possible syntypes*: Roumeguère, Fungi Sel. Gall. Exs. 4788 (*e.g.*, NY).

≡ ***Dendryphiella infuscans*** (Thüm.) M.B. Ellis, Dematiaceous Hyphomycetes: 500. 1971.

*Lit.*: Saccardo (1886: 361).

*jacarandae* Viégas, Bragantia 7(2): 33. 1947. Fig. 375.

*Holotype*: **Brazil**, Minas Gerais, Agua Limpa, Exp. de Agua Limpa, on living leaves of *Jacaranda* sp. (*Bignoniaceae*), 21 May 1945, E.P. Heringer (IACM).

≡ ***Fusicladium jacarandae*** (Viégas) K. Schub., U. Braun & F. Freire, Sydowia 56(2): 302. 2004.

*Ill.*: Viégas (1947: 46, fig. 11), Schubert & Braun (2004: 303, fig. 3).

*jaczewskii* Rojdest., *in herb*.

*Specimen*: **Russia**, Altaj, Bijskij uezd, on insect eggs from the lower side of leaves of *Prunus padus* (*Rosaceae*), 1 Nov. 1924, N.A. Rojdestwensky (LEP).

*Notes*: Excluded. A mixture of conidia of several hyphomycetes (*Alternaria* sp., *Cladosporium* cf. *herbarum*, *Cladosporium* sp.).

*lactucae in herb.*

*Specimen*: **Turkestan**, on leaves of *Lactuca serriola* (*Asteraceae*), 28 May 1912, Barbarin (LEP).

= ***Passalora scarioliae*** Syd., Ann. Mycol. 34: 401. 1936.

*Notes*: It is a new record for *Passalora scarioliae* until now only known from Germany, India and Iran.

*lactucae* Sawada, Rep. Gov. Res. Inst. Formosa 85: 92. 1943, *nom. inval*.

*Syntypes*: **Taiwan**, Taipei, on *Pteroscypsela indica* (≡ *Lactuca indica*) (*Asteraceae*), 9 Mar. 1924, K. Sawada (BPI 427238, PPMH).

= *Cladosporium lactucicola* Y. Cui & Z.Y. Zhang, Mycosystema 21(1): 22. 2002.

≡ *Cladosporium lactucicola* Z.Y. Zhang & Y. Cui, Flora Fungorum Sinicorum, Vol. 14: 114. 2003, *nom. superfl.*

≡ ***Passalora lactucicola*** (Y. Cui & Z.Y. Zhang) K. Schub. & U. Braun, Mycol. Progr. 4(2): 105. 2005.

*Ill.*: Schubert & Braun (2005a: 105, fig. 4).

*Additional authentic material*: **Japan**, Anetai, Iwate Prefecture, on *Lactuca raddeana*, 20 Oct. 1947, A. Ouchi, herb. Sawada (herb. Univ. Iwate).

*lactucicola* Y. Cui & Z.Y. Zhang, Mycosystema 21(1): 22. 2002. Fig. 376.

*Holotype*: **China**, Sichuan Prov., Chengdu, on living leaves of *Pteroscypsela indica* (≡ *Lactuca indica*) (*Asteraceae*), 15 Aug. 1985, Y. Qing (MHYAU 03881).

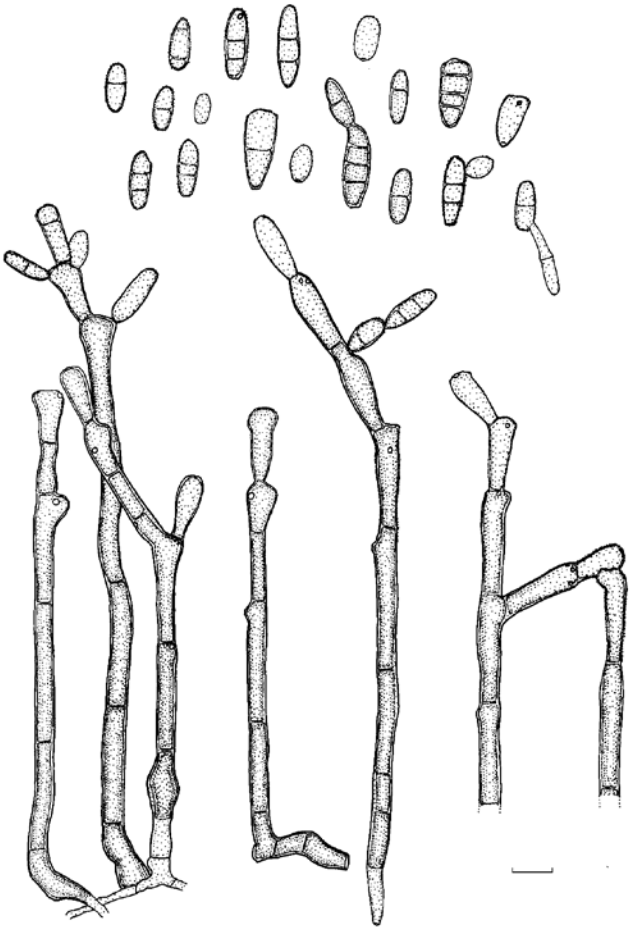


**Fig. 374.** *Dendryphiella infuscans* (WIS, lectotype of *C. elsinoes*). Conidia and conidiophores. Scale bar = 10 µm. B. Heuchert *del*.

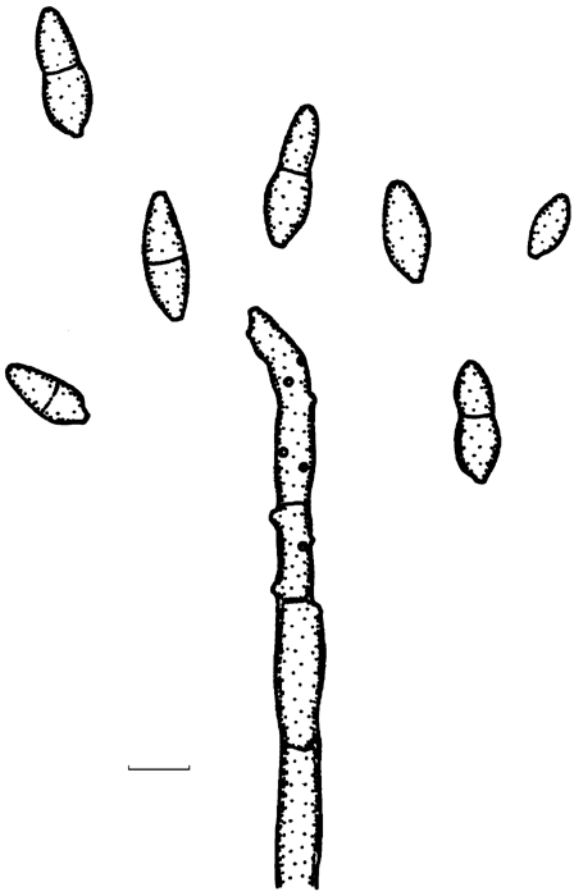


**Fig. 375.** *Fusicladium jacarandae* (IACM, holotype of *C. jacarandae*). Conidiophores and conidia. Scale bar = 10 µm. K. Bensch *del*.

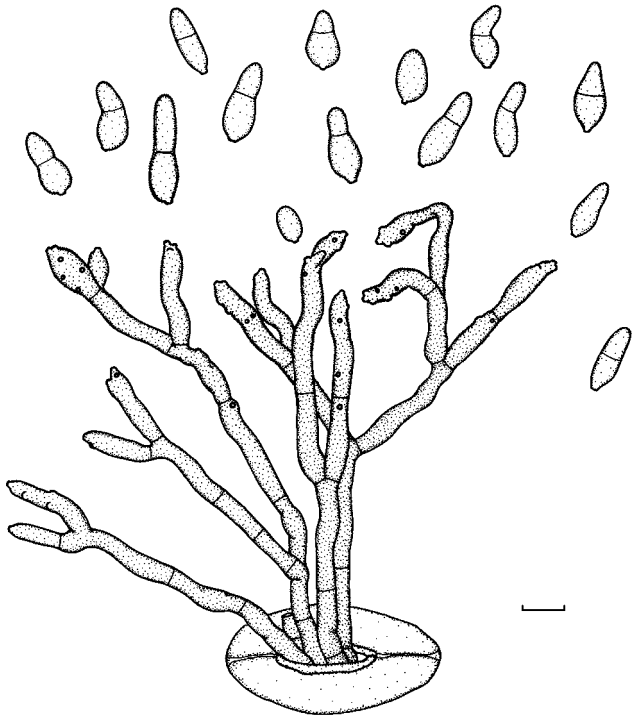


**Fig. 376.** *Passalora lactucicola* (BPI 427238, syntype of *C. lactucae*). Conidiophores and conidia. Scale bar = 10 µm. K. Bensch *del*.

≡ *Cladosporium lactucicola* Z.Y. Zhang & Y. Cui, Flora Fungorum Sinicorum, Vol. 14: 114. 2003, *nom. superfl.*

≡ ***Passalora lactucicola*** (Y. Cui & Z.Y. Zhang) K. Schub. & U. Braun, Mycol. Progr. 4(2): 105. 2005.

= *Cladosporium lactucae* Sawada, Rep. Gov. Res. Inst. Formosa 85: 92. 1943, *nom. inval.*

*Ill.*: He & Zhang (2002: 22, fig. 2), Zhang *et al.* (2003: 114, fig. 73), Schubert & Braun (2005a: 105, fig. 4).

*ladinum* E. Müll., Sydowia 4: 294. 1950.

*Type*: **Switzerland**, Graubünden, Scuol, on dead stems of *Laserpitium halleri* (*Apiaceae*), 17 Jul. 1948, E. Müller (ZT).

= ? *Leptosphaeria ladina* E. Müll., Sydowia 4: 293, 1950.

≡ *Nodulosphaeria ladina* (E. Müll.) L. Holm, Symb. Bot. Upsal. 14(3): 83, 1957.

*Notes*: "It must be considered a culture contaminant rather than an anamorph" (Crane & Shearer 1991).

*lantanae* K. Bhalla & A.K. Sarbhoy, Indian Phytopathol. 53(3): 263. 2000, as "(Deighton) K. Bhalla & A.K. Sarbhoy comb. nov.", *nom. illeg.* [based on *Mycovellosiella lantanae* var. *cubensis* Deighton, non *Cladosporium cubense* R.F. Castañeda, 1987, but the circumscription included *C. trichophilum* Petr.].

*Type*: **Cuba**, Bayamo, on living leaves of *Lantana camara* (*Verbenaceae*), Mar. 1967, R. Urtiaga (IMI 126781b).

≡ *Mycovellosiella lantanae* Chupp var. *cubensis* Deighton, Mycol. Pap. 137: 36. 1974.

≡ ***Passalora lantanae*** var. ***cubensis*** (Deighton) U. Braun & Crous, *Mycosphaerella* and its anamorphs: 1. Names published in *Cercospora* and *Passalora*, CBS Biodiversity Ser. 1: 243. 2003.

*laxum* Kalchbr. & Cooke, Grevillea 9(49): 24. 1880.

*Types*: **South Africa**, on fading leaves of *Printzia pyrifolia* (*Asteraceae*) (IMI 115272, K).

≡ *Mycovellosiella laxa* (Kalchbr. & Cooke) Deighton, Mycol. Pap. 137: 65. 1974.

≡ ***Passalora laxa*** (Kalchbr. & Cooke) U. Braun & Crous, *Mycosphaerella* and its anamorphs: 1. Names published in *Cercospora* and *Passalora*, CBS Biodiversity Ser. 1: 458. 2003.

*Lit.*: Saccardo (1886: 358).

*leproides* (L. Léger & Nogueira) Nann., Trattato di Micopatologia Umana 4: 409. 1934, as "(Léger & Nogueira) Thom 1930".

*Type*: Isol. from two patients with mild lesions resembling leprosy (location unknown).

*Basionym*: *Scopulariopsis leproides* L. Léger & Nogueira, Bull. Soc. Pathol. Exot. 15: 656. 1922.

≡ *Hormodendrum leproides* (L. Léger & Nogueira) C.W. Dodge, Med. Mycol.: 848. 1935.

*Notes*: "Certainly not a *Scopulariopsis*" ( Mycol. Pap. 86: 87, 1963). Not *Cladosporium s. str.*

*lethiferum* House, Bull. New York State Mus. Nat. Hist. 219/220: 62. 1919–1920.

*Notes*: Petrak (Petrak's Lists 1: 192) seems to have errored. *Cladosporium lethiferum* Peck is the published name. See comments under *Cladosporium brevipes* House.

*lethiferum* Peck, Rep. (Annual) New York State Mus. Nat. Hist. 40: 64. 1887.

*Holotype*: **USA**, New Hampshire, Keene, on living leaves of *Populus tremuloides* (*Salicaceae*), Jun. 1887, Peck (NYS). *Isotype*: BPI 427241.

≡ *Pollaccia lethifera* (Peck) M. Morelet, Bull. Soc. Sci. Nat. Archéol. Toulon & Var 34(219): 12. 1978.

≡ *Pollaccia radiosa* (Lib.) E. Bald. & Cif. var. *lethifera* (Peck) M. Morelet, Cryptog. Mycol. 6: 113. 1985.

≡ ***Fusicladium radiosum*** (Lib.) Lind var. ***lethiferum*** (Peck) Ritschel & U. Braun, Schlechtendalia 9: 87. 2003.

= *Clasterosporium populi* Ellis & Everh., J. Mycol. 7: 134. 1892, *nom. illeg.*, homonym, non *C. populi* Sacc., 1886. [Type: NY].

≡ *Stigmina populi* Pound & Clem., Bull. Geol. Nat. Hist. Surv. 9: 662. 1896, as "(Ellis & Everh.) Pound & Clem.".

≡ *Stigmina populi* Peck, Bull. New York State Mus. Nat. Hist. 157: 34. 1912, as "(Ellis & Everh.) Peck".

= *Dicoccum populinum* Ellis & Everh., Proc. Acad. Nat. Sci. Philadelphia 1893: 462. 1894. [Type: NY].

= *Fusicladium lageniforme* Solheim & Hadfield, Univ. Wyoming Publ. 1946: 18–19. 1946, *nom. inval.*

= *Pollaccia americana* Ondřej, Eur. J. Forest Pathol. 2: 144. 1972. [Type: DAOM, as *Fusicladium radiosum* (Lib.) Lind].

= *Venturia tremulae* Aderh. var. *grandidentatae* M. Morelet, Cryptog. Mycol. 6: 113. 1985.

*Lit.*: Saccardo (1892: 604).

*levieri* (Magnus) Hara, Agric. & Hort. 12: 2706. 1937.

*Holotype*: **Caucasus**, Georgia, Batum, "in silvis litoris Euscini", on *Diospyros lotus* (*Ebenaceae*), 16 Jun. 1890 (HBG).

≡ ***Fusicladium levieri*** Magnus, Trudy Imp. S.-Peterburgsk. Bot. Sada 16: 543. 1900.

≡ *Ragnhildiana levieri* (Magnus) Vassiljevsky, in Vassiljevsky & Karakulin, Parazitnye nesovershennye griby, Ch. 1., Gifomitsety: 373. 1937.

≡ *Phaeoramularia levieri* (Magnus) U. Braun, Proc. Komarov Bot. Inst. (St. Petersburg) 20: 68. 1997.

= *Fusicladium kaki* Hori & Yoshino, Bot. Mag. (Tokyo) 19: 220. 1905.

= *Fusicladium diospyros* Chona, Munjal & J.N. Kapoor, Indian Phytopathol. 9: 129. 1956. [Type: HClO?].

= *Fusicladium diospyros* Hori & Yoshino, *in herb.* (B).

Lit.: Schubert (2001), Crous & Braun (2003: 482), Schubert *et al.* (2003: 61–62), Scholler *et al.* (2004: 132–134).

*lichenicola* Linds., Quart. J. Microscop. Sci., N.S., 11: 42. 1871, as "*lichenicolum*", *nom. inval.*

*Type*: **UK**, Scotland, S. Aberdeenshire, Falls of the Garrawalt, on thallus of *Peltigera aphthosa* (*Peltigeraceae*), Aug. 1856, W.L. Lindsay.
*Lit.*: Hawksworth (1979: 269), Heuchert *et al.* (2005: 55).
*Notes*: "...refers only to sterile mycelium. Lindsay was hesitant in introducing the name as he stated that the fungus '... if it is entitled to specific distinction, may be fitly denominated *C. lichenicolum*'." (Hawksworth 1979). The original description of this species is insufficient and type material is not preserved so the generic affinity of this species remains unknown. Hawksworth (1979) considered this name as probably invalid, according to ICBN, Art. 34, a conclusion confirmed by examination of the original description.

*lichenum* Keissl., Centralbl. Bakteriol., 2. Abth., 37: 389. 1913.
*Holotype*: **Austria**, Steiermark, valle See-Aü at Leopoldsteiner See near Eisenerz, alt. 700 m, on apothecia of *Loxospora cismonica* (≡ *Haematomma cismonicum*) (*Sarrameanaceae*), Jul. 1912, K. von Keissler (W1912/117).
≡ *Pseudocercospora lichenum* (Keissl.) D. Hawksw., Bull. Brit. Mus. (Nat. Hist.), Bot. 6(3): 246. 1979.
*Lit.*: Saccardo (1931: 796), Heuchert *et al.* (2005: 69).
*Ill.*: Hawksworth (1979: 247, Fig. 31).
*Notes*: Excluded, status still unclear, but based on unthickened conidiogenous loci in any case not a species of *Cladosporium s. str.*

*lignatile* Schwein., Trans. Amer. Philos. Soc., N.S., 4(2): 277. 1832.
*Holotype*: **USA**, Pennsylvania, Bethlehem, on rotten wood, No. 2601 (PH 01020417, as "*lignatilis*").
≡ *Virgaria lignatilis* (Schwein.) S. Hughes, Canad. J. Bot. 31: 603. 1953.
= *Botrytis nigra* Link, Ges. Naturf. Freunde Berlin Mag. Neuesten Entdeck. Gesammten Naturk. 3: 14. 1809.
≡ ***Virgaria nigra*** (Link) Nees, Syst. Pilze 1: 54. 1817.
≡ *Sporotrichum nigrum* (Link) Fr., Syst. mycol. 3(2): 416. 1832.
≡ *Trichosporum nigrum* (Link) Fr., Summa veg. scand. 2: 492. 1849.
= *Sporotrichum fuliginosum* Pers., Mycol. eur. 1: 77. 1822. [Type: L].
= *Botrytis atrofumosa* Cooke & Ellis, Grevillea 6(39): 90. 1878. [Types K, NY].
≡ *Virgaria atrofumosa* (Cooke & Ellis) Sacc., Syll. fung. 4: 281. 1886.
= *Trichosporum splenicum* Sacc. & Berl., Atti Reale Ist. Veneto Sci. Lett. Arti, Ser. 6, 3(4): 741. 1885. [Type: PAD].
*Lit.*: Saccardo (1886: 356), Hughes (1958: 751, 823).

*lonicerae* Sawada, Rep. Gov. Res. Inst. Formosa 86: 163. 1943, *nom. inval*.
*Syntype*: **Taiwan**, Taipei, on *Lonicera japonica* var. *sempervillosa* (*Caprifoliaceae*), 20 Dec. 1914, K. Sawada (BPI 427243).
= ***Zasmidium lonicericola*** (Y.H. He & Z.Y. Zhang) Crous & U. Braun, Persoonia 23: 140. 2009.

*lonicericola* Y.H. He & Z.Y. Zhang, Mycosystema 20(4): 469. 2001 and in Zhang *et al.*, Flora Fungorum Sinicorum, Vol. 14: 116. 2003. Figs 377, 378.
*Holotype*: **China**, Yunnan Prov., Kunming, on living leaves of *Lonicera japonica* (*Caprifoliaceae*), 3 Aug. 1990, H. Li (MHYAU 03533). *Epitype* (designated in Crous *et al.*, 2009c): **South Korea**, Hongchon, on leaves of *Lonicera japonica*, 30 Oct. 2004, coll. H.-D. Shin, isol. P.W. Crous (CBS H-20271) (dried culture). *Ex-epitype cultures*: CPC 11671 = CBS 125008, CPC 11672, 11673.
≡ *Stenella lonicericola* (Y.H. He & Z.Y. Zhang) K. Schub., H.D. Shin & U. Braun, Fungal Diversity 20: 204. 2005.
≡ ***Zasmidium lonicericola*** (Y.H. He & Z.Y. Zhang) Crous & U. Braun, Persoonia 23: 140. 2009.
*Ill.*: He & Zhang (2001: 469, fig. 1), Zhang *et al.* (2003: 117, fig. 75), Schubert & Braun (2005b: 205–206, figs 7–8).

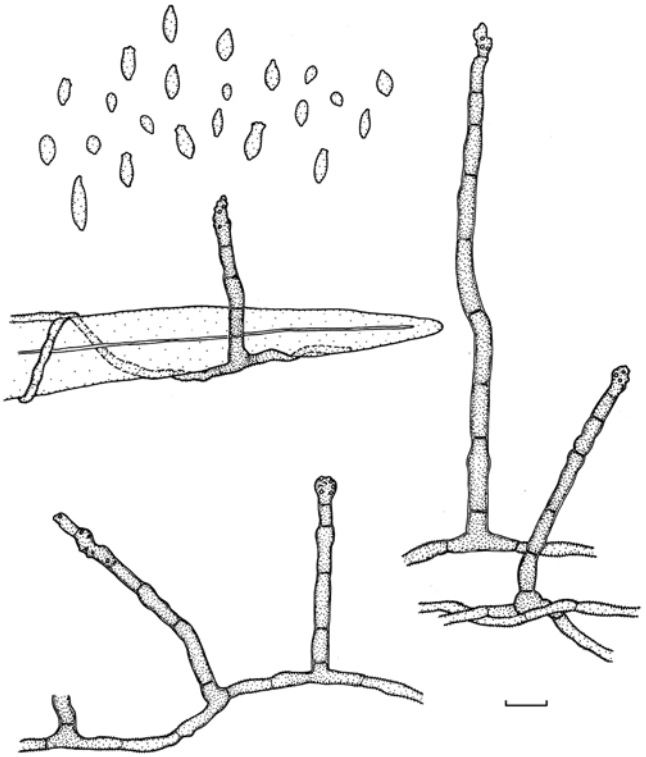


**Fig. 377.** *Zasmidium lonicericola* (BPI 427243, syntype of *C. lonicerae*). Conidiophores and conidia. Scale bar = 10 µm. K. Bensch *del*.

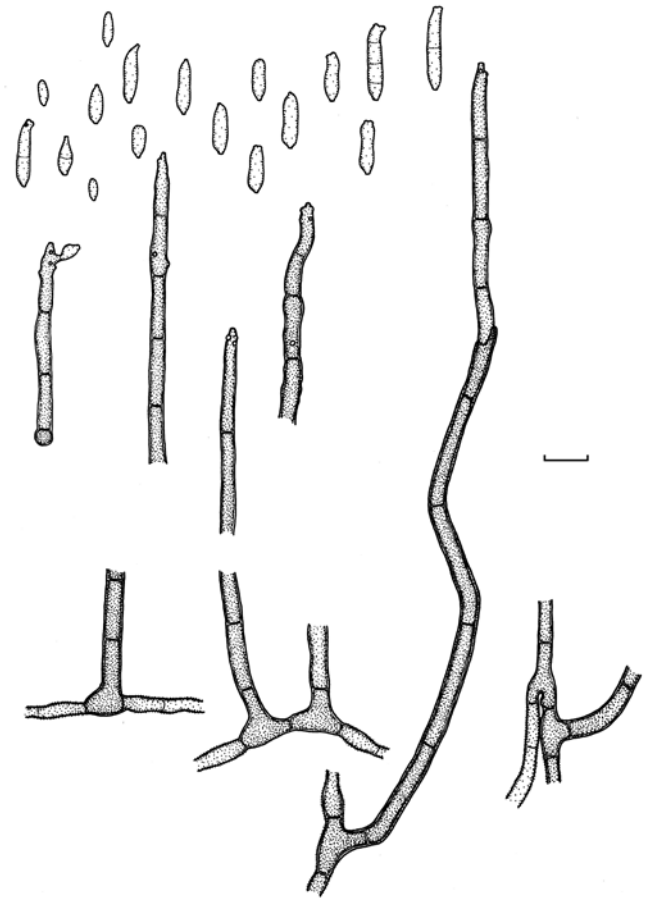


**Fig. 378.** *Zasmidium lonicericola* (HAL). Conidiophores and conidia. Scale bar = 10 µm. K. Bensch *del*.

*Notes*: Based on its ITS DNA phylogeny and scar type (planate instead of pileate), this species is better placed in *Zasmidium* (Crous *et al.* 2009c). *Abelia biflora* and *Leycesteria formosa* (*Caprifoliaceae*) are reported as additional hosts. *Cladosporium*

*lonicerae* Sawada is cited as synonym, which could be confirmed based on a re-examination.

*lysimachiae* H.C. Greene, Trans. Wisconsin Acad. Sci. 38: 232. 1946, *nom. illeg*., homonym, non *C. lysimachiae* Guba, 1939.
*Lectotype* (**designated here**): **USA**, Wisconsin, Dane Co., Madison, Univ. Wisconsin Arboretum, Marsh, on living leaves and stems of *Lysimachia terrestris* (*Primulaceae*), 24 Aug. 1943, H.C. Greene (WIS). *Isotype*: BPI 427245).
= ***Fusicladium lysimachiae*** (Guba) K. Schub. & U. Braun, Mycol. Progr. 4(2): 102. 2005.

*lysimachiae* Guba, Rhodora 41: 513. 1939. Fig. 379.
*Holotype*: **USA**, Massachusetts, Nantucket Co., Nantucket, in waste places near the waterfront east of Main Street, on living leaves, rarely on the stems of *Lysimachia vulgaris* (*Primulaceae*), 15 Aug. 1936, E.F. Guba, No. 115 (ILL 21101).
≡ ***Fusicladium lysimachiae*** (Guba) K. Schub. & U. Braun, Mycol. Progr. 4(2): 102. 2005.
= *Cladosporium lysimachiae* H. C. Greene, Trans. Wisconsin Acad. Sci. 38: 232. 1946, *nom. illeg.*
*Ill*.: Schubert & Braun (2005a: 103, fig. 1).

*lythri* Westend., Bull. Acad. Roy. Sci. Belgique 21(8): 240. 1854.
*Type*: **Belgium**, near Courtrai, on leaves of *Lythrum salicaria* (*Lythraceae*), Westendorp, No. 1091 (BR).
≡ *Cercospora lythri* (Westend.) Niessl, Hedwigia 15: 1. 1876.
≡ *Stenella lythri* (Westend.) J.L. Mulder, Trans. Brit. Mycol. Soc. 65: 517. 1975.
≡ ***Zasmidium lythri*** (Westend.) U. Braun & H.D. Shin, **comb. nov.** MycoBank, MB800302.
= *Cercospora sanguinea* Fuckel, Hedwigia 5: 30. 1866. [Type: Fuckel, Fungi Rhen. Exs. 1630, *e.g*., HAL].
*Lit*.: Saccardo (1886: 452), Lindau (1910: 122, 803), Chupp (1954: 362), Crous & Braun (2003: 259).

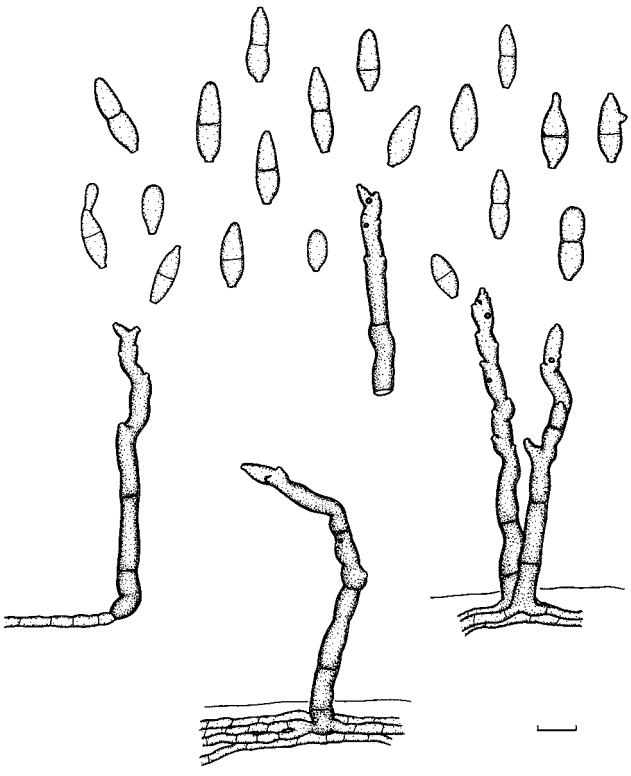


**Fig. 379.** *Fusicladium lysimachiae* (ILL 21101, holotype of *C. lysimachiae*). Conidiophores and conidia. Scale bar = 10 µm. K. Bensch *del*.

*machili* Sawada, Special Publ. Coll. Agric. Natl. Taiwan Univ. 8: 196. 1959, *nom. inval*.
*Holotype*: **Taiwan**, Pref. Taipei, Taipei, on leaves of *Machilus thunbergii* (*Lauraceae*), 15 Nov. 1914, Y.F (PPMH).
*Notes*: Excluded, taxonomic status remains unclear. *Gonatophragmium*?

*maculatum* Cooke, Fungi Brit. Exs., No. 162 (?).
*Syntype*: **UK**, Channel Islands, Jersey, on an unidentified host, Cooke, Fungi Brit. Exs. 162 (*e.g*., B 700006613).
*Lit*.: Oudemans (1921).
*Notes*: Excluded. Material immature and poor, cercosporoid.

*maculicola* Ellis & Barthol., *in herb*.
*Specimen*: **USA**, Kansas, Rockport, on leaves of *Populus deltoids* subsp. *monilifera* (≡ *P. monilifera*) (*Salicaceae*), Sep. 1894, E. Bartholomew, ex herb. Ellis (BPI 427256, type material of *Cladosporium subsessile*).
≡ ***Fusicladium subsessile*** (Ellis & Barthol.) K. Schub. & U. Braun, IMI Descriptions of Fungi and Bacteria 152, No. 1519. 2002.

*maculicola* (Romell & Sacc.) M. Morelet, Bull. Soc. Sci. Nat. Archéol. Toulon & Var 201: 4. 1972, as "*maculicolum*".
*Lectotype*: **Sweden**, Nacka Vikdalen, on living leaves of *Populus tremula* (*Salicaceae*), 24 Jun. 1890, L. Romell (S). *Isolectotypes*: IMI 17008, PAD, WINF(M) 11082.
*Basionym*: *Torula maculicola* Romell & Sacc., Grevillea 21(99): 69. 1893, non *Fusicladium maculicola* (Ellis & Kellerm.) Ondřej, 1973.
≡ *Phaeoramularia maculicola* (Romell & Sacc.) B. Sutton, Canad. J. Bot. 48: 471. 1970.
≡ ***Fusicladium romellianum*** Ondřej, Česká Mykol. 27(4): 237. 1973.
= *Pollacia borealis* A. Funk, Canad. J. Bot. 67: 776. 1989. [Type: DAVFP 23609].
*Lit*.: Ellis (1976: 322), Schubert & Braun (2002b, c), Schubert *et al.* (2003: 90–92).

*madagascarense* Sartory, Champignons Parasites de l'Homme et des Animaux 11: 729. 1923, as "*madagascarensis*".
*Type*: **Madagascar**, infection of human.
≡ *Cladosporium* sp. ("*madagascariensis*") Guég., Compt. Rend. Hebd. Séances Acad. Sci. 152(7): 412–413. 1911.
≡ ? *Cladosporium madagascariense* Verdun, Précis de Parasitologie Humaine, éd. 2: ?. 1912 [publication not found].
≡ *Hormodendrum madagascarense* (Verdun) C.W. Dodge, Med. Mycol.: 845. 1935.
*Lit*.: de Hoog *et al.* (2000: 1025).
*Notes*: The name *C. madagascariensis* was not coined by Guéguen (*C.* sp.). A description for this species was given in Sartory (1923: 729), who cited "Verdun, 1912" without any details. But this publication could not be traced, and it is unclear if Verdun introduced the name *C. madagascarense* and if he published a first description. Doubtful species, no material known (de Hoog *et al.* 2000).

*malopis* Fuss, Archiv Vereins Siebenb. Landesk., N.F., 14(2): 431. 1878, *nom. nud*.
*Type*: **Romania**, Giresau, on overwintered stems of *Malope malacoides* (*Malvaceae*), Fuss (location unknown).
*Notes*: Classified by Fuss (1878) as a forma of *C. herbarum*.

*malorum* Ruehle, Phytopathology 21: 1146. 1931.
*Type*: **USA**, Washington, on living fruits of *Malus sylvestris* (= *Pyrus malus*) (*Rosaceae*).
≡ *Cladosporium malorum* Heald & Ruehle, Wash. State Agric. Exp. Sta. Bull. 245: 48. 1930, *nom. nud.*
≡ *Alternaria malorum* (Ruehle) U. Braun, Crous & Dugan, Mycol. Progr.

2(1): 5. 2003.
= *Cladosporium gossypii* Jacz., Khlopkovoe Delo 1929, 5–6: 564. 1929 and Trudy Byuro Priklad. Bot. 24 (5): 181–182. 1931.
≡ ***Chalastospora gossypii*** (Jacz.) U. Braun & Crous, Persoonia 22: 144. 2009.
= *Phaeoramularia kellermaniana* Marasas & I.H. Bredell, Bothalia 11: 217. 1974 [Types: IMI 165252, PREM 44703].
≡ *Cladophialophora kellermaniana* (Marasas & I.H. Bredell) U. Braun & Feiler, Microbiol. Res. 150: 83. 1995.
≡ *Pseudocladosporium kellermaniana* (Marasas & I.H. Bredell) U. Braun, A monograph of *Cercospora*, *Ramularia* and allied genera 2: 393. 1998.
= *Cladosporium porophorum* Matsush., Icones Fungorum a Matsushima Lectorum: 36. 1975.

*Lit.*: Ho *et al.* (1999: 134), Goetz & Dugan (2006).

*Notes*: Due to the phylogenetic position of this taxon within the *Pleosporaceae* close to *Alternaria* spp. and the morphologically similarity to *Alternaria cetera* Braun *et al.* (2003) assigned *C. malorum* to *Alternaria s. lat.* However, the small, amero- to phragmosporous conidia of *A. cetera* as well as *A. malorum* are rather different from those of common *Alternaria* species. In a recently published manual of *Alternaria*, Simmons (2007) excluded *A. cetera* from the latter genus and placed it in the new genus *Chalastospora*. *Cladosporium malorum* agrees with the concept of this genus and is congeneric (Crous *et al*. 2009a). Type material of *C. gossypii* was re-examined and it is identical to *C. malorum*. However, *C. gossypii* is an older name than *C. malorum*, which was published in 1931, and has priority.

*mansonii* (Castell.) Pinoy, Ann. Dermatol. Syphiligr., Sér. 5, 3: 341. 1912 ? (not on page 341).

*Neotype* (selected by de Hoog & Hermanides-Nijhof, 1977): **India**, Ceylon [Sri Lanka], isol. from a human patient (CBS H-7131). *Isotypes*: CBS H-7132, CBS H-7133. *Ex-neotype culture*: CBS 158.58 = IMI 134457 = ATCC 18657.
≡ *Microsporum mansonii* Castell., Brit. Med. J. 2: 1271. 1905.
≡ *Foxia mansonii* (Castell.) Castell., J. Trop. Med. Hyg. 11: 261. 1908.
≡ *Malassezia mansonii* (Castell.) Verdun, Précis de Parasitologie Humaine, éd. 2: 698. 1912.
≡ *Torula mansonii* (Castell.) Vuill., Compt. Rend. Hebd. Séances Acad. Sci. 89: 406. 1929.
≡ *Sporotrichum mansonii* (Castell.) Toro, Sci. Surv. Porto Rico & Virgin Islands 8: 222. 1932, as "*mansoni*".
≡ *Dematium mansonii* (Castell.) C.W. Dodge, Med. Mycol.: 678. 1935.
≡ *Pullularia mansonii* (Castell.) Borelli, Riv. Anat. Patol. Oncol. 17: 617. 1960.
≡ *Aureobasidium mansonii* (Castell.) W.B. Cooke, Mycopathol. Mycol. Appl. 17: 34. 1962.
≡ *Rhinocladiella mansonii* (Castell.) Schol-Schwarz, Antonie van Leeuwenhoek J. Microbiol. Serol. 34: 122. 1968.
≡ ***Exophiala mansonii*** (Castell.) de Hoog, Stud. Mycol. 15: 114. 1977.
≡ *Wangiella mansonii* (Castell.) Bièvre & Mariat, Bull. Soc. Franç. Mycol. Méd. 8(2): 127. 1979.

*Lit.*: Nannizzi (1934: 405), Kwon-Chung & Bennett (1992: 191–192), de Hoog *et al.* (2000: 1026).

*Notes*: De Hoog & Hermanides-Nijhof (1977) and "Index fungorum" give "Castell. & Chalm." as authors of the combination *Cladosporium mansonii* (Castell.), Manual of Tropical Medicine, ed. 2: 1100, 1913. Kwon-Chung & Bennett (1992) summarise nomenclatural controversies surrounding the name *C. mansonii*. According to these authors, it was Castellani who proposed the combination *C. mansonii* and attributed it to Pinoy. This name has been abandoned because of confusion. The neotype strain, CBS 158.58, is also the ex-type strain of *Exophiala castellanii* (de Hoog *et al.* 2000).

*marinum* A.K. Pal & Purkay., J. Mycopathol. Res. 30(2): 175. 1992.

*Holotype*: **India**, West Bengal, Sundarban, Bakkhali, on living leaves of *Avicennia marina* (*Acanthaceae*), 10 Jun. 1991 (on the label) / 14 May 1991, A.K. Pal (IMI 351331).

*Ill.*: Pal & Purkayastha (1992: 174, figs 3–5).

*Notes*: Not *Cladosporium s. str.*, but status unclear.

*martianoffianum* Thüm., Byull. Moskovsk. Obshch. Isp. Prir., Otd. Biol. 55(1): 74. 1880.

*Lectotype*: **Russia**, Siberia, Minussinsk, near river Jenissei, on living leaves of *Populus laurifolia* (*Salicaceae*), Aug. 1879, N. Martianoff (M). *Isolectotypes*: Thümen, Mycoth. Univ. 2067.
≡ ***Fusicladium martianoffianum*** (Thüm.) K. Schub. & U. Braun, IMI Descriptions of Fungi and Bacteria 152, No. 1515. 2002.
= *Fusicladium asiaticum* Ondřej, Česká Mykol. 27(4): 237. 1973. [Type: LE 161361].

*Lit.*: Saccardo (1886: 357), Lindau (1907: 818, 1910: 796), Schubert *et al.* (2003: 64–65).

*Ill.*: Schubert *et al.* (2003: 65, fig. 31).

*metaniger* (Castell.) Ferraris, Atti Ist. Bot. "Giovanni Briosi" 3: 183. 1932.

*Type*: Isol. from a case of "trichomycosis nigra" on human skin, Castellani.

*Basionym*: *Cryptococcus metaniger* Castell., Archiv Dermatol. Syph. 16(4): 402. 1927.
= ***Hortaea werneckii*** (Horta) Nishim. & Miyaji, Jap. J. Med. Mycol. 26(2): 145. 1984.

*Lit.*: Nannizzi (1934: 406), Dodge (1935: 675), Cooke (1962: 27), Kwon-Chung & Bennett (1992: 195).

*Notes*: In Unesco (1955: 38) as "*metanigrum*". See *C. werneckii*.

*mikaniae* F. Stevens, Trans. Illinois Acad. Sci. 10: 208. 1917.

*Syntypes*: **Puerto Rico**, Las Marias, on leaves of *Mikania* sp. (*Asteraceae*), 22 Mar. 1913, F.L. Stevens (ILL 314, IMI 119607).
≡ *Mycovellosiella mikaniae* (F. Stevens) Deighton, Mycol. Pap. 137: 45. 1974.
≡ ***Passalora mikaniae*** (F. Stevens) U. Braun & F. Freire, Cryptog. Mycol. 23: 300. 2002.

*Lit.*: Saccardo (1931: 790), Crous & Braun (2003: 460).

*milii* Syd., Ann. Mycol. 12: 538. 1914.

*Syntypes*: **France**, "Lothringen", "Wald am Oetinger Tälchen" near Forbach, on leaves of *Milium effusum* (*Poaceae*), 22 Jun. 1913, A. Ludwig, Sydow, Mycoth. Germ. 1295; "Ostpreussen, Warnicken, Samland", on leaves of *Millium effusum*, 11 Jul. 1914, H. Sydow, Sydow, Mycoth. Germ. 1296 (*e.g.*, BPI 427263, HBG, M).
≡ ***Passalora milii*** (Syd.) G.A. de Vries, Contr. Knowl. Genus *Cladosporium*: 94. 1952.

*Lit.*: Saccardo (1931: 792), Crous & Braun (2003: 460).

*minor* R.F. Castañeda, Fungi Cubensis III: 22. 1988, as "*minus*", *nom. illeg.*, homonym, non *C. minor* Spreng. 1827.

*Holotype*: **Cuba**, Prov. Pinar del Río, Viñales, on an unidentified leaf, 25 Sep. 1987, R.F. Castañeda (INIFAT C87/292-2).
≡ *Alysidium minus* R.F. Castañeda & W.B. Kendr., Univ. Waterloo Biol. Ser. 35: 6. 1991, *nom. nov.*, as "(R.F. Castañeda) R.F. Castañeda & W.B. Kendr.".
≡ ***Castanedaea minor*** A. Baker & Partridge, Mycotaxon 78: 178. 2001, *nom. nov.*, as "(R.F. Castañeda) A. Baker & Partridge".

*minor* Spreng., Syst. veg. 4(1): 553. 1827, as "*minus*", *nom. superfl.*

*Type*: On fallen twigs and on stems of herbaceous plants.
= *Helminthosporium nanum* Nees, Syst. Pilze 1: 67. 1817, as "*Helmisporum nanum* Link".

≡ ***Dendryphion nanum*** (Nees) S. Hughes, Canad. J. Bot. 36: 761. 1958.

*Notes*: Cited in Lindau (1910: 40). Type material or any other collections unknown. *Cladosporium minor* is a superfluous name since *Helminthosporium nanum* was cited as synonym.

*minourae* Iwatsu, Mycotaxon 20(2): 523. 1984.

*Holotype*: **Japan**, Chiba, Shiroi, from rotting wood, 11 Feb. 1979, T. Iwatsu (IFM 4700, Depart. Pathog. Fungi, Research Inst. Chemobiodynamics, Chiba, Japan). *Ex-type culture*: ATCC 52853 = CBS 556.83 = IMI 298056).

≡ ***Cladophialophora minourae*** (Iwatsu) Haase & de Hoog, Stud. Mycol. 43: 94. 1999.

*Lit.*: Ho *et al.* (1999: 134).

*minus* R.F. Castañeda → *minor* R.F. Castañeda.

*minus* Spreng. → *minor* Spreng.

*modestum* Syd., Ann. Mycol. 37: 252. 1939.

*Type*: **Sierra Leone**, Kenema, on living leaves of *Anthostema senegalense* (*Euphorbiaceae*), 5 Dec. 1938, F.C. Deighton (IMI 7520).

≡ ***Denticularia modesta*** (Syd.) Deighton, Trans. Brit. Mycol. Soc. 59(3): 422. 1972.

*Lit.*: Ellis (1976: 183).

*molle* Cooke, Grevillea 6(40): 139. 1878.

*Syntypes*: **USA**, South Carolina, Aiken, on under surface of dead leaves of *Asclepias* (*Apocynaceae*) [IMI (slide), K, M].

≡ *Cercospora molle* (Cooke) Deighton, *in herb.* (IMI).

= *Cercospora venturioides* Peck, Rep. (Annual) New York State Mus. Nat. Hist. 34: 47. 1881. [Type: NYS].

≡ *Mycovellosiella venturioides* (Peck) U. Braun, Proc. Komarov Bot. Inst. (St. Petersburg) 20: 99. 1997.

≡ ***Passalora venturioides*** (Peck) U. Braun & Crous, *Mycosphaerella* and its anamorphs: 1. Names published in *Cercospora* and *Passalora*, CBS Biodiversity Ser. 1: 419. 2003.

= *Cercospora illionensis* Barthol., Fungi Columb., No. 2611. 1908. [Types: Bartholomew, Fungi Columb. 2611, *e.g.*, HBG, NY].

*Lit.*: Saccardo (1886: 363), Lindau (1907: 828), Crous & Braun (2003: 419).

*monardae* H.C. Greene, Amer. Midl. Naturalist 50(2): 508. 1953. Fig. 380.

*Lectotype* (**designated here**): **USA**, Wisconsin, Dane Co. Madison, Univ. Wisconsin Arboretum, Prairie, on living leaves of *Monarda punctata* (*Lamiaceae*), 10 Aug. 1952, H.C. Greene (WIS). *Isotype*: BPI 427271.

≡ ***Fusicladium monardae*** (H.C. Greene) K. Schub. & U. Braun, Mycotaxon 92: 71. 2005.

*Ill.*: Schubert (2005a: 70, fig. 8).

*murorum* Petr., Ann. Naturhist. Mus. Wien 52: 288. 1941.

*Syntypes*: **Austria**, Wien, on a kitchen wall, Apr. 1941, H. Lohwag, Krypt. exs. 3468 (B 700006638, M-00576779).

*Lit.*: Riedl (1968).

*Notes*: Taxonomic status unclear. The conidiogenous loci and conidial hila are truncate, unthickened and not darkened, *i.e.* they are not coronate as in *Cladosporium*. This species is *Cladophialophora*-like.

*musae* E.W. Mason, Mycol. Pap. 13: 2. 1945. Fig. 381.

*Type*: **Jamaica**, on leaves of *Musa* sp. (*Musaceae*), 7 Sep. 1942, E.B. Martyn [IMI 7521 (slide), ex type collection].

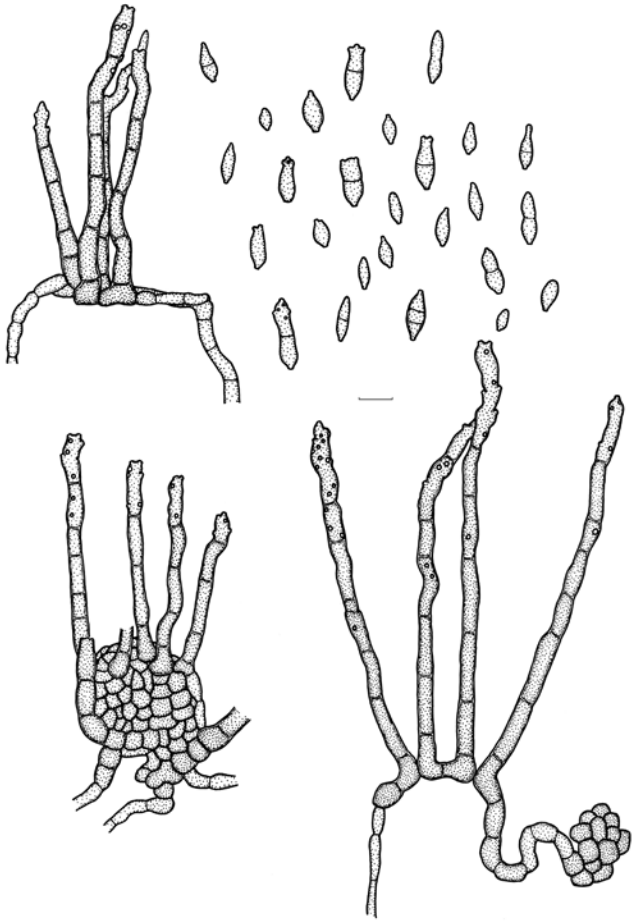


**Fig. 380.** *Fusicladium monardae* (WIS, lectotype of *C. monardae*). Conidia, conidiophores arising from hyphae and stromata. Scale bar = 10 µm. K. Bensch *del.*

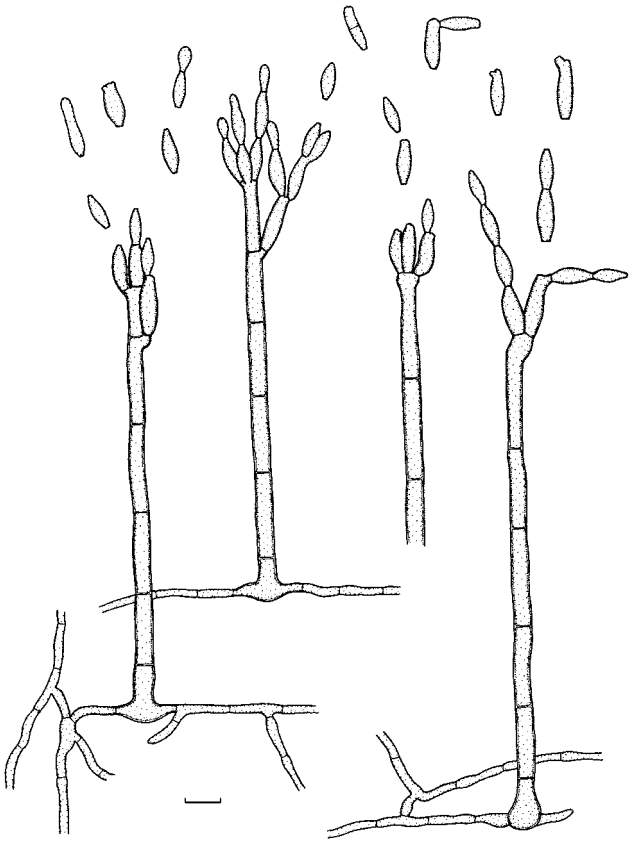


**Fig. 381.** *Metulocladosporiella musae* (IMI 7521, slide). Conidiophores and conidia. Scale bar = 10 µm. K. Bensch *del.*

≡ *Periconiella sapientumicola* Siboe, African J. Mycol. Biotechnol. 1994: 4. 1994, non *Periconiella musae* M.B. Ellis, 1967.

≡ ***Metulocladosporiella musae*** (E.W. Mason) Crous, Schroers, Groenewald, U. Braun & K. Schub., Mycol. Res. 110: 269. 2006.

*Lit.*: Ellis (1971: 317), David (1988c), Ho *et al.* (1999: 136).

*Ill.*: Martyn (1945: 3, fig. 1), Ellis (1971: 318, fig. 219 A), David (1988c: 1, fig.), Ho *et al.* (1999: 138, figs 35–37), Crous *et al.* (2006: 269–272, figs 3–14).

*myrticola* Bubák, Ann. Mycol. 13: 113. 1915, as "*myrticolum*". Fig. 382.

*Holotype*: **Italy**, Tyrol, Gries near Bozen, on leaves of *Myrtus communis* (*Myrtaceae*), 30 May 1914, Dr. W. Pfaff (BPI 427273).

≡ ***Fusicladium myrticola*** (Bubák) K. Schub. & U. Braun, Fungal Diversity 20: 197. 2005.

*Lit.*: Saccardo (1931: 793).

*Ill.*: Schubert & Braun (2005b: 199, fig. 4).

*Notes*: On the packet of the type specimen, the month of the collecting date is given as June.

*myrticola* R.F. Castañeda & W.B. Kendr., Univ. Waterloo Biol. Ser. 35: 20. 1991, *nom. illeg.*, homonym, non *C. myrticola* Bubák, 1915.

*Holotype*: **Cuba**, Pinar del Río, Cuchillas de San Simón, on dead leaves of *Syzygium jambos* (*Myrtaceae*), 24 Mar. 1990, R.F. Castañeda (INIFAT C90/108).

*Ill.*: Castañeda & Kendrick (1991: 22, fig. 11).

*Notes*: Excluded, but generic affinity unclear.

*nervale* Ellis & Dearn., in Bartholomew, Fungi Columb., Cent. 21, No. 2010. 1905.

*Syntypes*: **Canada**, London, on living leaves of *Rhus typhina* (*Anacardiaceae*), Jul./ Aug. 1904, J. Dearness, Bartholomew, Fungi Columb. 2010 (*e.g.*, BPI 427277–427278, ILL, NY).

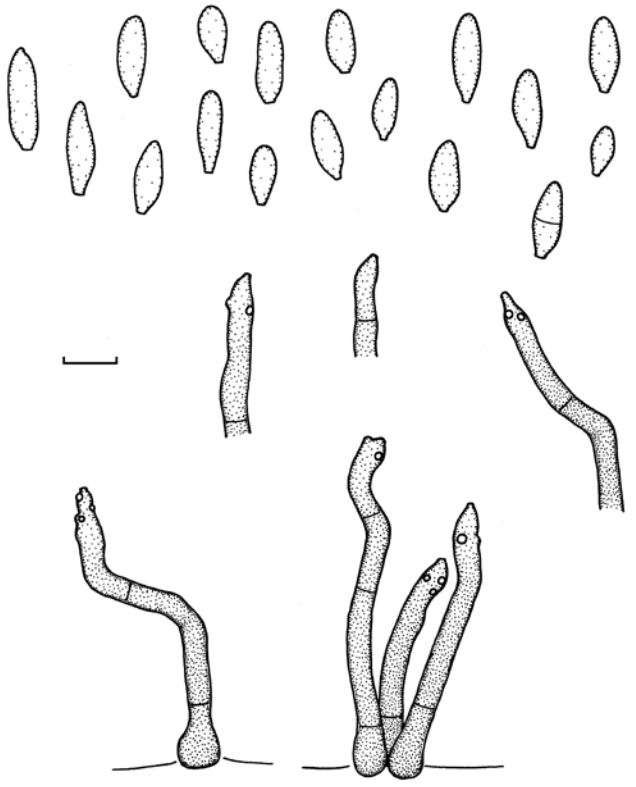


**Fig. 382.** *Fusicladium myrticola* (BPI 427273, holotype of *C. myrticola*). Conidiophores and conidia. Scale bar = 10 µm. K. Bensch *del.*

= *Cladosporium aromaticum* Ellis & Everh., Proc. Acad. Nat. Sci. Philadelphia 1895: 439. 1895.

≡ ***Fusicladium aromaticum*** (Ellis & Everh.) K. Schub. & U. Braun, Fungal Diversity 20: 192. 2005.

*Lit.*: Saccardo (1913a: 1367, 1931: 788), Cash (1952: 69), Zhang *et al.* (1999b: 42).

*Notes*: Zhang *et al.* (1999b) reported this species from China as causal agent of leaf spots on *Rohdea japonica* (*Liliaceae*), which is doubtful.

*obtectum* Roth – listed by Gola (1930: 21).

*occultum* Ces., Atti Accad. Sci. Fis. 8(4): 25. 1879.

*Type*: **Borneo**, Pulo-Pinang, on hidden glumes of *Sporobolus* sp. (*Poaceae*), May 1865, C.O. Beccari.

≡ ***Dactylosporium occultum*** (Ces.) Cif. & Vegni, Riv. Patol. Veg., Sér. 3, 3: 207. 1963.

*Lit.*: Saccardo (1886: 364).

*Notes*: Excluded. Two specimens in Cesati collection at RO (Palmer Marchi, pers. comm.).

*oleacinum* – Sacc., Syll. fung. 14: 900. 1899.

*Notes*: (= ? *Chaetophoma oleacina* Cooke). Under description of *Ch. oleacina*: "Peritheciis (sic) gregariis, subglobosis, inter hyphas fuligineas … cladosporioideas, conidia fuligenea, uniseptata, 8,4–10,5 x 3½–6 gerentes (*Cladosporium oleacinum*) oriundis, …; sporulis ovoideis, 2,3–2,6 x 1–1,3 …" *etc.*

*oleae* Ellis & Everh., *in herb.*

*Specimen*: **USA**, California, Santa Barbara, on *Olea europaea* (*Oleaceae*), 1 Jun. 1895, J.J. Davis (WIS).

*Notes*: Not *Cladosporium*, hyphomycete of unclear identity.

*oligocarpum* Corda, Icon. fung. 1: 14. 1837.

*Holotype*: **Czech Republic**, near Reichenberg, on rotting wood (PRM 155428).

≡ *Didymotrichum oligocarpum* (Corda) Bonord., Handb. Mykol.: 89. 1851.

*Lit.*: Saccardo (1886: 352), Lindau (1907: 810).

*Ill.*: Corda (1837: tab. 4, fig. 208).

*Notes*: Excluded, not *Cladosporium s. str.*, but status still unclear.

*oligocarpum* var. *malvacearum* Berk., J. Linn. Soc., Bot. 14: 353. 1875.

*Type*: **Cape-Verdes**, St. Vincent, on leaves of some malvaceous plant, Aug. 1873.

*Lit.*: Saccardo (1886: 352).

*Notes*: This seems to be an error in Saccardo (1886), because Berkeley (1875) did not describe a new variety, but rather considered it to be *C. oligocarpum*.

*opacum* Schulzer & Sacc. – cited in Oudemans (1919, 1924).

*Notes*: "*Cladosporium opacum* Schulzer & Sacc." appears to be an error in Oudemans (1919, 1924). *Cladotrichum opacum* Schulzer & Sacc., Hedwigia 23: 127. 1884 was intended.

*orbiculans* Schwein., *in herb.*

*Specimen*: **Surinam**, on leaves of *Ixora* sp. (*Rubiaceae*) (PH 01020416).

*Notes*: Excluded, not *Cladosporium*, but status unclear.

*orbiculatum* Desm., Ann. Sci. Nat. Bot., Sér. 3, 11: 275. 1849.

*Lectotype* (**designated here**): On living leaves of *Sorbus domestica* (*Rosaceae*), herb. Desmazières (PC).

≡ *Fusicladium orbiculatum* (Desm.) Thüm., Fungi Austr. Exs., Cent. VIII,

No. 774. 1873.
≡ *Passalora dendritica* var. *orbiculata* (Desm.) Berk., in Saccardo, Mycoth. Ven., Cent. XII, No. 1246. 1876 and Michelia 1(2): 265. 1878.
≡ *Fusicladium dendriticum* var. *orbiculatum* (Desm.) Sacc., Syll. fung. 4: 345. 1886.
= *Venturia inaequalis* (Cooke) G. Winter, Hedwigia 36: 81. 1897.
= ***Fusicladium pomi*** (Fr.) Lind, Dan. fung.: 521. 1913.

*Lit*.: Lindau (1907: 782), Oudemans (1921), Ritschel (2001), Crous & Braun (2003: 485), Schubert *et al.* (2003: 76).
*Notes*: For further synonyms see Schubert *et al.* (2003).

*orchidis* E.A. Ellis & M.B. Ellis, Mycol. Pap. 131: 17. 1972. Fig. 383.
*Holotype*: **UK**, Norfolk, Horsey Warren, on living leaves of *Dactylorhiza praetermissa* (≡ *Orchis praetermissa, Dactylorhiza majalis* subsp. *praetermissa*) (*Orchidaceae*), 17 Jul. 1955, E.A. Ellis (IMI 60545).
≡ ***Fusicladium orchidis*** (E.A. Ellis & M.B. Ellis) K. Schub. & U. Braun, Sydowia 56(2): 314. 2004.

*Lit*.: Ellis (1976: 338), Ellis & Ellis (1985).
*Ill*.: Ellis (1972: 18, fig. 17), Ellis (1976: 339, fig. 257 A), Schubert & Braun (2004: 315, fig. 8).

*osterici* Ces., *in herb*.
*Specimen*: **Italy**, Brescia, on *Peucedanum verticillare* (= *Ostericum verticillare*) (*Apiaceae*), 1846, Cesati (B 700006650, 700006651).
= ***Passalora depressa*** (Berk. & Broome) Sacc., Nuovo Giorn. Bot. Ital. 8: 187. 1876.

*oudemansii* Kupka, Oesterr. Bot. Z. 67: 157. 1918, *nom. nov*.
*Type*: **Netherlands**, on leaves of *Phragmites australis* (= *P. communis*) (*Poaceae*).
≡ *Cladosporium phragmitis* J. Opiz ex Oudem., Ned. Kruidk. Arch., Ser. II, 6: 57. 1892, non *C. phragmitis* J. Opiz, 1852.
= ***Deightoniella arundinacea*** (Corda) S. Hughes, Mycol. Pap. 48: 29. 1952.

*Lit*.: Lindau (1907: 814), de Vries (1952: 96), David (1997: 137).
*Notes*: See *C. phragmitis*.

*oxycocci* Shear, Bull. Torrey Bot. Club 34(6): 306. 1907. Fig. 384.
*Holotype*: **Canada**, Nova Scotia, Arichat, on living leaves of *Vaccinium macrocarpon* (*Ericaceae*), 21 Jun. 1902, C.L. Shear, No. 1492 (BPI 427299).
≡ *Stenella oxycocci* (Shear) K. Schub. & U. Braun, Nova Hedwigia 84: 205. 2007.
≡ ***Zasmidium oxycocci*** (Shear) K. Schub. & U. Braun, Schlechtendalia 20: 102. 2010.

*Lit*.: Saccardo (1913a: 1368).
*Ill*.: Schubert & Braun (2007: 206, fig. 9).

*paeoniae* Pass., in Thümen, Herb. Mycol. Oecon., Fasc. IX, No. 416. 1876 and Just's Bot. Jahresber. 4: 235. 1876.
*Lectotype* (selected in Schubert *et al*., 2007a): **Italy**, on living leaves of *Paeonia lactiflora* (= *P. edulis*) (*Paeoniaceae*), Thümen, Herb. Mycol. Oecon. 416 (M-0057753). *Isolectotypes*: Thümen, Herb. Mycol. Oecon. 416 and Thümen, Mycoth. Univ. 670 (*e.g.*, B 700006655, HAL, M-0057752).
= *Periconia chlorocephala* Fresen., Beiträge zur Mykologie 1: 21. 1850.
≡ ***Graphiopsis chlorocephala*** (Fresen.) Trail, Scott. Naturalist (Perth) 10: 75. 1889.
≡ *Dichocladosporium chlorocephalum* (Fresen.) K. Schub., U. Braun & Crous, Stud. Mycol. 58: 96. 2007.

*Lit*.: Saccardo (1886: 362), Lindau (1907: 822), Ferraris (1912: 348), Lind (1913: 524), de Vries (1952: 94), McKemy & Morgan-Jones (1991a), Schubert *et al.* (2007a), Braun *et al.* (2008a: 208–209).
*Notes*: See *C. chlorocephalum*.

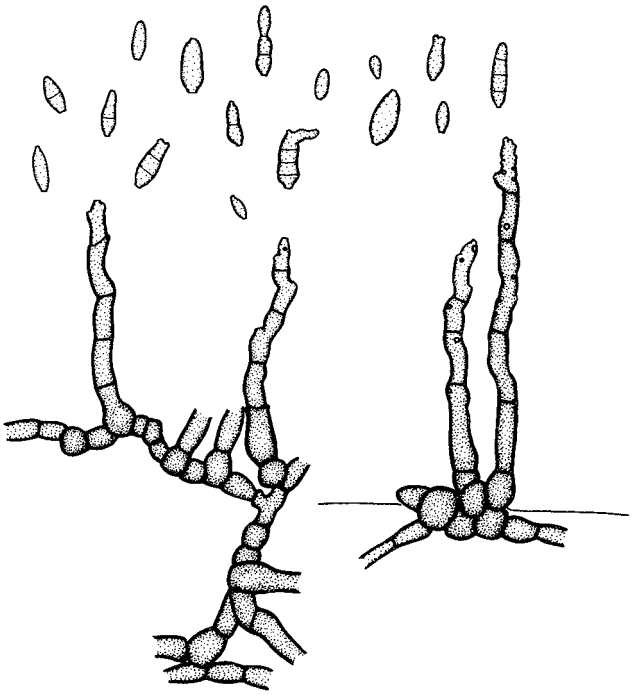


**Fig. 383.** *Fusicladium orchidis* (IMI 60545). Conidiophores and conidia. Scale bar = 10 µm. K. Bensch *del*.

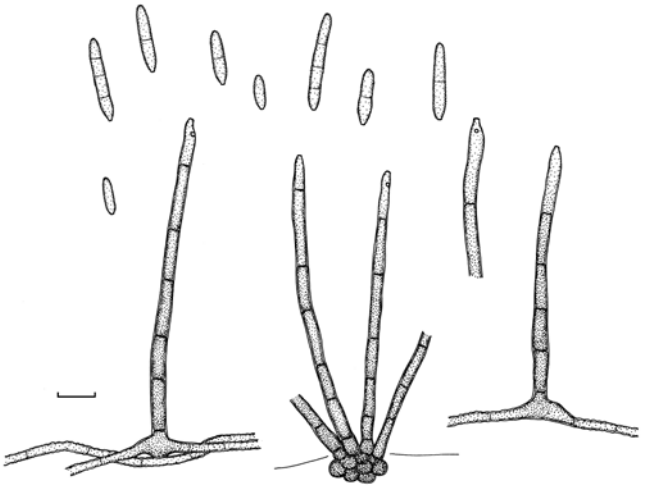


**Fig. 384.** *Zasmidium oxycocci* (BPI 427299, holotype of *C. oxycocci*). Conidiophores and conidia. Scale bar = 10 µm. K. Bensch *del*.

*paeoniae* var. *paeoniae-anomalae* Sacc., Syll. fung. 4: 362. 1886.
*Type*: **Russia**, Siberia, on faded leaves of *Paeonia anomala* (*Paeoniaceae*).
= *Cladosporium paeoniae* ("*paeoniae-anomalae*") Sacc., Michelia 2(6): 148. 1880.
= ***Graphiopsis chlorocephala*** (Fresen.) Trail, Scott. Naturalist (Perth) 10: 75. 1889.
≡ *Dichocladosporium chlorocephalum* (Fresen.) K. Schub., U. Braun & Crous, Stud. Mycol. 58: 96. 2007.

*Lit*.: Lindau (1907: 822), McKemy & Morgan-Jones (1991a), Schubert *et al.* (2007a), Braun *et al.* (2008a: 208–209).

"*paeoniae-anomalae*" Sacc., Michelia 2(6): 148. 1880.
*Notes*: Saccardo (1880) refers to *C. paeoniae* reported on *Paeonia anomala*.

*palmetto* Ger. – an error in Vanev & Taseva (1990).
*Notes*: In "Index fungorum" only *Helminthosporium palmetto* W.R. Gerard, Grevillea 17: 68, 1889, is listed. This species was transferred to the genus *Pleurophragmium* by Hughes (1958) and later to *Spiropes* by Ellis (1968).

*parasiticum* Sorokīn, Mikol. ocherki: 30. 1871. Fig. 385.
*Type*: **Russia**, Saratov, on abdomen of *Melolontha fullonis* (*Coleoptera*) (location unknown).
*Lit.*: Saccardo (1906: 681, 1913a: 1370).
*Notes*: In Saccardo (1906) under *Strumella parasitica* C. Wize (l.c.), [Pilze des Cleon. punctiventr. Crac. 1905: 725, fig. 11 (Bull. Acad. Crac.)] "An *Cladosporium parasiticum* Sorok. (ubi?)". Also cited in Guéguen, Champ. paras. homme: 256 (1904). Excluded. Status unclear.

*paulliniae* Deighton, Mycol. Pap. 144: 54. 1979. Fig. 386.
*Holotype*: **Ghana**, Essipun, on leaves of *Paullinia pinnata* (*Sapindaceae*), 9 May 1949, S.J. Hughes (IMI 37238a).
≡ *Stenella paulliniae* (Deighton) K. Schub. & U. Braun, Mycol. Progr. 4(2): 107. 2005.
≡ ***Zasmidium paulliniae*** (Deighton) K. Schub. & U. Braun, Schlechtendalia 20: 102. 2010.
*Ill.*: Deighton (1979: 54, fig. 28), Schubert & Braun (2005a: 107, fig. 7).

*pelliculosum* Berk. & M.A. Curtis, *in herb.*
*Specimen*: **USA**, South Carolina, on leaves of *Lobelia puberula* (*Campanulaceae*), No. 1742 (K 121567).
≡ ***Passalora lobeliae-cardinalis*** (Schwein.) U. Braun & Crous, *Mycosphaerella* and its anamorphs: 1. Names published in *Cercospora* and *Passalora*, CBS Biodiversity Ser. 1: 254. 2003.
*Lit.*: Cooke (1889), Saccardo (1892: 602, 1895: 621), Schubert & Braun (2005b: 201–202).
*Notes*: Cooke (1889): "Scarcely appears to differ from *Cladosporium effusum* Berk. & M.A. Curtis, and does not seem to have been described".

*pericarpium* Cooke, Grevillea 12(61): 31. 1883.
*Syntypes*: **USA**, South Carolina, Aiken, on husks of walnut (*Juglans nigra*) (*Juglandaceae*), Ravenel, Fungi Amer. Exs. 597 (*e.g.*, BPI 427378, K (F) 121566, NY, PH 01020429).
*Lit.*: Saccardo (1886: 353).
*Notes*: Excluded. Status unclear. Various hyphomycetes, including a few conidia agreeing with Cooke's original description and conidiophore fragments found, but without any trace of *Cladosporium*-like scars.

*persicum* (Sacc.) Tsuji, *in herb*.
*Specimen*: **Japan**, Iwate, Morioka, on *Prunus persica* (*Rosaceae*), 27 Oct. 1927, K. Togashi (BPI 427388).
= ***Stenella persicae*** T. Yokoy. & Nasu, Mycoscience 41: 92. 2000.
*Lit.*: Schubert & Braun (2007: 206–207).
*Notes*: The collection examined agrees well with the species concept of *Stenella persicae*, recently described on fruits of peach from Japan (Yokoyama & Nasu 2000). The Japanese collection was inscribed and deposited at BPI as "*Cladosporium persicum* (Sacc.) Tsuji", which is, however, a *lapsus* that has to be corrected to *Clasterosporium persicum* (Sacc.) Tsuji, a species quite distinct from *Stenella persicae*.

*personatum* Berk. & M.A. Curtis, Grevillea 3(27): 106. 1875.
*Syntypes*: **USA**, Santee River, on leaves of *Arachis hypogaea* (*Fabaceae*), Ravenel, No. 1612 (IMI 104553, K).

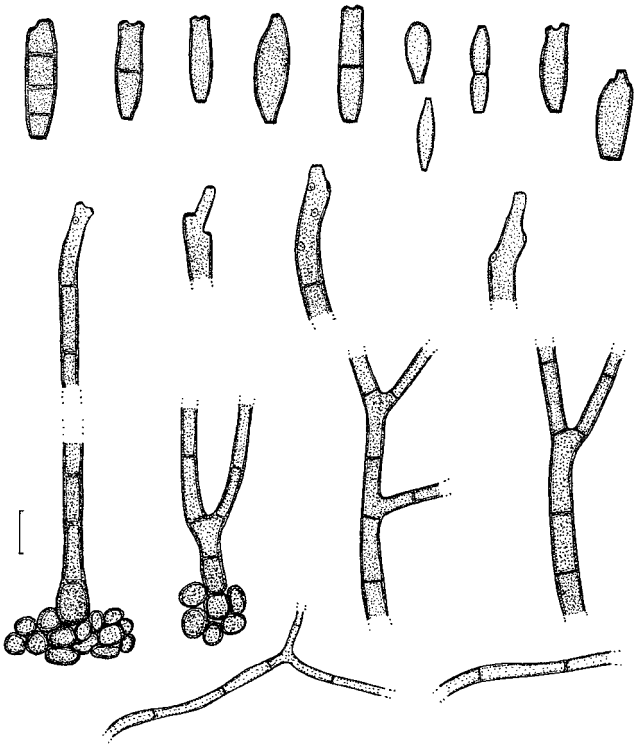


**Fig. 385.** *Fusicladium parasiticum* (K 130656, neotype of *C. phyllochorae*). Conidiophores and conidia. Scale bar = 10 µm. U. Braun *del.*

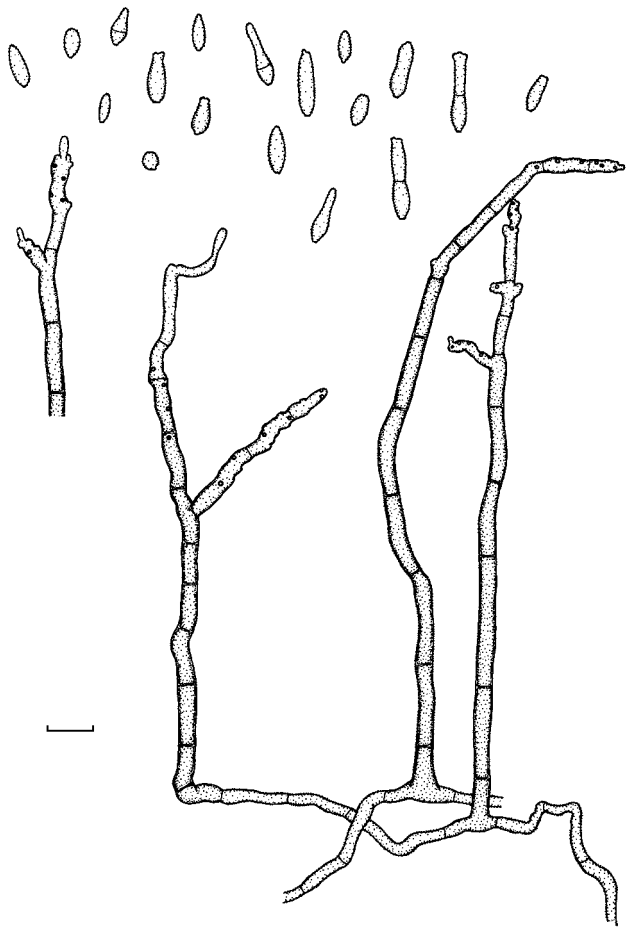


**Fig. 386.** *Zasmidium paulliniae* (IMI 37238a, holotype of *C. paulliniae*). Conidiophores and conidia. Scale bar = 10 µm. K. Bensch *del.*

≡ *Cercospora personata* (Berk. & M.A. Curtis) Ellis & Everh., J. Mycol. 1: 63. 1885.
≡ *Cercosporiopsis personata* (Berk. & M.A. Curtis) Miura, Flora of Manchuria and East Mongolia, III. Cryptog. Fungi: 529. 1928, as "*personatum*".

≡ ***Passalora personata*** (Berk. & M.A. Curtis) S.A. Khan & M. Kamal, Pakistan J. Sci. Res. 13: 188. 1961.
≡ *Cercosporidium personatum* (Berk. & M.A. Curtis) Deighton, Mycol. Pap. 112: 71. 1967.
≡ *Phaeoisariopsis personata* (Berk. & M.A. Curtis) Arx, Proc. Kon. Ned. Akad. Wetensch. C, 86(1): 43. 1983.
≡ *Passalora personata* (Berk. & M.A. Curtis) Poonam Srivast., J. Liv. World 1(2): 117. 1994, *comb. inval. et nom. illeg.*
= *Septogloeum arachidis* Racib., Z. Pflanzenkrankh. 8: 66. 1898.
= *Cercospora arachidis* Henn., Hedwigia 41: 18. 1902. [Type: B].
= ?*Mycosphaerella berkeleyi* W.A. Jenkins, J. Agric. Res. 56: 330. 1938.

*Lit*.: Saccardo (1886: 439), Sivanesan (1984: 219), Crous & Braun (2003: 317).

*personatum* f. *arachidis-hypogaeae* Thüm., Herb. Mycol. Oecon., Fasc. XIII, No. 608. 1878, *nom. nud.*
*Type*: **USA**, South Carolina, on living leaves of *Arachis hypogaea* (*Fabaceae*), Thümen, Herb. Mycol. Oecon. 608 (*e.g.* B 700006673).
*Notes*: No fructification found on the type material, but this forma is probably synonymous with *Passalora personata*.

*personatum* var. *cassiae* Thüm., Mycoth. Univ., Cent. XX, No. 1964. 1881.
*Syntypes*: **USA**, South Carolina, Aiken, on living leaves of *Senna occidentalis* (≡ *Cassia occidentalis*) (*Fabaceae*), 1876, H.W. Ravenel, Thümen, Mycoth. Univ. 1964 (*e.g.*, BPI, G, HBG, HAL, S, W).
= *Cercospora personata* var. *cassiae-occidentalis* Berk. & M.A. Curtis, Grevillea 3(27): 106. 1875. [Types: IMI 104555, K].
= *Cercospora occidentalis* Cooke, Hedwigia 17: 39. 1878. [Types: BPI 438975, K, IMI 92632a, Ellis & Everhart, N. Amer. Fungi 642, Ravenel, Fungi Amer. Exs. 65].
≡ *Ramularia cassiicola* Heald & F.A. Wolf, U.S.D.A. Bur. Pl. Industr. Bull. 226: 101. 1912, *nom. nov*., non *Ramularia occidentalis* Ellis & Kellerm., 1883.
≡ *Phaeoramularia occidentalis* (Cooke) Deighton, More Dematiaceous Hyphomycetes: 322. 1976.
≡ ***Passalora occidentalis*** (Cooke) U. Braun, Schlechtendalia 5: 70. 2000.
= *Cercospora sphaeroidea* Speg., Anales Soc. Ci. Argent. 9: 279. 1880. [Types: IMI 206774, LPS 911].
≡ *Phaeoisariopsis sphaeroidea* (Speg.) L.G. Br. & Morgan-Jones, Mycotaxon, 4: 303. 1976.
= *Cercospora cassiicola* Roum., Fungi Sel. Gall. Exs., No. 4486. 1886, as "*cassiaecola*", *nom. nud*. [lectotype (**designated here**): LEP].
= *Cercospora paulensis* Henn., Hedwigia 48: 18. 1909. [Type: B].
= *Cercospora iponemensis* Henn., Hedwigia 48: 18. 1909. [Type: B].
≡ *Cercosporina iponemensis* (Henn.) Sacc., Syll. fung. 25: 906. 1931.
= *Cercospora occidentalis* Ellis & Kellerm., U.S.D.A. Bur. Pl. Industr. Bull. 226: 101. 1912, *nom. illeg*., homonym, non *C. occidentalis* Cooke, 1878.
= *Cercospora somalensis* Curzi, Boll. Staz. Patol. Veg. Roma, N.S., 12: 158. 1932.

*Lit*.: Ellis (1976: 322), Crous *et al.* (2000), Crous & Braun (2003: 294).

*pestis* Thüm., Herb. Mycol. Oecon., Fasc. IX, No. 419. 1876 and Oesterr. Bot. Z. 27: 12. 1877.
*Syntype*: **Austria**, Klosterneuburg, Krems, on living leaves of *Vitis vinifera* (*Vitaceae*), 1876, von Thümen, Thümen, Herb. Mycol. Oecon. 419 (*e.g.*, M).
= ***Passalora dissiliens*** (Duby) U. Braun & Crous, *Mycosphaerella* and its anamorphs: 1. Names published in *Cercospora* and *Passalora*, CBS Biodiversity Ser. 1: 164. 2003.

*Lit*.: Saccardo (1886: 458), Lindau (1910: 117), Crous & Braun (2003: 164).
*Notes*: See also *C. roesleri*.

*phaseoli* Fuss, Archiv Vereins Siebenb. Landesk., N.F., 14(2): 431. 1878, *nom. nud*.
*Specimen*: **Romania**, Giresau, on overwintered fruits of *Phaseolus vulgaris* (*Fabaceae*), Fuss (location unknown).
*Notes*: Classified by Fuss (1878) as a forma of *C. herbarum*.

*phragmitis* J. Opiz, Seznam: 117. 1852, *nom. nud*., non *C. phragmitis* J. Opiz ex Oudem., 1892.
*Type*: **Czech Republic**, on leaves of *Phragmites australis* (= *P. communis*) (*Poaceae*) (PRM).
= *Heterosporium phragmitis* Sacc., Rev. Mycol. (Toulouse) 6: 37. 1884. as "(Opiz?) Sacc.".

*Lit*.: Saccardo (1886: 370), Lindau (1907: 814), Oudemans (1919), de Vries (1952: 96).
*Notes*: Excluded. This species represents a "Fumago" (Kupka 1918, David 1997).

*phragmitis* J. Opiz ex Oudem., Ned. Kruidk. Arch., Ser. 2, 6(1): 57. 1892.
*Type*: **Netherlands**, Bien de Campagne Zorgvlied, near Haye, on leaves of *Phragmites australis* (= *P. communis*) (*Poaceae*), Jul. 1889, C.E. Destrée.
≡ *Cladosporium oudemansii* Kupka, Oesterr. Bot. Z. 67: 157. 1918.
= *Helminthosporium arundinaceum* Corda, Icon. fung. 3: 10. 1839, as "*Helmisporium*".
≡ *Napicladium arundinaceum* (Corda) Sacc., Syll. fung. 4: 482. 1886.
≡ ***Deightoniella arundinacea*** (Corda) S. Hughes, Mycol. Pap. 48: 29. 1952.

*Lit*.: de Vries (1952: 96), David (1997: 137).
*Notes*: David (1997): "Oudemans (1892) provided a description of what he took to be Opiz's species. This description, also given by Lindau (1907), is of an entirely different fungus, as noted by Kupka (1918) and de Vries (1952)".

*phyllachorae* M.B. Ellis, More Dematiaceous Hyphomycetes: 332. 1976.
*Neotype* (selected in Schubert & Braun, 2007): **Philippines**, Prov. Laguna, Luzon, on *Phyllachora pseudes* (*Phyllachoraceae*) on dead leaves of *Ficus nota* (*Moraceae*), Oct. 1915, M. Ramos, Bureau of Sciences No. 23781 [K (M) 130656].
≡ *Monotospora parasitica* Syd. & P. Syd., Ann. Mycol. 15: 263. 1917, non *Cladosporium parasiticum* Sorokin, 1891.
≡ ***Fusicladium parasiticum*** (Syd. & P. Syd.) U. Braun & K. Schub., Nova Hedwigia 84: 193. 2007.

*Lit*.: Heuchert *et al.* (2005: 56–57).
*Ill*.: Ellis (1976: 333, fig. 251), Schubert & Braun (2007: 194, fig. 3).
*Notes*: A further collection for *Monotospora parasitica* is mentioned in the original diagnosis on *Phyllachora pseudes* on leaves of *Ficus nota*, Phillipines, Luzon, Prov. Laguna, San Antonio, Oct. 1915, M. Ramos (Bureau of Sciences 23781).

*piricularioides* Dearn. & House, Circ. New York State Mus. 24: 57. 1940, *nom. inval*.
*Syntypes*: **USA**, New York, Essex Co., Newcomb, on leaves of *Panicum boreale* (*Poaceae*), 17 Aug. 1924, H.D. House (DAOM 5741, NY, NYS 2365).
= *Passalora fusimaculans* var. *barretoana* U. Braun & Crous, *Mycosphaerella* and its anamorphs: 1. Names published in *Cercospora* and *Passalora*. CBS Biodiversity Ser. 1: 453. 2003.
≡ ***Passalora barretoana*** (U. Braun & Crous) D.J. Soares, U. Braun & R.W. Barreto, Australas. Pl. Pathol. 35(3): 348. 2006.

*Lit*.: Schubert & Braun (2005a: 104–105).

*pithecolobii* Kulhara & Singh, *in herb*. (?)
*Specimen*: **India**, M. Pradesh, Jabalpur, on *Pithecellobium dulce* (*Fabaceae*).

*polymorphosporum* R.F. Castañeda & W.B. Kendr., Univ. Waterloo Biol. Ser. 35: 24. 1991.

*Holotype*: **Cuba**, Pinar del Río, Sandino, on stem of an unidentified grass, 24 Mar. 1990, R.F. Castañeda (INIFAT C90/139).
*Ill.*: Castañeda & Kendrick (1991: 23, fig. 12).
*Notes*: Excluded, not *Cladosporium s. str.*, but status not yet clear.

*polymorphum* Peyl, Lotos 15: 18. 1865 and Hedwigia 5: 60. 1866.
*Type*: **Czech Republic**, Kačina, near Neuhof, on fruits of *Pyrus* sp. (*Rosaceae*), 1864.
= *Helminthosporium pyrorum* Lib. (p.p.), Pl. Crypt. Arduenna, Fasc. 2, No. 188. 1832. [Type: *e.g.*, DAOM].
≡ ***Fusicladium pyrorum*** (Lib.) Fuckel, Jahrb. Nassauischen Vereins Naturk. 23–24: 357. "1869", 1870, as "*Fusicladium pyrinum*".
≡ *Passalora pyrina* (Lib.) Sacc., Michelia 1: 537. 1879.
≡ *Megacladosporium pyrorum* (Lib.) Vienn.-Bourg., Les Champignons parasites des plantes cultivèes 1: 489. 1949, as "*Megacladosporium pirinum*".
= *Arthrinium pyrinum* Wallr., Fl. crypt. Germ. 2: 163. 1833. [Types: IMI 68300, STR].
= *Fusidium pyrinum* Corda, Icon. Fung. 1: 3. 1837. [Type: PRM].
= *Fusicladium virescens* Bonord., Handb. Mykol.: 80. 1851. [Iconotype: Bonorden, 1851: Fig. 94].
= *Fusicladium fuscescens* Rabenh., Bot. Zeitung (Berlin) 15: 430. 1857. [Syntypes: Rabenhorst, Herb. Viv. Mycol. 588, *e.g.*, HAL, HBG].
= *Passalora pomi* G.H. Otth, Mitteil. Naturf. Ges. Bern 1868: 66. 1868. [Type: BERN].
= *Fusicladium pyrorum* var. *cladophilum* Ellis & Everhart, N. Amer. Fungi, No. 2791. 1892. [Types: Ellis & Everhart, N. Amer. Fungi 2791, *e.g.*, BPI, M, NY].
= *Venturia pyrina* Aderh., Landw. Jahrb. 25: 875. 1896, as "*pirina*".
= *Cercospora porrigo* Speg., Anales Mus. Nac. Buenos Aires, Ser. 2, 6: 341. 1899. [Holotype: LPS 934].
= *Fusicladium pyrorum* f. *carpophila* Sacc., Mycoth. Ital., No. 992. 1901. [Types: Saccardo, Mycoth. Ital. 992, *e.g.*, B].
= *Acrotheca dearnessiana* Sacc., Ann. Mycol. 10: 314. 1912. [Types: Bartholomew, Fungi Columb. 5001, *e.g.*, IMI 7073].
≡ *Fusicladium dearnessianum* (Sacc.) M.B. Ellis, *in herb*.
*Lit.*: Lindau (1907: 781), Oudemans (1921), Schubert *et al.* (2003: 82).

*polysporum* Link, Sp. pl. 6(1): 40. 1824.
*Type*: **Germany**, Berlin, on rotten wood, Link (B 700006685).
= *Trichoderma globosum* Schwein., Syn. fung. Carol. sup.: 77. 1822 : Fr., Syst. Mycol. 3(1): 215. 1829. [Syntypes: BPI, K, PH, UPS].
≡ *Oidium inquinans* Schwein., Trans. Amer. Philos. Soc., N.S., 4(2): 286. 1832, *nom. nov*.
≡ *Torula inquinans* (Schwein.) Sacc., Syll. fung. 4: 251. 1886.
≡ *Streptothrix globosa* (Schwein. : Fr.) S. Hughes, Canad. J. Bot. 31: 606. 1953.
≡ ***Conoplea globosa*** (Schwein. : Fr.) S. Hughes, Canad. J. Bot. 36: 755. 1958.
= *Steptothrix atra* Berk. & M.A. Curtis, Grevillea 3(27): 107. 1875.
= *Strumella coryneoidea* Sacc. & G. Winter, in Rabenhorst, Fungi Eur. Exs., Cent. XXX, No. 2984. 1883 and Hedwigia 22(11): 175. 1883. [Syntypes: *e.g.*, CUP, HAL, HBG, M].
= *Trichosporium densum* P. Karst., Hedwigia 23(4): 59. 1884.
= *Streptothrix pereffusa* Sumst., Mycologia 6: 34. 1914.
*Lit.*: Saccardo (1886: 354), Lindau (1907: 831), de Vries (1952: 96).

*porophorum* Matsush., Icones Microfungorum a Matsushima Lectorum: 36. 1975.
*Holotype*: **Japan**, isol. from seeds of *Raphanus sativus* (*Brassicaceae*), Feb. 1969 (Matsush. herb. 2578).
= ***Chalastospora gossypii*** (Jacz.) U. Braun & Crous, Persoonia 22: 144. (2009).
*Lit.*: Ho *et al.* (1999: 134).
*Notes*: See *C. malorum* Ruehle.

*psammicola* (Sacc.) Morgan-Jones & W.B. Kendr., Canad. J. Bot. 50(9): 1817. 1972. Fig. 387.
*Holotype*: **Libya**, Ras Carrac in Magna Syrte, on dead leaves of *Ammophila arenaria* (≡ *Psamma arenaria*) (*Poaceae*), 18 May 1913, A. Trotter (PAD).
*Basionym*: *Exosporium psammicola* Sacc., Ann. Mycol. 11: 420. 1913.
≡ ***Fusicladium psammicola*** (Sacc.) U. Braun & K. Schub., Mycotaxon 103: 212. 2008.
*Ill.*: Morgan-Jones & Kendrick (1972: 1818, fig. 1), Braun *et al.* (2008a: 213, fig. 3).

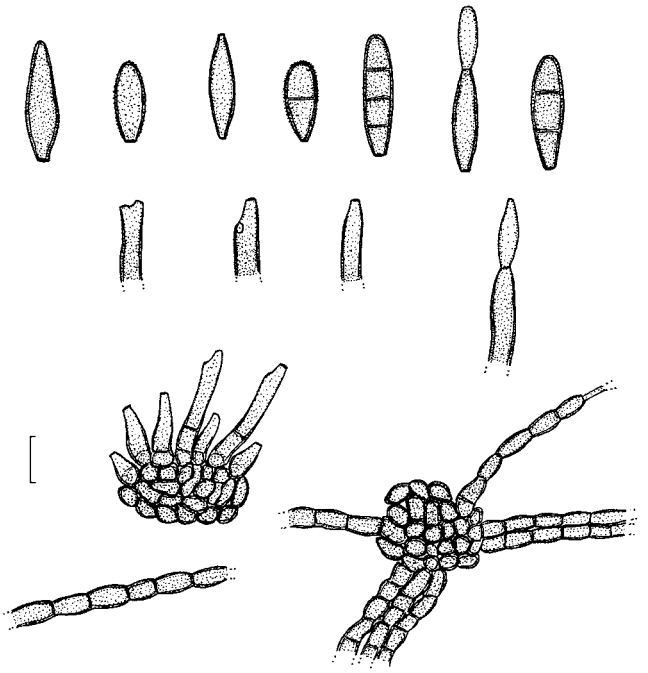


**Fig. 387.** *Fusicladium psammicola* (PAD, holotype of *Exosporium psammicola*). A. Hyphae, hyphal aggregations and strands. B. Fasciculate conidiophores. C. Conidiogenous cells. D. Conidia. Scale bar = 10 µm. U. Braun *del*.

*puccinioides* Cooke, Grevillea 5(33): 15. 1876. Fig. 388.
*Holotype*: **India**, on under side of living leaves of an unidentified host plant, 1876, Colonel Hobsen, No. 57 (K 121568).
≡ *Prathigada puccinoides* (Cooke) M.B. Ellis, *in herb*.
≡ ***Pseudoasperisporium puccinioides*** (Cooke) K. Schub. & U. Braun, Fungal Diversity 20: 202. 2005.
*Lit.*: Saccardo (1886: 361), Subramanian (1971: 291).
*Ill.*: Cooke (1876: pl. 74, fig. 11), Schubert & Braun (2005b: 203, fig. 6).

*pulcherrimum* Ellis & Everh., N. Amer. Fungi, Ser. 2, Cent. XXIX, No. 2877. 1893, *nom. nud.*
*Type*: **USA**, Ontario, on *Carpinus* sp. (*Betulaceae*), Ellis & Everhart, N. Amer. Fungi 2877 (*e.g.*, NY).
*Lit.*: Cash (1952: 69).

*pullulans* (de Bary) Sacc., Syll. fung. 22: 1250. 1913.
*Neotype*: **France**, on fruits of *Vitis vinifera* (*Vitaceae*). *Ex-neotype culture*: CBS 584.75.
≡ *Dematium pullans* de Bary, Vergl. Morph. Biol. Pilze: 182. 1884.
≡ *Oidium pullulans* (de Bary) Lindner, Wochenschr. Brauerei 15: 209–213. 1898.
≡ *Oospora pullulans* (de Bary) Sacc., Syll. fung. 18: 499. 1906.
≡ ***Aureobasidium pullulans*** (de Bary) G. Arnaud (var. *pullulans*), Ann. Écol. Nat. Agric. Montpellier, N.S., 16: 39. 1918.
≡ *Pullularia pullulans* (de Bary) Berkhout, Die schimmelgeschlachten *Monilia*, *Oidium*, *Oospora* en Torula: 55. 1923.
≡ *Hormonema pullulans* (de Bary) Lagerb. & Melin, Nyt Mag. Naturvidensk 71: 256. 1932.
*Notes*: Cited by Saccardo (1913) under *Oidium erysiphoides* Fr. f. *cordiae* Sacc., Ann. Mycol. 8: 339 (1910): "Hab. In foliis *Cordiae*

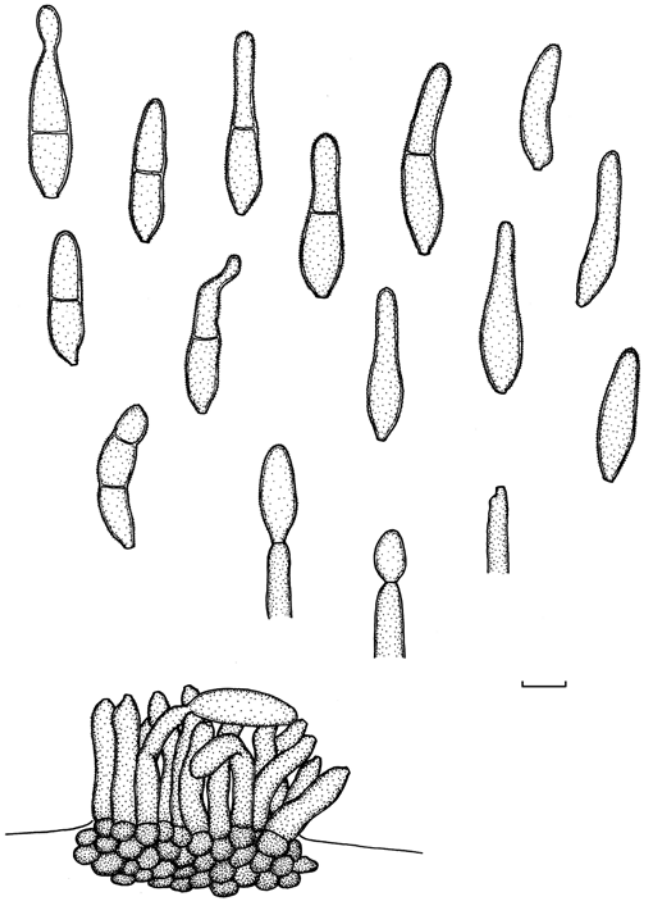


**Fig. 388.** *Pseudoasperisporium puccinioides* (K 121568, holotype of *C. puccinioides*). Fascicle of conidiophores, conidiogenous cells and conidia. Scale bar = 10 µm. K. Bensch *del.*

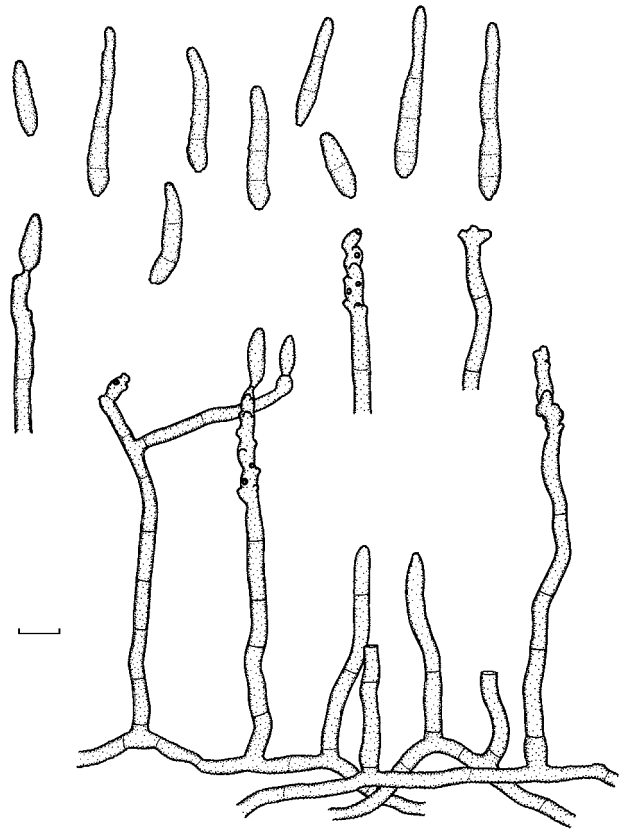


**Fig. 389.** *Zasmidium quitense* (B 700006694, lectotype of *C. quitense*). Conidiophores and conidia. Scale bar = 10 µm. K. Bensch *del.*

*subopposita* … Socium adest *Cladosporium* (*Demat.*) *pullulans*.". In Saccardo (1886), Lindau (1907) and Ferraris (1912) "*Dematium pullulans* de Bary & Löwenthal" is cited as synonym of *Cladosporium herbarum*. For further synonyms and comments on *Aureobasidium pullulans* see Subramanian (1971), de Hoog & Yurlova (1994) and Yurlova *et al.* (1999).

*punctiforme* Fuckel, Fungi Rhen. Exs., Fasc. II, No. 116. 1863.

*Syntype*: **Germany**, "auf der Geis im Hattenheimer Wald", on living leaves of *Sanicula europaea* (*Apiaceae*), Fuckel, Fungi Rhen. Exs. 116 (*e.g.*, HAL).

≡ *Cercospora punctiformis* (Fuckel) G.A. de Vries, Contr. Knowl. Genus *Cladosporium*: 97. 1952, *nom. illeg*, homonym, non *C. punctiformis* Sacc. & Roum., 1881.

= *Cercospora saniculae-europaeae* E. Müll. & Arx, Phytopathol. Z. 24: 356. 1955.

≡ ***Pseudocercospora saniculae-europaeae*** (E. Müll. & Arx) U. Braun & Crous, *Mycosphaerella* and its anamorphs: 1. Names published in *Cercospora* and *Passalora*, CBS Biodiversity Ser. 1: 365. 2003.

*Lit.*: Fuckel (1870: 355), Saccardo (1886: 362), Lindau (1907: 825), Oudemans (1923).

*putrefaciens* – Z. Pflanzenkrankh. 4: 333. 1894.

*Notes*: Without author on *Beta* sp. – maybe an error and *Clasterosporium putrefaciens* (Fuckel) Sacc. was intended.

*pygmaeum* Ellis & Everh. (in Exs.: Flora Sequoia Gigantea Region, No. 1235, *nom. nud*.).

*Syntypes*: **USA**, California, Amador Co., Pine Grove, on *Vitis californica* (*Vitaceae*), Jul. 1893, G.E. Hansen (B 700006691–700006692, BPI 427408–427409, NY).

= ***Asperisporium minutulum*** (Sacc.) Deighton, in Ellis, More Dematiaceous Hyphomycetes: 242. 1976.

*Lit.*: Schubert & Braun (2005b: 188).

"*pyrorum* Berk.", Gard. Chron. 1848: 398. 1848.

*Lit.*: Lindau (1907: 779), Oudemans (1921).

*Notes*: Lindau cited "Gard. Chron. p. 398, 1848" for *C. pirorum* Berk. and listed it as synonym of *Fusicladium dendriticum* [= *Fusicladium pomi*]. The page concerned has been examined, but the name "*Cladosporium pyrorum* Berk." was not found.

*quitense* Syd., Ann. Mycol. 37: 420. 1939. Fig. 389.

*Lectotype*: **Ecuador**, Pichincha mountains near Quito, on leaves of *Berberis schwerinii* (*Berberidaceae*), 11 Sep. 1937, H. Sydow (B 700006694). *Isolectotypes*: B 700006693 and Sydow, Fungi Exot. Exs. 1232, *e.g.*, B 700006695, BPI 427427, M-0057728.

≡ *Stenella quitensis* (Syd.) K. Schub. & U. Braun, Mycol. Progr. 4(2): 108. 2005.

≡ ***Zasmidium quitense*** (Syd.) K. Schub. & U. Braun, Schlechtendalia 20: 103. 2010.

*Ill.*: Schubert & Braun (2005a: 108, fig. 8).

*radians* Sacc. & D. Sacc., Syll. fung. 16: 1059. 1902. Fig. 390.

*Lectotype*: **Italy**, Padua, on leaves of *Abies pinsapo* (*Pinaceae*), Apr. 1900, Saccardo, Mycoth. Ital. 787 (B 700006696). *Isolectotypes*:

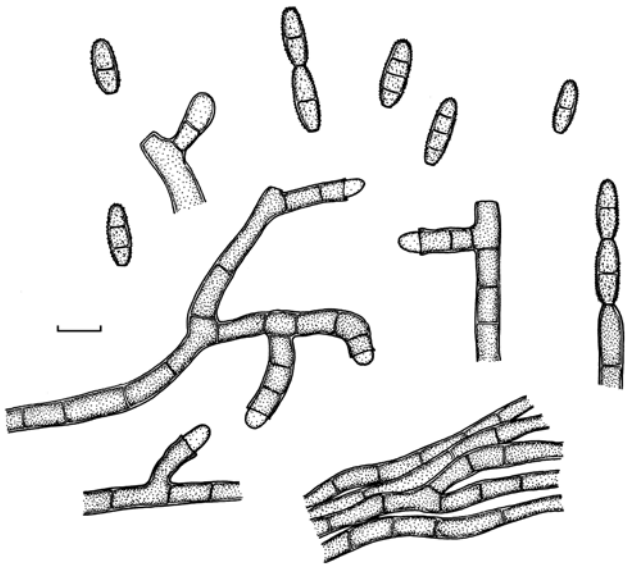


**Fig. 390.** *Septonema acicola* (B 700006696, lectotype of *C. radians*). Conidiophores and conidia. Scale bar = 10 µm. K. Bensch *del*.

Saccardo, Mycoth. Ital. 787, *e.g.*, B 700006696, BPI 427428, HAL, HBG, SIENA.

≡ *Cladosporium radians* Sacc. & D. Sacc., Mycoth. Ital., Cent. VIII., No. 787. 1901, *nom. nud*.

≡ ***Septonema acicola*** U. Braun & K. Schub., Nova Hedwigia 84: 200. 2007.

*Lit.*: Lindau (1907: 812), Ferraris (1912: 336).
*Ill.*: Schubert & Braun (2007: 201, fig. 6).

*ramulosum* Rab. – Oudemans (1924).
*Notes*: An error. *C. ramulosum* Roberge ex Desm. was intended.

*ramulosum* Roberge ex Desm., Ann. Sci. Nat. Bot., Sér. 3, 18: 361. 1852, *nom. illeg.*, non *C. ramulosum* Reissek, 1851.
*Holotype*: **France**, Paris, Parc du Libisy, on *Populus alba* (*Salicaceae*), May 1851, Roberge (PC 1518). *Isotype*: herb. Desmazières 2135 (PC).

≡ *Fusicladium ramulosum* Rostr., Tidsskr. Skovbr. 6: 294. 1883, *nom. nov.*, as "(Roberge, in Desm.) Rostr.".

≡ *Pollaccia ramulosa* (Rostr.) Ondřej, Eur. J. Forest Pathol. 2: 143. 1972, *nom. nov.*, as "(Desm.) Ondřej".

= ***Fusicladium radiosum*** (Lib.) Lind, Ann. Mycol. 3: 429. 1905 (var. *radiosum*).

*Lit.*: Saccardo (1886: 357), Lindau (1907: 777), Oudemans (1920), Baldacci & Ciferri (1937: 61), Ritschel (2001), Schubert *et al.* (2003: 85).
*Notes*: See *C. asteroma*.

*rectum* Preuss, in Sturm, Deutschl. Fl. 3(26): 29. 1848.
*Holotype*: **Germany**, near Hoyerswerda, on the innerside of bark of *Pinus* (*Pinaceae*), Preuss (B 700006697).

= *Helminthosporium fasciculare* Corda, Icon. fung. 1: 14. 1837, as "*Helmisporium*". [Type: PRM].

≡ ***Septonema fasciculare*** (Corda) S. Hughes, Canad. J. Bot. 36: 803. 1958.

= *Dendryphion pini* Höhn., Sitzungsber. Kaiserl. Akad. Wiss., Math.-Naturwiss. Cl., Abt. 1, 116: 153. 1907. [Type: FH].

*Lit.*: Saccardo (1886: 354, 374, 1906: 577), Lindau (1907: 810).

*resinae* (Lindau) G.A. de Vries, Antonie van Leeuwenhoek J. Microbiol. Serol. 21: 167. 1955.
*Holotype*: **Germany**, Fl. v. Hamburg, Sachsenwald, on resin of *Picea abies* (*Pinaceae*), 29 Apr. 1904, O. Jaap (B). *Isotype*: DAOM 41888 (slide).

≡ ***Hormodendrum resinae*** Lindau, in Rabenhorst, Krypt.-Fl., ed. 2, 1(8): 699. 1907, as "*Hormodendron*".

≡ *Hormoconis resinae* (Lindau) Arx & G.A. de Vries, Verh. Kon. Ned. Akad. Wetensch., Afd. Natuurk., Tweede Sect., 61(4): 62. 1973.

= *Racodium resinae* Fr., Observ. mycol. 1: 216. 1815. [Type: B, DAOM 41890 (slide)].

≡ *Sporocybe resinae* (Fr.) Fr., Syst. mycol. 3(2): 341. 1832.

≡ ***Sorocybe resinae*** (Fr.) Fr., Summa veg. Scand. 2: 468. 1849 (synnematous form, *H. resinae* is the mononematous form of this species).

≡ *Dendryphion resinae* (Fr.) Corda, Icon. fung. 6: 11. 1854.

≡ *Stysanopsis resinae* (Fr.) Ferraris, Flora Ital. Crypt., Pars I, Fungi, Fasc. 6: 187. 1910.

= *Pycnostysanus resinae* Lindau, Verh. Bot. Vereins Prov. Brandenburg 45: 160. 1904. [Type: B].

≡ *Stysanus resinae* (Lindau) Sacc., Syll. fung. 18: 651. 1906.

*Lit.*: Ellis (1971: 309), Ho *et al.* (1999: 149), Partridge *et al.* (2001: 179), Partridge & Morgan-Jones (2002: 344–348), Seifert *et al.* (2007).
*Notes*: Based on the type material, the name *Hormodendrum resinae* refers to the mononematous state of the resin fungus. However, this name was often confused with and applied for the anamorph of *Amorphotheca resinae*, the creosote fungus. The oldest valid name for the latter species is, however, *Cladosporium avellaneum*.

*resinae* f. *albidum* (G.A. de Vries) G.A. de Vries, Antonie van Leeuwenhoek J. Microbiol. Serol. 21: 167. 1955.
*Basionym*: *Cladosporium avellaneum* f. *albidum* G.A. de Vries, Contr. Knowl. Genus *Cladosporium*: 56. 1952.
*Notes*: See *C. avellaneum* f. *albidum*.

*resinae* f. *avellaneum* (G.A. de Vries) G.A. de Vries, Antonie van Leeuwenhoek J. Microbiol. Serol. 21: 167. 1955.
*Basionym*: *Cladosporium avellaneum* f. *avellaneum* G.A. de Vries, Contr. Knowl. Genus *Cladosporium*: 56. 1952.
*Notes*: See *C. avellaneum*.

*resinae* f. *sterile* (G.A. de Vries) G.A. de Vries, Antonie van Leeuwenhoek J. Microbiol. Serol. 21: 167. 1955.
*Basionym*: *Cladosporium avellaneum* f. *sterile* G.A. de Vries, Contr. Knowl. Genus *Cladosporium*: 56. 1952.
*Notes*: See *C. avellaneum* f. *sterilis*.

*resinae* f. *viride* G.A. de Vries) G.A. de Vries, Antonie van Leeuwenhoek J. Microbiol. Serol. 21: 167. 1955.
*Basionym*: *Cladosporium avellaneum* f. *viride* G.A. de Vries, Contr. Knowl. Genus *Cladosporium*: 56. 1952.
*Notes*: See *C. avellaneum* f. *viride*.

*rhododendri*, *in herb*.
*Specimen*: **Switzerland**, Bern, Berner Oberland, vom Faulhorn, on leaves of *Rhododendron* sp. (*Ericaceae*), 7/58 (B 700006700).
*Notes*: Excluded, generic affinity not yet clear.

*rhodomyrti* Sawada, Rep. Gov. Res. Inst. Formosa 87: 74. 1944, *nom. inval*.
*Holotype*: **Taiwan**, on *Rhodomyrtus tomentosa* (*Myrtaceae*) (PPMH).
*Notes*: Description only in Japanese, not validly published. Excluded, generic affinity remains unclear.

*rhois* Arcang., in Thümen, Mycoth. Univ., Cent. XIV, No. 1371. 1879.
*Syntypes*: **Italy**, Etruria, Tuscany, Settignano, near Florence, on living leaves of *Rhus coriaria* (*Anacardiaceae*), Nov. 1878,

Arcangeli, Thümen, Mycoth. Univ. 1371 and Baglietto *et al.*, Erb. Critt. Ital. 849 (*e.g.*, BPI 427440, E, HAL, K).

= *Cercospora marmorata* Tranzschel, Mycoth. Ross., Fasc. 5, No. 250. 1911. [Types: *e.g.*, K, LE, W].

≡ *Cercosporina marmorata* (Tranzschel) Sacc., Syll. fung. 25: 895. 1931.

≡ *Phaeoramularia marmorata* (Tranzschel) Deighton, Mycol. Pap. 144: 34. 1979.

≡ ***Passalora marmorata*** (Tranzschel) U. Braun & Crous, *Mycosphaerella* and its anamorphs: 1. Names published in *Cercospora* and *Passalora*, CBS Biodiversity Ser. 1: 267. 2003.

= *Cercospora rhois-coriariae* Kuhnh.-Lord., Ann. Épiphyt., Ser. 2, 13: 54. 1947.

*Lit*.: Saccardo (1886: 359), Lindau (1907: 827), Ferraris (1912: 346).

*rietmanni* Sart. & Syd., Rev. Pat. Malad. Pays Chauds 15(1): 9–44. 1935.

*Type*: Isol. from man (mycosis of the epidermis) (location unknown).

= ***Hortaea werneckii*** (Horta) Nishim. & Miyaji, Jap. J. Med. Mycol. 26(2): 145. 1984.

*Lit*.: Ciferri (1960: 501), de Hoog *et al.* (2000: 721).

*Notes*: See *C. werneckii*.

*rigidiphorum* R.F. Castañeda, *in herb.*

*Holotype*: **Cuba**, on dead leaves of *Smilax* sp. (*Smilacaceae*), 6 Nov. 1994, R.F. Castañeda (CBS H-19938). *Ex-type culture*: CBS 314.95, MUCL 39142.

≡ ***Penidiella rigidophora*** Crous, R.F. Castañeda & U. Braun, Stud. Mycol. 58: 21. 2007.

*Ill*.: Crous *et al.* (2007b: 22–23, figs 12–13).

*roesleri* Catt., Bol. Commiss. Agrar. Voghera 13: 263. 1876.

*Type*: **France**, Dep. de l'Eure, Eburense, on *Vitis vinifera* (*Vitaceae*), A. Malbranche.

≡ *Cercospora roesleri* (Catt.) Sacc., Michelia 2(6): 128. 1880.

≡ *Cercospora roesleri* "f. *typica* (Catt.)" Elenkin, Bolezni Rast. 4: 67. 1909, *nom. inval*.

≡ *Ragnhildiana roesleri* (Catt.) Vassiljevsky, Parazitnye nesovershennye griby, Ch. I, Gifomitsety: 375. 1937.

= *Torula dissiliens* Duby, Mem. Soc. Phys. Genève 7: 128. 1835.

≡ *Septocylindrium dissiliens* (Duby) Sacc., Mycoth. Ven., No. 583. 1876.

≡ *Phaeoramularia dissiliens* (Duby) Deighton, More Dematiaceous Hyphomycetes: 324. 1976.

≡ ***Passalora dissiliens*** (Duby) U. Braun & Crous, *Mycosphaerella* and its anamorphs: 1. Names published in *Cercospora* and *Passalora*, CBS Biodiversity Ser. 1: 164. 2003.

= ? *Septocylindrium virens* Sacc., Nuovo Giorn. Bot. Ital. 8: 186. 1876.

= *Septosporium fuckelii* Thüm., Oesterr. Bot. Z. 27: 137. 1877.

≡ *Cercospora fuckelii* (Thüm.) Jacz., Parasitic fungal diseases of grape vine, Ed. 2: 81. 1906.

≡ *Cercospora roesleri* f. *fuckelii* (Thüm.) Elenkin, Bolezni Rast. 4: 68. 1909.

≡ *Isariopsis fuckelii* (Thüm.) du Plessis, Farming South Africa 17: 62. 1942.

= *Cladosporium pestis* Thüm., Oesterr. Bot. Z. 27: 12. 1877.

= ? *Cercospora coryneoides* Săvul. & Rayss, Rev. Pathol. Vég. Entomol. Agric. France 22: 223. 1935.

= *Cercospora leoni* Săvul. & Rayss, Rev. Pathol. Vég. Entomol. Agric. France 22: 222. 1935. [Type: HUJ].

= *Cercospora judaica* Rayss, Palestine J. Bot., Jerusalem Ser. III, 50: 22. 1943. [Type: HUJ].

*Lit*.: Saccardo (1886: 458, as "*rosleri*"), Lindau (1910: 117, as "*R*ösleri"), Chupp (1954: 604), Crous & Braun (2003: 164).

*salicis* Moesz & Smarods, Magyar Bot. Lapok 31: 42. 1932. Fig. 391.

*Type*: **Latvia**, near Adaži, on branches of *Salix cinerea* (*Salicaceae*), 10 Jun. 1930, J. Smarods (M-0057719). *Topotypes*: Behr, Plantae rarae et novae 134-1939 (*e.g.*, HAL), material collected at the type locality in 1937.

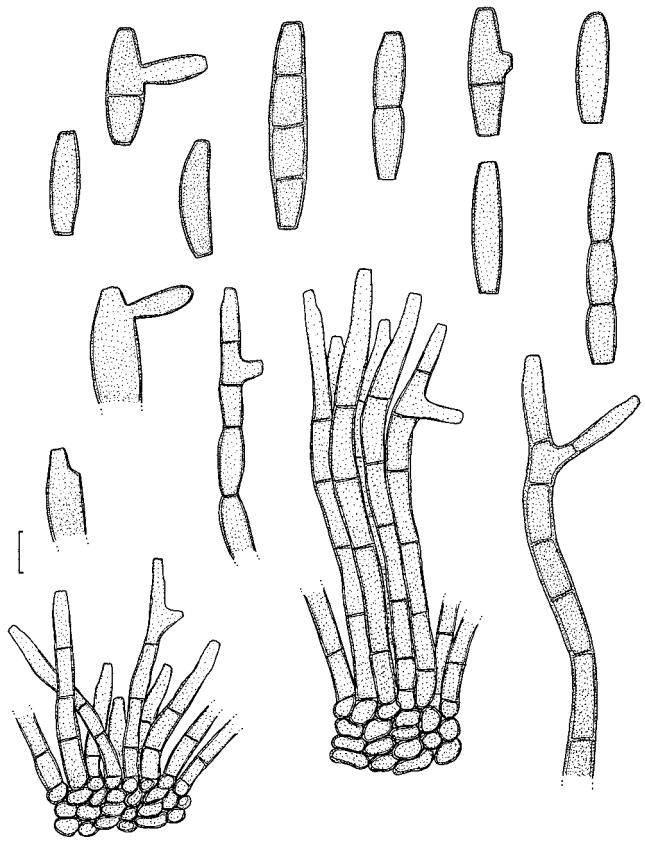


**Fig. 391.** *Fusicladium salicis* (HAL, topotype of *C. salicis*). A. Conidiophores. B. Conidia. Scale bar = 10 µm. U. Braun *del*.

*Authentic material*: Petrak, Mycoth. Gen. 1808 (*e.g.*, BPI 427452, M-0057720).

≡ ***Fusicladium salicis*** (Moesz & Smarods) U. Braun & K. Schub., Schlechtendalia 16: 73. 2007.

*Lit*.: Saccardo (1972: 1339).

*Ill*.: Moesz (1932: 43, fig. 6), Braun & Schubert (2007: 74, fig. 7).

*salicis-sitchensis* Dearn. & Barthol., Mycologia 16: 174. 1924.

*Lectotype*: **USA**, Washington, Langley, on living leaves of *Salix sitchensis* (*Salicaceae*), Sep. 1922, Grant, No. 5011 (DAOM).

= *Ramulaspera salicina* var. *tirolense* Bubák & Kabát, Oesterr. Bot. Z. 55: 243. 1905.

≡ *Ramularia salicina* var. *tirolense* (Bubák & Kabát) Deighton, Trans. Brit. Mycol. Soc. 90(2): 330. 1988.

≡ ***Phacellium salicinum*** var. ***tirolense*** (Bubák & Kabát) U. Braun, Nova Hedwigia 56: 438. 1993.

*Lit*.: Saccardo (1972: 1339), Braun (1998: 337).

*sambuci* Pass., *in herb*.

*Specimen*: **Italy**, on living leaves of *Sambucus nigra* (*Adoxaceae*) (B 700006710).

= ***Pseudocercospora sambucigena*** U. Braun, Crous & K. Schub., Mycotaxon 92: 400. 2005.

*Notes*: The herbarium name *Cladosporium sambuci* proved to be a true and new species of the genus *Pseudocercospora*. The abundantly sporulating collection was sparsely intermixed with a *Cladosporium* sp.

"*sarcopodioides* Sacc." – Oudemans (1924).

*Notes*: An error. *Clasterosporium sarcopodioides* was intended.

*scillae* Deighton, New Zealand J. Bot. 8(1): 55. 1970.

*Holotype*: **New Zealand**, Levin, on living leaves of *Scilla peruviana* (*Asparagaceae*), 21 Dec. 1965, G.F. Laundon, LEV

477 (IMI 116997). *Epitype*: CBS H-19903. *Ex-epitype culture*: CBS 116461.

≡ *Fusicladium scillae* (Deighton) U. Braun & K. Schub., IMI Descriptions of Fungi and Bacteria 152, No. 1518. 2002.

≡ ***Cladophialophora scillae*** (Deighton) Crous, U. Braun & K. Schub., Stud. Mycol. 58: 198. 2007.

*Lit.*: Schubert *et al.* (2003: 94–96), Crous *et al.* (2007d: 198–199).
*Ill.*: Laundon (1970: 57, fig. 4), Braun & Schubert (2002: figs A–D), Schubert *et al.* (2003: 95, fig. 47), Crous *et al.* (2007d: 199, fig. 12)

*sclerotiophilum* Sawada, Rep. Gov. Res. Inst. Formosa 51: 112. 1931, *nom. inval.*
*Holotype*: **Taiwan**, on twigs of *Citrus maxima* (= *C. grandis* f. *butan*) (*Rutaceae*), 25 Nov. 1928, K. Sawada (PPMH).
*Notes*: Description only in Japanese. Excluded, but taxonomic status not yet clear.

*scopiforme* Berk., Hooker's J. Bot. Kew Gard. Misc. 6: 208. 1854, as "*scopæforme*".
*Type*: **India**, Khasia (Churra), on leaves of *Myristica* sp. (*Myristicaceae*), Hooker (K 115206, UPS).

≡ *Helminthosporium scopiforme* (Berk.) Subram., J. Indian Bot. Soc. 35: 450. 1956, as "*scopæforme*".

≡ *Pleurophragmium scopiforme* (Berk.) S. Hughes, Canad. J. Bot. 36: 798. 1958, as "*scopæforme*".

≡ ***Spiropes scopiformis*** (Berk.) M.B. Ellis, Mycol. Pap. 114: 30. 1968.

= *Cladosporium congestum* Berk. & Broome, J. Linn. Soc., Bot. 14: 99. 1873, 1875. [Type: K].

= *Helminthosporium iteodaphnes* Thüm., Rev. Mycol. (Toulouse) 2: 38. 1880. [Type: W 89009].

≡ *Cercospora iteodaphnes* (Thüm.) Sacc., Syll. fung. 4: 464. 1886.

*Lit.*: Saccardo (1886: 358).

*scribnerianum* Cavara, in Briosi & Cavara, Fung. Paras. Piante Colt. Utili Ess., Fasc. 7/8, No. 187. 1892 and Hedwigia 31: 143. 1892.
*Syntype*: **Italy**, Pavia, on leaves of *Betula populifolia* (*Betulaceae*), 1890, F.L. Scribner, Briosi & Cavara, Fung. Paras. Piante Colt. Utili Ess. 187 (*e.g.*, HAL).

≡ ***Fusicladium scribnerianum*** (Cavara) M.B. Ellis, More Dematiaceous Hyphomycetes: 238. 1976.

*Lit.*: Saccardo (1895: 620), Lindau (1907: 819), Ferraris (1912: 340), Schubert *et al.* (2003: 96–97).
*Ill.*: Schubert *et al.* (2003: 97, fig. 48).

*sericeum* Ellis & Everh., *in herb*.
*Specimen*: **USA**, West Virginia, on a decorticated limb of *Magnolia fraseri* (*Magnoliaceae*), 18 Sep. 1895, L.W. Nutall (BPI 427456, BPI 427457).
*Notes*: Not *Cladosporium*, status unclear.

*sidae* Cif. & Gonz. Frag., Bol. Real Soc. Esp. Hist. Nat. 25: 455. 1925 and Publ. Estac. Agron. Haina, Ser. B, Bot., 2: 12. 1926.
*Holotype*: **Dominican Republic**, Haina, on dry stems of *Sida* sp. (*Malvaceae*), 28 Jun. 1925, R. Ciferri (MA 06453). *Isotype*: BPI 427458.
*Lit.*: Saccardo (1972: 1339).
*Notes*: Type material has been examined, but no *Cladosporium* agreeing with the original description could be traced. The type contains a mixture of several saprobic hyphomycetes.

*solanicola* Viégas, Bragantia 6: 368. 1946, as "*solanicolum*".
*Holotype*: **Brazil**, Prov. St. Pauli, Campinas, Bosque de Jequitibás, on *Solanum lycocarpum* (*Solanaceae*), 27 Jun. 1913, A.P. Viégas (IACM).

≡ *Mycovellosiella solanicola* (Viégas) Munt.-Cvetk., Lilloa 30: 178. 1960.

= *Cercospora brachycarpa* Syd., Ann. Mycol. 28: 207. 1930. [Type: IMI 8500a].

≡ *Mycovellosiella brachycarpa* (Syd.) Deighton, Mycol. Pap. 137: 8. 1974.

≡ ***Passalora brachycarpa*** (Syd.) U. Braun & Crous, *Mycosphaerella* and its anamorphs: 1. Names published in *Cercospora* and *Passalora*, CBS Biodiversity Ser. 1: 87. 2003.

= *Cercospora jaguarensis* Chupp & A.S. Mull., Bol. Soc. Venez. Ci. Nat. 8: 48. 1942, *nom. inval.* [Types: CUP, IMI 105210a].

*Notes*: Zhang *et al.* (1998c) mentioned a first record of this species from China on *Solanum melongena*.

*sphaeroideum* Cooke, Grevillea 8(46): 60. 1879.
*Holotype*: **New Zealand**, Canterbury Alps, on leaves of *Poa foliosa* (*Poaceae*), No. 398 (K 121569).

= ***Passalora graminis*** (Fuckel) Höhn., Zentralbl. Bakteriol. Parasitenk., Abt. 2, 60: 6. 1923.

*Lit.*: Saccardo (1886: 365), Lind (1913), Schubert & Braun (2005b: 198–200).

*sphaerosporum* (sic) – Barron (1968: 130, fig. 55).
*Notes*: Neither *C. sphaerospermum* nor *C.* "*sphaerosporum*" are amongst the *Cladosporium* species indexed by Barron (1968), but Figure 55, of which a detail provides the illustration for the cover and an enlargement the frontispiece for Barron (1968), is a commendable illustration of typical *C. sphaerospermum*.

*sphondylii* Fuss, Archiv Vereins Siebenb. Landesk., N.F., 14(2): 431. 1878, *nom. nud*.
*Type*: **Romania**, Grosscheuern, Giresau, on dry stems of *Heracleum sphondylium* (*Apiaceae*), Fuss (location unknown).
*Notes*: Classified by Fuss (1878) as a forma of *C. herbarum*.

*staurophorum* (W.B. Kendr.) M.B. Ellis, More Dematiaceous Hyphomycetes: 333. 1976.
*Lectotype*: **UK**, Cheshire, Delamere Forest, on fallen needles of *Pinus sylvestris* (*Pinaceae*), 1957, isol. B. Kendrick (IMI 71590).

≡ *Hormodendrum staurophorum* W.B. Kendr., Canad. J. Bot. 39: 835. 1961.

≡ ***Devriesia staurophora*** (W.B. Kendr.) Seifert & N.L. Nickerson, Canad. J. Bot. 82: 919. 2004.

*Lit.*: Ellis & Ellis (1985: 175), Ho *et al.* (1999: 140).
*Ill.*: Kendrick (1961: 833–834, figs 1–2; pl. 1, figs 3–5), Ellis (1976: 334, fig. 252 B), Ho *et al.* (1999: 141, figs 44–45), Seifert *et al.* (2004: 920, figs 2–12).

*stipae* H.C. Greene, Trans. Wisconsin Acad. Sci. 41: 127. 1952. Fig. 392.
*Lectotype* (**designated here**): **USA**, Wisconsin, Dane Co., Madison, Univ. Wisconsin Arboretum, Oak opening, on living leaves of *Hesperostipa spartea* (≡ *Stipa spartea*) (*Poaceae*), 6 Sep. 1951, H.C. Greene (WIS). *Isolectotype*: BPI 427474.

≡ *Stenella stipae* (H.C. Greene) K. Schub. & U. Braun, Mycotaxon 92: 71. 2005.

≡ ***Zasmidium stipae*** (H.C. Greene) K. Schub. & U. Braun, Schlechtendalia 20: 103. 2010.

*Ill.*: Schubert (2005a: 72, fig. 9).

"*strictum* Sacc." - Gola (1930), *Cladotrichum strictum* Sacc. was intended.

"*stromatum* Pers." – listed by Saccardo & Berlese (1884: 100).

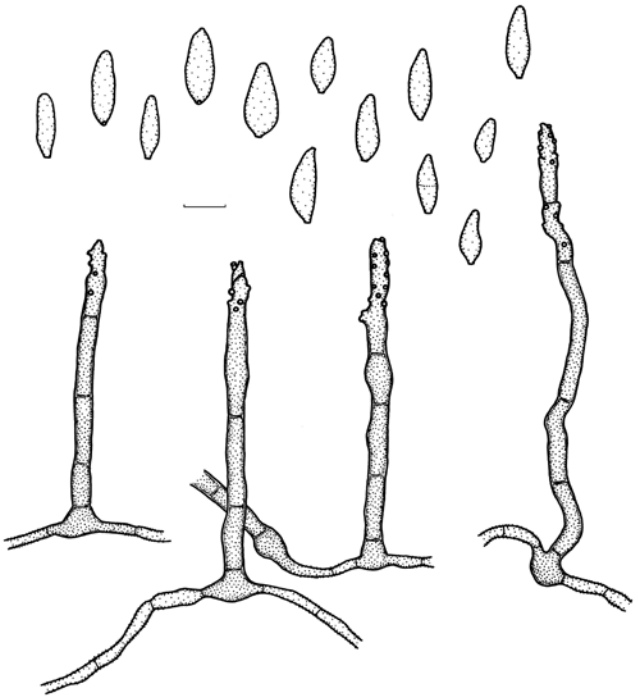


**Fig. 392.** *Zasmidium stipae* (WIS, lectotype of *C. stipae*). A. Conidia. B. Conidiophores. Scale bar = 10 µm. K. Bensch *del*.

*strumelloideum* Milko & Dunaev, Novosti Sist. Nizsh. Rast. 23: 134. 1986.

*Holotype*: **Russia**, Yaroslavskaya Oblast, Rybinskoe, Sutka, on leaves of *Carex* sp. (*Cyperaceae*) from stagnant water (BKMF-2534). *Ex-type culture*: CBS 114484.

≡ ***Penidiella strumelloidea*** (Milko & Dunaev) Crous & U. Braun, Stud. Mycol. 58: 23. 2007.

*Ill*.: Milko & Dunaev (1986: 135, fig. 1), Crous *et al.* (2007b: 23–24, figs 14–15).

*suaveolens* (Lindner) Delitsch, Ergebnisse der theoretischen und angewandten Mikrobiologie, Ed. Lembke, Bd. 1, Systematik der Schimmelpilze: 135. 1943.

*Type*: In a distillery.

≡ *Sachsia suaveolens* Lindner, Mikroskopische Betriebskontrolle in den Gährungsgewerben: 153. 1895.

≡ *Oospora suaveolens* (Lindner) Lindau, in Rabenhorst, Krypt.-Fl., ed. 2, 1(8): 35. 1907.

≡ *Candida suaveolens* (Lindner) Langeron & Guerra, *ined*. ?

≡ *Geotrichum suaveolens* (Lindner) Cif., Atti Ist. Bot. Lab. Crittog. Univ. Pavia, Ser. 5, 19: 6. 1962. cited as "Cif., in Diddens & Lodder, 1942" ?.

≡ ***Moniliella suaveolens*** (Lindner) Arx, Antonie van Leeuwenhoek J. Microbiol. Serol. 38(3): 294. 1972.

*Notes*: "The species does not belong in the genus *Cladosporium*" (de Vries 1952: 97, with comments on type and other specimens).

*subsessile* Ellis & Barthol., Erythea 4: 83. 1896.

*Lectotype* (designated by Schubert *et al.* 2003): **USA**, Kansas, on living leaves of *Populus deltoides* subsp. *monilifera* (≡ *P. monilifera*) (*Salicaceae*), 18 Sep. 1894, Bartholomew (NY). *Isolectotypes*: **USA**, Kansas, Rockport, on leaves of *Populus deltoides* subsp. *monilifera*, Sep. 1894, E. Bartholomew, Ellis & Everhart, N. Amer. Fungi 3288 (*e.g.*, M, NY).

≡ *Cladosporium brevipes* Ellis & Barthol., Erythea 4: 27. 1896, *nom. illeg*., non *C. brevipes* Peck, 1887.

≡ ***Fusicladium subsessile*** (Ellis & Barthol.) K. Schub. & U. Braun, IMI Descriptions of Fungi and Bacteria 152, No. 1519. 2002.

≡ *Cladosporium maculicola* Ellis & Barthol., *in herb*. (BPI 427256).

*Lit*.: Saccardo (1899: 1081), Ferraris (1912: 345), Schubert *et al.* (2003: 99–100).

*Notes*: Syntype material is also deposited at NYS (USA, Kansas, Rooks Co., Rockport, on living leaves of *Populus monilifera*, 17 Sep. 1894, E. Bartholomew, Kansas Fungi 1576).

*superficiale* Petch, Ann. Roy. Bot. Gard. (Peradeniya) 9: 327. 1925.

*Holotype*: **Ceylon** [Sri Lanka], Hakgala, on leaves of *Cinnamomum ovalifolium* (*Lauraceae*), 27 Feb. 1922, No. 6570 (K 121571).

= ***Heteroconium solaninum*** (Sacc. & Syd.) M.B. Ellis, More Dematiaceous Hyphomycetes: 65. 1976.

*Lit*.: Saccardo (1972: 1339).

*Notes*: In the type material, which has been examined, this fungus is associated with a sooty mould. The conidiophores are solitary, 80–200 × 3–5 µm, pluriseptate, brown, with terminal conidiogenous cells, often somewhat swollen, becoming intercalary by monopodial proliferation, unilocal, conidia solitary or in short chains, ellipsoid, subcylindrical, fusiform, 8–20 × 4–5 µm, mostly 3-septate.

*symphoricarpi* Dearn., *in herb*.

*Specimen*: **Canada**, British Columbia, Salmo, on *Symphoricarpos acutus* (*Caprifoliaceae*), 11 Jul. 1935, G.G. Hedgcock (BPI 427503).

= *Cercospora symphoricarpi* Ellis & Everh., J. Mycol. 5: 70. 1889.

≡ *Phaeoramularia symphoricarpi* (Ellis & Everh.) Deighton, More Dematiaceous Hyphomycetes: 317. 1976.

≡ ***Passalora symphoricarpi*** (Ellis & Everh.) U. Braun & Crous, *Mycosphaerella* and its anamorphs. 1. Names published in *Cercospora* and *Passalora*. CBS Biodiversity Ser. 1: 393. 2003.

*Notes*: As secondary invader *Cladosporium herbarum s. lat*. and a *cladosporioides*-like *Cladosporium* species are occasionally intermixed.

*syphiliticum* Hallier, Flora, Neu Reihe, 26(19): 294. 1868.

*Type*: Isol. from man associated with syphilis.

≡ *Cladosporium coniothecii-syphilitici* Hallier, Flora, Neue Reihe, 26(19): 294. 1868 (alternative name).

*Lit*.: Saccardo (1913a: 1371), Nannizzi (1934: 409).

*Ill*.: Hallier (1868a: tab. 3, fig. 13).

*Notes*: Introduced as state (morph) of *Coniothecium syphiliticum* Hallier and *Penicillium syphiliticum* Hallier (p. 295). A doubtful, human pathogenic fungus associated with syphilis, undoubtedly not belonging to *Cladosporium s. str.* "Est species omnini obscura et vix *Cladosporium*." (Saccardo 1913a). "Species incertae" (Saccardo 1911: 282). Of E. Hallier, "Herbarium and types: unknown" (Stafleu & Cowan 1979).

*tectonae* Sawada, Rep. Gov. Res. Inst. Formosa 85: 92. 1943, *nom. inval*.

*Syntypes*: **Taiwan**, Taipei, on *Tectona grandis* (*Lamiaceae*), 6 May 1930, K. Sawada (BPI 427507, PPMH).

= ***Fusicladium tectonicola*** (Yong H. He & Z.Y. Zhang) U. Braun & K. Schub. (see below).

≡ *Cladosporium tectonicola* Yong H. He & Z.Y. Zhang, Mycosystema 21(1): 21. 2002 and in Zhang *et al*., Flora Fungorum Sinicorum, Vol. 14: 164. 2003.

*Notes*: Description only in Japanese, not validly published.

*tectonicola* Y.H. He & Z.Y. Zhang, Mycosystema 21(1): 21. 2002 and in Zhang *et al*., Flora Fungorum Sinicorum, Vol. 14: 164. 2003.

*Holotype*: **China**, Guangdong, Ledong, on living leaves of *Tectona grandis* (*Lamiaceae*), 30 Aug. 1978, D.R. Duan (HMAS 38603).

≡ ***Fusicladium tectonicola*** (Yong H. He & Z.Y. Zhang) U. Braun & K. bensch, **comb. nov.** MycoBank MB800297.

*Basionym*: *Cladosporium tectonicola* Yong H. He & Z.Y. Zhang, Mycosystema 21(1): 21. 2002 and in Zhang *et al.*, Flora Fungorum Sinicorum, Vol. 14: 164. 2003.

= *Cladosporium tectonae* Sawada, Rep. Gov. Res. Inst. Formosa 85: 92. 1943, *nom. inval*.

*Lit.*: Schubert (2005a: 224).

*Ill.*: He & Zhang (2002: 21, fig. 1), Zhang *et al.* (2003: 165, fig. 114).

*Notes*: Zhang *et al.* (2003) cited *Cladosporium tectonae* as synonym, which could be confirmed by a re-examination of type material. This species is known from China (Gungdong and Taiwan) on *Tectona grandis*. Furthermore, this species has recently been found in Africa, also on *T. grandis* (Cameroon, East Province, Dept. Lom et Djérem, between Gamboula and Bazzama, *ca.* 23 km E of Bertoua, *ca.* 690 m alt., 4 Dec. 2007, J. & M. Piątek, KRAM). This species is cladosporioid, but due to unthickened, not darkened conidiogenous loci and conidial hila, it is rather *Pseudocladosporium*-like. As a result of a phylogenetic reassessment of venturiaceous anamorphs (Crous *et al*. 2007d), *Pseudocladosporium* was reduced to synonym with *Fusicladium*. Based on the examination of type material and the new collection from Cameroon, *F. tectonicola* can be redescribed as follows:

On the lower leaf surface as dark olivaceous-brown to reddish brown discolorations, effuse, at first punctiform, later confluent, often along leaf veins, on the upper side grey-brown. *Colonies* hypophyllous, pale brown, villose, between leaf hairs. *Mycelium* internal and external, superficial; hyphae branched, 1–5 µm wide, septate, sometimes with swellings and slightly constricted at the septa, very pale olivaceous, subhyaline, smooth, walls unthickened or almost so. *Stromata* absent. *Conidiophores* solitary, arising from hyphae, erect, straight, somewhat curved to flexuous, cylindrical-oblong to filiform, unbranched, (20–)40–150(–300) × 3–6 µm, pluriseptate, sometimes slightly constricted at the septa, pale to medium dark brown, paler towards the apex, smooth, walls thin to slightly thickened, ≤ 1 µm, often somewhat swollen at the base, up to 10 µm wide. *Conidiogenous cells* integrated, terminal or occasionally intercalary, 8–15 µm long, proliferation sympodial; conidiogenous loci rather inconspicuous to subdenticulate, planate to slightly convex, 0.5–1.5 µm wide, unthickened, not darkened-refractive. *Conidia* catenate, in unbranched or branched chains, straight, shape variable, limoniform, ellipsoid-ovoid, obovoid, fusiform, subcylindrical, rarely subglobose, 5–15(–18) × 2–5 µm, 0(–1)-septate, subhyaline to very pale brown (occasionally with a few ramoconidia distinguished from conidia and secondary ramoconidia by being darker brown and have a broader truncate base), smooth, thin-walled, apex rounded or with up to three apical hila, base rounded to somewhat attenuated, hila truncate to slightly convex, 0.5–1.5 µm wide, unthickened, not darkened, sometimes slightly refractive.

*tenerum* (Link) E.W. Mason, *in herb*.?, Kirk *et al.* (n. d.) – www.indexfungorum.org.

*tenuis* – Gola (1930: 21).

*trichellum* Sacc. – Gola (1930: 21).

*trichoides* C.W. Emmons, Amer. J. Clin. Pathol. 22: 541. 1952.

*Type*: **USA**, isol. from man.

= ***Cladophialophora bantiana*** (Sacc.) de Hoog, Kwon-Chung & McGinnis, J. Med. Veterin. Mycol. 33: 343. 1995.

*Lit.*: McGinnis & Borelli (1981), Ho *et al.* (1999: 146).

*Notes*: See *C. bantianum*.

*trichoides* C.W. Emmons var. *chlamydosporum* Kwon-Chung, Mycologia 75(2): 320. 1983.

*Type*: **USA**, Maryland, from brain abscess in man.

= ***Cladophialophora bantiana*** (Sacc.) de Hoog, Kwon-Chung & McGinnis, J. Med. Veterin. Mycol. 33: 343. 1995.

*trichophilum* H.C. Greene, Amer. Midl. Naturalist 48(3): 756. 1952, *nom. illeg*., non *C. trichophilum* Petr. & Cif., 1932. Fig. 393.

*Lectotype* (**designated here**): **USA**, Wisconsin, Rusk Co., Hawkins, on living leaves of *Lonicera hirsuta* (*Caprifoliaceae*), 26 Aug. 1918, J.J. Davis (WIS). *Isolectotype*: BPI 427512.

= *Mycovellosiella nopomingensis* B. Sutton, Mycol. Pap. 132: 77. 1973.

≡ ***Passalora nopomingensis*** (B. Sutton) U. Braun & Crous, *Mycosphaerella* and its anamorphs: 1. Names published in *Cercospora* and *Passalora*. CBS Biodiversity Ser. 1: 462. 2003.

*Lit.*: Shvartsman *et al.* (1975: 96), Schubert (2005a: 73–75).

*Ill.*: Schubert (2005a: 74, fig. 10).

*trichophilum* Petr. & Cif., Ann. Mycol. 30: 337. 1932.

*Syntypes*: **Dominican Republic**, Valle del Cibao, Prov. Santiago, Las Lagunas, at Pozo Hediondo, on living leaves of *Lantana trifolia* (*Verbenaceae*), 7 Dec. 1930, R. Ciferri & E.L. Ekman (BPI 427513A, 43696A, IMI 127138a, M-0057713, W).

≡ *Mycovellosiella trichophila* (Petr. & Cif.) Deighton, *in herb.* ?

= *Cercospora lantanae* Chupp, J. Dept. Agric. Porto Rico 15: 10. 1931. [Types: CUP-PR 1200, IMI 132050].

≡ *Mycovellosiella lantanae* (Chupp) Deighton, Mycol. Pap. 137: 33. 1974.

≡ ***Passalora lantanae*** (Chupp) U. Braun & Crous, *Mycosphaerella* and its anamorphs: 1. Names published in *Cercospora* and *Passalora*, CBS Biodiversity Ser. 1: 242. 2003.

= *Chaetotrichum lantanae* Petr., Sydowia 5: 38. 1951, *nom. nov*., non *Chaetotrichum trichophilum* (Stev.) Petr., 1951.

= *Mycovellosiella lantanae* var. *verbenacearum* K. Bhalla, S.K. Singh & A.K. Srivast., Australas. Syst. Bot. 12: 369. 1999. [Type: IMI 373101].

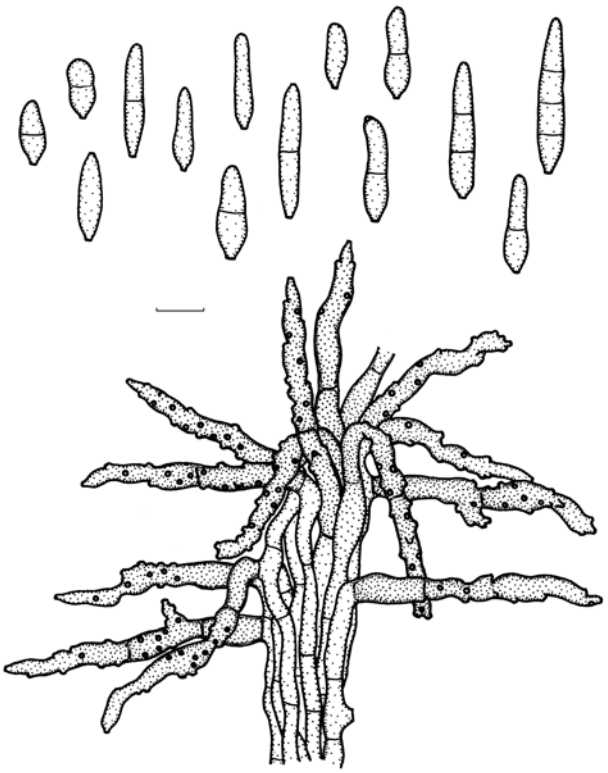


**Fig. 393.** *Passalora nopomingensis* (WIS, lectotype of *C. trichophilum*). Conidia and conidiophores climbing leaf hairs. Scale bar = 10 µm. K. Bensch *del*.

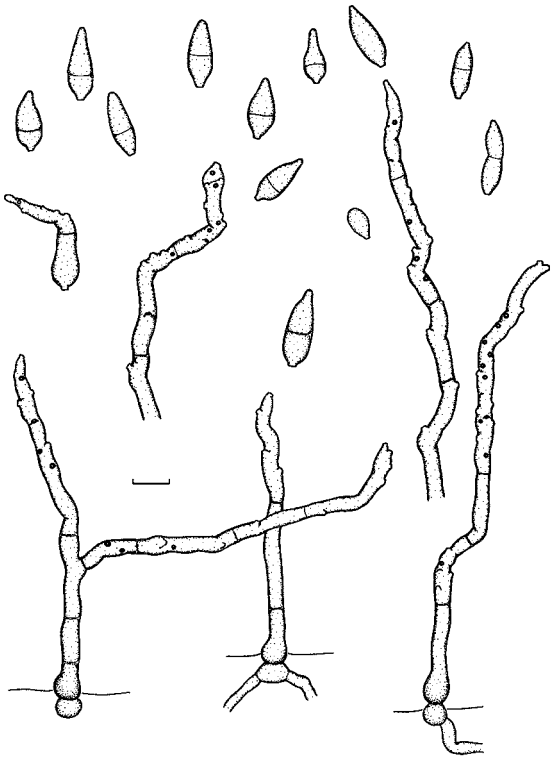


**Fig. 394.** *Fusicladium triostei* (NYS 3219, holotype of *C. triostei*). Conidiophores and conidia. Scale bar = 10 µm. K. Bensch *del*.

*triostei* Peck, Trans. Wisconsin Acad. Sci. 6: 119. 1885 and J. Mycol. 1: 13. 1885. Fig. 394.
*Holotype*: **USA**, Wisconsin, La Crosse, on leaves of *Triosteum perfoliatum* (*Caprifoliaceae*), L.H. Pammel (NYS 3219).
≡ ***Fusicladium triostei*** (Peck) K. Schub. & U. Braun, Mycol. Progr. 4(2): 102. 2005.
*Lit*.: Saccardo (1886: 359), de Vries (1952: 99).
*Ill*.: Schubert & Braun (2005a: 103, fig. 2).

*tropicale* Sartory, Bull. Acad. Roy. Méd. 113(24): 890. 1935, as "*tropicalis*", *nom. inval*.
*Type*: **Central Africa**, "Dermatomycosis tropicalis", disease caused in man, (location unknown).
*Notes*: Latin diagnosis lacking, description rudimentary. "Doubtful, probably an *Exophiala*" (de Hoog *et al.* 2000: 1033) or an *Aureobasidium* (Ciferri 1960: 501).

"*typharum* f. *fuscum* P. Karst.", Hedwigia 35: 48, 1896.
*Notes*: Cited by Oudemans (1919); see *C. typharum* var. *fuscum*. The actual reference in Hedwigia is to *Brachysporium typharum* (Desm.) P. Karst. var. *fuscum* n. var.

"*typharum* var. *fuscum* P. Karst.", Hedwigia 35: 48. 1896.
*Lit*.: Saccardo (1899: 1081).
*Notes*: See comment under *Cladosporium typharum* f. *fuscum*.

*uleanum* Henn., Hedwigia 34: 116. 1895.
≡ ***Septoidium uleanum*** (Henn.) U. Braun, **comb. nov.** MycoBank MB800298.
*Basionym*: *Cladosporium uleanum* Henn., Hedwigia 34: 116. 1895.
= ? *Septoidium consimile* Arnaud, Ann. Épiphyt. 7: 62. 1921.
*Lectotype* (**designated here**): **Brazil**, Uberaba in Minas Gerais, on living leaves of a *Myrtaceae*, Jun. 1892, E. Ule, no. 1927 (B 700006438). *Isolectotype*: HBG.
*Lit*.: Saccardo (1895: 620), Lindau (1907: 828), Lind (1913: 524), Oudemans (1923).
*Notes*: The fungus described by Hennings as *C. uleanum* is a species of the genus *Septoidium* (hyphae broad, 5–10 µm wide, medium brown, wall irregularly rugose; conidia formed by unilocal conidiogenous cells, solitary, broadly ellipsoid-clavate, 50–80 × 12–20 µm, 2-septate, wall pale, 1–2 µm wide, content golden-brown, smooth, apex rounded, base subtruncate to convex, 7–10 µm wide, cells often with distinct lumina, 5–15 µm diam.). This species agrees well with *Septoidium consimile*, known from South American on myrtaceous hosts, and is possibly an older name for this fungus.

*unedonis* Gonz. Frag., Mem. Real Acad. Ci. Barcelona, Ser. 3, 15(17): 459 (33). 1920.
*Holotype*: **Spain**, near Barcelona, Las Planas, on living leaves, becoming dry, of *Arbutus unedo* (*Ericaceae*), 28 Mar. 1918, A. Caballero (MA 06466).
*Lit*.: Gonzáles-Fragoso (1927: 204), Saccardo (1931: 790).
*Notes*: Excluded, taxonomic status unclear; *Taeniolella*/ *Heteroconinium*-like.

*vagans* (Pers.) Desm., Pl. Crypt. N. France, Ed. 1, Fasc. I, No. 6. 1825, as "Pers.".
*Type*: On leaves of *Acer*, *Tilia*, *etc.*
≡ *Fumago vagans* Pers., Mycol. eur. 1: 9. 1822.
*Lit*.: Saccardo (1886: 370), Oudemans (1923), Friend (1965).
*Notes*: *Fumago* is a mixture of *Aureobasidium pullulans*, *Cladosporium* spp. (mainly *C. herbarum s. lat.*) and sometimes additional saprobic hyphomycetes, growing in honeydew secreted by aphids on the upper leaf surface of trees (Friend 1965). See also *C. fumago* Link.

*vangueriae* (Thirum. & Mishra) Arx, Genera Fungi Sporul. Pure Cult., Ed. 2: 222. 1974.
*Types*: **India**, Bihar, Darbhanga, on leaves of *Meyna laxiflora* (≡ *Vangueria spinosa*) (*Rubiaceae*) (BPI 442756, IMI 51482).
*Basionym*: *Biharia vangueriae* Thirum. & Mishra, Sydowia 7(1–4): 79. 1963.
≡ *Stenella vangueriae* (Thirum. & Mishra) Deighton, Mycol. Pap. 144: 53. 1979.
≡ ***Zasmidium vangueriae*** (Thirum. & Mishra) Kamal, *Cercosporioid fungi of India*: 252. 2010.

*versicolor* P.A. Dang., Botaniste 22: 455. 1931.
*Type*: **France**, in a glass of water containing a piece of potato (location unknown).
*Ill*.: Dangeard (1931: 489, pl. 17; 491, pl. 18).
*Notes*: Dangeard (1931) described and illustrated this species as a pycnidial fungus. Excluded.

*versicolor* T.E.T. Bond, Ceylon J. Sci., Sect. A, Bot. 12: 183. 1947, *nom. illeg*., non *C. versicolor* P.A. Dang., 1931.
*Type*: **India**, Ceylon [Sri Lanka], St. Coombs, on *Ageratum conyzoides* (*Asteraceae*), Dec. 1943 (IMI 676).
= *Cercospora perfoliati* Ellis & Everh., J. Mycol. 5: 71, 1889, as "*perfoliata*". [Type: NY].
≡ *Mycovellosiella perfoliati* (Ellis & Everh.) Munt.-Cvetk., Lilloa 30: 201. 1960.
≡ ***Passalora perfoliati*** (Ellis & Everh.) U. Braun & Crous, *Mycosphaerella* and its anamorphs: 1. Names published in *Cercospora* and *Passalora*, CBS Biodiversity Ser. 1: 314. 2003.
= *Cercospora agerati* F. Stevens, Bernice P. Bishop Mus. Bull. 19: 154. 1925. [Type: ILL 16297].
≡ *Ragnhildiana agerati* (F. Stevens) F. Stevens & Solheim, Mycologia 23: 402. 1931.

= *Ramularia agerati* Sawada, Special Publ. Coll. Agric. Natl. Taiwan Univ. 8: 190. 1959, *nom. inval*. [Types: NTU-PPE, herb. Sawada, IMI 123997a (slide)].
= *Cercosporella coorgica* Muthappa, Mycopathol. Mycol. Appl. 34: 194. 1968. [Type: IMI 937100].

*Lit.*: Deighton (1974: 69).

"*virescens* Pers.", Mycol. eur. 1: 14. 1822.
*Notes*: *Cladosporium virescens* is cited in Lindau (1907: 206) as synonym of *Sporotrichum virescens* (Pers.) Link (Bas.: *Dematium virescens* Pers.) which seems to be an error. Persoon (1822) refers to *Dematium virescens*; the name *Cladosporium virescens* Pers. was never published.

*virgultorum* Schwein., Trans. Amer. Philos. Soc., N.S., 4(2): 277. 1832.
*Syntypes*: **USA**, Pennsylvania, Bethlehem, on branches, No. 2605 (PH 01020411, 01020412).
*Lit.*: Saccardo (1886: 356).
*Notes*: Excluded, not *Cladosporium s. str.*, but identity not yet clear.

*viticola* Ces., Flora 37: 206. 1854 and in Klotzsch, Herb. Viv. Mycol., Cent. XIX, No. 1877. 1854, as "*viticolum*".
*Syntypes*: **Italy**, on *Vitis* sp. (*Vitaceae*), Klotzsch, Herb. Viv. Mycol. 1877 (*e.g.*, BPI 797134, HAL).
≡ *Cercospora viticola* (Ces.) Sacc., Syll. fung. 4: 485. 1886.
= ***Pseudocercospora vitis*** (Lév.) Speg., Anales Mus. Nac. Buenos Aires 20: 438. 1910.
*Lit.*: Lindau (1910: 116, as "*viticolum*"), Chupp (1954: 605), Sivanesan (1984: 210).

*vitis* (Lév.) Sacc., Mycoth. Ven., Cent. III, No. 284. 1875.
*Type*: **Italy**, Treviso, Selva, on leaves of *Vitis vinifera* (*Vitaceae*), Sep. 1874, Saccardo, Mycoth. Ven. 284 (*e.g.*, HAL).
*Basionym*: *Septonema vitis* Lév., Ann. Sci. Nat. Bot., Sér. 3, 9: 261. 1848.
≡ *Cercospora vitis* (Lév.) Sacc., Nuovo Giorn. Bot. Ital. 8: 188. 1876.
≡ *Helminthosporium vitis* (Lév.) Pirotta, Rev. Mycol. (Toulouse) 11: 185. 1889.
≡ ***Pseudocercospora vitis*** (Lév.) Speg., Anales Mus. Nac. Buenos Aires 20: 438. 1910.
≡ *Phaeoisariopsis vitis* (Lév.) Sawada, Rep. Dept. Agric. Gov. Res. Inst. Formosa 2: 164. 1922.
≡ *Cercosporiopsis vitis* (Lév.) Miura, Flora of Manchuria and East Mongolia, III. Cryptog. Fungi: 527. 1928.
= *Cladosporium viticola* Ces., Flora 38: 206. 1854 and in Klotzsch, Herb. Viv. Mycol., Cent. XIX, No. 1877. 1854, as "*viticolum*". [Type: *e.g.*, HAL].
≡ *Cercospora viticola* (Ces.) Sacc., Syll. fung. 4: 485. 1886.
= *Cladosporium ampelinum* Pass., in Baglietto, Cesati & Notaris, Erb. Critt. Ital., Ser. II, No. 595. 1872.
= *Graphium clavisporium* Berk. & Cooke, Grevillea 3(27): 100. 1874. [Type: K].
≡ *Isariopsis clavispora* (Berk. & Cooke) Sacc., Syll. fung. 4: 631. 1886.
= *Cercospora vitis* var. *rupestris* Cif., Ann. Mycol. 20: 45. 1922.
= ? *Mycosphaerella personata* B.B. Higgins, Amer. J. Bot. 16: 287. 1929.
= *Cercospora vitis* f. *parthenocissi* Docea, Lucr. Şti. Inst. Agron. 'N. Bălescu', Ser. A., 11: 406. 1968.
*Lit.*: Lindau (1910: 116, as "*vitis* Sacc."), Chupp (1954: 605), Deighton (1976: 131), Sivanesan (1984: 210), Crous & Braun (2003: 427).

*werneckii* Horta, Revista Med. Cirugía Brasil 29: 274. 1921, as "*Wernecki*".
*Type*: **Brazil**, on man. *Ex-type culture*: ATCC 36317.
≡ *Dematium werneckii* (Horta) C.W. Dodge, Med. Mycol.: 676. 1935.
≡ *Pullularia werneckii* (Horta) G.A. de Vries, Contr. Knowl. Genus *Cladosporium*: 101. 1952.
≡ *Exophiala werneckii* (Horta) Arx, Genera Fungi Sporul. Pure Cult.: 180. 1970.
≡ ***Hortaea werneckii*** (Horta) Nishim. & Miyaji, Jap. J. Med. Mycol. 26(2): 145. 1984.
≡ *Phaeoannellomyces werneckii* (Horta) McGinnis & Schell, Sabouraudia 23(3): 184. 1985.
= *Cryptococcus metaniger* Castell., Archiv Dermatol. Syph. 16(4): 402. 1927.
≡ *Cladosporium metaniger* (Castell.) Ferraris, Atti Ist. Bot. "Giovanni Briosi" 3: 183. 1932.
= *Cladosporium rietmanni* Sartory & Syd., Rev. Pat. Malad. Pays Chauds 15(1): 9–44. 1935.
*Lit.*: Nannizzi (1934: 408), de Vries (1952: 100), Cooke (1962: 34), Kwon-Chung & Bennett (1992: 195), Schell (2003: 606).

*wikstroemiae* H. Zhang & Z.Y. Zhang, Proceedings of Phytopathological Symposium Organized by Phytopathology Laboratory of Yunnan Province 2: 306. 1998, *nom. nov.*, as "(Sawada) H. Zhang & Z.Y. Zhang *comb. nov*.", *nom. inval*.
*Lectotype*: **Taiwan**, Taipei, on *Wikstroemia indica* (*Thymelaeaceae*), 19 Feb. 1913, K. Sawada (TNS F218930). *Isolectotype*: PPMH.
≡ *Heterosporium wikstroemiae* Sawada, Rep. Gov. Res. Inst. Formosa 87: 77. 1944, *nom. inval. et illeg*., non *H. wikstroemiae* Petch, 1922.
= *Heterosporium wikstroemiae* Petch, Ann. Roy. Bot. Gard. (Peradeniya) 7: 319. 1922. [Types: K, PAD].
≡ *Stenella wikstroemiae* (Petch) J. Walker, Mycol. Res. 95: 1010. 1991.
≡ ***Zasmidium wikstroemiae*** (Petch) U. Braun, **comb. nov**. MycoBank MB800299.
*Lit.*: David (1997: 126).
*Notes*: *Heterosporium wikstroemiae* Sawada was published without a Latin description.

*zeae* Peck, Rep. (Annual) New York State Mus. Nat. Hist. 46: 114. 1894.
*Holotype*: **USA**, Menands, on unripened grains of *Zea mays* (*Poaceae*), Sep., C.H. Peck (NYS 3441).
*Lit.*: Saccardo (1895: 620).
*Notes*: Excluded, taxonomic status could not be clarified, only sterile brown mycelium could be observed.

*zizyphi* P. Karst. & Roum., Rev. Mycol. (Toulouse) 12(46): 78. 1890, non *Pseudocercospora zizyphi* (Petch) Crous & Braun, 1996.
*Syntypes*: **Vietnam**, Tonkin, Hai Phong and "ad Sontag", on faded leaves of *Zizyphus* (*Rhamnaceae*), May 1888 and Dec. 1889 (B 700006769, PC and Roumeguère, Fungi Sel. Gall. Exs. 5500, *e.g.*, B).
= *Cercospora jujubae* S. Chowdhury, Indian J. Agric. Sci. 16: 525. 1946. [Type: IMI 113803].
≡ ***Pseudocercospora jujubae*** (S. Chowdhury) N. Khan & Shamsi, Bangladesh J. Bot. 12: 117. 1983.
*Lit.*: Saccardo (1892: 604), Ferraris (1912: 342), Oudemans (1923), Crous & Braun (2003: 233).

Unnamed *Cladosporium* states of named teleomorphs:

*Cladosporium* state of *Apiosporina collinsii* (Schwein.) Höhn.
≡ ***Fusicladium* state of *Apiosporina collinsii*** (Schwein.) Höhn.
*Lit.*: Sivanesan (1984: 598), Schubert (2001), Schubert *et al.* (2003: 105–106), Crous *et al.* (2007c: 205).
*Notes*: Using molecular sequence analyses, Crous *et al.* (2007c) demonstrated that *Apiosporina collinsii* clusters in and belongs to the *Venturiaceae*. They reduced *Apiosporina* to synonymy with *Venturia* and its anamorph was referred to as *Fusicladium*. Zhang *et al.* (2011) revealed *Venturia* to be polyphyletic, suggesting that the anamorphs associated with *Apiosporina* are not members of *Venturia s. str.*

## *Heterosporium*

The epithets are listed alphabetically. The generic name, *i.e.*, *Heterosporium*, is dropped. *Heterosporium* was monographed by David (1997), *i.e.*, this list is mainly based on his examinations.

*adeniae* Hansf., Proc. Linn. Soc. London 155: 46. 1943.
*Lectotype* (selected by David, 1997): **Uganda**, Kiagwe, on *Adenia cissampeloides* (*Passifloraceae*), Jun. 1938, C.G. Hansford (IMI 10035). *Isolectotype*: K.
≡ *Stenella adeniae* (Hansf.) Deighton, Mycol. Pap. 144: 52. 1979.
≡ ***Zasmidium adeniae*** (Hansf.) U. Braun, **comb. nov.** MycoBank MB800300.
*Basionym*: *Heterosporium adeniae* Hansf., Proc. Linn. Soc. London 155: 46. 1943.
= *Cercospora adeniae* J.M. Yen & Gilles, Bull. Soc. Mycol. France 90: 307. 1975.
*Lit.*: David (1997: 100).

*albiziae* (Petch) N. Naito, Mem. Coll. Agric. Kyoto Univ. 47: 51. 1940.
*Holotype*: **Sri Lanka**, Central Province, Perideniya, on *Albizia lebbek* (*Fabaceae*), 21 Jun. 1908, Petch 2589 (K).
≡ *Helminthosporium albiziae* Petch, Ann. Roy. Bot. Gard. Perideniya 4(5): 51. 1940.
≡ ***Camptomeris albiziae*** (Petch) E.W. Mason, in Hansford, Proc. Linn. Soc. London 155: 61. 1943.
*Lit.*: Ellis (1971: 286), David (1997: 100).
*Ill.*: Ellis (1971: 286, fig. 196).

*allii* var. *bomareae* Pat., Bull. Soc. Mycol. France 11: 233. 1895.
*Holotype*: **Ecuador**, Rio Machangara, on *Bomarea* sp. (*Alstroemeriaceae*), 1892, G. de Lagerheim (F).
= *Scolectotrichum alstroemeriae* Allesch., Hedwigia 34: 116. 1895.
≡ ***Asperisporium alstroemeriae*** (Allesch.) Maubl., Lavoura 16: 211. 1913.
*Lit.*: David (1997: 100).

*californicum* Ellis & Everh., Fungi Columb., No. 1171. 1897, *nom. inval*.
*Syntypes*: **USA**, California, on *Eriodictyon californicum* (*Boraginaceae*), Ellis & Everhart, Fungi Columb. 1171 (*e.g.*, K, NY).
= *Heterosporium eucalypti* var. *maculicola* ("*maculicolum*") Ellis & Everh., N. Amer. Fungi, Ser. II, No. 3491. 1896, *nom. inval.*
= *Coniothecium eriodictyonis* Dearn. & Barthol., in Dearness, Mycologia 21: 331. 1929.
≡ ***Trimmatostroma eriodictyonis*** (Dearn. & Barthol.) M.B. Ellis, More Dematiaceous Hyphomycetes: 28. 1976.
*Lit.*: David (1997: 104–106).
*Ill.*: Ellis (1976: 29, fig. 13), David (1997: 105–106, figs 29 A–H, 30).

*callospermum* Speg., Anales Soc. Ci. Argent. 22: 213. 1886.
*Holotype*: **Argentina**, in fields near Santa Barbara and Villarica, on spikes of *Sporobolus* sp. (*Poaceae*), Jan. 1882, C.L. Spegazzini (LPS).
= ***Bipolaris ravenelii*** (M.A. Curtis) Shoemaker, Canad. J. Bot. 37: 884. 1959.
*Lit.*: David (1997: 107).

*chloridis* Speg., Revista Argent. Hist. Nat. 1(6): 430. 1891.
*Holotype*: **Paraguay**, in fields near Paraguarí, on *Chloris* sp. (*Poaceae*), Feb. 1884, C.L. Spegazzini 4311 (location unknown, not at LPS).
≡ ***Acroconidiellina chloridis*** (Speg.) M.B. Ellis, Mycol. Pap. 125: 24. 1971.
*Lit.*: Ellis (1976: 409), David (1997: 107).
*Ill.*: Ellis (1971: 410, fig. 318B).

*colocasiae* Massee, J. Linn. Soc. London 24: 48. 1887.
*Holotype*: **Jamaica**, Portland Parish, near Priestman's River, on *Colocasia esculenta* (*Araceae*), without any date and collector (location unknown).
*Lit.*: David (1997: 107).
*Ill.*: Massee (1887: pl. 1, fig. 2).
*Notes*: Excluded, no *Cladosporium*, but status unclear due to depauperate type material. According to David (1997), this fungus could either be *Trichocladium asperum* Harz or *Johnstonia colocasiae* M.B. Ellis. A mixture of these two species should also be taken into consideration.

*dalmaticum* Jaap, Ann. Mycol. 14: 43. 1916.
*Holotype*: **Montenegro**, Herceg Novi (Castelnuovo), Zelenika, on rotting stems of *Phytolacca americana* (*Phytolaccaceae*), 30 Apr. 1914, O. Jaap 307 (HBG).
*Lit.*: David (1997: 108).
*Notes*: Status unclear.

*dianellae* Sawada, Rep. Gov. Res. Inst. Formosa 87: 76. 1944, *nom. inval*.
*Holotype*: **Taiwan**, Taipei, on *Dianella ensifolia* (*Xanthorrhoeaceae*), 19 Nov. 1925, K. Sawada (NTU-PPE).
= *Cercospora dianellae* Sawada & Katsuki, Special Publ. Coll. Agric. Natl. Taiwan Univ. 8: 216. 1959.
≡ *Stenella dianellae* (Sawada & Katsuki) Goh & W.H. Hsieh, Trans. Mycol. Soc. Republ. China 2: 137. 1987.
≡ ***Zasmidium dianellae*** (Sawada & Katsuki) U. Braun, **comb. nov.** MycoBank MB800301.
*Basionym*: *Cercospora dianellae* Sawada & Katsuki, Special Publ. Coll. Agric. Natl. Taiwan Univ. 8: 216. 1959.
*Lit.*: David (1997: 108–110), Goh & Hsieh (1990: 209).
*Ill.*: David (1997: 110, fig. 31), Goh & Hsieh (1990: 210, fig. 162).

*eschscholtziae* Harkn., Bull. Calif. Acad. Sci. 1: 38. 1884.
*Holotype*: **USA**, California, San Francisco, on *Eschscholtzia californica* (*Papaveraceae*), Jan. 1884, Harkness 3116 (not preserved).
≡ ***Acroconidiella eschscholtziae*** (Harkn.) M.B. Ellis, More Dematiaceous Hyphomycetes: 407. 1976.
≡ *Cladosporium eschscholtziae* (Harkn.) Dingley, *nom. ined.*
*Lit.*: David (1997: 111).
*Ill.*: Ellis (1976: 408, fig. 317).

*eucalypti* var. *maculicola* ("*maculicolum*") Ellis & Everh., N. Amer. Fungi, Ser. II, No. 3491. 1896, *nom. inval.*
*Syntype*: **USA**, California, San Gabriel, on *Eriodictyon californicum* (*Boraginaceae*), Jan. 1896, A.J. McClatchie, Ellis & Everhart, N. Amer. Fungi 3491 (*e.g.*, NY).
= *Heterosporium californicum* Ellis & Everh., Fungi Columb., No. 1171. 1897, *nom. inval.*
= *Coniothecium eriodictyonis* Dearn. & Barthol., in Dearness, Mycologia 21: 331. 1929.
≡ ***Trimmatostroma eriodictyonis*** (Dearn. & Barthol.) M.B. Ellis, More Dematiaceous Hyphomycetes: 28. 1976.
*Lit.*: David (1997: 104–106).
*Ill.*: Ellis (1976: 29, fig. 13), David (1997: 105–106, figs 29 A–H, 30).

*gramineum* (Rabenh. ex Schltdl.) J. Schröt., in Cohn, Kryptfl. Schlesien 3(2): 499. 1897.
≡ *Helminthosporium gramineum* Rabenh. ex Schltdl., Bot. Zeitung (Berlin) 15: 94. 1857.
≡ ***Drechslera graminea*** (Rabenh. ex Schltdl.) Shoemaker, Canad. J. Bot. 37: 881. 1959.
*Lit.*: Ellis (1971: 428), David (1997: 112).
*Ill.*: Ellis (1971: 428, fig. 298).

*granulatum* (Berk. & M.A. Curtis) Cooke, Grevillea 5: 123. 1877.
*Holotype*: **Cuba**, on dead herbaceous stems, Wright 795, ex herb. Berkeley, Cuban Fungi 631 (K).
≡ *Helminthosporium granulatum* Berk. & M.A. Curtis, in Berkeley, J. Linn. Soc. London 10: 361. 1868.
= ***Dendryphiella vinosa*** (Berk. & M.A. Curtis) Reisinger, Bull. Trimestriel Soc. Mycol. France 84: 27. 1968.
*Lit.*: Ellis (1971: 500), David (1997: 112).
*Ill.*: Ellis (1971: 499, fig. 358).

*interseminatum* (Berk. & Ravenel) G.F. Atk., Cornell Univ. Sci. Bull. 3: 48. 1897.
≡ *Helminthosporium interseminatum* Berk. & Ravenel, Grevillea 3: 103. 1875.
≡ *Dendryphiella interseminata* (Berk. & Ravenel) Bubák & Ranoj., Ann. Mycol. 12: 417. 1914.
≡ *Dendryphion interseminatum* (Berk. & Ravenel) S. Hughes, Canad. J. Bot. 31: 638. 1953.
= ***Dendryphiella vinosa*** (Berk. & M.A. Curtis) Reisinger, Bull. Trimestriel Soc. Mycol. France 84: 27. 1968.
*Lit.*: Cooke (1950), Ellis (1971: 500), David (1997).
*Ill.*: Ellis (1971: 499, fig. 358).

*lagunense* Syd. & P. Syd., Ann. Mycol. 18: 104. 1920.
*Type*: **Philippines**, Los Baños, on *Cajanus cajan* (*Fabaceae*), 3 Nov. 1919, F.B. Serrano 6278 (location unknown, neither S nor B).
= ? ***Dendryphiella vinosa*** (Berk. & M.A. Curtis) Reisinger, Bull. Trimestriel Soc. Mycol. France 84: 27. 1968.
*Lit.*: David (1997).

*lilacis* (Desm.) Puttemans, Notes Phytopathol. Mycol. Bruxelles: 2. 1918.
*Syntypes*: **France**, Pas-de-Calais, Arras, on *Syringa vulgaris* (*Oleaceae*), Desmazières, Pl. Crypt. N. France 1850 (*e.g.*, K, PC).
≡ *Exosporium lilacis* Desm., Ann. Sci. Nat. Bot., Sér. 3, 11: 364. 1849.
≡ *Cercospora lilacis* (Desm.) Sacc., Michelia 2: 128. 1880.
≡ ***Pseudocercospora lilacis*** (Desm.) Deighton, Trans. Brit. Mycol. Soc. 88: 389. 1987.
*Lit.*: David (1997: 113), Crous & Braun (2003: 251).

*magnoliae* Weedon, Mycologia 18: 222. 1926.
*Holotype*: **USA**, Florida, St. Petersburg, on *Magnolia grandiflora* (*Magnoliaceae*), 15 Feb. 1923, A.G. Weedon, Fungi of Florida 1 (ILL 16167).
≡ *Stenellopsis magnoliae* (Weedon) Morgan-Jones, Mycotaxon 10: 406. 1980.
≡ ***Parastenella magnoliae*** (Weedon) J.C. David, Mycol. Res. 95: 124. 1991.
*Lit.*: David (1997: 113).
*Ill.*: David (1997: 114, fig. 32).

*munduleae* Syd. & P. Syd., Ann. Mycol. 10: 45. 1912.
*Holotype*: **South Africa**, Transvaal, Koedoesriver, Zoutpansberg, on *Mundulea sericea* (*Fabaceae*), 10 Aug. 1911, E. M. Doidge (S). *Isotype*: IMI 38033.
≡ ***Sirosporium munduleae*** (Syd. & P. Syd.) M.B. Ellis, More Dematiaceous Hyphomycetes: 302. 1976.
*Lit.*: David (1997: 115).
*Ill.*: Ellis (1976: 302, fig. 227).

*paradoxum* Syd. & P. Syd., in Fuhrmann & Mayor, Mém. Soc. Neuchâtel. Sci. Nat. 5: 441. 1914.
*Holotype*: **Colombia**, Antioquia Dép., Guaca, on *Calea sessiliflora* (= *C. glomerata*) (*Asteraceae*), 12 Sep. 1910, E. Mayor (S).
≡ ***Laocoön paradoxus*** (Syd. & P. Syd.) J.C. David, Mycol. Pap. 172: 116. 1997.
*Ill.*: David (1997: 117–119, figs 33–35).

*paulsenii* Rostr., Bot. Tidskr. 28: 218. 1907.
*Holotype*: **Tadzhikistan**, Pamir Mts., on *Arnebia euchroma* (≡ *Macrotomia euchromon*) (*Boraginaceae*), 22 Jul. 1898, O. Paulsen 864 (C).
*Lit.*: David (1997: 120).
*Notes*: Not *Cladosporium*, but status unclear, probably a *Scolecobasidium*.

*phragmitis* var. *ammophilae* Grove, *in herb*.
*Material examined by David* (1997): **UK**, Cheshire, Leasowe, on old leaves of *Ammophila arenaria* (*Poaceae*), 15 Oct. 1921, V.S.J. (K).
= ***Scolecobasidium arenarium*** (Nicot) M.B. Ellis, More Dematiaceous Hyphomycetes: 194. 1976.
*Lit.*: David (1997: 120).

*repandum* Ferd. & Winge, Bot. Tidskr. 29: 23. 1908.
*Holotype*: **West Indies**, St. Thomas, Lovenlund, on dry branches, 16 Dec. 1905, C. Raunkiær (C).
= ***Dendryphiella vinosa*** (Berk. & M.A. Curtis) Reisinger, Bull. Trimestriel Soc. Mycol. France 84: 27. 1968.
*Lit.*: Ellis (1971: 500), David (1997: 120).
*Ill.*: Ellis (1971: 499, fig. 358).

*sambuci* Earle, Bull. Torrey Bot. Club 20: 30. 1897.
*Holotype*: **USA**, Alabama, Lee Co., Auburn, on dead stems of *Sambucus* sp. (*Adoxaceae*), 13 Mar. 1896, F.S. Earle & J.M. Underwood (NY).
= ***Dendryphiella vinosa*** (Berk. & M.A. Curtis) Reisinger, Bull. Trimestriel Soc. Mycol. France 84: 27. 1968.
*Lit.*: Ellis (1971: 500), David (1997: 120).
*Ill.*: Ellis (1971: 499, fig. 358).

*secalis* Dippen., S. African J. Sci. 28: 286. 1931.
*Holotype*: **South Africa**, Cape, Stellenbosch, on *Secale cereale* (*Poaceae*), 25 Sep. 1929, BJ Dippenaar (PREM 46907).
= ***Passalora graminis*** (Fuckel) Höhn., Zentralbl. Bakteriol. Parasitenk., Abt. 2, 60: 6. 1923.
*Lit.*: David (1997: 121), Crous & Braun (2003: 203).

*selaginellarum* M.L. Farr, in Farr & Horner, Nova Hedwigia 15: 266. 1968.
*Holotype*: **USA**, Florida, Highlands Co., Archibold Biological Station, 10 miles S of lake Placid, on *Selaginella arenicola* (*Selaginellaceae*), 22 Jan. 1945, Morton (BPI 802195). *Isotype*: F.
*Lit.*: David (1997: 121).
*Ill.*: David (1997: 122, fig. 36).
*Notes*: Generic affinity unclear.

*terrestre* (E.V. Abbott) R.G. Atk., Mycologia 44: 813. 1952.
*Holotype*: **Canada**, Ontario, Ancaster, isol. from soil, 31 Oct. 1947, RG Atkinson (DAOM 28282).
= *Scolecobasidium constrictum* E.V. Abbott, Mycologia 19: 30. 1927.
≡ ***Ochroconis constricta*** (E.V. Abbott) de Hoog & Arx, Kavaka 1: 57. 1973.
*Lit*.: David (1997: 123).
*Notes*: All names described in the genus *Ochroconis* will be revised in a paper by de Hoog and co-workers which will be published in Persoonia.

*tropaeoli* T.E.T. Bond, Ceylon J. Sci., Sect. A, Bot. 12: 185. 1947.
*Holotype*: **Sri Lanka**, St. Coombs, Talawakelle, on *Tropaeolum majus* (*Tropaeolaceae*), 9 Mar. 1944, T.E.T. Bond (TRI 359). *Isotype*: IMI 677.
≡ ***Acroconidiella tropaeoli*** (T.E.T. Bond) J.C. Lindq. & Alippi, Darwiniana 13: 613. 1964.
*Lit*.: Ellis (1971: 462), David (1997: 125).
*Ill*.: Ellis (1971: 461, fig. 328).

*tschawytschae* Doty & D.W. Slater, Amer. Midl. Naturalist 36: 663. 1946.
*Holotype*: **USA**, California, Anderson, Coleman Fisheries Station, isol. ex mycoses of the kidney of the fish *Onchorhyncus tschawytscha*, without date and locality (BPI).
≡ *Scolecobasidium tschawytschae* (Doty & D.W. Slater) McGinnis & Ajello, Trans. Brit. Mycol. Soc. 63: 202. 1974.
≡ ***Ochroconis tschawytschae*** (Doty & D.W. Slater) Kiril. & Al-Achmed, Mikrobiol. Zhurn. 39: 305. 1977.
*Lit*.: David (1997: 125).
*Notes*: See comments on the genus *Ochroconis* above under *H. terrestre*.

*wikstroemiae* Petch, Ann. Roy. Bot. Gard. Perideniya 7: 319. 1922.
*Holotype*: **Sri Lanka**, Perideniya, on *Wikstroemia indica* (= *W. viridiflora*) (*Thymelaeaceae*), 2 Feb. 1919, T. Petch 5878 (PDA). *Isotype*: K.
≡ *Stenella wikstroemiae* (Petch) J. Walker, Mycol. Res. 95: 1010. 1991.
≡ ***Zasmidium wikstroemiae*** (Petch) U. Braun, **comb. nov.** MycoBank MB800299.
*Basionym*: *Heterosporium wikstroemiae* Petch, Ann. Roy. Bot. Gard. Perideniya 7: 319. 1922.
*Lit*.: David (1997: 126).
*Ill*.: David (1997: 127, fig. 38).
*Notes*: See list of excluded *Cladosporium* species.

## UNCERTAIN AND DOUBTFUL SPECIES OF *CLADOSPORIUM S. LAT.*

Type material of the following taxa could not be traced, was not available or too sparse for a final conclusion, so that the generic affinity and taxonomic status of these taxa could not be proven and remain unclear. Original descriptions and illustrations, if present and available, are reproduced. The particular epithets are alphabetically listed, but the generic name *Cladosporium* is not applied. Numerous new species have recently been described from China by Z.Y. Zhang and co-authors (Zhang *et al*. 2003), using a rather broad, traditional concept of *Cladosporium s. lat*. Type collections are deposited at MHYAU, but all attempts to re-examine these collections, including a visit of the herbarium concerned, failed, *i.e.* the access to the material was refused. Hence, the species described by Z.Y. Zhang and co-authors have to be included in the list of uncertain and doubtful species. For illustrations of published species consult MycoBank.

### *Cladosporium*

*acerinum* Noelli, Nuovo Giorn. Bot. Ital., N.S. 24(3): 195. 1917.
*Type*: **Italy**, Piemont, Bruere (Rivoli), on branches of *Acer negundo* (*Aceraceae*), 29 Mar. 1915.
*Lit.*: Saccardo (1931: 787).
*Original diagnosis* (Noelli 1917): Caespitulis effuses, minutis, aterrimis, inaequalibus; conidiophoris ramosis, dilute olivaceis, aggregatis, septatis, flexuosis; conidiis copiosis, initio oblongis et simplicibus, olivaceis, deinde ovatis, 1-septatis, constrictis, obtusis vel acutis, 20–27 × 10–12 µm, fuscis.
*Notes*: Noelli (1917) compared his newly introduced species with *C. epiphyllum*, a synonym of *C. herbarum*, which differs however in having narrower conidia. *Cladosporium acerinum* could rather belong to *C. macrocarpum*, if it is a member of the *C. herbarum* complex at all. *Cladosporium epiphyllum* var. *acerinum* collected on leaves of *Acer platanoides* in the USA proved to be synonymous with *C. macrocarpum* (Schubert 2005b).

*aeruginosum* F. Patt., Bull. Torrey Bot. Club 27: 284. 1900.
*Type*: **USA**, Department of Agriculture, greenhouse, on living leaves of *Osmanthus fragrans* (*Olea fragrans*) (*Oleaceae*) affected by *Gloeosporium oleae*, Jan. 1900, F.W. Patterson (type in herb. of "Division of Vegetable Physiology and Pathology, U.S. Department of Agriculture"). *Topotype*: 6 Feb. 1900 (BPI 426094).
*Lit.*: Saccardo (1902: 1058).
*Original diagnosis* (Patterson 1900): Tufts epiphyllous, verdigris green, densely fasciculate, distinct, upon light-coloured arid spots; hyphae simple, septate, nodulose, very light green, 45–90 × 3–3.5 µm; conidia lateral and terminal, in chains of 5 or more, almost hyaline, generally oblong and continuous, sometimes oblong-elliptical and once or twice septate, 5–12 × 2–2.5 µm.
*Notes*: Type material of *C. aeruginosum* could not be located. The collection from BPI can be considered as topotype material, but could not be examined during the course of the recent morphotaxonomic studies.

*albiziae* S.N. Khan & B.M. Misra, Indian Forester 125(7): 746. 1999.
*Holotype*: **India**, Uttar Pradesh, Kalsi (Dehra Dun), on leaves of *Albizia lebbek* (*Fabaceae*) (IMI 282484).
*Ill.*: Khan & Misra (1999: 745, fig. 2).
*Original diagnosis* (Khan & Misra 1999): Conidiophora simplica, raro ramosa, brunnea ad atro-brunnea ad cinereo-brunneae, septata, parietibus parum crassibus, levi, 60–180 × 5–7 µm. Ramoconidia pallida brunnea, 0–3 septata, ovalia vel cylindrica, 16–22 × 4–5 µm. Conidia pallida-brunnea, cylindrica, levi, 8–12 × 5–6 µm.
*Notes*: Khan & Misra (1999) reported this species as being allied to *C. psoraleae* but different in its virulence, lesion formation and conidial characters. However, type material, cited to be deposited at IMI, could not be traced and is probably not preserved.

*alliorum* Hanzawa, Mycol. Centralbl. 5: 11. 1914.
*Type*: **Japan**, Sapporo, on leaves of *Allium cepa* (*Amaryllidaceae*).
*Lit.*: Saccardo (1931: 793).
*Ill.*: Hanzawa (1914: 6, fig. 2).
*Original diagnosis* (Hanzawa 1914): Der Pilzrasen besteht aus vielen Conidienträgern, er entspringt aus den Spaltöffnungen der Blätter. Die Conidienträger sind unverzweigt, schwach gebogen, stellenweise etwas angeschwollen, bräunlich gefärbt, vacuoliert. Ihre Länge ist verschieden, bis 135 µm lang, 4–6 µm (auch 10 µm breit), angeschwollene 8 µm breit. Conidien oval, elliptisch, besitzen kleine Auswüchse an der Spitze, Oberfläche feinpunctiert, gelb-bräunlich, ohne oder mit 1–2 Septen. Größe verschieden, meistens 14–25 µm lang, 12–17 µm breit.
*Notes*: Type material of this species could not be traced. Hanzawa (1914) described this species as closely related to *Cladosporium herbarum*, but distinct by having somewhat swollen conidiophores and thick conidia. Based on the description and figure given above, *C. alliorum* is possibly identical with *C. macrocarpum*, but the conidia of *C. alliorum* are somewhat wider, well agreeing with the conidial width in *C. allii*, which has, however, much longer conidia. *Cladosporium allii-cepae*, occurring on *Allium cepa*, possesses wider conidiophores and usually solitary, much longer conidia.

*alpiniae* T. Zhang & Z.Y. Zhang, Plant Diseases and Their Control: 108. 1998.
*Holotype*: **China**, Hubei, Wuchang, on living leaves of *Alpinia galanga* (*Zingiberaceae*), 22 Sep. 1980, J.Y. Li & T.Y. Zhang, No. 4074 (MHYAU 03947).
*Ill.*: Zhang & Zhang (1998b: 109, fig. 1), Zhang *et al*. (2003: 38, fig. 12; pl. 10, fig. 2).
*Original diagnosis* (Zhang & Zhang 1998b): Maculis amphigenis, apicis vel marginis, atro-brunneis, longi-striatis, marginalibus pallide brunneis longi-undulatis ornatis, spot blight usque ad 18 × 1.2 cm vel 3–5 × 1.2 cm, olivaceis mucoris amphigenis, inusitatis. Conidiphoris solitariis vel rarius ramosis, erectis, septatis, sympoditer proliferis denticulatis vel cicatrisosis, brunneis, prope apicem pallescentis, 11.5–219.0 × 2.6–4.6 µm. Ramoconidiis 0–1-septatis, rarius 2–3-septatis, cicatricibus protrudentibus, praeditis, pallide brunneis, 5.0–18.0 × 3.3–4.6 µm. Conidiis catenatis, fusiformis, subsphaericis, continuis, laevis, pallide brunneis, 2.6–7.2 × 2.6–5.1 µm.
*Notes*: Zhang & Zhang (1998b) cited *Alpinia zerumbet* as an additional host species and compared *C. alpiniae* with *C. cladosporioides*, the only other species occurring on a host belonging to the *Zingiberaceae* (on *Zingiber officinale*), stating that the latter species possesses longer, limoniform or ellipsoid conidia. Since type material was not available the status of this taxon remains unclear.

*ambrosiae* House, *in herb.*
*Specimen*: **USA**, New York, Albany Co. Selkirk, on dead stems of *Ambrosia trifida* (*Asteraceae*), 10 Apr. 1925, H.D. House (NYS).

*amphitrichum* Sacc., Syll. fung. 4: 354. 1886.
*Type*: **Czech Republic**, near Reichenberg, on rotten wood of *Pinus* sp. (*Pinaceae*).
≡ *Amphitrichum olivaceum* Corda, Icon. fung. 1: 16. 1837. non *C. olivaceum* (Corda) Bonord., 1851.
*Lit*.: Lindau (1907: 811).
*Ill*.: Corda (1837: tab. 4, fig. 221).
*Original diagnosis* (Saccardo 1886): Caespitulis effusis, oblongis olivaceis; stromatibus aggregatis, convexis, olivaceis opacis, mycelio spurio suffultis; hyphis simplicibus, gracilibus, flexilibus, pauciseptatis, olivaceis, tectis; conidiis oblongis, simplicibus vel didymis, obtusis, pellucidis, 9.5 µm crass.
*Notes*: Type material could not be traced at PRM. A collection from Austria, deposited as *C. amphitrichum*, proved to be *C. herbarum s. lat*. (on dead wood of *Picea abies*, Austria, Tirol, near Lienz, Jun. 1922, K. Keissler, BPI 426111). However, in the brief description of this species the conidial wides was given to be 9.5 µm. Hence, *C. amphitrichum* could rather belong to *C. macrocarpum*, if it is a member of the *C. herbarum* complex at all.

*aphidis* var. *muscae* Briard & Har., Rev. Mycol. (Toulouse) 12: 132. 1890.
*Type*: **France**, Méry-sur-Seine, on a dead carcass of a fly (*Musca*), P. Hariot.
*Lit*.: Saccardo (1892: 605).
*Original diagnosis* (Briard & Hariot *l.c.*): Hyphes droits, rameux, fascicules, les uns continus et les autres septés légèrement fuligineux, diaphanes, 5–7 micro. diam; Conidies nombreuses, ovales ou ovales-oblongues, apiculées au point d'attache et souvent aux deux extrémités, simples ou 1–2 septées, de meme couleur que les hyphes ou un peu plus pales, mesurant: les simples 6–8 × 4–5, les didymes 20–22 × 7–8.
*Notes*: Type material could not be traced. Status remains unclear. A single collection from Hungary on dead carcasses of *Musca* sp. proved to be phylogenetically conspecific with *C. fusiforme*.

*apiculatum* Berk., *in herb*.
*Specimen*: **USA**, Carolina, on *Helianthus* sp. (*Asteraceae*) (K).
*Lit*.: Saccardo (1895: 621).

*aquilinum*, *in herb*.
*Specimen*: On *Pteridium* sp. (*Dennstaedtiaceae*); on *Pteridium*, Northampton (PH).

*arcticum* Berl. & Voglino, Syll. fung. 4a: 170. 1886.
*Type*: **Denmark**, Greenland, Kaiser-Franz-Joseph-Fjord, on *Epilobium latifolium* (*Onagraceae*).
*Lit*.: Saccardo (1891: 882).
*Original diagnosis* (Berlese & Voglino 1886): Caespitulis minutis, maculaeformibus, olivaceis, velutinis; hyphis subsimplicibus, cylindraceis, septatis, sub lente fuscis, apice conidiophores; conidiis oblongo-ovatis vel subclavatis, 1–2-septatis, quandoque oblique pedicellatis, flavo-fuscis, 24 × 8.
*Notes*: The species was described by Berlese & Voglino (1886) as anamorphic state of *Pleospora arctica* Fuckel. In a collection from B (Greenland, Umanakfjord, on dead leaves of *Arabis hookeri*, 14 Jul. 1892, E. Vanhöffen, B 700006170), referred to as *C. arcticum*, only *C. herbarum* and other saprobic hyphomycetes have been found.

*aristolochiae* H. Zhang & Z.Y. Zhang, Mycosystema 17(4): 304. 1998.
*Holotype*: **China**, Hubei, Wuchang, on living leaves of *Aristolochia kwangsiensis* (*Aristolochiaceae*), 22 Sep. 1980, J.Y. Li & T.Y. Zhang (MHYAU 03956).
*Ill*.: Zhang & Zhang (1998a: 304, fig. 1), Zhang *et al*. (2003: 46, fig. 19).
*Original diagnosis* (Zhang & Zhang 1998a): Maculae amphigenae, flavo-brunneae vel griseae, longe undulatae, atro-brunneae, 4.5 × 8.0 cm. Conidiophora solitaria, erecta, simplicia, septata, sympodialia cicatricosa brunnea, sursum pallide brunnea, 39–90 × 3.7–3.8 µm. Ramoconidia 0–1 interdum 3-septata, ellipsoidea vel ellipsoideo-cylindrica, pallide brunnea, cicatricibus conspicuis, 3.9–22 × 3.9–9.1 µm. Conidia catenata, continua vel raro 1-septata, subsphaerica vel ellipsoidea, laevia, pallide brunnea, 2.8–11.1 × 2.8–5.1 µm.

*arundinaceum* Mont., Ann. Sci. Nat. Bot., Sér. 3, 12: 299. 1849.
*Type*: **France**, Marseille, on sheaths and leaves of *Arundo mediterranea* (= *A. mauritanica*, *Ampelodesmos mauritanicus*) (*Poaceae*), Castagne.
*Lit*.: Saccardo (1886: 364).
*Original diagnosis* (Montagne 1849): Fibris erumpentibus lineatim seriatis atris apice fasciculato-ramosis ramisque strictis inaequaliter septatis, sporis simplicibus et rotundo ovatis tandem fuscis.
*Notes*: Type material could not be traced, but all collections referred to as "*C. arundinaceum*" (*e.g.*, B 700006173–700006175) proved to be *C. herbarum*.

*arundinicola* Berl., Riv. Patol. Veg. 4: 19. 1895, as "*arundinicolum*".
*Type*: **Italy**, Avellino, on rotting culms of *Arundo donax* (*Poaceae*).
*Lit*.: Saccardo (1913a: 1371), Ferraris (1914: 883), Gonzáles-Fragoso (1927: 210).
*Ill*.: Berlese (1895: tab. 3, fig. 17).
*Original diagnosis* (Berlese 1895): Esso é del tutto superficiale, di colore tra il fulvo e l'olivaceo, e costituisce uno spesso ifasma crostaceo alla superficie del substrato. I conidiofori sono quá e cola raccolti in cespuglietti piuttosto compatti, hanno pure un maggiore o minore numero di nodi. I conidi, che abbondantissimi compaiono sotto al microscopio, sono in generale piuttosto allungati, muriculati, continui o divisi da uno, due e perfino cinque setti trasversali. Ciò si osserva specialmente nei ramo-conidi direttamente inseriti sul conidiofora, i quail hanno forma decisamente cilindrica od alquanto fusoidea e rispondono alle dimensioni di 20–26 × 6–8, non mancano conidi quasi rotondi (gli apicali) per cui l'apparato conidiale va compreso fra le seguenti dimensioni 6–26 × 4–8.
*Notes*: Type material could not be traced, status remains unclear.

*asteromatoides* Sacc., Atti Reale Ist. Veneto Sci. Lett. Arti, Ser. 6, 3(4): 722. 1885. Fig. 395.
*Type*: **Tahiti**, on legumes of *Erythrina* sp. (?) (*Fabaceae*), May 1884, G. Brunaud, Roumeguère, Fungi Sel. Gall. Exs. 3292 (*e.g.*, B, FH, PAD).
≡ *Cladosporium asteromatoides* Sacc. & Roum., in Roumeguère, Fungi Sel. Gall. Exs., Cent. 33, No. 3292. 1885, *nom. illeg*., homonym [host given as "*Cassia* sp." and authors as "Sacc. & Roum."].
*Lit*.: Saccardo (1886: 353).
*Original diagnosis* (Saccardo & Berlese 1885): Caespitulis adpressis, subradiantibus, asteromatoideis, nigris minutis; hyphis

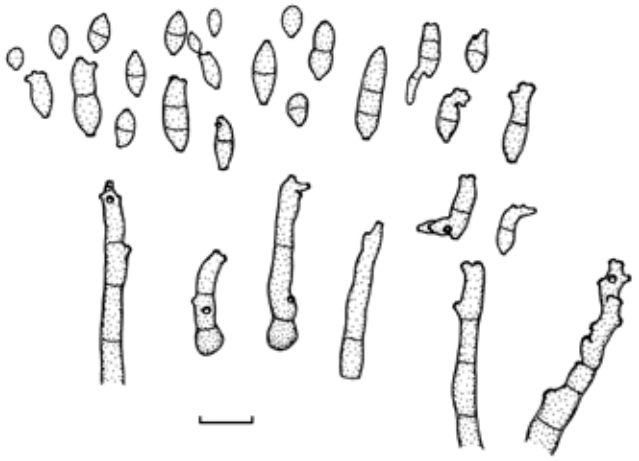


**Fig. 395.** *Cladosporium asteromatoides* (PAD). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

varie ramosis, ad basim contextis, septulatis, olivaceo-fuscis; conidiis ellipsoideis, minutis, 5.7 × 2.5 continuis v. 1-septatis.

Description based on the holotype (PAD): On pods which appear to be deformed, spots numerous, scattered to subeffuse, punctiform or as small patches, often growing dendritic in the peripherie, sometimes confluent, up to 3 mm diam, mostly smaller, sometimes slightly raised in the centre, brownish to somewhat blackish, often somewhat darker in the centre. *Colonies* scattered to subeffuse, shortly caespitose, often not very conspicuous, brownish, somewhat velvety. *Mycelium* internal, subcuticular to intraepidermal; hyphae branched, 2–10 µm wide, pluriseptate, often with swellings and constrictions, pale olivaceous brown, darker when aggregated, medium brown, smooth, walls somewhat thickened, forming extended often radiating hyphal plates, loose to dense, appearing pseudoparenchymatous, cells often somewhat irregular, sometimes more or less lobed. *Stromata* well-developed, extended, dense, up to 100 µm diam, cells subglobose to somewhat angular-polygonal, 4–10 µm wide, medium brown, smooth, thick-walled. *Conidiophores* solitary or in loose groups, arising from stromata, erumpent, erect, straight to more or less flexuous, somewhat geniculate-sinuous, non-nodulose, unbranched, occasionally branched, 14–50 × 3–4(–5) µm, septate, not constricted, pale brown, smooth to somewhat rough-walled, walls unthickened or almost so. *Conidiogenous cells* integrated, terminal and intercalary, cylindrical, slightly geniculate, 8–20 µm long, wih a single or few conidiogenous loci, protuberant, 0.5–1.5(–2) µm diam, thickened, somewhat darkened-refractive. *Conidia* catenate, in unbranched or branched chains, straight, subglobose, ovoid, obovoid, ellipsoid to subcylindrical, 4–15(–17) × (2–)3–4(–5) µm, 0–2-septate, not constricted at septa, subhyaline to pale olivaceous brown or brown, smooth, walls unthickened or almost so, hila protuberant, thickened, somewhat darkened-refractive; microcyclic conidiogenesis occurring.

*Notes*: True *Cladosporium* species, but its status is not yet clear since all collections were very sparsely fruiting. In the duplicates of Roumeguère, Fungi Sel. Gall. Exs. 3292 at B (B 700006190 and 700006191) only sterile stromata have been observed. Morphologically *C. asteromatoides* resembles *C. minusculum* but the latter species deviates in having somewhat wider, usually minutely verruculose or verruculose conidia. Additional collections are urgently needed to clarify the status of *C. asteromatoides*.

*atriplicis* Massee & Rodway, *in herb*. (?).
*Specimen*: **Australia**, Tasmania, on *Atriplex cinerea* (*Amaranthaceae*).
*Notes*: Status unclear. No material traced at Kew (K).

*atroseptum* Pidopl. & Deniak, in Pidoplichko, Gribnaya Flora Grubykh Kormov: 268. 1953, *nom. inval.*
*Type*: **Ukraine**, isolated from damp straw.
*Ill.*: Pidoplichko (1953: 268, fig. 69).
*Notes*: Type material could not be traced, possibly not maintained. The diagnosis is given in Russian.

*autumnale* Kübler, Arch. Sci. Phys. Nat., Sér. 3, 2: 699. 1879.
*Type*: **Switzerland**, on leaves of *Vitis* sp. (*Vitaceae*), 1876, M. Kübler.
*Notes*: Type material could not be traced.

*baccae* Verwoerd & Dippen., S. African J. Sci. 27: 327. 1930.
*Type*: **South Africa**, Stellenbosch, on fruits of *Vitis vinifera* (*Vitaceae*), B.J. Dippenaar, No. 392 in herbarium of Len Verwoerd at Stellenbosch.
*Original diagnosis* (Verwoerd & Dippenaar 1930): At first punctiform and covered by the epidermis, erumpent, then developing a somewhat raised, olivaceous, circular, velvety spot in the circular infected area through confluence of the acervuli; conidiophores recumbent, somewhat flexuous, very rarely branched, olive coloured, darker in mass, irregularly septate, not constricted at the septa, not nodulose, up to 128 µm long and 6.5 µm thick, slightly swollen at the base; conidia very variable in shape and size, spherical, subspherical, ovate, clavate, cylindrical or elongate, 1- to 2-septate, not or very seldom slightly constricted at the septa, 1-celled: 12–23 × 4.8–7.5 µm, 2-celled: 9.6–17.6 × 6.5–7.0 µm, 3-celled: 25.6 × 6.5 µm, with round, blunt or slightly pointed ends, smooth, light brown with darker walls, produced terminally.
*Notes*: Type material could not be traced in South Africa and is probably not preserved.

*banaticum* Săvul., Bul. Sti. Acad. Republ. Populare Române 3(2): 227. 1951.
*Type*: **Romania**, Severin, Moldova Nouă, on dry leaves of *Dianthus kitaibelii* (= *Dianthus petraeus* subsp. *petraeus*) (*Caryophyllaceae*), 11 Jul. 1948.
*Original diagnosis* (Săvulescu 1951): Caespitulis minutis, punctiformibus, epi- vel hypophyllis, nervisequiis, nigricantibus, e stromate vel hypostromate cellulose oriundis; conidiophoris caespitosis, 8–20 in quoque caespitulo, 50–120 × 3–6 µm simplicibus, erectis vel subflexuosis, non torulosis, continuis vel 1-septatis, fusco-bruneis apice dilutioribus, obtusiusculis; conidiis ovoideis vel ellipsoideis 6–10 × 4–6 µm solitariis, primum continuis subhyalinis, dein 1-septatis, palide violaceis.
*Notes*: Type material was not available.

*bignoniae* Schwein., Trans. Amer. Philos. Soc., N.S., 4(2): 277. 1832.
*Syntypes*: **USA**, Carolina, Pennsylvania, Bethlehem, on legumes of *Campsis radicans* (= *Bignonia radicans*) (*Bignoniaceae*), No. 2600 (PH 01020422, 01020423).
*Original diagnosis* (Schweinitz 1832): C. acervulis sparsis, minutis, frequentibus, sphaeriaeformibus, nigro-olivaceis. Floccis breviusculis cum sporidiis concoloribus.
*Lit.*: Saccardo (1886: 353), Gonzáles-Fragoso (1927: 206), Schubert & Braun (2004: 297–298).
*Notes*: Status unclear, type material too meagre to be identified.

*boenninghauseniae* Togashi & Katsuki, Kyushu Agric. Res. 8: 84. 1951.
*Type*: **Japan**, Kyushu, Pref. Fukuoka, Mizu-nashi, Ito-mura, on leaves of *Boenninghausenia albiflora* (*Rutaceae*), 15 Oct. 1950, S. Katsuki.
*Ill.*: Katsuki (1951: 84, fig. 1).
*Original diagnosis* (Katsuki 1951): Maculis amphigenis, sparsis vel laxe gregariis, rotundatis vel subrotundatis 3–10 mm diametris, supra griseo-brunneis, infra brunneis vel nigro-brunneis; caespitulis hypophyllis, effusis, brunneis; conidiophoris erectis vel flexuosis, ascendentibus, cylindraceis, simplicibus, 1–3 septatis, olivaceo-brunneis, 70–105 × 5.0–7.5 µm; conidiis oblongis, cylindraceis vel fusiformibus, utrimque rotundatis, rectis, non vel leniter constrictis, 1–3 septatis, raro non-septatis, olivaceo-brunneis, 12.5–30 × 5–6 µm.

*brachormium* Berk. & Broome, Ann. Mag. Nat. Hist., Ser. 2, 7: 99. 1851.
*Type*: On leaves of *Fumaria officinalis* (*Papaveraceae*), King's Cliffe.
*Lit.*: Cooke (1871: 584), Saccardo (1886: 363).
*Original diagnosis* (Saccardo 1886): Effusum tenue, griseum; hyphis erectis, flexuosis, sursum nodulosis; conidiis ellipsoideis oblongis, breviter concatenatis, terminalibus.
*Notes*: Since the conidiophores were described as nodulose and conidia as being ellipsoid-oblong, this species is maybe conspecific with *C. herbarum*, but the diagnosis is too sparse for a final conclusion.

*brassicicola* Sawada, Special Publ. Coll. Agric. Natl. Taiwan Univ. 8: 195. 1959, *nom. inval*.
*Type*: **Taiwan**, Pref. Taichung, Taichung, on leaves of *Brassica juncea* (*Brassicaceae*), 17 Feb. 1913, K. Sawada.
*Ill.*: Sawada (1959: pl. 3, figs 4–5).
*Original diagnosis* (Sawada 1959): Lesions on leaves, broadly spreading, 30–50 mm, yellowish brown; conidiophores amphigenous, single or more or less fasciculate, not branched, 2–4-septate, yellowish brown, 55–104 × 5–7 µm; conidia catenulate, hyaline or yellowish brown, elliptical or short cylindrical, rounded at both ends or truncate at base, 0–2-septate, 7–26 × 3–5 µm.
*Notes*: *Cladosporium brassicicola* was invalidly published since the author failed to provide a Latin diagnosis. *Cladosporium brassicae*, known from North America on *Brassica oleracea*, is distinguished from the latter taxon by its coarsely verrucose or echinulate, much wider conidia, 10–14 µm (David 1997).

*brevicatenulatum* Rebr. & Sizova, Novosti Sist. Nizsh. Rast. 15: 137. 1978, as "*brevi-catenulatum*".
*Type*: **Russia**, Yaroslavskaya Oblast', Rostov, isolated from ancient cloth, 1973, T.P. Sizova.
*Ill.*: Rebrikova & Sizova (1978: 138, figs a–b).
*Original diagnosis* (Rebrikova & Sizova 1978): Coloniae in medio agarisato Czapeki saccharoso 30 % addito ad diem decimam 1.4–1.7 cm in diam., marginibus inaequalibus, substrato subimmersae, ad centrum vix elevatae, puberulae, margine atro-olivaceae (e4), centro nigrescentes (a2), reverse atrato (a2). Exsudatus hyalinus, minute guttulatus centro coloniae praecipue congestus. Conidiophora brunnescentia, numerosa, a substrato et hyphis aeries oriunda, apice vix ramose, saepe septate, ad septa subinflata, 190–210 × 4–5 µm. Conidia in catenulas breves per unum-tria congesta, unicellularia (10–14 × 6–8 µm), interdum bicellularia (14–20 × 6–8 µm), valde aculeate, atro-brunnea, cylindrical, brevissime catenulate; in mediis ad sporulationem stimulandam destinatis (agaro Raistricki, agaro aquoso) metaconidia copiosissima, microconidia vero subnulla. Coloniae in agaro musti maltati ad diem decimam 2.2–2.5 cm in diam., plicatulae, puberulo-velutinae, margine crescenti aequali, substrato fere immerse, centro vix excavatae, margine atro-olivaceae (e4), medio atratae (a2); exsudatus hyalinus, minute guttulatus, centro coloniae praecique congestus.
*Notes*: Rebricova & Sizova (1978) mention type material as "Cultura typica No. 10P in Laboratorio Centrali". Based on description and illustration this species probably belongs to *C. herbarum s. lat*.

*brevicompactum* Pidopl. & Deniak, Mikrobiol. Zhurn. 5(2): 186, 194. 1938, as "*brevi-compactum*", *nom. inval*.
*Type*: Isolated from soil.
*Lit.*: Pidoplichko (1953: 271).
*Ill.*: Pidoplichko & Deniak (1938: 186, fig. 3).
*Notes*: Neither in Mikrobiol. Zhurn. (1938) nor in Pidoplichko (1953) a Latin diagnosis is given.

*brevicompactum* var. *tabacinum* Pidopl. & Deniak, in Pidoplichko, Gribnaya Flora Grubykh Kormov: 272. 1953, *nom. inval*.
*Type*: Ukraine, isolated from fermented tobacco leaves.
*Ill.*: Pidoplichko (1953: 271, fig. 72).

*calcareum* Beeli, Bull. Soc. Roy. Bot. Belgique 56: 68. 1924.
*Type*: **Belgium**, Brussels, on lime-coated wall and wood in a cellar.
*Lit.*: Saccardo (1972: 1337).
*Ill.*: Beeli (1923: tab. 4, fig. 14).
*Original diagnosis* (Saccardo 1972): Maculis violaceis; mycelio repenti brunneo septate; hyphis fertilibus adscendentibus septatis simplicibus, 50–70 × 4 µm; conidiis ellipsoideis 1-septatis brunneis levibus, 10 × 3–3.5 µm.
*Notes*: Type material could not be traced.

*caricinum* C.F. Zhang & P.K. Chi, Guangdong Guoshu Zhenjun Binghai Zhi.: 54. 2000, *nom. inval*. (ICBN Art. 37.6).
*Type*: **China**, Guangzhou, on living leaves and fruits of *Carica papaya* (*Caricaceae*), 1993, C.F. Zhang, No. 01371.
*Ill.*: Zhang & Chi (*l.c.*: 54, fig. 41).
*Original diagnosis* (Zhang & Chi, *l.c.*): Maculae saepe hypophyllae, primo albidae tandem flavo-albidae, orbiculares vel ellipsodeae, convexae, 1.7–3.3 µm diam. Fructis morbidis vivis. Cultura in malt-extracto agaro (25°C, 7 dies): Coloniae 3.8 cm diam., effusae, velutinae, griseo-brunneae vel olivaceo-brunneae, dorsale atroviridis. Conidiophora solitaria vel fasciculata, fusco-brunnea, flexuosa, nodosa, 39–183 × 3.0–6.8 µm, laevia, septata. Conidia saepe 0-septata, interdum 1–2-septata, catenata, orbicularia, ellipsoidea vel cylindrica, dense verrucosa, subhyalina vel pallide olivaceo-brunnea, 4–16.2 × 2.5–5.0 µm vulgo 5–9 × 2.5–4.2 µm.
*Notes*: The name *C. caricinum* is not validly published since there is no indication where the type material has been deposited.

*chrysanthemi* Pidopl. & Deniak, in Pidoplichko, Gribnaya Flora Grubykh Kormov: 272. 1953, *nom. inval*.
*Type*: **Ukraine**, on fallen petals of chrysanthemum.
*Ill.*: Pidoplichko (1953: 273, fig. 74).
*Notes*: Type material probably not preserved.

*chrysanthemi* A.K. Das, Indian Phytopathol. 56(2): 164. 2003.
*Holotype*: **India**, Bengal, Rahara, North 24 Parganas, on living leaves of *Chrysanthemum* sp. (*Asteraceae*), 17 Mar. 1985, A.K. Das, HCIO No. 44743 (IMI 295539). *Isotype*: PCC 3719.
*Ill.*: Das (2003: 164, fig. 1).
*Original diagnosis* (Das 2003): Maculae amphigenae, distinctae, numerosae, subcirculares vel irregulares, interdum aggregatae, griseo vel griseo brunneae, interdum margin griseo cinctae, 1–3.5 µm latae. Caespituli hypophylli, brunneae. Mycelium immersum et superficiale, laevis. Stroma parvum, atro-brunneae. Conidiophora solitaria vel fasciculata, 3–10 infasciculo, recta vel curvata, pallide brunneae, simplicia vel ramose, interdum inflatae, terminalis et intercalaris, crasse tunicate, laevia, pluriseptate, interdum geniculate, conidialibus nemerosis praedita, cicatrices conidiales distincto, apice subacute vel obtuse, 3.5–4.5 µm (6.5 µm inflatae) × 16.5–82 µm (raro 180 µm), raro curvata, cylindrica, laevia vel verruculose, 3-septata, 10–36 × 3.5–5 µm.

*circaeae* Y. Qin & Z.Y. Zhang, Mycosystema 18(2): 135. 1999.
*Holotype*: **China**, Jiangxi, Lushan, on living leaves of *Circaea mollis* (*Onagraceae*), 5 Oct. 1980, J.Y. Li & T.Y. Zhang, No. 41440 (MHYAU 03953).
*Ill.*: Qin & Zhang (1999: 135, fig. 1), Zhang *et al*. (2003: 69, fig. 38; pl. 13, fig. 4).
*Original diagnosis* (Qin & Zhang 1999): Maculae amphigenae, ellipsoideae, rubro-brunneae, centro sub-orbiculares griseae, 6 mm diam. Conidiophora solitaria, erecta, simplicia, septata, apice sympodialiter prolifera, atro-brunnea, prope apicem pallescentia, 46–77 × 3.4–5.1 µm. Ramoconidia continua, pallide brunnea, apice inflata denticulata, cicatrices evidentes, 8.2–12.9 × 2.6–2.8 µm. Conidia catenata, clavata vel soleiformia, bicellularia, raro simplicia fusiformia, pallide brunnea, basi vel utrinque cicatricosa, 1-septata, 5.7–15.9 × 2.6–3.1 µm.

*citri* Massee, Text book Pl. Diseas. 1899: 310. 1899.
*Type*: **USA**, Florida and Louisiana, on leaves and fruits of *Citrus medica* (=×*limon*) (*Rutaceae*) (K ?).
*Lit.*: Saccardo (1913a: 1367), Jenkins (1925).
*Original diagnosis* (Saccardo 1913a): Conidiophoris caespitulosis, erectis, ramosis, septatis, brunneis, 30–75 × 2–4 µm; conidiis fusoideis, obscuris, pro more continuis, interdum 1–3-septatis, 8–9 × 2.5–4 µm.
*Notes*: Massee gave no specimen or herbarium designations, nor a description, but on p. 311 refers to "Bull. Torrey Bot. Club 13: 181". The only reference in this article to a named fungus is that to a *Fusarium* on page 182, but on the same page "oblong, oval one-celled conidia" are mentioned. On page 311 Massee also cites "USDA Bull. No. 8", which refers to the above article from "Bull. Torrey Bot. Club" and other literature. The USDA Bulletin attributes the disease of *Citrus* to a *Cladosporium*, for which a short description is rendered without specifying specimens or herbaria. Fawcett (1936: 535) wrote on the identity of *C. citri* that the fungus is now regarded as a *Sphaceloma*. The name *Cladosporium citri*, based on descriptions given by Scribner and Swingle & Weber, applies to the fungus observed by Swingle & Weber on the old lesions (Jenkins 1925). The pathogen isolated by Fawcett and reported as *C. citri* is described as a new species, *Sphaceloma fawcettii* Jenkins.

*clavatum* Schwabe, Fl. anhalt. 2: 349. 1839.
*Type*: **Germany**, on dry wood of *Quercus* sp. (*Fagaceae*).
*Lit.*: Saccardo (1913a: 1369).
*Ill.*: Schwabe (1839: tab. 6, fig. 13).
*Original diagnosis* (Schwabe 1839): Filis nigro-viridibus pellucidis, sporis obovato-clavatis. Fila inaequalia flexuosa valde torosa subramulosa oblique septate; articulis plerumque gibbosis. Sporae minors concolores, 1–3-septatae.
*Notes*: Type material not found, probably not preserved. A collection in the herbarium of Preuss (Germany, on wood of oak, 1844, Preuss 274, B 700006216) proved to be *C. herbarum*.

*clemensiae* P.W. Graff, Philipp. J. Sci. 9: 40. 1914.
*Type*: **Guam**, Agaña, on leaves of *Eragrostis amabilis* (= *E. tenella*) (*Poaceae*), 27 Nov. 1910, M.S. Clemens.
*Original diagnosis* (Merrill 1914): Hypophyllis, caespitulis erumpentibus, fuscis; hyphis ramosis, flexuosis, septatis; hyphis fertilibus sparsis, erectis, septatis, fuscis, simplicibus, 100–150 × 4–5.5 µm; conidiis concoloribus, ellipticis oblongis subcylindraceisve, continuis dein 1–3-septatis, leniter constrictis, 23–35 × 7.5–11.5 µm.

*comesii* Carbone, Atti Ist. Bot. Univ. Pavia, Ser. 2, 14: 322. 1914.
*Type*: **Italy**, Pavia, isolated from sausage ["in botulis (Salame crudo)"].
*Lit.*: Saccardo (1931: 799).
*Original diagnosis* (Carbone 1914): Effusum, atre viridi-olivaceum. – Razza 1. – Hyphis fertilibus cespitosis, erectis, quandoquidem leviter tortuosis et apud apicem denticulatis, septatis, simplicibus vel apud apicem ramosis, brunneis, 60–200 × 3–5 µm; conidiis in hyphis et ramis acropleurogenis, continuis (rarissime 1-septatis), dilute brunneis, rotundatis vel ovalibus vel ellipticis, 4–10 × 2–4 µm. – Razza 2. – Hyphis fertilibus fasciculatis, saepe curvatis vel undosis et tortuosis, brunneis, quandoquidem apud apicem breviter ramosis, septatis, 50–100 × 4 µm; conidiis in hyphis et in ramis acropleurogenis, rotundatis vel ovalibus vel ellipticis, continuis, dilute brunneis, breviter catenulatis, 4–12 × 2–4 µm.
*Notes*: Type material could not be found, and has possibly not been maintained.

*compactiusculum* Sacc. & P. Syd., Syll. fung. 14: 1082. 1899.
*Type*: **Ceylon**, on twigs of *Sterculia foetida* (*Malvaceae*) and ?*Frusinalia* (*Combretaceae*).
≡ *Cladosporium subcompactum* Roum. & P. Karst., Rev. Mycol. (Toulouse) 12: 80. 1890, *nom. illeg*. homonym, non *C. subcompactum* Sacc., 1886.
≡ *Cladosporium zeylanicum* Sacc. & Trotter, Syll. fung. 22: 1371. 1913, *nom. superfl*.
*Original diagnosis* (Karsten *et al.* 1890): Caespituli superficiales, tomentosi, compacti, suborbiculares, atri, 1–5 µm lati. Hyphae dense aggregatae et intricatae, ramosae, articulatae, fuligineo-hyalinae vel dilute fuligineo-olivaceae, 3–6 µm crassae. Conidia ovoidea vel ellipsoidea, 1-septata, ad septum non constricta, e hyalino fuligineo-fusca, impellucida vel semipellucida, longit. 20–28 µm, crassit. 12–16 µm.
*Notes*: The original material from PC is deposited under "*Cladosporium subcompactum* B. et C." (on *Sterculia foetida*, Ceylon). Status remains unclear.

*compactum* Sacc. → *subcompactum* Sacc.

*compactum* **punctatum* Sacc. → *punctatum* Sacc.

*corchori* Z.Y. Zhang & T. Zhang, in Zhang, Liu, Wei & He, Plant Diseases and Their Control: 103. 1998.
*Holotype*: **China**, Shaanxi, Yizhan, on living stems of *Corchorus capsularis* (*Malvaceae*), 20 Aug. 1973, J.Y. Li & T.Y. Zhang, No. 0412 (MHYAU 03955).
*Ill*.: Zhang *et al*. (1998c: 104, fig. 1), Zhang *et al*. (2003: 79, fig. 43; pl. 11, fig. 3).
*Original diagnosis* (Zhang *et al*. 1998c): Caulinus blightus, 40 mm longus, coloniae punctiformae, interdum confluentia, velutinae, fuscae. Mycelium immersum. Conidiophora solitaria, erecta, simplicia, septata, brunnea, prope apicem pallescenta, 40 × 40 µm, parte fertili sympodialiter prolifera leviter geniculata denticulata. Ramoconidia continua vel raro 1-septata, pallide brunnea, apice ± inflata denticulata, 7.7–19.3 × 2.8–3.9 µm. Conidia catenata, continua, fusiformis, laevia, pallide brunnea, utrinque cicatricis fuscis, 4.4–8.0 × 2.6–4.6 µm.
*Notes*: This species is reported to cause stem blight on *Corchorus capsularis*. Induced symptoms are shown in Zhang *et al*. (2003, pl. XI, fig. 3).

*corynitrichum* Ellis & Everh., in Millspaugh, West Virginia Geol. Surv., Ser. A, 5: 36. 1913, *nom. nud*.
*Type*: **USA**, West Virginia, Fayette Co., on dead fallen leaves of *Magnolia fraseri* (*Magnoliaceae*), 29 Nov. 1895, L.W. Nuttall (NY, WIS).
*Notes*: It is a mixed collection of various hyphomycetes, including numerous large, medium to dark brown subcylindrical to cylindrical, verruculose, 3-septate conidia of *C. herbarum* and conidiophores with typical swellings as well as small smooth conidia and smaller conidiophores with small loci. Ascomycetous stromata and immature ascomata are also present.

*cyrtomii* Z.Y. Zhang, H.H. Peng & H. Zhang, Mycosystema 17(1): 4. 1998.
*Type*: **China**, Prov. Yunnan, Gejiu, on living leaves of *Cyrtomium caryotideum* (*Dryopteridaceae*), 9 Dec. 1994, Wang Ying-Xiang & Li Mao-Lan (MHYAU 04048).
*Ill*.: Zhang *et al*. (1998a: 4, fig. 1), Zhang *et al*. (2003: 84, fig. 48; pl. 11, fig. 4).
*Original diagnosis* (Zhang *et al.* 1998a): Maculis amphigenis, distinctis, interdum confluentibus, rotundis, atro-brunneis, marginibus fuligineis prominulis, 2–4 mm diam., postea interdum perforatis, epiphyllis velutinis, atro-viridibus, hypophyllis fulvis. Conidiophoris fasciculatis, rectis vel leniter flexuosis, septatis, atro-brunneis, ad apicem pallide brunneis, 167–321 × 2.6–4.6 µm. Cellulis conidiogenis in conidiophoris coalitis, sympodialibus, cicatricibus conspicuis. Ramoconidiis 0–1 septatis, ad apicem denticulatis, cicatricibus conspicuis, 7.7–17.9 × 2.6–5.1 µm. Conidiis subellipsoideis, fusiformibus, longe ellipsoideis vel cylindricis, continuis, laevis, atro-olivaceis, 2.6–12.8 × 2.6–5.1 µm.

*delectum* f. *ailanthi-glandulosae* Thüm., Mycoth. Univ., Cent. XVII, No. 1666. 1880, *nom. nud.*
*Syntypes*: **USA**, South Carolina, Aiken, on leaves of *Ailanthus altissima* (= *A. glandulosa*) (*Simaroubaceae*), H.W. Ravenel, Thümen, Mycoth. Univ. 1666 (*e.g.*, HAL, NY).
*Notes*: Material too sparse for a final conclusion about its status.

*densum* Sacc., Bull. Orto Bot. Regia Univ. Napoli 6: 71. 1921.
*Type*: **Italy**, Salerno, Scafati, on dead stems of *Ricinus communis* (*Euphorbiaceae*), A. Trotter.
*Lit*.: Saccardo (1931: 791).
*Original diagnosis* (Saccardo 1921): Maculas atras, velutinas, in caule longitrorsum elongatas, saepe rhomboideas 0.5–1.5 cm. long. formans; conidiophoris dense lateque parallele stipatis, non caespitulosis, filiformibus, subrectis, simper indivisis, 80–120 × 4, aequalibus (non nodosis), parce septatis, totis dilute olivaceo-fuligineis, ad apicem obtusiusculum vix dilutioribus, ex hypostromate brunneo, laxe celluloso orientibus; conidiis versiformibus, typice oblongis, 1-septatis, non constrictis, 10–15 × 4–5, raro magis elongatis 3–4-septatis, 18–22 × 5 (junioribus breviter ovoideis, continuis).
*Notes*: Type material not preserved in Saccardo's herbarium at PAD. Status remains unclear.

*desmodicola* A.K. Das, Indian Phytopathol. 56(2): 165. 2003.
*Holotype*: **India**, Bengal, Howrah, Bagnan, on living leaves of *Desmodium gangeticum* (*Fabaceae*), 4 May 1985, A.K. Das, HCIO No. 44742 (IMI 296439). *Isotype*: PCC 3754.
*Ill*.: Das (2003: 165, fig. 2).
*Original diagnosis* (Das 2003): Maculae amphigenae, venas-limitatae, angulares vel irregulars, pallide brunneae vel griseo-brunneae, 3–12 µm latae. Caespituli amphigenae, plerumque epiphyllae, leniter effusae, pallide olivacea-brunneae vel fuscae. Mycelium partim immersum, partim superficiale, laevis. Stroma nullum. Conidiophora amphigenae, singularia vel fasciculata (3–5 infasciculo), recta vel flexuosa, apicem versus, inflatae, pallide vel pallide olivacea brunneae, laevis, crasse tunicate, pluriseptata (usque ad 15), cicatrices conidials distinctae, apicem obconico rotundata vel rotundata, intercalares inflatae 5–9 µm lata, 66–429 µm (560 µm) × 4–7 µm. Conidia solitaria vel catenata (usque ad 3), elliptica vel subsphaerica, olivacea, interdum pallide olivacea brunneae, 0–2 septata, laevia vel minute echinulate, 4.5–6.2 × 2.5–7.5 µm.
*Notes*: The type material from IMI could not be traced.

*desmotrichum* Desm., Ann. Sci. Nat. Bot., Sér. 3, 16: 297. 1851, as "*desmitrichum*".
*Type*: **France**, on dry leaves of *Fraxinus ornus* (*Oleaceae*).
*Lit*.: Saccardo (1886: 360), Ferraris (1912: 346), Oudemans (1923).
*Original diagnosis* (Desmazières 1851): C. amphigenum, nigrum. Floccis fasciculatis, rigidis, simplicibus, divergentibus, septatis, fusco-brunneis, apice subobtusis, hyalinis; fasciculis aggregatis. Sporulis ovoideis vel ellipsoideis, hyalinis, simplicibus vel didymis.
*Notes*: Type material not seen. Most collections deposited as *C. desmotrichum* belong to *C. herbarum* (*e.g.*, on *Fraxinus* sp., *ex herb*. Bresadola, Nov. 1922, BPI 426449).

*dianellicola* Y. Cui & Z.Y. Zhang, Mycosystema 20(4): 470. 2001.
≡ *Cladosporium dianellicola* Z.Y. Zhang & Y. Cui, Flora Fungorum Sinicorum, Vol. 14: 88. 2003, *nom. superfl.*
*Holotype*: **China**, Zhejiang Prov., Hangzhou, on living leaves of *Dianella ensifolia* (*Xanthorrhoeaceae*), 2 Nov. 1980, J.Y. Li & T.Y. Zhang (MHYAU 03922).
*Ill*.: He & Zhang (2001: 470, fig. 2), Zhang *et al*. (2003: 88, fig. 52).
*Original diagnosis* (He & Zhang 2001): Maculis purpureo-brunneis, in centro griseis, 1.5–3.5 cm longis. Conidiophoris brunneis, 1–3-septatis, 82.2–187.6 × 2.6–4.6 µm. Ramoconidiis 0–2-septatis, 7.5–18.5 × 4.6–5.1 µm. Conidiis ellipsoideis vel sub-globosis, continuis, pallide brunneis, 3.1–10.3 × 3.1–4.1 µm.

*Notes*: Type material was not available. *Heterosporium dianellae* Sawada (*nom. inval*.), described on leaves of *Dianella ensifolia* from Taiwan, proved to be a true member of the genus *Stenella* [= *Stenella dianellae* (Sawada & Katsuki) Goh & W.H. Hsieh] (David 1997, Crous & Braun 2003), now assigned to *Zasmidium* (see *Heterosporium dianellae*), and possesses finely verruculose, longer conidia, 20–45 × 2.5–3.5 µm.

*digitalicola* Z.Y. Zhang, T. Zhang & W.Q. Pu, Mycosystema 17(3): 195. 1998.
*Holotype*: **China**, Prov. Yunnan, Kunming, on living flowers of *Digitalis purpurea* (*Plantaginaceae*), 25 Jun. 1990, Li Hua (MHYAU 03934).
*Ill*.: Zhang *et al*. (1998d: 196, fig. 1), Zhang *et al.* (2003: 90, fig. 53).
*Original diagnosis* (Zhang *et al*. 1998d): Maculis amphigenis vel petalicolis, circularibus, brunneis vel atrobrunneis, 0.5 mm diam. Conidiophoris singularibus vel usque ad 36 fasciculatis, rectis vel geniculatis, 3–10 septatis, ad apicem 3–5 cicatricibus conspicuis, nodis 5.2–9.1 µm crassis, atrobrunneis, ad apicem brunner is vel hyalinis, 45–502 × 4.0–7.9 µm. Ramoconidiis longe cylindricis, ovoideis vel limoniformibus, 0–1 septatis, cicatricibus 3–5 hyalinis vel pallide brunneis, 5.2–20.8 × 2.6–7.8 µm. Cellulis in conidiogenis in conidiophoris coalitis, sympodialibus. Conidiis longe ellipsoideis, ovoideis, limoniformibus vel cylindricis, 0–4 septatis, levis, catenulatis, cicatricibus conspicuis, hyalinis vel pallide brunneis, 3.9–15.6 × 2.6–11.8 µm.
*Notes*: Type material was not available.

*dufourii* Brond., Arch. Fl. 1: 60, 1854.
*Type*: France, on decaying fruits of cucurbits (*Cucurbitaceae*), autumn and winter.
*Lit*.: Saccardo (1886: 370).
*Original diagnosis* (Brondeau 1854): Dense caespitosum, filamentis ramosis, geniculatis, septatis, olivaceis, e macula circulari atrocaerulea orientibus. Sporidiis rotundis vel oblongis, saepe didymis.
*Notes*: Types of Louis de Brondeau are at TL [according to Stafleu & Mennega (1995)], but no material seen.

*edgeworthiae* H. Zhang & Z.Y. Zhang, Mycosystema 17(4): 305. 1998.
*Holotype*: **China**, Jiangxi, Lushan, on living leaves of *Edgeworthia gardneri* (= *E. chrysantha*) (*Thymelaeaceae*), 15 Oct. 1980, J.Y. Li & T.Y. Zhang (MHYAU 03957).
*Ill*.: Zhang & Zhang (1998a: 305, fig. 2), Zhang *et al*. (2003: 92, fig. 55).
*Original diagnosis* (Zhang & Zhang 1998a): Maculis amphigenis distinctis vel confluentibus, griseo-brunneis, margine fuligeneis prominulis, atro-brunneis, flave holonatis, 6.0 × 1.0 cm. Conidiophoris solitariis, erectis, simplicibus, septatis, apice sympodialiter elongatis, pallide brunneis, prope apicem pallescentibus, 54–183 × 2.8–3.9 µm. Ramoconidiis 0–1-septatis, laevibus, pallide brunneis, ad apicem inflatis denticulatis, cicatricibus conspicuis, fuscis, 7.5–23.0 × 4.1–5.1 µm. Conidiis catenatis, fusiformibus, continuis, laevibus, pallide brunneis, basi vel utrinque cicatricibus protudentibus praeditis, 3.9–10.3 × 2.8–4.6 µm.

*elaeagnus* Gapon., Uzbekistan Biol. Zurn. (1964).
*Type*: **Uzbekistan**, Bukharskaya Oblast', on *Elaeagnus* (*Elaeagnaceae*).
*Lit*.: Sagdullaeva *et al.* (1990: 47).
*Notes*: This species is listed in Sagdullaeva *et al.* (1990) without giving volume and page numbers. Neither the original diagnosis nor type material were available.

*elegantulum* Pidopl. & Deniak, Mikrobiol. Zhurn. 5(2): 182, 193. 1938, *nom. inval*.
*Type*: **Ukraine**, from a rotting fruit of *Malus* sp. (*Rosaceae*) and from meat.
*Lit*.: Pidoplichko (1953: 270).
*Ill*.: Pidoplichko & Deniak (1938: 182, fig. 1).
*Notes*: Type material not seen, probably not preserved. Status remains unclear. The diagnosis is given in Russian.

*epibryum* Cooke & Massee, in Cooke, Grevillea 17(84): 76. 1889.
*Type*: **USA**, on capsules of various mosses, E.G. Britton (K).
*Lit*.: Saccardo (1892: 605).
*Original diagnosis* (Cooke 1889): Caespitulis minutissimis, atris. Hyphis simplicibus, brevibus, flexuosis, sepatis, olivaceis, superne pallidioribus; conidiis ellipticis, utrinque rotundatis, uniseptatis, medio constrictis, pallide fuscis, hyalinis, 18–20 × 10–12 µm.
*Notes*: The status of this species is unclear. Type material is preserved at Kew (K), but too scant to be re-examined, so a loan of this material was not possible.

*epiphyllum* f. *castaneae-sativae* Thüm., Herb. Mycol. Oecon. Fasc. 10, No. 469. 1877, *nom. nud*.
*Type*: On dead leaves of *Castanea sativa* (*Fagaceae*), Krain, Laibach, 1876, W. Voss, Thümen, Herb. Mycol. Oecon. 469 (*e.g.,* M-0057492).
*Notes*: This is a member of the *C. herbarum* complex, but the exact identity is unclear.

*eucalypti* Tassi, Bull. Lab. Orto Bot. Reale Univ. Siena 3(1): 20. 1900.
*Type*: **Italy**, Siena, botanical garden, on frozen leaves of *Eucalyptus globulus* (*Myrtaceae*).
*Lit*.: Saccardo (1902: 1057), Lindau (1907: 827), Ferraris (1912: 342), Gonzáles-Fragoso (1927: 202).
*Ill*.: Gonzáles-Fragoso (1927: 202, fig. 45).
*Original diagnosis* (Saccardo 1902): Caespitulis gregariis, maculas orbiculares atro-olivaceas usque 4 mm diam. formantibus; hyphis intricato-ramosis, subfasciculatis, suberectis, quandoque prope basim leniter nodulosis, olivaceis, 8–10 µm latis; conidiis ovoideis v. oblongis, 1–3-septatis, non constrictis, levibus, 25–30 × 8–10 µm, olivaceis.
*Notes*: Type material is not preserved in Tassi's herbarium at herb. SIENA. A collection on dead leaves of *Eucalyptus globulus* from Spain, recorded and illustrated by Gonzáles-Fragoso (1927) has been examined (MA 06397) and proved to be *C.* cf. *herbarum* (conidia typical for this species, but conidiophores less distinctly nodulose as in typical samples). A second collection from Spain on brown lesions on *Eucalyptus viminea* (MA 07502) is quite distinct. The conidiophores are very long, up to 350 µm, filiform, non-geniculate, only with few terminal scars, and the conidia are ellipsoid-ovoid, subcylindrical, 3–18 × 2–5 µm, 0–1-septate, pale olivaceous. It can be referred to as *C.* cf. *cladosporioides*. However, the conidia are consistently verruculose.

*euphorbiae* Politis, Pragmat. Akad. Athen 4: 39. 1935.
*Type*: **Greece**, Attica, near Athina, on *Euphorbia sibthorpii*

(*Euphorbiaceae*).
*Lit*.: Saccardo (1972: 1337).
*Original diagnosis* (Politis 1935): Caespitulis parvis, nigricantibus, dispersis, v. gregariis; conidiophoris in fasciculos densos, erectos, atro-olivaceos confertis, septatis, 40–70 × 5–6 µm; conidiis acrogenis flavido-brunneis, ovoideis, v. oblongis, continuis v. uniseptatis, 5–11 × 4–5 µm.
*Notes*: Type material not found. Status remains unclear.

*farnetianum* Sacc., Syll. fung. 22: 1366. 1913.
*Type*: **Italy**, Sicily, on fruits of *Citrus medica* (=*C.* ×*limon*) (*Rutaceae*).
≡ *Cladosporium citri* Briosi & Farneti, Atti Ist. Bot. Univ. Pavia, Ser. 2, 10: 19. 1907, *nom. illeg*., homonym, non *C. citri* Massee, 1899.
≡ *Kurosawaia citri* Hara, List of Japanese Fungi, ed. 4: 172. 1954, *nom. nov*., as "(Briosi & Farneti) Hara".
*Lit*.: Ferraris (1914: 884).
*Original diagnosis* (Saccardo 1913a): Hyphis erectis v. adscendentibus, rectis v. flexuosis, simplicibus, septatis, apice plerumque oblique obtusatis, brunneis v. pallide fuscis, solitariis v. 2–4 caespitosis, 50–70 × 3–4.5 µm, rarius 110 × 5 µm, e pseudostromate immerso orientibus; conidiis ellipsoideis v. oblongis, simplicibus v. didymis, pallide fuscis, minutis, 5–11 × 4 µm.
*Notes*: See comments on *C. citri* Massee above.

*fasciculare* Fr., Syst. mycol. 3(2): 370. 1832.
*Type*: On herbal stems.
≡ *Dematium articulatum* Pers., Neues Mag. Bot. 1: 121. 1794.
= *Helminthosporium vesicarium* Wallr., Fl. crypt. Germ. 2: 166. 1833.
*Lit*.: Cooke (1871: 583), Saccardo (1886: 367), Lindau (1907: 817), Ferraris (1912: 339), Oudemans (1919–1924), Gonzáles-Fragoso (1927: 207).
*Ill*.: Persoon (1794: tab. 4, fig. 2).
*Original diagnosis* (Fries 1832): Fasciculis minutis leviter erumpentibus, fibris apice flexis subseptatis, sporidiis conglobatis seriatisque concoloribus.
*Notes*: Type material could not be traced, probably not preserved. Status remains unclear.

*fasciculatum* f. *amerotrichum* Traverso, Malpighia 19: 149. 1905.
*Type*: **Italy**, Prov. Di Como, Villa Stroppa in Tradate, on faded leaves of *Gladiolus* sp. (*Iridaceae*), Sep. 1902.
*Lit*.: Saccardo (1906: 577), Lindau (1907: 817), Oudemans (1919).
*Original diagnosis* (Traverso 1905): A typo differt conidiophoris omnino continuis necc septatis.
*Notes*: Traverso (1905) described it as differing from typical *C. fasciculatum* in having non-septate conidiophores. Type material could not be traced, probably not preserved.

*fasciculatum* var. *densum* Ravenel, Fungi Amer. Exs., Cent. 7, No. 602. 1882, *nom. nud*.
*Type*: **USA**, South Carolina, Aiken, on *Euonymus japonicus* (*Celastraceae*), Ravenel, Fungi. Amer. Exs. 602 (*e.g.*, BPI 426554).
*Notes*: A true *Cladosporium*. The conidiophores are 30–110 × 4–6 µm, brown, smooth, thin-walled, without any swellings, conidiogenous loci 1.5–2 µm diam. The conidia are formed in simple or branched chains, broadly ellipsoid to cylindrical, 10–25 × 4–7 µm, 0–2-septate, pale brown, thin-walled, smooth. However, the material examined was too scarce for a final conclusion. Furthermore some verruculose, *C. herbarum*-like conidia have also been observed in this material.

*festucae* Sawada, Bull. Gov. Forest Exp. Sta. 105: 95. 1958.
*Type*: **Japan**, Tohoku District, on leaves of *Festuca japonica* (*Poaceae*), 29 Sep. 1947.
*Original diagnosis* (Sawada 1958): Sine maculis. Fungus amphigenus, sparsus vel confertus, solum affixus in epidermide, obscuri-cinereus, minutus, 0.1–0.5–0.7 mm diam. Conidiophorum epigenum, assurgens recte vel oblique ex serpente hypha, simplex vel 1–2 ramificans, septum partis, apud quam conidiophorum divisum ex hypha, locatum 18–20 µm distans adversum conidiophorum, 6–10 septatum, cinereo-fuscum, cylindricum, 235–390 × 4.5–5 µm. Conidium catenulatum, hilum leviter exertum, brevi-ellipticum vel longi-oblongum, 0–1 septatum, cinereum, 5–15 × 4–6 µm.
*Notes*: Type material could not be traced, neither in herb. PPMH nor BPI, and is probably not preserved.

*fici* F. Patt., Bull. Torrey Bot. Club 27: 285. 1900.
*Type*: **USA**, Department of Agriculture, green-house, on living leaves of *Ficus parcellii* (*Moraceae*), Jan. 1900, F.W. Patterson (herb. of the "Division of Vegetable Physiology and Pathology, U.S. Department of Agriculture").
*Lit*.: Saccardo (1902: 1059).
*Original diagnosis* (Patterson 1900): Not forming spots; tufts conspicuous, aggregated, sometimes confluent, olive green; hyphae long, erect, slightly wavy, very rarely branched, septate, 45–250 × 4 µm; conidia light olive, terminal and lateral, more especially borne near the tips of the hyphae, oblong continuous ones 6–9 × 4 µm, sometimes in chains of 4, those 1–3 septate, oblong-elliptical to cylindrical, 9–25 × 4–5 µm, somewhat thickened at the septa and the longer ones often equilateral.
*Specimens examined*: **Cuba**, Santiago de Las Vegas, Antilles, on *Ficus religiosa*, 12 Feb. 1920, S. Bruner (BPI 426579); 28 Enero 1920, D.C. Brunner & B. Chias (?) (BPI 426578).
*Notes*: Type material of this species could not be traced and was not available for a re-examination. Two collections from BPI, determinated as *C. fici*, showed a *Passalora* species well agreeing with the species concept of *Passalora urostigmatis* (Henn.) Crous & M.P.S. Câmara. The latter species deviates from the description of *C. fici* given above in forming shorter and wider conidiophores and solitary conidia so that this name was very probably misapplied. *Ficus religiosa* is a new host species of *Passalora urostigmatis*, until now known from Brazil, Venezuela and Florida, USA (Crous & Câmara 1998).

*forsythiae* Z.Y. Zhang & T. Zhang, J. Anhui Agric. Univ. 26: 36. 1999.
*Holotype*: **China**, Henan, Zhengzhou, on living leaves of *Forsythia suspensa* (*Oleaceae*), 20 Aug. 1992, Qing Yun (MHYAU 07030).
*Ill*.: Zhang *et al*. (1999b: 37, fig. 1), Zhang *et al*. (2003: 101, fig. 63).
*Original diagnosis* (Zhang *et al*. 1999b): Maculis amphigenis, apeicis vel marginis, brunneis vel atro-brunneis, marginalibus fuligineis longi-undulatis ornatis, spot blight usque ad 5–10 × 3–8 mm vel 35 × 30 mm, olivaceis mucoris punctatis hypophyllis. Myceliis immersis. Stromata praeditis Conidiophoris solitariis, erectis vel sinualatis, simplicibus, septatis, apice denticulatis, cicatricibus conspicuis, brunneis vel atro-brunneis, prope apicem pallescentibus, 21.0–69.0 (36.3) × 3.6–5.1 (4.4) µm. Cellulis in conidiogenis in conidiophoris coalitis, sympodialibus. Ramoconidiis cylindricis, 0–1 septatis, rarius 2 septatis, cicatricibus protrudentibus praeditis, brunneis, 7.7–18.0 (12.9) × 4.4–5.9 (5.2) µm. Conidiis catenatis, fusiformis, cylindricis, ovoides, laevis, rarius echinatis, 0–1 septatis, rarius 2 septatis, pallide brunneis vel hyalinis, cicatricibus ornatis, 5.7–38.6 (10.1) × 4.4–5.1 (4.8) µm.

*Notes*: A second collection is mentioned by Zhang *et al*. (1999b) on *Forsythia* sp. from Liaoning, China.

*fuligo* Bonord., *in herb*.
*Specimen*: On *Tilia europaea* (*Tiliaceae*), Funk (B).

*fulvum var. violaceum* Voglino, Ann. Reale Accad. Agric. Torino 55: 381. 1912, 1913.
*Type*: **Italy**, Liguria, Albenga, on leaves of *Solanum lycopersicum* (= *Lycopersicon esculentum*) (*Solanaceae*).
*Lit*.: Saccardo (1931: 794).
*Original diagnosis* (Voglino 1913): Maculis flavescentibus, rotundis, 6–8–10 mm latis, numerosis; caespitulis effusis, lanosis, violaceis vel violaceo-fuliginosis, fulvis; conidio-foris erectis, septatis, non vel parce ramosis, apice clavatis, violaceo-fuliginosis, fulvis, 100–150 µm longis, 5–7–10 µm crassis; conidiis ellipsoideis, continuis, 1-septatis, pallide flavis, 14–20–28, rar. 40 µm longis, 8–10–12 µm latis.
*Notes*: Very probably synonymous with *Passalora fulva* (Cooke) U. Braun & Crous.

*fumosa* Preuss, *in herb*.
*Specimen*: Without detailed data, Nr. 386 (Mappe 274), herb. C.G.T. Preuss (B 700006438).
*Notes*: The collection contains leaves of various host species, but no trace of a *Cladosporium* has been found.

*furfuraceum* McAlpine, Fungus Dis. Citrus Trees Austral.: 78. 1899.
*Type*: Australia, Victoria, Doncaster and elsewhere, on fruits of *Citrus medica* (*Rutaceae*).
*Lit*.: Saccardo (1902: 1058).
*Ill*.: McAlpine (1899: Figs 19–20).
*Original diagnosis* (McAlpine 1899): Forming dingy-white patches on surface of Lemon, ultimately becoming dotted over with brownish-black spots. The discoloured portions readily peel off in minute flakes, and the Lemon becomes scurfy in appearance. Hyphae yellowish-green, septate, branched, regular or irregular, in breadth 4–5.5 µm. Conidia ovate to pear-shaped, lemon-yellow, continuous or 1-septate, not constricted at septa, pretty constant in size, 15–17 × 8.5–9.5 µm.
*Notes*: Type material is not preserved in the McAlpine herbarium (VPRI).

*fuscum* Link, Sp. pl. 6(1): 40. 1824 : Fr., Syst. mycol. 3(2): 372. 1832.
*Lectotype* (**designated here**): **Germany**, Berlin, ?Link (B 700006442).
*Lit*.: Fries (1832: 372), Saccardo (1886: 352), Lindau (1907: 805), Ferraris (1912: 335), Oudemans (1921), Gonzáles-Fragoso (1927: 201).
*Original diagnosis* (Link 1824): Cl. thallo effuso, floccis dense aggregatis fuscis apice ramosis, sporidiis globosis. Tomentum format fuscum durum late caules plantarum investiens. Sub microscopio composito flocci dense aggregati transparentes ut solent in hoc genere continui, apice multo magis ramosi ac in praecedentibus luculentius septate. Saepissime flocci decumbunt a pluvial uti videtur prostrate. Sporidia hinc inde adspersa.
*Notes*: Hughes (1958: 751) examined and annotated the material designated as lectotype and stated that it just represents a sterile basidiomycetous fungus, which could be confirmed.

*glochidionis* C.D. Sharma, Gadp., Firdousi, A.N. Rai & K.M. Vyas, Indian Phytopathol. 51(2): 152. 1998.
*Holotype*: **India**, Madhya Pradesh, Shahdol circle, Amarkantak (south forest division), Kapil dhara, on living leaves of *Glochidion* sp. (*Phyllanthaceae*), Jan. 1993, C.D. Sharma (S.U. Herb. No. C.S.1). *Isotype*: IMI 356765.
*Ill*.: Sharma *et al*. (1998: 153, fig. 1).
*Original diagnosis* (Sharma *et al*. 1998): Maculae amphigenosae, parvae vel magnae, aetate progrediente, se extendentes per majorum superficiem folii, plerumque initiate ad marginateae, interdum necroticae, brunneae infra superficiem et griseo albidus supra superficiem, cum fuscae brunneae margin. Caespitulli amphiphyllae plerumque hypophyllae, ad maculae limitatae, plus minusve lanatae, brunneae atro. Mycelium hypharum, immersum vel superficiales, angustum, laevia, ramosum, septatum, olivacea brunneae, 1.5–5 µm diametro, hyphae repentes usque 6.5 µm crassa. Stromata bene evoluta, irregulares, pseudoparenchymatosa, obscure brunneae, 24–70 µm diametro. Conidiophora caespitosa vel solitaria, macronematosa, mononematosa, septata eramosa, erecta vel suberecta, recta vel interdum flexuousa, plerumque glabra interdum verruculosa plerumque tumoribus ad apices, olivaceo-brunneae 7–137 × 1.5–6.5 µm et usque 9.5 µm ad basim. Cellulae conidiogenosae integrateae, terminales et intercalares, polyblasticae, sympodiales, cicatricatae, cicatricis fuscis distinctae et crassato. Conidia simplicia, variabilis catenata vel solitaria, arida, acropleurogenosa, subcylindrata vel obclavato-cylindrata interdum clavato-cylindrata, doliiformia, ellipsiformia, fusiformia, ovata, spheriformia vel subspheriformia, apices obtusa vel subacuta, bases rotundatae, obconico-truncata vel subtruncata, usque 0–5 transversae septata rarissime oblique septata, hilo fuscae distinctae et crassata, interdum emenentia, conidia progenerentes progenrent tube longa et eramosa, laevia, septata, usque 28 × 3 µm pallide vel moderate olivacea, 2–45 × 1.5–12 µm.
*Notes*: Type material was not available neither from India nor IMI (probably lost). *Cladosporium glochidionis* was morphologically compared with *C. spongiosum*, *C. diaphanum* and *C. buteicola* but proved to be distinct in its symptomatology, well-developed, irregular stromata, olivaceous-brown, smooth, sometimes verruculose conidiophores and comparatively thicker, variously shaped, light to medium olivaceous conidia (Sharma *et al*. 1998). Sharma *et al*. (1998) described and illustrated protuberant, darkened and thickened conidiogenous loci and hila, so *C. glochidionis* possibly belongs to *Cladosporium s. str*. New collections are necessary to prove the generic affinity of this species.

*gossypiicola* Pidopl. & Deniak, in Pidoplichko, Gribnaya Flora Grubykh Kormov: 273. 1953, as "*gossypicola*", *nom. inval*.
*Type*: **Ukraine**, on seeds of cotton (*Gossypium* sp., *Malvaceae*), also found on damp straw.
= ? *Cladosporium cladosporioides* (Fresen.) G.A. de Vries
*Lit*.: Ho *et al*. (1999: 128).
*Ill*.: Pidoplichko (1953: 274, fig. 75), Ho *et al*. (1999: 130, fig. 20).
*Notes*: *Cladosporium gossypiicola* is an invalid name (type material probably not preserved). Ho *et al*. (1999) examined a culture isolated from cotton in Israel. At the CBS this culture was reclassified as "*C. tenuissimum*", but on account of shorter conidiophores, Ho *et al*. (1999) maintained *C. gossypiicola* as a separate species. However, the original description as well as the culture studied by Ho *et al*. (1999) are rather close to *C. cladosporioides*. The culture studied by Ho *et al.* (1999) was included in the phylogenetic studies within the *C. cladosporioides* complex and proved to be conspecific with *C. cladosporioides* (Bensch *et al.* 2010).

Zhang *et al*. (2003) cited collections on *Bombax malabaricum* (China, Shaanxi), *Gossypium hirsutum* (China, Henan), and *Gossypium* sp. (China, Hubei).

*gossypiicola* var. *minor* Pidopl. & Deniak, in Pidoplichko, Gribnaya Flora Grubykh Kormov: 273. 1953, *nom. inval*.
*Type*: **Ukraine**, Krim, on seeds of cotton (*Gossypium* sp., *Malvaceae*).
*Notes*: Type material unknown, status remains unclear.

*graminum* f. *bambusae* Roum., Fungi Sel. Gall. Exs., Cent. XLII, No. 4191. 1887, *nom. nud*.
*Syntypes*: **France**, Dept. Haute-Garonne, Vallee du Lys, Bagnères-de-Luchon, park of casino, on leaves of *Bambusa* sp. (*Poaceae*), Dec. 1886, Ch. Fourcade, Roumeguère, Fungi Sel. Gall. Exs. 4191 (*e.g.*, B).

*graminum* f. *inflorescentiae* Sacc., Syll. fung. 25: 791. 1931.
*Type*: **France**, on flowers of *Phalaris arundinacea* (= *Baldingera arundinacea*) (*Poaceae*), Hariot.
*Original diagnosis* (Saccardo 1931): Est forma caerealibus, noxia, forte cum *Sphaerella tulasnei* Janez. connexa. Hyphae 4.7–5 µm cr. e basi stromatica fasciculatae; conidia saepius bicellularia, 7–9 × 5 µm, fuliginea.
*Notes*: Type material not found. Status remains unclear.

*graminum* f. *poae-pratensis* Thüm., Mycoth. Univ., Cent. 5, No. 490. 1876, *nom. nud.*
*Syntypes*: **Germany**, Bavaria, Bayreuth, on dead culms of *Poa pratensis* (*Poaceae*), 1874, Thümen, Mycoth. Univ. 490 (*e.g.*, HAL, M-0057620).
*Notes*: No *Cladosporium* found in the original collections examined.

*grewiae* Bacc., Ann. Bot. (Rome) 4: 277. 1906, as "*graeviae*".
*Type*: **Eritrea**, Mai Hiryi, Pappi, on dead leaves of *Grewia* (*Malvaceae*).
*Lit*.: Saccardo (1913a: 1368).
*Original diagnosis* (Saccardo 1913a): Caespitulis epi-hypophyllis maculis aridis late effusis, insidentibus; hyphis erectis, simplicibus, gregariis vel fasciculatis, septatis, 70–200 µm longis, conidiis apici et lateri hypharum insidentibus, continuis, uniseptatis vel rarius biseptatis, rotundis vel ovatis 6–7 µm long.
*Notes*: Type material could not be traced; status remains unclear.

*griseo-olivaceum* Pidopl. & Deniak, Mikrobiol. Zhurn. 5(2): 183, 193–194. 1938, *nom. inval*.
*Type*: **Ukraine**, on grains of *Zea mays* (*Poaceae*).
*Lit*.: Pidoplichko (1953: 271).
*Ill*.: Pidoplichko & Deniak (1938: 183, fig. 2).
*Notes*: Neither in Mikrobiol. Zhurnal (1938) nor in Pidoplichko (1953) a Latin diagnosis is given. Type probably not preserved. Status remains unclear.

*grumosum* (Pers.) Link, Sp. pl. 6(1): 42. 1824.
*Type*: Not specified in the original publication.
≡ *Dematium grumosum* Pers., Mycol. eur. 1: 16. 1822.
*Lit*.: Fries (1832: 373), Corda (1837: 14), Saccardo (1886: 363), Lindau (1907: 822).
*Original diagnosis* (Link 1824): Cl. acervulis densis sparsis minutis grumosis fusco-nigricantibus.
*Notes*: In Oudemans (1919), *Pteris aquilina* (= *Pteridium aquilinum*) is mentioned as host species. See *C. aquilinum*. No type material could be traced.

*helminthosporioides* (Corda) Fr., Summa veg. Scand. 2: 499. 1849.
*Type*: **Czech Republic**, on dead leaves of conifers.
≡ *Azosma helminthosporioides* Corda, Deutsch. Fl. 3(12): 35. 1831.
≡ *Macrosporium helminthosporioides* (Corda) Sacc. & Traverso, Syll. fung. 20: 8. 1911.
*Ill*.: Corda (1831: tab. 18).
*Original diagnosis* (Corda 1831): A. acervulis oblongis olivaceis; sporis cuneiformibus diophanis olivaceis, floccis simplicibus concoloribus.
*Notes*: Type material could not be located in herb. PRM.

*herbarum* f. *agaves-echeveriae* Savelli, Ann. Reale Accad. Agric. Torino 56: 113. 1914 (dated 1913).
*Type*: **Italy**, Torino, on living leaves of *Agave americana* (*Asparagaceae*) and *Echeveria* sp. (*Crassulaceae*), Mar. 1913, A. Tonelli.
*Lit*.: Ferraris (1914: 882), Prasil & de Hoog (1988: 53).
*Original diagnosis* (Ferraris 1914): Maculis subcircularibus luteolis; caespitulis gossypino-pulverulentis, fulvis; hyphis sterilibus intercellularibus, cylindraceis, septatis ramosis, 4–5 µm crass.; conidiophoris caespituloso-erumpentibus epiphyllis, olivaceis, flexuosis, septatis, simplicibus, 100–150 × 6–7 µm, subdenticulato-conidigeris; conidiis fulvo-olivaceis, continuis vel 1-septatis, 12–20 × 10–12 µm.
*Notes*: Prasil & de Hoog (1988) did not find any authentic material in FI, PDA, PAV, RO, ROPV and TO and considered it to be unlikely that this forma was a true *Cladosporium*.

*herbarum* f. *asparagi* Thüm., Herb. Mycol. Oecon., Fasc. VII, No. 320. 1875.
*Type*: **USA**, on *Asparagus* sp. (*Asparagaceae*), Thümen, Herb. Mycol. Oecon. 320.
*Notes*: Status remains unclear.

*herbarum* f. *carpophilum* D. Sacc., Mycoth. Ital. 590. 1899.
*Type*: **Italy**, Selva, on dead fruit of *Cheiranthus cheiri*, Jul. 1899, Saccardo, Mycoth. Ital. 590 (*e.g.*, BPI 427188, SIENA).
*Notes*: A mixture of *Cladosporium cladosporioides* and *C. herbarum*.

*herbarum* f. *fimicola* Marchal, Bull. Soc. Roy. Bot. Belgique 24: 67. 1885.
*Type*: **Belgium**, Brussels, on dung of shrew and mice, summer 1883 and winter 1883–1884 (in fimo soricino et murino).
*Lit*.: Prasil & de Hoog (1988: 53).
Notes: No authentic material is maintained at BR. Probably this was only a substrate form (Prasil & de Hoog 1988).

*herbarum* f. *flosculorum* Thüm., Fungi Austr. Exs., Cent. XII, No. 1173. 1874.
*Type*: **Czech Republic**, Bohemia, Teplitz, on *Anthemis austriaca* (*Asteraceae*), summer 1873, von Thümen, Thümen, Fungi Austr. Exs. 1173 (*e.g.*, BPI 427196, HAL).
*Notes*: Often wrongly cited as *C. herbarum* var. *flosculorum* Thüm. No identifiable *Cladosporium* found in the material examined.

*herbarum* f. *fructicola* Thüm., Fungi Austr. Exs. No. 266. 1872.
*Type*: **Austria**, Krems, on fruits of *Datura stramonium* (*Solanaceae*), 1871, A. Boller, Thümen, Fungi Austr. Exs. 266 (*e.g.*, BPI 427198, HAL).
*Notes*: Status remains unclear, a mixture of different hyphomycetes, including *Alternaria* sp.

*herbarum* f. *mesembrianthemi* Rabenh., Herb. Mycol., Ed. II, No. 767. 1858.
*Syntype*: **Germany**, Niedersachsen, Giesen, botanical garden, on leaves of *Mesembryanthemum umbellatum* (*Aizoaceae*), H. Hoffmann, Rabenhorst, Herb. Mycol. 767 (*e.g.*, M).
*Notes*: True *Cladosporium* species, *cladosporioides*-like, but exact identification impossible without culture.

*herbarum* f. *parasiticum* Sacc., Ann. Mycol. 13(2): 133. 1915, as "*parasitica*". Fig. 396.
*Holotype*: On *Taphrina tosquinetii* (= *Exoascus tosquinetii*) on leaves of *Alnus glutinosa* (*Betulaceae*), M. Weisskirchen (PAD).
*Lit.*: Saccardo (1931: 797), Prasil & de Hoog (1988: 54), Heuchert *et al.* (2005: 53)
*Ill.*: Heuchert *et al.* (2005: 55, fig. 22).
*Original diagnosis* (Saccardo 1915b): Characteres morphologici a typo vix diversi, sed stirps videtur biogena, parasitica.
*In vivo: Colonies* medium brown, effuse, confluent, caespitose. *Mycelium* immersed and superficial; hyphae 3–5 µm wide, septate, not or only rarely constricted at the septa, subhyaline to pale brown, smooth, walls thickened, often somewhat swollen, 6–7 µm wide, swollen hyphal cells forming loose to dense aggregations. *Conidiophores* solitary, arising from hyphae, or forming loose fascicles arising from hyphal aggregations, erumpent, erect to almost decumbent, straight to curved, more or less geniculate-sinuous, unbranched, 52–82 × 3.5–5.5 µm, slightly swollen at the very base, up to 7 µm, 0–3-septate, not constricted at the septa, pale to medium brown, paler towards the apex, walls somewhat thickened, occasionally with intercalary swellings, up to 6 µm wide, swellings with conidiogenous loci, but loci not confined to swellings. *Conidiogenous cells* integrated, terminal and intercalary, 31–48 µm long, polyblastic, sympodially proliferating, conidiogenous loci protuberant, thickened and darkened-refractive, 1–2 µm wide. *Conidia* catenate, mostly in branched chains, straight, subglobose, obovoid, ellipsoid, subcylindrical, 5–20 × 3–5 µm, 0–1-septate, not constricted at the septa, pale medium brown, smooth, walls unthickened to slightly thickened, apex rounded to slightly attenuated, with up to four hila, base truncate to convex, occasionally attenuated, hila protuberant, thickened, darkened-refractive, 0.5–1.5 µm wide, basal hilum up to 2 µm wide, microcyclic conidiogenesis not observed.
*Notes*: Prasil & de Hoog (1988) examined the type material of this forma and described it to be a mixed collection of *C. herbarum* and *C. cladosporioides*. In the course of our own examinations, we have not found any verruculose conidia which are characteristic for *C. herbarum.* Furthermore, the conidia in this collection deviate from *C. herbarum* in shape and width of the conidia (*C. herbarum* conidia 4–7 µm wide). The conidiophores in f. *parasiticum* are also characterised by being nodulose with conidiogenous cells as in *C. herbarum*, but they are less consistent. Conidiophores and conidia agreeing with those of *C. cladosporioides* have not been found in the type collection.

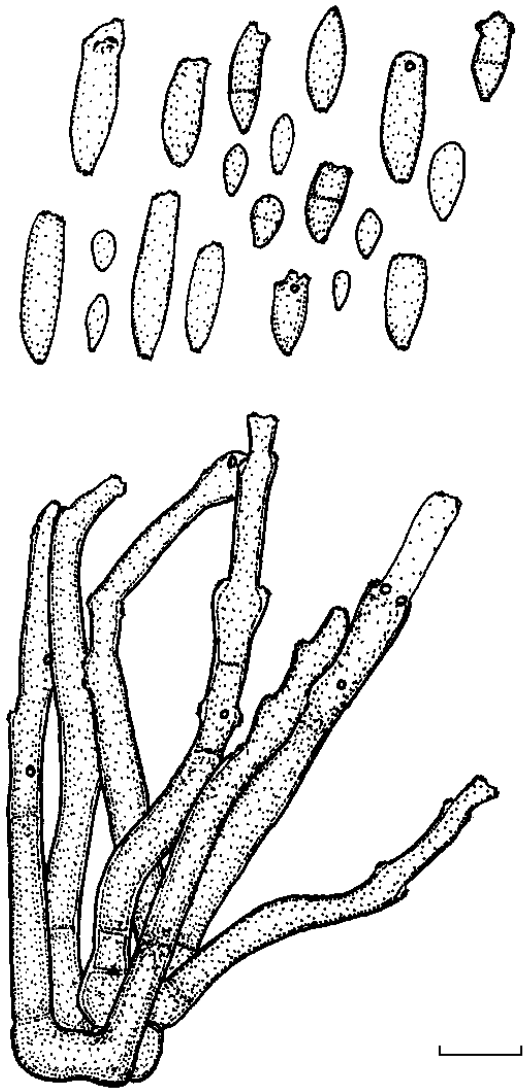


**Fig. 396.** *Cladosporium herbarum* f. *parasiticum* (PAD). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. B. Heuchert *del.*

*Cladosporium taphrinae*, also occurring on *Taphrina* spp., inhabits the asci of *Taphrina coerulescens*, but the conidiophores do not have any swellings and the apex is rugose-subdenticulate by having numerous densely crowded conidiogenous loci. The conidia are 0–2(–3)-septate. The conidiophores of *C. phyllophilum* (= *C. exoasci*), which are also known from *Taphrina* spp., are often decumbent to repent, but they are somewhat wider and intercalary swellings are lacking. Furthermore, ramoconidia, 13–35(–38) × 3–10 µm, mostly 1–5-septate, are formed.

This fungus is only known from the type specimen; additional collections have not been seen. Therefore, a final conclusion about its taxonomic status is not yet possible.

*herbarum* f. *Phaseoli vulgaris* Thüm., Herb. Mycol. Oecon. 206. 1874, *nom. nud.* Fig. 397.
*Type*: **Czech Republic**, Böhmen, Tetschen, on leaves of *Phaseolus vulgaris* (*Fabaceae*), Sep. 1873, von Thümen, Thümen, Herb. Mycol. Oecon. 206 (M).
*In vivo*: *Leaf spots* amphigenous, scattered, at first punctiform, later enlarging, subglobose to somewhat irregular, 1–25 mm diam, sometimes confluent, pale brown to somewhat reddish brown, often spots somewhat raised, margin indefinite. *Colonies* amphigenous, loosely caespitose, effuse, pale brown to medium brown with dense fructification. *Mycelium* internal, subcuticular to

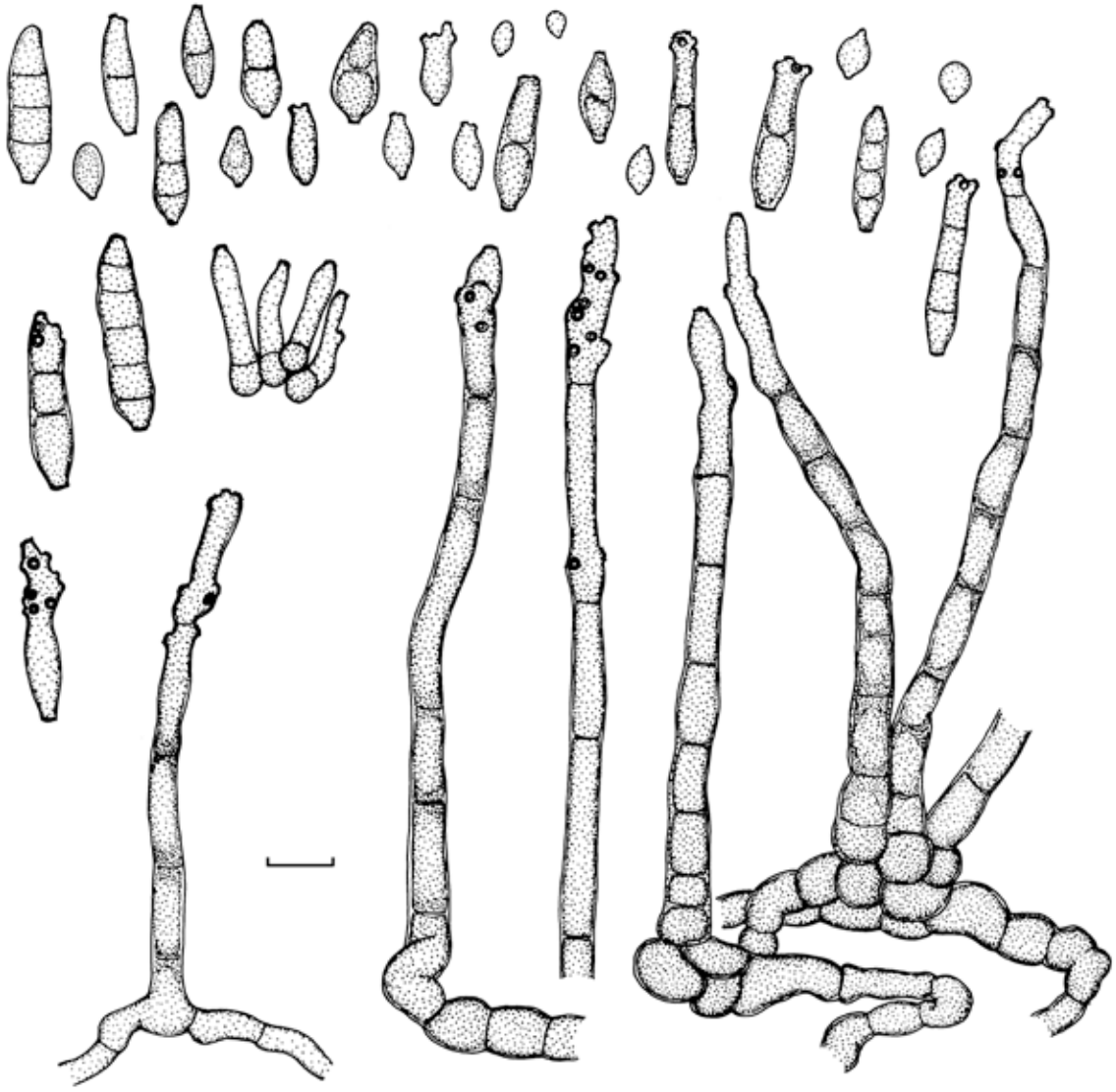


**Fig. 397.** *Cladosporium herbarum* f. *Phaseoli vulgaris* (M). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del.*

intraepidermal; hyphae branched, (2–)3–10 µm wide, septate, often with small swellings and constrictions, sometimes swollen up to 15 µm, pale olivaceous or olivaceous-brown, smooth, walls slightly thickened, somewhat aggregated or forming small stromatic hyphal aggregations, subcuticular to intraepidermal, small, composed of only few swollen hyphal cells, up to 30 µm diam, cells 5–10(–14) µm diam, pale to medium brown, smooth, walls thickened. *Conidiophores* solitary or in pairs, sometimes in small groups, arising from hyphae, swollen hyphal cells or hyphal aggregations, erumpent through the cuticle, erect, straight to slightly flexuous, non-nodulose, not geniculate or only sometimes so, unbranched, rarely once branched, 80–200 × 4–7(–8) µm, pluriseptate, usually not constricted, medium brown, sometimes pales at the apex, smooth, walls thickened, sometimes even two-layered, lumen apparently somewhat aggregated at septa, somewhat wider at the base, attenuated towards the apex; somewhat dimorph, few small conidiophores intermixed, 15–60 × 3–4 µm, solitary or in small groups, pale olivaceous or pale brown, smooth, walls almost unthickened. *Conidiogenous cells* integrated, both terminal and intercalary, proliferation sympodial, 14–40(–50) µm long, with several conidiogenous loci per cell, loci somewhat protuberant, truncate or slightly convex, 1–2(–3) µm diam, somewhat thickened and refractive, sometimes darkened. *Conidia* in branched chains, straight, subglobose, obovoid, ellipsoid to subcylindrical, 4–23(–30) × (3–)4–6(–7) µm, 0–3(–5)-septate, mostly 0–1-septate, not constricted at septa, pale olivaceous-brown or brown, smooth or almost so, sometimes slightly rough-walled, walls unthickened or only slightly thickened, between wall and lumen very pale, lumen appears somewhat darker, slightly rounded or attenuated at apex and base, hila more or less protuberant and truncate, (0.5–)1–2(–3) µm diam, dome sometimes higher than the surrounding rim, up to 1 µm high.

*Notes*: *Cladosporium leguminicola* described from dead legumes of *Phaseolus* differs in having shorter, 0–3-septate, fasciculate conidiophores and verruculose conidia formed solitary or in unbranched chains. *Cladosporium pisicola* on *Pisum sativum* and *C. cladosporioides* differ in having somewhat narrower, thin-walled conidiophores and 0–1(–3)-septate narrower conidia.

*herbarum* f. *psoraleae* Gonz. Frag., Intr. al. est. de la flor. de micr. de Cat.: 152. 1917.

*Type*: **Spain**, on *Psoralea* sp. (*Fabaceae*).

*Lit.*: Gonzáles-Fragoso (1927: 198).

*Original diagnosis* (Gonzáles-Fragoso 1927): Manchas epifilas, purpúreas; céspedes pequeños, escasos, sobre un pseudoestroma inmergido; conidióforos fasciculados, rectos o flexuosos, sencillos,

hasta de 40 × 5–5.5 µm, color ahumado claro; conidios ovoideo-oblongos, de 7–10 × 3–4 µm, continuos primero, luego 2-celulares, casi hialinos o amarillentos.
*Notes*: Type not found. Status remains unclear.

*herbarum* f. *repens* Fresen., Beitr. Mykol. 1: 24. 1850.
*Type*: (Fresenius 1850: tab. 3, fig. 29: iconotype).
*Notes*: Fresenius (1850) described a "forma" *repens* without indicating any morphological differences. A type collection was not mentioned. Lindau (1907: 801) cited it as a synonym of *C. herbarum*.

*herbarum* f. *rhois* Thüm., Fungi Austr. Exs., Cent. 6, No. 537. 1872.
*Type*: **Austria**, Lower Austria, Krems, on dead branches of *Rhus typhina* (*Anacardiaceae*), winter 1870, A. Boller, Thümen, Fungi Austr. Exs. 537 (BPI 427203, HAL).
*Notes*: Status unclear, immature, no identifiable *Cladosporium* seen in the material examined. Sometimes wrongly cited as *C. herbarum* var. *rhois*.

*herbarum* f. *saxicola* Sacc., Michelia 2(8): 578. 1882.
Type: **USA**, New Jersey, Newfield, on wet stones, Ellis no. 3551 (PAD).
*Lit.*: Prasil & de Hoog (1988: 54).
*Original diagnosis* (Saccardo 1882): Conidia oblonga, 8–15 × 5, plerumque 1-septata, olivacea.
*Notes*: Original specimen at PAD contains no fungus (Prasil & de Hoog 1988).

*herbarum* var. *aphidicola* C. Massal., Madonna Verona 1918: 21. 1918.
*Type*: **Italy**, parasitic on aphids (PAD).
*Lit.*: Saccardo (1931: 798), Prasil & de Hoog (1988: 52).
*Original diagnosis* (Saccardo 1931): Hyphis fertilibus remote septatis, cylindraceis, parum ramosis, 3–4 µm cr.; conidiis valde polymorphis, modo ovalibus continuis, modo fusoideo-teretibus et vulgo 2–3-septatis, utrinque interdum apiculatis, magnitudine valde variis 6–20 × 3–6 µm.
*Notes*: Neither aphids nor *Cladosporium* conidia could be found in authentic specimen at PAD (Prasil & de Hoog 1988).

*herbarum* var. *aphidis* Fuckel, Fungi Rhen. Exs., Fasc. 2, No. 111. 1863, *nom. nud.*
≡ *Cladosporium herbarum* var. *aphidis* Fuckel, Jahrb. Nassauischen Vereins Naturk. 23–24: 356. "1869", 1870, as "α *aphidis*", *nom. nud.*
*Lectotype* (**designated here**): **Germany**, near Oestrich, on dead carcass of aphids on *Cornus sanguinea* (*Cornaceae*), Fuckel, Fungi Rhen. Exs. 111 (M-0057467). *Isolectotypes*: Fuckel, Fungi Rhen. Exs. 111 (*e.g.* HAL).
*Lit.*: Saccardo (1886: 369), Lindau (1907: 830), Prasil & de Hoog (1988: 52).
*Notes*: Prasil & de Hoog (1988) noted that type material is not preserved in herb. G, but the material distributioned in "Fungi Rhen. Exs. 111" is syntype material. This variety represents a mixture of *C. aphidis* and *C. herbarum*.

*herbarum* var. *brassicae* Desm., in Thümen, Fungi Austr. Exs. No. 1294. 1875.
*Syntype*: **Czech Republic**, Bohemia N., Decin (Tetschen), on leaves of *Brassica napus* (*Brassicaceae*), spring 1873, de Thümen, Fungi Austr. Exs. 1294 (*e.g.*, BPI 427187, HAL).
*Notes*: Status unclear. No *Cladosporium* found in the material examined.
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*herbarum* var. *cellulosae* Sartory, R. Sartory, J. Mey. & Baumli, Papier 38(1): 43. 1935? (not in this volume, probably not in this journal).
*Type*: France, on rotten paper.
*Lit.*: Prasil & de Hoog (1988: 52).
*Notes*: Location of material unknown (no material in PC or STR); possible identity with *C. sphaerospermum*.

*herbarum* var. *cerealium* Sacc., Ann. Mycol. 7: 285. 1909.
*Type*: **Europe**, on leaves, culms *etc.* of cereals (*Triticum*, *Hordeum*, *Secale etc.*) (*Poaceae*) (PAD?).
*Lit.*: Lindau (1910: 795), Ferraris (1912: 333), Saccardo (1913a: 1366), Prasil & de Hoog (1988: 52).
*Original diagnosis* (Ferraris 1909): Stromatibus cellulosis, atro-brunneis; conidiophoris minutis, caespituloso-fasciculatis, brunneis, septatis, plerumque simplicibus; conidiis catenulatis, primum continuis deinde 1-, rar. 2-septatis, olivaceis.
*Notes*: The species was described as a substrate form on cereals without any real morphological difference (Prasil & de Hoog 1988).

*herbarum* var. *densum* Roum., Fungi Sel. Gall. Exs., Cent. X, No. 950. 1880.
*Type*: **France**, on leaves of *Rhus cotinus* (= *Cotinus coggygria*) (*Anacardiaceae*), Roumeguère, Fungi Sel. Gall. Exs. 950.
*Lit.*: Oudemans (1921).

*herbarum* var. *ephedrae* Allesch., *in herb*. (M). Fig. 398.
*Specimen*: **Germany**, Berlin, botanical garden, on dead stems of *Ephedra gerardiana* (= *E. distachya*) (*Ephedraceae*), Apr. 1894, P. Hennings, No. 38 (M).
*In vivo*: *Colonies* at first punctiform, scattered, later confluent, effuse, erumpent, densely caespitose, brown, velvety. *Mycelium* internal, subcuticular or intraepidermal; hyphae branched, 4–10 µm wide, septate, not constricted at septa, sometimes slightly so, pale brown to pale medium brown, smooth, walls unthickened or almost so, often aggregating forming stromatic hyphal aggregations. Stromata well-developed, extended, 50–150 µm diam or even larger, several layers deep, composed of swollen hyphal cells, subglobose to somewhat angular, 8–13 µm diam, pale to medium brown, smooth, walls somewhat thickened. *Conidiophores* in small to usually moderately large or large groups, loose to somewhat dense, arising from stromata, erumpent through the cuticle, erect, straight to substraight, occasionally somewhat flexuous, non-nodulose, sometimes geniculate and once branched, 30–70(–85) × 5–7(–8) µm, septate, not constricted at septa, pale to pale medium brown, paler at apices, sometimes almost hyaline, smooth, walls slightly thickened, often somewhat attenuated towards the apex. *Conidiogenous cells* integrated, terminal or intercalary, 15–35 µm long, proliferation sympodial, with a single or several, up to eight conidiogenous loci per cell, loci protuberant, short cylindrical, 1.5–3 µm wide, up to 1 µm high, dome usually not higher than surrounding rim, thickened and somewhat darkened-refractive. *Ramoconidia* formed, subcylindrical-oblong, sometimes somewhat irregular in outline, up to 27 µm long, usually 5 µm wide, pale brown, smooth. *Conidia* catenate, in unbranched or branched chains, straight or slightly curved, subglobose, obovoid, ellipsoid to subcylindrical, 4–23 × 3–7.5 µm, 0–3-septate, not constricted at septa, septa becoming somewhat sinuous with age, pale

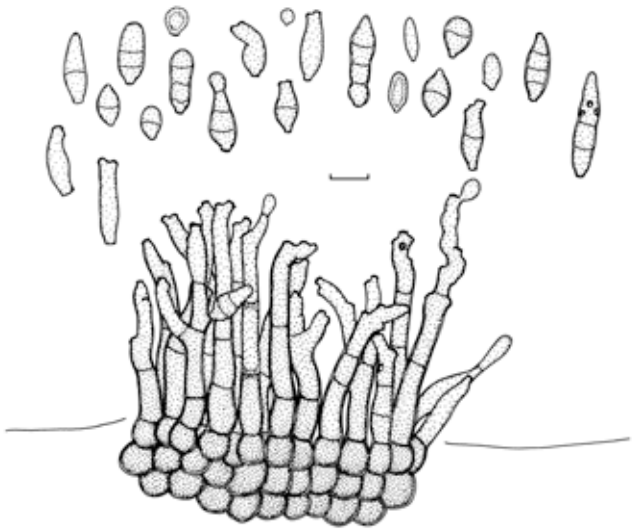

**Fig. 398.** *Cladosporium herbarum* var. *ephedrae* (M). Conidiophores and conidia *in vivo*. Scale bar = 10 µm. K. Bensch *del*.

brown, smooth or almost so, walls almost unthickened or slightly thickened, attenuated towards apex and base, apex often broadly rounded or attenuated, hila protuberant, truncate or slightly convex, (0.5–)1–3 µm diam, thickenend, somewhat refractive; microcyclic conidiogenesis occurring.
*Notes*: True *Cladosporium* species, but not identical with *C. herbarum*. Status remains unclear.

*herbarum* var. *fasciculare* Corda, Icon. fung. 3: 9. 1839, as "β *fasciculare*".
*Type*: **Czech Republic**, on stems of umbellifers, *Liliaceae* and *Equisetum* sp.
*Lit*.: Saccardo (1886: 351), Lindau (1907: 803), Ferraris (1912: 333), Prasil & de Hoog (1988: 52).
*Ill*.: Corda (1839: tab. 1, fig. 20).
*Original diagnosis* (Corda 1839): Caespitibus minutissimis, gregariis, non confluentibus, atro-viridibus; stromate celluloso immerso; floccis simplicissimis, fasciculatis, olivaceis; sporis oblongis pallidioribus.
*Notes*: Type material is not preserved in PRM, but from the figures it seems to be indistinguishable from *C. herbarum* (Prasil & de Hoog 1988). Rabenhorst (1844) listed it as synonym of *C. fasciculare* (Pers.) Fr. All samples from different herbaria deposited as *C. herbarum* var. *fasciculare* proved to be *C. herbarum* or *C. macrocarpum.* The collection in Allescher & Schnabl, Fungi Bav. 592, belongs to *C. macrocarpum*.

*herbarum* var. *lablab* Sacc., Philipp. J. Sci. 18: 604. 1921.
*Type*: **China**, Foochow, on legumes of *Dolichos lablab* (*Fabaceae*) (PAD).
*Lit*.: Saccardo (1931: 792), Prasil & de Hoog (1988: 52).
*Notes*: Authentic material at PAD contains *C. herbarum*, *C. cladosporioides*, *Alternaria alternata* and *Penicillium*-like conidia (Prasil & de Hoog 1988).

*herbarum* var. *macrosporum* Lagière, Ann. École Natl. Agric. Grignon, Sér. 3, 5: 159. 1945–1946.
*Type*: **France**, Seine-et-Oise, Grignon, on leaves of *Phleum pratense* (*Poaceae*), 1944, Lagière.
= ? *Cladosporium phlei* (C.T. Greg.) G.A. de Vries, Contr. Knowl. Genus *Cladosporium*: 49. 1952.
*Lit*.: Prasil & de Hoog (1988: 53).
*Original diagnosis* (Lagière 1945–1946): Conidiis majoribus: 27–39(21–36) × 9–12 µm.
*Notes*: Original material seems to be lost. Prasil & de Hoog (1988) consider it to be probably a *Heterosporium* species.

*herbarum* var. *nigricans* (Roth : Fr.) Fr., Syst. mycol. 3(2): 371. 1832, as "β *nigricans*".
*Type*: On wood and other hard substrates.
*Basionym*: *Byssus nigricans* Roth, Catal. Bot. 1: 216. 1797.
= ? *Dematium hippocastani* Pers., Ann. Bot. (Usteri) 11: 32. 1794; Syn. meth. fung. 2: 698. 1801.
*Lit*.: Saccardo (1886: 351, 1931: 798), Lindau (1907: 803), Arens (1945), Prasil & de Hoog (1988: 53).
*Original diagnosis* (Fries 1832): Caespitibus densis compactis nigricantibus, fibris subobscuris.
*Notes*: Material could not be traced neither in herb. B nor PRM (Prasil & de Hoog 1988).

*herbarum* var. *phlei* Lagière, Ann. École Natl. Agric. Grignon, Sér. 3, 5: 159. 1945–1946.
*Type*: **France**, Seine-et-Oise, Grignon, on leaves of *Phleum pratense* (*Poaceae*), summer 1944, R. Lagière.
*Lit*.: Prasil & de Hoog (1988: 53).
*Original diagnosis* (Lagière 1945–1946): Caespitulis erumpentibus, foliicolis; hyphis noduloso-flexuosis, fuscis, 220–300 × 4–5 µm; conidiis oblongis vel fusoideis, 1–3-septatis, tenuiter echinulatis, 18–24 (15–29) × 9–11 (7.5–12) µm.
*Notes*: Prasil & de Hoog (1988): "Original material is probably lost, possible identity with *C. macrocarpum*."

*herbarum* var. *typharum* Westend., Cryptogames: 26. 1854, *nom. inval*.
*Lit*.: Oudemans (1919).
*Notes*: See entry below.

*herbarum* var. *typharum* Westend. & Van Haes., Cat. crypt.: 8. 1838. no. 173.
*Notes*: Cited in Lindau (1907: 801) as synonym of *C. herbarum*.

*herbarum* var. *vitricola* Sacc., Ann. Mycol. 7: 286. 1909.
*Type*: **Italy**, on dirty, wet glass (PAD).
*Lit*.: Lindau (1910: 795), Ferraris (1912: 334), Saccardo (1913a: 1366), Prasil & de Hoog (1988: 53).
*Original diagnosis* (Saccardo 1913a): A typo differt caespitulis dendritico-radiantibus, soridiis.
*Notes*: "*Byssocladium fenestrale* auct. p.p. non Mart. nec Link" (Saccardo 1913a: 1366). True *Cladosporium* species, but status is not yet clear.

*heuglinianum* Thüm., Rev. Mycol. (Toulouse) 1: 11. 1879.
*Type*: **Eritrea**, near Nakfa on Red Sea (Nakfa ad Mare Rubrum), on leaves of *Buddleja polstachya* (*Scrophulariaceae*).
*Lit*.: Saccardo (1892: 603).
*Original diagnosis* (Saccardo 1892): Maculis amphigenis, sparsis, plus minus orbiculatis, magnitudine variis, nitido-atris, subeffusis, velutinis; hyphis subrectis, subulato-rigidis, simplicibus, septatis, 6 mm. cr., longis, dilute fuscis; conidiis 1-septatis, cylindrico-subellipticis, utrinque subacutis, non constrictis, 12–20 × 6–8 µm; hyphis concoloribus.
*Notes*: Type material could not be located.

*hibisci* Reichert, Bot. Jahrb. Syst. 56: 721. 1921.
*Type*: **Egypt**, near Siut, on dry stems of *Abelmoschus esculentus* (≡ *Hibiscus esculentus*) (*Malvaceae*), Oct. 1822/25, Ehrenberg (B).
*Lit.*: Saccardo (1972: 1338).
*Ill.*: Reichert (1921: tab. 4, fig. 3).
*Original diagnosis* (Reichert 1921): Caespitulis effuses, confluentibus, atris; hyphis fertilibus, non confertis, plerumque solitariis, rectis, simplicibus, raro leniter nodosis, non flexuosis, septatis, fuscis, 75–125 µm longis, 3–6 µm latis; conidiis terminalibus elongatis, ellipsoideis, pallid-fuscescentibus vel hyalinis non constrictis, 7–15 µm longis, 3–5 µm latis.
*Notes*: Zhang *et al*. (2003) cited collections on *Hibiscus syriacus* (China, Shaanxi) and *H. tiliaceus* (China, Heilongjiang). It is now treated at a synonym of *C. sphaerospermum*.

*hydrangeae* Z.Y. Zhang & T.F. Li, J. Anhui Agric. Univ. 26: 40. 1999.
*Holotype*: **China**, Liaoning, on living leaves of *Hydrangea macrophylla* (*Hydrangeaceae*), 16 Sep. 1992, Wang & Li (MHYAU 07029).
*Ill.*: Zhang *et al*. (1999a: 41, fig. 1), Zhang *et al*. (2003: 110, fig. 70).
*Original diagnosis* (Zhang *et al*. 1999a): Maculis petalicolis vel sepalis, distinctis vel confluentibus, atro-brunneis, 4 × 2 mm, amphigenis, brunneis, atro-brunneis, longe undulatis purpuratis vel fuscus brunneis, 10 × 2.5 cm. Myceliis immersis. Conidiophoris solitariis, erectis, sinualatis, simplicibus, septatis, apice sympodialiter elongatis, inflatis denticulatis, cicatricibus conspicuis, brunneis, prope apicem pallescentibus, 25.2–121.0 (60.0) × 4.1–5.1 (4.5) µm. Ramoconidiis longe cylindricis, 0–1 septatis, rarius 2–3 septatis, pallide brunneis, ad apicem inflatis denticulatis, cicatricibus fuscis, 9.8–20.5 (14.3) × 3.9–5.1 (4.7) µm. Conidiis catenatis, cylindricis, fusiformibus, 0–1 septatis, laevibus, pallide brunneis, laxe vel utrimque cicatricibus protrudentibus praeditis, 6.2–22.6 (14.6) × 3.6–5.1 (4.8) µm.
*Notes*: Additional collections on *Hydrangea macrophylla* were reported from Liaoning and Yunnan, China (Zhang *et al*. 2003), and Lu *et al*. (2003) mentioned *Viburnum macrocephalum* f. *keteleeri* as an additional host.

*hypophloeum* Berk. & M.A.Curtis, J. Linn. Soc., Bot. 10: 362. 1869.
*Type*: **Cuba**, on leaves of a *Sapindaceae*, February.
*Lit.*: Saccardo (1886: 359), Stevenson (1975).
*Original diagnosis* (Berkeley 1869): Maculis orbicularibus; floccis flexuosis implexis; sporis curvulis oblongis triseptatis.
*Specimen examined*: **Puerto Rico**, limestone hills on the coast eight miles west of Ponce, on leaves of *Thouinia* sp., 1 Dec. 1902, A.A. Heller, Porto Rican Fungi 6172 (B 700006554).
*Notes*: Type material of *C. hypophloeum* could not be traced and is probably not preserved. A single collection from herb. B could be examined and proved to be conspecific with *Pseudocercospora thouiniae* (F. Stevens) U. Braun & Crous.

*insectorum* Gonz. Frag., Broteria, Sér. Bot. 22: 69. 1926, as "*insectarum*".
*Type*: **Spain**, Madrid, botanical garden, on *Saissetia hemisphaerica* (*Hemiptera*, *Coccidae*) on leaves of *Asplenium lineatum* (*Aspleniaceae*) and *Cordyline congesta* (*Asparagaceae*), Mar. 1925, Menor.
*Lit.*: Saccardo (1972: 1338).
*Original diagnosis* (Gonzáles-Fragoso 1926): Caespitulis aggregatis, effusis, ramosis, intricatissimis, pallide olivaceis, pauci vel pluri-septatis, subtoruloideis, conidiophoris paucis distinctis, conidiis terminalibus, subconcatenatis, concoloribus, oblongo-ovatis, 4–10 × 2.7–4 µm, continuis vel 1-septatis, rarissimis 5–4 locularibus.
*Notes*: Type collections could not be located in herb. MA.

*iridicola* Schwein., Trans. Amer. Philos. Soc., N.S., 4(2): 277. 1832.
*Type*: **USA**, Pennsylvania, Bethlehem, on leaves of *Iris virginica* (*Iridaceae*), No. 2604.
*Lit.*: Saccardo (1886: 367, as "*iridicolum*"), Zhang *et al*. (1999b: 41−42).
*Ill.*: Zhang *et al*. (1999b: 41, Fig. 2).
*Original diagnosis* (Schweinitz 1832): C. minutissimum, sparsum, acervulis nempe non confluentibus, quanquam e longrinquo maculam sistunt latiusculam ob approximationem. Floccis brevibus, cum sporidiis, fusco-nigris. Acervulis floccorum exsoletis, quasi sphaeriaemorphibus.
*Notes*: Type material could not be located in herb. PH, it is probably not preserved. A record of this species from China is reported by Zhang *et al*. (1999b), but the name is probably misapplied.

*javanicum* Wakker, Meded. Proefstat. Oost-Java, N.S., 28: 1–9. 1896.
*Type*: **Java**, on cortex of (in corticibus) *Saccharum officinarum* (*Poaceae*).
*Lit.*: Saccardo (1899: 1082).
*Ill.*: Wakker (1896: tab. 1).
*Original diagnosis* (Saccardo 1899): Hyphis tenuibus, breve ramosis; conidiis in ramorum apicibus oriundis, ovalibus, minutis, 2.5–3 × 1.5–2 µm.

*juglandinum* Cooke, Grevillea 16(79): 80. 1888.
Type: **UK**, Highgate, on fading leaves of walnut (*Juglans regia*, *Juglandaceae*).
*Lit.*: Saccardo (1892: 604), Lindau (1907: 819).
*Original diagnosis* (Cooke 1888): Hypophyllous. Tufts small, scattered, fuliginous. Threads septate, nodulose, rather flexuous, dark brown below, paler above, mostly simple. Conidia acrogenous, fusiform, uniseptate, translucent, 35 × 9 µm.
*Notes*: Type material of this species was not among a loan of *Cladosporium* types form Kew (K). Based on the original description (nodulose conidiophores and large conidia, 35 × 9 µm), this species seems to be a synonym of *Cladosporium macrocarpum*.

*juncicola* Rabenh. / P. Magnus, *in herb*., as *juncicolum*
*Specimen*: **Egypt**, on *Juncus acutus*? (*Juncaceae*), P. Ascherson, iter aegyptiacum quartum, ex herb. P. Magnus (HBG).
*Notes*: On the label "viell. *Brachysporium juncicolum* Rabenh.; *Helminthosporium juncicolum* Rabenh.". Saccardo (1886: 430): "*Brachysporium juncicolum* (Rabenh.) Sacc. *Helminthosporium juncicolum* Rabenh., Bot. Zeit. 1851, p. 626 – An *Cladosporium* ?".

*kapildharense* C.D. Sharma, Gadp., Firdousi, A.N. Rai & K.M. Vyas, Indian Phytopathol. 51(2): 160. 1998.
*Holotype*: **India**, Madhya Pradesh, Shahdol circle, Amarkantak (south forest division), Kapildhara, on living leaves of an unknown hosts ("*hospitis ignoti*"), Jan. 1993, C.D. Sharma (S.U. Herb. No. C.S.2). *Isotype*: IMI 356766.
*Ill.*: Sharma *et al.* (1998: 155, fig. 3).

*Original diagnosis* (Sharma *et al*. 1998): Maculae epigenosae, expando per totam superficiem folii, brunneae atro. Coloniae epiphyllosae, effusae, latescentes atro. Mycelium hypharum, plerumque superficiales, angustum, septatum, laevia, et ramosum, hyphae repentes, pallide vel moderate olivacea, usque 1–4.5 µm diametro. Stromata presentia, tenuiter evoluta, irregulares, pseudoparenchymatosi, obscure, olivaceae. Conidiophori plerumque solitaria raro caespitosi, macronematosi, mononematosi, usque 6 transversae septati, laevia, raro ramosi erecti vel suberecti, recti vel flexuousi, cum tumoribus, pallide vel moderate olivacea, 9–116 × 1.5–5.5 µm. Cellulae conidiogenosae integratae, terminales et intercalares, polyblastae, sympodiales, conidis orientibus ex tumoribus, terminalibus, quae, fiunt, postea intercalares, cicatricatae, cicatricis distincto crassae, conidia simplicia, arida, catenata, incatenis ramosis, acropleurogenosae, pallide olivacea, cylindrata, doliiformia, ellipsiformia, fusiformia, ovata, globosa vel subglobosa, apices obtusi, bases rotundatae vel obconico-truncatae, laevia, usque 2 transverse septata, hilo distincto et crassae, interdum eminentia, few conidis having banded septa, pallide olivacea, et parvae, conidia hyalini, 1.5–26 × 1–6.5 µm.
*Notes*: Sharma *et al*. (1998) reported this species as being morphologically similar to *C. psoraleae* and *C. acaciicola* but different in its colour and nature of colonies, presence of poorly developed stromata, size and colour of conidiophores and variable conidia. However, type material could not be traced at herb. IMI and is probably lost. *Cladosporium acaciicola* proved to be a black yeast-like hyphomycete and, therefore, has been excluded from *Cladosporium s. str*.

*laricis* var. *pini-pineae* Sacc. & Trotter, I Funghi dell'Avellinese, Avellino: 154. 1920.
*Type*: **Italy**, Campania, near Avellino, mixed infection with *Pestalozzia hartigi*, on sheaths of living leaves or leaves becoming dry ("in vaginis adhuc vivis vel arescentibus foliorum") of *Pinus pinea* (*Pinaceae*).
*Lit*.: Saccardo (1931: 790).
*Original diagnosis* (Saccardo 1931): Caespitulis fusco-griseis, subeffusis, in vaginis foliorum sitis; cetera eadem.
*Notes*: Type material of *C. laricis* could be re-examined and proved to be synonymous with *C. herbarum*. The variety *pini-pineae* is possibly an additional synonym.

*lathyri* Z.Y. Zhang & Y.L. Liu, J. Yunnan Agric. Univ. 15(3): 219–221. 2000.
*Holotype*: **China**, Liaoning, Shenyang, on leaves and stems of *Lathyrus quinquenervius* (*Fabaceae*), 20 Oct. 1992, Y.X. Wang & H. Li (MHYAU 07835).
*Ill*.: Zhang & Liu (2000: 219, fig. 1), Zhang *et al*. (2003: 115, fig. 74).
*Original diagnosis* (Zhang & Liu 2000): Maculis brunneis, 1–6 mm longis, coloniis dispersis, punctiformibus, aliquando confluentibus, velutinis, olivaceis vel atro-brunneis. Myceliis immersis. Stromatibus praeditis. Conidiophoris singularibus vel 3–4 fasciculatis, rectis vel geniculatis, septatis, simplicibus, ad apicem 1–3 cicatricibus conspicuis, nodis 5–8 µm crassis, pallide brunneis, 19.3–56.5 × 4.6–5.1 (av. 36.5 × 5.0) µm. Cellulis conidiogenis conidiophoris coalitis, sympodialibus. Ramoconidiis longe cylindricis, 0–1-septatis, ad apicem inflatis denticulatis, cicatricibus ornatis, pallide brunneis, 10.3–21.0 × 4.1–5.1 (av. 14.3 × 4.2) µm. Conidiis catenatis, fusiformibus, cylindricis, 0–1-septatis, laevibus, cicatricibus protrudentibus praeditis, pallide brunneis, 8.9–20.6 × 3.6–5.6 (av. 11.5 × 4.4) µm.

*lauri* Raybaud, Congr. Pathol. Végét. (Cent. Pasteur), Strausbourg: 48. 1923.
*Type*: **France**, on leaves of *Laurus nobilis* (*Lauraceae*), on *Aonidia lauri* (*Hemiptera*, *Diaspididae*) and *Lecanium hesperidum*.
*Original diagnosis* (Raybaud 1923): Lé mycélium de cette moisissure est blanchâtre, il se développe surtout à la surface inférieure des feuilles sous forme de taches couleur chocolat formées par l'ensemble des conidiophores bruns et des conidies moins brunes. Les taches se trouvent presque uniquement sur la feuille qu'elles pénètrent au niveau des Cochenilles, qui sont fixées à l'épiderme. ... Examinons d'abord le champignon développé en dehors de la Cochenille, c'est-à-dire à la surface des feuilles. Les conidies, nées le plus souvent le long des conidiophores ou à leurs extrémités, sont le plus souvent unicellulaires ou bicellulaires. Leurs dimensions varient de 3.5 µm à 5 µm de largeur et de 6 µm à 8 µm de longueur. Mais il en existe de plus grandes qui peuvent être tri- ou quadricellulaires. Parfois même nous en distinguons qui se composent de cinq cellules; dans ce dernier cas, les cellules centrales sont les plus volumineuses.
*Notes*: Type material could not be traced.

*laxicapitulatum* Matsush., Icones Microfungorum a Matsushima Lectorum: 35. 1975.
*Type*: **Japan**, Hyogo, Kobe City, on a rotting leaf of *Pasania edulis* (*Fagaceae*), Apr. 1969 (Matsush. herb. 2570).
*Lit*.: Ho *et al*. (1999: 131).
*Ill*.: Matsushima (1975: pl. 42, figs 1–2), Ho *et al.* (1999: 133, figs 24–25).
*Original diagnosis* (Matsushima 1975): Coloniae effusae, tenues, fulvae. Mycelium immersum. Conidiophora solitaria, erecta, recta, simplicia, septata, crassitunicata, (150–)200–300(–400) µm longa, prope basin 6–8 µm crassa, sursum leviter angustata, prope apicem 4.5-5 µm lata, apice 2–4 dentibus conicis praedita, atrobrunnea sursum brunnea. Conidia catenas ramosas ad dentes conidiophore formantia, ellipsoidea, continua, pallide brunneae, 9–15 × 5–7.5 µm; ramoconidia continua vel raro 1-septatia, elliptico-cylindrica vel ellipsoidea, brunnea vel pallide brunnea, usque ad 40 µm longa et 8 µm crassa. Conidia ut in toto capitulum laxum deciduum fulvum ad apicem conidiophore formantibus.
*Notes*: Type material not seen.

*leprosum* Morgan-Jones, Mycotaxon 6(1): 1. 1977.
*Holotype*: **USA**, Alabama, Lee Co., Auburn, on painted surface of veneer, Apr. 1976, G. Morgan-Jones (BPI). *Isotype*: AUA.
*Ill*.: Morgan-Jones (1977: 2, fig. 1).
*Original diagnosis* (Morgan-Jones 1977): Coloniae effusae, atrobrunneae vel fuscae, interdum olivaceo-brunneae, densae vel sparsae, crustaceae vel pulveraceae, plerumque orbiculares. Mycelium immersum vel superficial, ex hyphis ramosis, septatis, pallide brunneis, 2.5–3.5 µm crassis compositum. Hyphae ex cellulis inflates saepe compositae. Stromata frequenter adsunt vel rudimentale, ex cellulis brunneis, farinacea, isodiametricis, usque ad 10 µm crassa composita. Conidiophora macronemata vel semimacronemata, mononemata, ex hyphis superficialibus oriunda, simplicia vel ramosa, recta vel flexuosa, septata, plerumque inflates, ad septa constricta, laevia vel farinacea, brunnea, apicem versus pallidiora, 12–55 × 4–5 µm. Cellulae conidiogenae polyblasticae, indeterminatae, in conidiophoris incorporatae, terminales, interdum intercalares, sympodiales, cylindricae vel doliiformes, usque ad 5 cicatrices atro brunneae, applanatas, incrassates, protrudentes gerentes. Conidia catenate, sicca, ellipsoidea vel doliiformia,

pallide brunnea, laevia vel verruculosa, 0–1 septata, ad bases cicatrice protrudenti et ad apice 1–4 cicatricibus protrudentibus, 9–16 × 4–5 µm.
*Notes*: Type material could not be traced in BPI and could therefore not be re-examined.

*linicola* Pidopl. & Deniak, in Pidoplichko, Gribnaya Flora Grubykh Kormov: 267. 1953, *nom. inval.*
*Type*: **Ukraine**, Kievsk. Oblast, on seeds of flax (*Linaceae*), also found on damp hay.
*Ill*.: Pidoplichko (1953: 267, fig. 68).
*Notes*: Type material not traced, probably not preserved.

*longipes* Sorokin, On nekot. bolez. vinograda i drug. rast. Kavkazk. Kraja, Tiflis: 26. 1892. also in Z. Pflanzenkrankh. 3: 154. 1893.
*Type*: **Caucasus**, "im kubanischen Bezirk", on leaves of *Vitis vinifera* (*Vitaceae*).
*Lit*.: Saccardo (1895: 619).
*Ill*.: Sorokin (1893: tab. 4, figs 49–50).
*Original diagnosis* (Sorokin 1893): Nach ihrem äusseren Aussehen sind die durch diesen Pilz verletzten Blätter den durch das *Cladosporium fasciculatum* geschädigten sehr ähnlich. Hier finden wir dieselben bräunlichen Flecken ohne deutliche Umrisse, mit dunklen Punkten im Zentrum, welche den Wohnsitz des Parasiten anzeigen. Aber bei der mikroskopischen Untersuchung ist ein grosser Unterschied sogleich zu bemerken; hier haben wir ein Bündel von Hyphen, welche auch aus einer Spaltöffnung der Nährpflanze herauskommen, aber sich durch eine ungewöhnliche Länge unterscheiden. Keine der bekannten Cladosporium-Arten hat solche langen fruchttragenden Hyphen; darum der Name *Cl. longipes*. Das Bündel ist an der Stelle, wo es aus der Spaltöffnung heraustritt, etwas angeschwollen, gleichsam eine Zwiebel bildend; die hellgrauen Hyphen sind durch zahlreiche Querwände geteilt und schnüren auf ihrer Spitze durchsichtige und farblose, längliche Sporen ab. Die reifen Sporen sind durch 1–3 Querwände geteilt, 2–3 µm breit und 6–9 µm lang; sie entspringen nicht nur aus der Spitze der Hyphe, sondern bisweilen auch an der Seite, so dass man Präparate finden kann, wo die fruchttragende Hyphe nicht eine sondern mehrere Sporen trägt. Innerhalb des kranken Blattes findet man das Mycelium, welches aus Fäden von verschiedener Dicke besteht. Im Protoplasma liegen hier und da glänzende Öltropfen. Querwände hat Verf. im Mycelium nicht bemerkt.
*Notes*: Type material could not be traced. Status remains unclear.

*lophodermii* Georgescu & Tutunaru, Rev. Biol. (Bucharest) 3(1): 61. 1958.
*Type*: **Romania**, Poiana Stalin at Postăvaru, on apothecia of *Lophodermium pinastrum* (*Rhytismataceae*) on needles of *Pinus sylvestris* (*Pinaceae*), Jun. 1956.
*Lit*.: Heuchert *et al*. (2005: 56).
*Ill*.: Georgescu & Tutunaru (1958: 60, fig. 14).
*Original diagnosis* (Georgescu & Tutunaru 1958): Tapeta supra discum, velutosa, bruneo, nigricantia et interdum fasciculis hypharum bruneis ad basis et lateralia apotheciorum praedita. Mycelium ante hypothecium e plectenchymo cellularum rotundarum, ante hymenium ascarum hyphis solitarii, erectis irregulariter curvatis, parce oblique sursum ramosis cum cellulis clavulatis. Supra hymenium e his hyphis duo vel plures conidiophori erecti irregulariter curvati atque geniculati flavobrunnei, hyalini, septis sparsis, 110–130 µm longis et 4–5 µm crassis, cellula terminali 30–40 µm longa, apice ± clavuta evadunt. Conidia formiis variis, irregulariter ellipsoidea et ovoidea brunnea vel ægre verrucata, apice sæpe rotundata frequenter unicellularia 5–15 µm longa, 5–6 µm lata, bicellularia 10–18 × 5–8 µm, raro tricellularia 18–21 × 5.5 µm et quadricellularia 20–26 × 5.5–6 µm, ad septa non constricta.
*Notes*: Type material of this species was not available for a re-examination. The status of this species is unclear. According to the original description and illustration, it is possibly a true member of *Cladosporium s. str*. Järva & Parmasto (1980) recorded this species from Estonia, but without any details.

*lychnidis* Z.Y. Zhang & Y.L. Liu, in Zhang, Liu, Wei & He, Plant Diseases and Their Control: 104. 1998.
*Holotype*: **China**, Hubei, Wuchang, on *Lychnis coronata* (*Caryophyllaceae*), 21 Sep. 1980, J.Y. Li & T.Y. Zhang, No. 13632 (MHYAU 03958).
*Ill*.: Zhang *et al*. (1998c: 105, fig. 2), Zhang *et al*. (2003: 118, fig. 76).
*Original diagnosis* (Zhang *et al*. 1998c): Coloniae effusae, tenuis atro-brunneae, dispersae, punctatae vel patulae. Mycelium immersum. Conidiophora solitaria, erecta, simplicia, septata, atro-brunneae, 33.4–56.5 × 3.3–3.3 µm, apice sympodialiter elongata cicatricosa. Ramoconidia continua vel 1-septata, laevia, apice ± inflata denticulata, basi atro-brunnea apicem versus brunnea, 7.7–13.1 × 4.6–7.2 µm. Conidia catenata, ellipsoidea, ovoides vel subrotunda, continua vel raro uniseptata, laevia pallide brunnea, 4.1–12.3 × 2.8–3.1 µm.
*Notes*: Zhang *et al*. (2003) mentioned a second collection on *Dianthus chinensis*.

*lycopersici* Plowr., Gard. Chron. 16: 621. 1881.
*Type*: **UK**, on fruits of *Solanum lycopersicum* (= *Lycopersicon esculentum*) (*Solanaceae*).
*Lit*.: Saccardo (1892: 602), Ferraris (1912: 350).
*Original diagnosis* (Plowright *l.c.*): Hypha tufted, septate, irregular in outline at their apices, springing by their bases from a black spot; compacted mycelium, spores abundant, cylindrical, black, 1–3-septate, slightly pointed at their extremities; 10–30 mk. long, by 8–10 mk. wide.
*Notes*: Status remains unclear. Type material could not be found at Kew (K).

*maculans* (Catt.) Sacc. → *oryzae* Sacc. & P. Syd.

*malvacearum* C.D. Sharma, Gadp., Firdousi, A.N. Rai & K.M. Vyas, Indian Phytopathol. 51(2): 156. 1998.
*Holotype*: **India**, Madhya Pradesh, Shahdol circle, Amarkantak (south forest division), on living leaves of *Kydia calycina* (*Malvaceae*), Jan. 1993, C.D. Sharma (S.U. Herb. No. C.S.5).
*Isotype*: (?) IMI 254691.
*Ill*.: Sharma *et al*. (1998: 154, fig. 2).
*Original diagnosis* (Sharma *et al.* 1998): Maculae amphigenosae, fere irregulares et parvae sed avadentes magnae, et aetate progrediente se extendents per totam superficiem folii atro. Coloniae epiphyllosae, forma punctorum, tenuissimorum, glaucae atrae. Mycelium hypharum, plerumque immersum, interdum superficiales septatum, angustum, laeve et ramosum, hyphae repentes, medio vel fusce brunneis, usque 2.5–5 µm diametro. Stromata presentia, misere formata, pseudoparenchymatosa, obscure brunneae vel atro. Conidiophori plerumque solitarii, interdum caespitosi, lax fasciculati, macronematosi, mononematosi, usque 11 transversae septati

glabrae, raroramosi, erecti vel suberecti, parvum curvati, medio vel fusce brunneae, 18.5–228 × 1.5–6.5 µm. Cellulae conidiogenosae integratae, terminales et intercalares, polyblastae, sympodiales, conidis, orientibus ex tumoribus, terminalibus, quae, fiunt, postea intercalares, cicatricatae, cicatrices, distinctae, crassae. Conidia simplicia, catenata in catenis, ramosis, arida, acropleurogenosa, cylindrata, doliiformia, ellipsiformia, fusiformia, ovata, globosa vel subglobosa, apices obtusi, bases rotundatae vel obconico-truncatae, laevia, usque 4 transverse septati, hilo distincto crassae interdum non crassae, cum eminentia, plerumque moderate brunneae, et parvae conidis fusce olivacea, 3–25.5 × 1.5–9.5 µm.
*Notes*: Data given on the label of the isotype collection in herb. IMI (254691) [on *Grewia* sp. (*Tiliaceae*), India, Univ. Gorakhpur, A.N. Rai] deviate from the data cited in the original diagnosis. Isotype material of *C. malvacearum* has probably been mixed up with a second, quite distinct collection. The collection on leaves of *Grewia* sp. showed a *Stenella*-like or *Ramichloridium*-like hyphomycete. Sharma *et al*. (1998) compared the symptomatological and morphological features of *C. malvacearum* with those of earlier validly published species of *Cladosporium* on various hosts stating that the species differs considerably from all in its important taxonomical characters. They reported *C. malvacearum* as showing some affinities with *C. apicale* and *C. uredinicola* but being distinct in having amphigenous, irregular, small to very large leaf spots and epiphyllous colonies, mid to dark brown comparatively smaller conidiophores, and olivaceous-brown, up to 4 transversely septate, broad conidia.

*manoutchehrii* Esfand., Sydowia 5: 368. 1951.
*Type*: **Iran**, Polé Zangouleh, on living leaves of *Quercus* ×*atropatena* (*Fagaceae*), 27 Jul. 1948, Manoutchehri.
*Original diagnosis* (Esfandiari 1951): Caespituli hypophylli, raro etiam epiphylli, ambitu orbiculares vel omnino irregulares, saepe confluentes et magnam folii partem aequaliter et densissime obtegentes, obscure olivacei; conidiophora solitaria vel saepe complura e hypostromate innato-erumpenti, pseudoparenchymatico, pellucide olivaceo oriunda, divergentia, recta vel plus minusve flexuosa, septata, 25–90 µm, raro usque 120 µm longa, 3–6 µm crassa, olivacea, simplicia vel apicem versus 2–3-furcata, ramulis inaequialtis, valde divergentibus; conidia quoad formam et magnitudinem variabilissima, minora plerumque plus minusve globosa, 2.5–4 µm diam., continua, majora ellipsoidea vel oblonga, interdum subfusiformia vel clavato-oblonga, continua vel circa medium septata, non vel lenissime constricta, mellea vel pallide olivacea, 5–15 × 3.5–5 µm.
*Notes*: Esfandiari (1951) reported this species to occur in dense caespituli mainly on the lower leaf surface on pale brown spots caused by a gloeosporioid fungus, so that *C. manoutchehrii* is probably only a secondary invader.

*melanophlaei* Thüm., Flora 60: 412. 1877.
*Type*: **South Africa**, Promont, near Grahamstown, on living leaves of *Rapanea melanophlaeos* (≡ *Myrsine melanophlaeos*) (*Primulaceae*), summer 1876, P. Mac. Owan, No. 1255.
*Lit*.: Saccardo (1886: 358).
*Original diagnosis* (Thümen 1877): Cl. in foliorum pagina inferiore maculas indeterminatas, fibrosas, velutinas, explanatas, inquinantes formans; hyphis longissimis, gracillimis, erectis, subrectis vel minime curvatis, breviarticulatis, tenuissimis, fuscis; sporis cylindraceis, apice rotundatis, basi obtusis, uniseptatis, 14–16 mm. long, 3 mm. crass., pallide fusco-stramineis, subdiaphanis.
*Notes*: Type material could not be located.

*metaplexis* Z.Y. Zhang & X.Y. Wang, Mycosystema 19(2): 165. 2000.
*Holotype*: **China**, Heilongjiang, Harbin, Xiang-fang, on living leaves of *Metaplexis japonica* (*Apocynaceae*), 2 Sep. 1992, Y.X. Wang & H. Li (MHYAU 07830).
*Ill*.: Zhang *et al*. (2000a: 166, fig. 1), Zhang *et al*. (2003: 123, fig. 80).
*Original diagnosis* (Zhang *et al*. 2000a): Maculis angularibus, irregularibus, pallide flavis vel flavido-brunneis, coloniis brunneis vel atro-brunneis hypophyllis, dispersis vel interdum confluentibus, 1.5–5.0 × 1.5–4.0 mm. Myceliis immersis. Conidiophoris solitariis, erectis, flexuosis vel undulatis, simplicibus, septatis, geniculatis, pallide brunneis, versus apicem pallidis, 3–5-cicatricosis, 31–103 × 5.1–5.7 µm. Ramoconidiis continuis, rarenter ad apicem inflatis denticulatis, basi cicatricibus conspicuis, 20.6 × 7.7 µm. Conidiis solitariis, cylindricis, obclavatis, rectis vel sinuosis, 0–1-septatis, raro 2–3-septatis, cellulis amplitudine inaequalibus, laevibus, pallide brunneis, basi cicatricibus praeditis, 15.4–28.3 × 6.4–7.7 µm.

*microporum* Rabenh., Grevillea 17(83): 66. 1889.
*Types*: **Italy**, Sardinia, Gonnos-Fanadiga, on leaves of *Nerium oleander* (*Apocynaceae*), Dr. Marcucci, Unio Itin. Crypt. 42 (*e.g.*, B, HBG, M).
≡ *Cladosporium microporum* Rabenh., in Marcucci, Unio Itin. Crypt., No. 42. 1866, *nom. nud.*
*Original diagnosis* (Cooke 1889): Hypophyllum. Caespitulis erumpentibus, gregariis, minutissimis, atris. Hyphis conidiisque – ?
*Notes*: Unio Itin. Crypt. (1866) is a selection of species made by Marcucci and determinated by Rabenhorst. New species were not validly published, because descriptions were not given. Cooke (1889): "In our specimens only a minute species of *Coniothyrium* can be found". Saccardo (1892: 603, 1895: 617) changed the name to *C. microsporum* Rabenh. Several duplicated of the original material have been examined, but no trace of a *Cladosporium* was found.

*microspermum* Berk. & M.A. Curtis, Grevillea 3(27): 107. 1875.
*Type*: **USA**, South Carolina, on leaves of *Quercus obtusiloba* (*Fagaceae*), No. 1686.
*Lit*.: Saccardo (1886: 360).
*Original diagnosis* (Berkeley 1875): Floccis tenuibus divaricato-furcatis articulatis; sporis minutis uniseptatis.
*Notes*: Zhang *et al*. (1998d) described and illustrated a collection determinated as *C. microspermum* on *Lithocarpus viridis* from China, which could not be checked.

*microspilum* Syd. & P. Syd., Ann. Mycol. 18: 102. 1920.
*Type*: **Philippines**, Luzon, Prov. Laguna, Mt. Maquiling, on leaves of *Cissampelos pareira* (*Menispermaceae*), 26 Apr. 1919, T. Collado, No. 6271.
*Lit*.: Saccardo (1931: 793).
*Original diagnosis* (Sydow & Sydow 1920): Maculae minutae, orbiculares, 1–2 mm diam.; caespituli amphigeni, saepius hypophylli, olivaceo-brunnei; hyphae fuscae vel fuscidulae, usque 400 µm longae, pluries septatae (articulis 20–50 µm longis), 4–5 µm crassae, rectae vel leniter curvatae; conidia sive continua 8–12 × 4–5 µm, sive 1-septata usque 20 µm longa, rarius 2-septata et tunc usque 25 µm longa, non constricta, fuscidula, levia.
*Notes*: Type material could not be traced, neither in herb. B nor S.

*microsporum* Trab., in Roumeguère, Fungi Sel. Gall. Exs., Cent. XV, No. 1426. 1881.

*Type*: **Algeria**, Trabut, on leaves of *Nerium oleander* (*Apocynaceae*).
≡ *Bispora trabutiana* Sacc., Bull. Soc. Roy. Bot. Belgique 31(2): 237. 1892.
*Lit.*: Saccardo (1895: 616), Lindau (1907: 768).
*Original diagnosis* (Saccardo 1895): Caespitulis hypophyllis, exiguis, atris, e stromatum locellis oriundis; catenulis fasciculatis, 45–60 × 6–7 µm, hyphopodio brevi, 15 × 2.5 µm, continuio, simplici, rarius furcate suffultis; conidiis ellipsoideis, utrinque obtusis, 8–9 × 6–7 µm, ternissenis in quaque catenula, typice 1-septatis, non v. vix constrictis, rarissime 3-septatis v. submuriformibus, fuligineis.
*Notes*: Type material was not available for a re-examination. Lindau (1907) reported an additional collection of this species on leaves of *Rhododendron ponticum* from the Netherlands.

*miyakei* Sacc. & Trotter, Syll. fung. 22: 1370. 1913.
≡ *Cladosporium oryzae* I. Miyake, J. Coll. Agric. Imp. Univ. Tokyo 2: 262. 1910, *nom. illeg*., homonym, non *C. oryzae* Sacc. & P. Syd., 1899.
*Type*: **Japan**, on leaves of *Oryza sativa* (*Poaceae*).
*Lit.*: Padwick (1950: 170).
*Ill.*: Miyake (*l.c.*: tab. 14, figs 68–70).
*Original diagnosis* (Saccardo 1913a): Mycelio superficiali, repente, maculas nigras efficiente; conidiophoris prominentibus obscuris, varie longis, plerumque 45–70 × 4–5 µm, septatis, apice alterne denticulatis; conidiis brunneis, 1–4-sed plerumque 2-locularibus, magnitudine variabilibus, 7–20 × 4–6 µm, septis constrictulis.
*Notes*: "A. *Cl. maculani* mycelio superficiali distinctum". (Saccardo 1913a). Padwick (1950) cited a record of this species from Bengal, India.

*mori* (Yendo) H. Zhang & Z.Y. Zhang, Proceedings of Phytopathological Symposium Organized by Phytopathology Laboratory of Yunnan Province 2: 306. 1998.
*Basionym*: *Hormodendrum mori* Yendo, Dai-Nihon Sanshi Kaiho 335: 6. 1919.
*Type*: **Japan**, on *Morus* sp. (*Moraceae*).
*Ill.*: Yendo (1919: fig. 2), Yendo (1927: 217–218, figs 91–92), Zhang *et al*. (2003: 127, fig. 83).
*Original diagnosis* (Yendo 1919): Leaf spots distinct, irregular to angular, vein-limited, later confluent and enlarged, greyish-brown. Fruit bodies amphigenous, mainly hypophyllous dark indigo brown, velvety. Hyphae immersed and creeping on the leaf surface. Conidiophores emerging from creeping hyphae, straight, 235–290 × 5–7 µm, brown, simple or branched, 6–9-septate, occasionally sympodially proliferating. Conidial scars thickened. Conidia in simple or branched chain, lower conidia brown, 1–3-septate or non-septate and 23–30 x 6–8 µm, pale brown, ellipsoidal to limoniform and 6–10 × 5–6 µm.
*Notes*: Yendo (1919) provided a Japanese diagnosis for the new species *Hormodendrum mori*, which has been kindly translated by C. Nakashima (Japan). Zhang & Zhang (*l.c.*) assigned this species to *Cladosporium s. str*. and mentioned several records from China on *Morus alba*. However, neither type material of *Hormodendrum mori* nor the Chinese collections have been available for a re-examination, so the taxonomic status of this taxon remains unclear. A single collection on *Morus* from Germany proved to be conspecific with *C. cladosporioides* (Bensch *et al.* 2010).

*multigeniculatum* W. Yamam., Sci. Rep. Hyogo Univ. Agric., Ser. Agric. 4(1): 3. 1959, *nom. inval.*
*Type*: **Japan**, on *Phyllostachys reticulata* (*Poaceae*).
*Lit.*: Ho *et al*. (1999: 136).
*Ill.*: Yamamoto (1959: 4, figs 13–16), Ho *et al*. (1999: 135, figs 33–34).
*Original diagnosis* (Yamamoto 1959): Coloniis in agaro Czapeki rapide crescentibus; caespitulis velutinis, pulverulentibus, planis, interdum leniter sulcatis, olivaceis vel olivaceo-griseis, postea fusco-olivacentibus, reversum viridi-atrum; mycelio compacto intertexto, ex hyphis laxe ramosis, irregulariter septatis, ad septa non vel parum constrictis, levibus vel scabriusculis, e subhyalino pallide brunneis, 2.2–5.5 µm crassis composito; conidiophoris in hyphis terminalibus vel lateralibus, simplicibus, raro ramosis, rectis vel plus minus sinuosis, saepe dense irregulariterque multigeniculatis, interdum 1–5 nodulosis, 6–27 vel pluriseptatis, ad septa non vel parum constrictis, fuscis, sursum pallescentibus, levibus, 160–880 × 4–5 µm, ramis 48–88 µm longis, raro usque 180 µm longis; conidiis acropleurogenis, catenulatis, in catenulas dense ramosas dispositis; conidiis basis obclavatis vel obclavato-cylindraceis, deorsum attenuato-truncatis, apice plus minusve inflatis, saepe breviter pluraliterque proliferatis et irregulariter geniculatis, apice cum pluraliter hilis, continuis vel 1–2-septatis, pallide olivaceis, levibus, 13–34 × 3–5 µm; conidiis supernis ellipsoideis vel ovoideis, raro subglobosis vel oblongis, raro subglobosis vel oblongis, interdum apice cum 1–5 hilis, continuis vel 1-septatis, levibus vel minutissime verruculosis, e subhyalino pallide olivaceis, 4–12 × 2.5–4.5 µm.
*Notes*: Yamamoto did not designate a type. Ho *et al*. (1999) selected figures 33/34 as "lectotype" (iconotype) of this species, with lyophilized culture of ATCC 38012, batch 12-13-78 as epitype. This "lectotypification" is, however, incorrect since the figures cited are not elements from the protologue. Hence, the name *C. multigeniculatum* was not validated by Ho *et al*. (1999). A dried culture of ATCC 38012 has been examined (BPI 746095). This material does not fully agree with the original description [the long filiform conidiophores are not or only slightly geniculate in the upper part, *i.e.*, not strongly and densely geniculate as depicted in the original drawing, and the conidia are aseptate, (2–)4–18 × (2–)3–4(–5) µm (septate, much larger ramoconidia as originally described and illustrated have not been found]. The material examined agrees well with *C. tenuissimum*, except for the somewhat geniculate conidiogenous cells. Hence, the status of *C. multigeniculatum* remains unclear. The CBS culture CBS 122130 which probably represents an authentic strain of *C. multigeniculatum* was included in the phylogenetic analyses of the *C. cladosporioides* complex and proved to be conspecific with *C. cladosporioides* (Bensch *et al.* 2010).

*myrmecophilum* (Fresen.) Bayl. Ell., Trans. Brit. Mycol. Soc. 5(1): 138. 1914.
*Type*: **Germany**, in a nest of *Lasius fuliginosus* (insect).
*Basionym: Septosporium myrmecophilum* Fresen., Beitr. Mykol. 3: 49. 1863.
≡ *Macrosporium myrmecophilum* (Fresen.) Sacc., Syll. fung. 4: 538. 1886.
≡ *Cladotrichum myrmecophilum* (Fresen.) Lagerh., Entomol. Tidskr. 1900: 17. 1900.
*Lit.*: Saccardo (1931: 798).
*Ill.*: Fresenius (1863: tab. 6, figs 29–32), Bayliss Elliott (1914: tab. 2, figs 1–4).
*Original diagnosis* (Fresenius 1863): Schwarze, oft bündelweise zusammenstehende, einfache oder auch mitunter ästige, gerade oder mehr oder weniger gekrümmte Fäden, aus einer kriechenden, torulos-zelligen Basis. Sie sind unten dichter, oben entfernter querwändig und verdünnen sich nach oben allmählich. Sporen in

verschiedener Grösse und Entwicklung, einfach, zweizellig und mehrzellig. Die letzteren ausgebildeten haben eine rundlich-eckige Form und messen 1/80–1/50 mm; sie sind undurchsichtig und nur mit Mühe sieht man eine Spur ihrer Zellentheilung, während die jüngeren durchsichtig sind. Auch die Fäden sind durchsichtig. Ansitzende Sporen waren nirgends zu finden; sie lagen in ihren verschiedenen Entwicklungsformen zwischen der Basis der Fäden und die Spitze der letzteren erschien immer scharf abgestutzt.
*Notes*: Type material is not preseved. Status remains unclear. Material examined by Jessie S. Bayliss Elliott was supplied by H. Donisthorpe from freshly excavated ant (*L. fuliginosus* and *L. umbratus*) nests. Further designation or deposit of material was not specified by Elliott. Fresenius (1863) described his new species from the surface of a nest of *Formica fuliginosa* (= *Lasius fuliginosus*) consisting of wood fibres of *Picea*.

*neocheiropteridis* Y.L. Liu & Z.Y. Zhang, Mycosystema 19(2): 169. 2000.
*Holotype*: **China**, Yunnan, Kunming, Jindian, on living leaves of *Neocheiropteris palmatopedata* (*Polypodiaceae*), 4 Apr. 1997, K. Li & H. Xiong (MHYAU 07827).
*Ill*.: Liu *et al*. (2000: 170, fig. 1), Zhang *et al*. (2003: 129, fig. 85).
*Original diagnosis* (Liu *et al.* 2000): Maculis amphigenis, irregularibus, fulvis, 2–11 mm diam., postea interdum perforatis. Coloniis in PDA effusis, velutinis, fulvis. Conidiophoris fasciculatis, rectis vel flexis, non ramosis, septatis, pallide brunneis, 27.6–141.0 × 3.8–8.0 µm. Cellulis conidiogenis in conidiophoris coalitis, sympodialibus. Cicatricibus conspicuis. Ramoconidiis 0–1 septatis, laevis, 10.1–30.1 × 7–7.7 µm. Conidiis globosis, ovatis, ellipsoideis, pallide brunneis, laevis, 0–1 septatis, 3.7–8.8 × 3.7–7.8 µm.

*neottopteridis* Y.L. Liu & Y.H. He, Mycosystema 19(2): 169. 2000.
*Holotype*: **China**, Yunnan, Kunming, Jindian, on living leaves of *Asplenium nidus* (≡ *Neottopteris nidus*) (*Aspleniaceae*), 4 Apr. 1997, K. Li & H. Xiong (MHYAU 07828).
*Ill*.: Liu *et al*. (2000: 170, fig. 2), Zhang *et al*. (2003: 130, fig. 86).
*Original diagnosis* (Liu *et al*. 2000): Maculis amphigenis, saepe margine folii occupantibus, ellipsoideis, atro-brunneis, 3–8 mm diam., postea interdum perforatis. Coloniis in PDA effusis, velutinis, atro-brunneis. Conidiophoris fasciculatis, rectis, non ramosis, septatis, atro-brunneis, 190–563 × 3.5–7.7 µm. Cellulis conidiogenis in conidiophoris coalitis, sympodialibus. Cicatricibus conspicuis. Ramoconidiis 0–2 septatis, brunneis, laevis, 6.1–23.1 × 3.8–6.2 µm. Conidiis fusiformibus, ovatis vel ellipsoideis, 0–1 septatis, brunneis, laevis, 2.7–12.6 × 2.8–6.4 µm.

*nervisequum* Mont., Ann. Sci. Nat. Bot., Sér. 4, 8: 298. 1857.
*Type*: **France**, on leaves of *Eriobotrya japonica* (*Rosaceae*), L. Castagne, No. 2789.
*Original diagnosis* (Montagne 1857): Maculae variae magnitudinis in pagina foliorum superiori conspiciuntur ex epidermide emortua dealbataque griseae, subtus rufidulae, initio orbiculares tandem confluentia, ut evenire solet, irregulares, omnes limbo fusco plus minus lato ut in Depazeis vel Phyllostictis cinctae. Fibrarum fasciculi e fissuris cuticulae erumpentes nervos ultimi ordinis folii sequentes et tum reticulum visu mirabile efformantes. Fibrae ipsae stromate celluloso junctae, basi ob cellulam globosam subbulbosae, tunc erectae, flexuosae, tunc apice declinatae, ramum plerumque singulum gerentes, inaequales et inaequaliter septatae, septis modo appressis modo laxiusculis, oculo nudo vel armato atrae, at microscopii ope visae rufo-fuscae, 1/5–1/8 millim. longae, 0$^{mm}$,0050 ad 0$^{mm}$,006 crassae, sensim a basi ad apicem saepe decolorem et fructificantem attenuatae. Sporae acrogenae, initio continuae, ovoideae, mox deciduae, oblongae, septo transversali divisae, tandem septis ternis quadriloculares, longitudine inter 0$^{mm}$,005 et 0$^{mm}$,01 variabiles.

*nicotianae* Oudem., Ned. Kruidk. Arch., Ser. 3, 2(3): 769. 1902.
*Type*: **Netherlands**, Amerongen, on decaying leaves of *Nicotiana tabacum* (*Solanaceae*), Jul. 1901, C.J. Koning (L).
= *Cladosporium tabaci* Oudem., Beih. Bot. Centralbl. 11: 538. 1902.
*Lit*.: Saccardo (1906: 576), Lindau (1907: 829), Oudemans (1923), de Vries (1952: 94).
*Original diagnosis* (Oudemans 1902b): Hyphes en touffes médiocrement denses, en partie diffuses, en partie dressées, simples, flexueuses, à peine noueuses, couleur noisette, 150–170 × 20 µm, terminées par une conidie elliptique, 8 × 4–5 µm, d'abord hyaline, plus tard couleur noisette, ordinairement 1-septée.
*Notes*: The type is represented by only two drawings, the description is short and the drawings are so poor that this species was regarded as doubtful [a *nomen dubium*] (de Vries 1952).

*nitrariae* Dumitraş & Bontea, Rev. Roumaine Biol., Sér. Bot. 12(6): 387. 1967.
*Type*: **Romania**, Ploeşti, between Pîclele Mari and Pîclele Mici, on living leaves, fruits and twigs of *Nitraria schoberi* (*Nitrariaceae*), Jul. 1962, Tiberiu Oprescu (BUCM).
*Ill*.: Bontea & Dumitraş (1967: 388, fig. 2).
*Original diagnosis* (Bontea & Dumitraş 1967): Conidiophoris brunneis apice pallidioribus, erectis vel geniculatis, 3–5 septatis, rare continuis, 17–57 × 3–5 µm, solitariis vel 5–8 fasciculatis. Conidiis terminalis, ovatis, elongatis vel globosis, uni- rare 2-septatis, primum hyalinis deinde pallide brunneis vel atro-brunneis, 4–12 × 2–5 µm, solitaribus vel breviter catenulatis, facile caduci.
*Notes*: *Cladosporium nitrariae* parasitizes all aerial parts of its host plant *Nitraria schoberi*, an endemic plant in Romania, but particularly the fruits and apices of young shoots. Discoloured zones bordered by a blackish brown margin appear on fruits, which soon blacken due to the formation of the fructification of the fungus. The early attacked fruits wrinkle, dry and fall before maturation. The apices of attacked shoots defoliate prematurely and present blackish, elongated spots, sometimes comprising the shoot all around (Bontea & Dumitraş 1967). Type material of this species was not available for a re-examination.

*olivaceum* (Corda) Bonord., Handb. Mykol.: 72. 1851.
*Type*: **Czech Republic**, on rotten wood of *Picea* (*Pinaceae*).
*Basionym*: *Mydonosporium olivaceum* Corda, Deutschl. Fl. 3(13): 95. 1833.
*Lit*.: Saccardo (1886: 354), Lindau (1907: 811).
*Ill*.: Corda (1833: tab. 48).
*Original diagnosis* (Corda 1833): Acervuli minuti olivacei; floccis olivaceis septatis, subimpellucidis; sporis didymis luteis diophanis; muco colorato.

*ophiopogonis* T. Zhang & Z.Y. Zhang, Plant Diseases and Their Control: 110. 1998.
*Holotype*: **China**, Zhejiang, Hangshou, on living leaves of *Ophiopogon mairei* (*Asparagaceae*, *Liliaceae s. lat*.), 3 Nov. 1980, J.Y. Li & T.Y. Zhang, No. 44132 (MHYAU 03951).

*Ill.*: Zhang & Zhang (1998b: 110, fig. 2), Zhang *et al*. (2003: 136, fig. 91; pl. 13, fig. 2).
*Original diagnosis* (Zhang & Zhang 1998b): Maculata amphigena, subrotunda vellonge-ellipsoidea, ochracea, lineolata red-brunnea margina, prominula, 1–2(–5) mm longa. Conidiophora solitaria, erecta, simplicia, septata, recta vel sinuolata, sympodialiter prolifera denticulata, flavo-brunnea sursum pallescentia, 54.0–244.0 × 4.6–5.9 µm. Ramoconidia continua vel raro 1–2 septata, denticulata, pallide brunnea, 5.1–15.4 × 3.1–5.1 µm. Conidia catenata, continua, fusiformia, longe-ellip-soidea, sphaerica, laevia, pallide brunnea, hili non evident, 2.8–11.6 × 2.8–4.6 µm.
*Notes*: *Chlorophytum elatum* was given as an additional host (Zhang & Zhang 1998b). Since hila have been described as "non evident" this species probably does not belong in *Cladosporium s. str*.

*oplismeni* Syd., Philipp. J. Sci., (Ser. C., Bot.) 8: 507. 1913.
*Type*: **Philippines**, Luzon, Ifugao, Mt. Polis, on spikes of *Oplismenus hirtellus* ssp. *undulatifolius* (≡ *O. undulatifolius*) (*Poaceae*), McGregor.
*Lit.*: Saccardo (1931: 792).
*Original diagnosis* (Saccardo 1931): Caespitulis crassis, fructus totos densissime obte-gentibus et eos omnino destruentibus, olivaceo-brunneis; hyphis simplicibus, remote septatis, olivaceo-brunneis, usque ad 90 µm longis, 3–5 µm crassis; conidiis olivaceo-brunneis, continuis, 6–10 × 3.5–4.5 µm, vel elongatis, 1–3-septatis et tunc usque ad 20 µm longis, levibus.
*Notes*: Type material could not be traced, neither at herb. B nor at herb. S.

*oryzae* I. Miyake → *miyakei.*

*oryzae* Sacc. & P. Syd., Syll. fung. 14: 1082. 1899.
*Type*: **Italy**, on rotten culms of *Oryza sativa* (*Poaceae*).
≡ *Helminthosporium maculans* Catt., Arch. Triennale Lab. Bot. Crittog. 2/3: 122. 1879.
≡ *Cladosporium maculans* (Catt.) Sacc., Syll. fung. 4: 365. 1886, *nom. illeg*., homonym, non *C. maculans* Schwein., 1832.
*Lit.*: Lindau (1907: 814), Ferraris (1912: 339), Padwick (1950: 170).
*Ill.*: Cattaneo (1879: tab. 14, figs 7–9).
*Original diagnosis* (Saccardo 1886): Caespitulis discoideis, carnoso-fibrosis; hyphis simplicibus, fasciculatis, erectis, septatis, luteo-fuscis; conidiis minutis, oblongis, ditridymis, hyalinis, 15 × 6 µm.
*Notes*: Type material could not be traced. No authentic material in Saccardo's herbarium (PAD). All collections examined, deposited under *C. oryzae* did not contain any *Cladosporium* species. Oudemans (1923) cited *Jasminum fruticans* as host species, but this record presumably refers to *C. maculans* Schwein.

*ovorum* Pidopl. & Deniak, in Pidoplichko, Gribnaya Flora Grubykh Kormov: 272. 1953, *nom. inval.*
*Type*: **Ukraine**, on a hen's egg.
*Ill.*: Pidoplichko (1953: 272, fig. 73).
*Notes*: Type material probably not preserved.

*pallidum* Berk. & M.A. Curtis, Proc. Amer. Ackad. Arts 4: 127. 1858, 1860.
*Type*: **Nicaragua**, Greytown, on leaves of an unidentified host, 1856, U.S. Pac. Ex. 354 (K).
≡ *Cercospora pallida* (Berk. & M.A. Curtis) Cooke, Grevillea 17(81): 21. 1888, *nom. illeg*., non *C. pallida* Ellis & Everh., 1887.
*Lit.*: Saccardo (1886: 361, 1892: 638), Chupp (1954: 609), Crous & Braun (2003: 304).
*Original diagnosis* (Berkeley & Curtis 1860): Maculis orbicularibus pulveraceis; floccis erectis simplicibus; sporis oblongis sinuatis.

*pallidum* (Oudem.) H. Zhang & Z.Y. Zhang, Proceedings of Phytopathological Symposium Organized by Phytopathology Laboratory of Yunnan Province 2: 306. 1998, *nom. illeg.*, homonym, non *C. pallidum* Berk. & M.A. Curtis, 1860.
*Basionym*: *Hormodendrum pallidum* Oudem., Arch. Néerl. Sci. Exact. Nat. 7: 293. 1902.
*Type*: **Netherlands**, Bussum, from soil.
*Lit.*: Saccardo (1906: 581), Zhang *et al.* (2003: 233).
*Ill.*: Zhang *et al*. (2003: 233, fig. 152).
*Notes*: Zhang *et al*. (2003) recorded this species from China on *Antirrhinum majus* and *Enkianthus quinqueflorus*. In any case, the description and illustration of "*C. pallidum*" from China do not agree with the original description of *Hormodendrum pallidum* by Oudemans, who described branched (dendroid) conidiophores and much wider conidia, 12–20 × 5–8 µm.

*penicilloides* Preuss, Deutschl. Fl. 3(26): 31. 1848.
*Holotype*: **Germany**, on *Tubercularia granulata* and *T. vulgaris* (anamorphic fungi), C.G.T. Preuss, Nr. 396 (B 700006672).
*Lit.*:Heuchert *et al.* (2005: 56).
*Ill.*: Preuss (1848: pl. 16).
*Original diagnosis* (Preuss 1848): Caespitus effusis, olivaceis, crassis; floccis erectis, longis, irregulariter ramosis, ramulisque intricatis, fuscis, septatis, polymorphis; sporis ovatis, obovatis, oblongis, subrotundis, bisulcisve multiformibus; episporio hyalino, hylo basilari saepe instructo; nucleo firmiusculo diaphano.
*Specimen examined*: **Italy**, Veneto, Prov. di Treviso, Selva di Cadore, on *Prunus domestica*, Sep. 1875, P.A. Saccardo, Saccardo, Mycoth. Ven. 587 (B 700006671).
*Notes*: Type material and an additional collection from Italy have been examined, but proved to be in very poor condition, not allowing a final conclusion about the taxonomic status of this species. Nannizzi (1934) considered *C. madagascarense* a synonym of *C. penicilloides*. *Cladosporium madagascarense*, described as isolated from a human, is, however, a doubtful, excluded name (Dugan *et al*. 2004). Saccardo (1886) cited *C. penicilloides* as found on chrysalises at still attached leaves of *Prunus domestica* in north Italy. Oudemans (1920) listed *Betula verrucosa* and (1921) *Prunus domestica* as hosts. Bontea (1985, 1986) reported it from Romania on *Calycanthus floridus*, *C. laevigatus* and *C. occidentalis*.

*perpusillum* Sacc., Atti Reale Ist. Veneto Sci. Lett. Arti, Ser. 6, 2(3): 449. 1883–1884.
*Type*: **France**, Vendée, Malbranche, on culms of *Ammophila* sp. (*Poaceae*), no. 78.
*Lit.*: Saccardo (1886: 364).
*Original diagnosis* (Saccardo 1883–1884): Caespitulis creberrimis, punctiformibus, atris, superficialibus; hyphis e basi stromatica hemisphaerica sphaeriaeformi oriundis, filiformibus, 40–50 × 5 µm, sursum denticulato-sporigeris, continuis, fuligineis; conidiis oblongis v. breve fusoideis, continuis mox 1- (raro 2–3)-septatis, vix constrictis, 9–11 × 4 µm, olivaceis.
*Notes*: Type material could not be found. Status remains unclear.

*peruamazonicum* Matsush., Matsushima Mycol. Mem. 7: 47. 1993.
*Type*: **Peru**, Rio Ampiyacu, on rotten leaves, Oct. 1992.

*Original diagnosis* (Matsushima 1993): OBS in b/c – Coloniae effusae, luteo-brunneae. Conidiophora mononematica, erecta, recta, cylindrical, simplicia, septata, rigida, laevia, 50–100 µm longa, 3.0–4.0 µm crassa, circa basim atro-fusca, supra fusca, cellula terminali pallidiora sporadice verrucata, p.m. facile disarticulata, quae apice polyblastica denticulataque, conidiorum catenibus simlicibus acropetalibus blastogenis 3–7-seriebus dispositis ferens. Ramoconidia ubi presentia, 18–31.5 µm longa, 0–1-septata, apice polyblastica, denticulata, sporadice verrucata, pallide vel modice fusca. Conidia 1-septata, rarissime 2-septata, praecique sporadice verrucata, sicca, pallidissime brunnea, modice luteo-brunnea in massa; conidia primo (et interdum secundarie) formata clavata, 18.5–36.5 × 3.5–5.0 µm, conidia postea formata ellipsoidea 12–22 × 4.5–6.5 µm. In CMA – Coloniae p.m. lente crescentes, pallide luteo-brunnea, reverso atro-fusco.
*Notes*: Type material was not available.

*phlei-pratensis* Sawada, Bull. Gov. Forest Exp. Sta. 105: 96. 1958, as "*phlei-pratense*", *nom. inval.*
*Types*: **Japan**, Tohoku District, on leaves of *Phleum pratense* (*Poaceae*), 27 Jul. 1940, Iizuka (10516) and 18 Jul. 1941, Ikeda (10440).
*Original diagnosis* (Sawada 1958): Macula phyllogena, sparsa, fusiformis vel utrimque truncata, fulva vel centro rotunde fulva vel cana et circum fulva, circa 3 mm longa. Nonnulla–10 et nonnulla conidiophora densa badia, cylindrica, continua, 70–131 × 4.5–6 µm, apice cum nonnullis conidiis. Conidium ellipticum vel oblongum, 0–3 septatum, apud septa non constrictum vel constrictum, fuscum, 6–20 × 3–6 µm.
*Notes*: Type material could not be traced. In the original diagnosis two collections were mentioned, but the author did not designate a type. *Cladosporium phlei*, known from Asia, Europe and North America on *Phleum pratense*, deviates from the description of *Cladosporium phlei-pratensis* given above in having longer and wider conidiophores, up to 300 × 6–9 µm, and longer and wider conidia, 13–36(–57) × 6–14 µm (David 1997).

*pilicola* Richon, Cat. Champ. Marne: 452. 1889.
*Type*: **France**, Marne, Soulanges, on dry stems of *Galium mollugo* (*Rubiaceae*).
*Lit*.: Saccardo (1892: 602, as "*pilicolum*").
*Original diagnosis* (Saccardo 1892): Hyphis fasciculatis, brunneis, ramosis; conidiis cylindraceis, 1–3-septatis, concoloribus.
*Notes*: Type material undoubtedly not preserved. Status remains unclear.

*pisi* Cugini & Macch., Boll. Reale Staz. Agric. Modena, N.S., 10(1890): 104. 1891.
*Type*: **Italy**, Vaciglio near Modena, on legumes of *Pisum sativum* (*Fabaceae*).
*Lit*.: Saccardo (1892: 601), Lindau (1907: 825), Ferraris (1912: 349), Oudemans (1921: on *Vicia faba*), Gonzáles-Fragoso (1927: 203, on *Phaseolus* and *Pisum*), Snyder (1934: 890), Morgan-Jones & McKemy (1992: 11).
*Ill*.: Cugini & Macchiati (1891: tab. 5).
*Original diagnosis* (Saccardo 1892): Caespitulis fuscis, minutissimis in pustulis ex epicarpio deformato exortis insidentibus; hyphis elongatis, ramosis, flexuosis, crebre septatis, brunneis; hyphis fertilibus, pallide fuligineis; conidiis terminalibus, ovatis, subhyalinis, saepius 1-septatis, constrictis, 2-guttatis, 4.5–5.5 × 4–4.5 µm, lateralibus ellipsoideis, continuis, hyalinis, 7–9 × 2.5–4.5 µm.
*Notes*: The status of this taxon is uncertain (Farr *et al*. 1989). Type material could not be traced. Material from Spain, recorded by Gonzáles-Fragoso (1927), has been re-examined and proved to be a separate new species, *viz*., *C. leguminicola*. Gonzáles-Fragoso (1927) did not provide any new morphological details, but just translated the original description into Spanish. The original description of very small, subhyaline conidia, 4.5–5.5 × 4–4.5 µm (terminal) and 7–9 × 2.5–4.5 µm suggest a synonymy with *C. cladosporioides*, but without type material, a final conclusion is impossible.

*platycodonis* Z.Y. Zhang & H. Zhang, Mycosystema 19(3): 308. 2000.
*Holotype*: **China**, Heilongjiang, Monte Maoer, on living leaves and petals of *Platycodon grandiflorus* (*Campanulaceae*), 5 Sep. 1992, H. Li & Y.X. Wang (MHYAU 07826).
*Ill*.: Zhang *et al*. (2000b: 309, fig. 1), Zhang *et al*. (2003: 145, fig. 97).
*Original diagnosis* (Zhang *et al*. 2000b): Maculae in petalis evolutae vel amphigenae, circulares, brunneae, margine atrobrunneae, 1–2 mm diam. Coloniae punctiformes, interdum confluentes, velutinae, fuscae. Mycelium immersum. Conidiophora solitaria vel fasciculata, erecta vel leniter curvata, simplicia, septata, geniculata, denticulata vel cicatricosa, brunnea, sursum pallescentia, 29.6–110.5 × 3.6–4.6 µm. Ramoconidia continua vel raro 1-septata, ellipsoidea, ellipsoideo-cylindrica, apice denticulata vel cicatricosa, pallide brunnea, 7.2–19.3 × 2.6–4.7 µm. Conidia catenata, continua vel 1-septata, fusiformia, longe ellipsoidea, laevia, pallide brunnea vel hyalina, 5.1–16.7 × 3.1–5.1 µm, sporarum cicatrices visibiles.
*Notes*: Zhang *et al*. (2000b) reported the species also on *Adenophora stricta* from Jilin, China.

*polygonaticola* Z.Y. Zhang & W.Q. Pu, in Zhang, Liu, Wei & He, Plant Diseases and Their Control: 105. 1998.
*Holotype*: **China**, Jiangxi, Lushan, on living leaves of *Polygonatum cirrhifolium* (*Asparagaceae*, *Liliaceae s. lat*.), 6 Oct. 1980, J.Y. Li & T.Y. Zhang, No. 41551 (MHYAU 03949).
*Ill*.: Zhang *et al*. (1998c: 106, fig. 3), Zhang *et al*. (2003: 146, fig. 98; pl. 13, fig. 5).
*Original diagnosis* (Zhang *et al*. 1998c): Maculata amphigena, ellipsoidea, grisea, marginae atrobrunnea, protrudenta, 5 × 3 mm. Conidiophora solitaria, erecta, simplicia, septata, pallide brunnea, 65–167 × 3.1–5.1 µm, parte fertii sympodialiter prolifera geniculata denticulata, sinuolata. Ramoconidia continua vel 1 septata, laevia, cicatricia vel denticulata praedita, pallide brunnea, 5.7–20.6 × 5.1–5.1 µm. Conidia catenata, continua, ellipsoidea, laevia, pallide brunnea, cicatricia inconspicua, 3.1–7.7 × 2.6–3.9 µm.
*Notes*: Zhang *et al*. (2003) cited three hosts, viz., *Polygonatum cirrhifolium*, *P. cyrtonema* (China, Hubei) and *P. sibiricum* (China, Yunnan). The conidiophores of *C. polygonati*, described on *Polygonatum* sp. from Ireland, are solitary or fasciculate, typically monilioid, especially swollen at the conidiogenous loci, wider, 9–10 µm wide in the narrow parts, 15–18 µm where swollen; and the conidia are solitary or formed in short chains, 1–3-septate, longer and, above all, wider, (35–)40–70 × 18–24 µm (David 1997).

*polytrichorum* Reichardt, Verh. K.K. Zool.-Bot. Ges. Wien 27: 844. 1877, 1878.
*Type*: **Austria**, Tobelbad, near Graz, on *Polytrichum formosum* (*Polytrichaceae*), Sep. 1875, H.W. Reichardt.
*Original diagnosis* (Reichardt 1878): Hyphae in stupam e ferrugineo nigricantem contextae, longissimae, flexuosae, irregulariter

ramosae, cylindricae, apice obtusae, 0.003 mm crassae, fuscae, pachydermae, septatae, articulis diametro transversali terquinquies longioribus. Conidia hypharum articulis supremis lateraliter in ramulis brevibus conicis, 0.004–0.006 mm longis, 0.003 mm latis insidentia, mox decidua, unicellularia, sub-reniformia, 0.006–0.009 mm longa, e fusco nigricantia, cytiodermatae crasso, tuberculato.
An status conidiophorus *Lizoniae emperigoniae* Ces.?
*Notes*: This species is probably not a *Cladosporium*.

*potebniae* Pidopl. & Deniak, Mikrobiol. Zhurn. 5(2): 189, 194. 1938, as "*potebnjae*", nom. inval.
*Type*: **Ukraine**, from rotting fruit of *Malus* sp. (*Rosaceae*).
*Lit.*: Pidoplichko (1953: 270).
*Ill.*: Pidoplichko & Deniak (1938: 189, fig. 6).
*Notes*: Type is probably not preserved. Status remains unclear.

*profusum* Desm. ex Sacc., Syll. fung. 10: 602–603. 1892.
*Type*: **France**, Desmazières, Pl. Crypt. N. France 755 (*e.g.*, PC).
≡ *Cladosporium profusum* Desm., Pl. Crypt. N. France, No. 755. 1836, *nom. nud.*
≡ *Cladosporium profusum* Desm., in Rabenhorst, Fungi Eur. Exs., Cent. 6, No. 578. 1863, *nom. nud.*
*Lit.*: Saccardo (1886: 370, 1892: 602), Lindau (1907: 832), Gonzáles-Fragoso (1927: 211).
*Original diagnosis* (Saccardo 1892): Hyphis fasciculatis, nodulosis, septatis, fuscis, sursum pallidioribus, erectis, 6–7 µm crassis; conidiis apice hypharum v. nodulis insertis, ovoideis, magnitudine variis, continuis, uni-biseptatis, guttuligeris, 18–24 × 5 µm, pallidis.
*Notes*: Lindau (1907): "...Ebensowenig war es mir möglich festzustellen, wo Rabenhorst die Diagnose veröffentlicht hat und ob dies überhaupt geschehen ist. Woher Saccardo die Diagnose hat, ist mir nicht bekannt. Cooke hat in seinem zitierten Aufsatz nur die Abbildung, nimmt aber im Text auf die Art keinen Bezug. Am besten läßt man sie vielleicht ganz fort".
*Notes*: Gonzáles-Fragoso (1927: 211) provided a description and considered this species to be very close to *C. herbarum*. Rabenhorst, Fungi Eur. Exs. 578 (B, HAL, HBG) contained only *C. herbarum*, and the type of *C. profusum* f. (var.) *robustior* also proved to be the latter species.

*prunicola* McAlpine, Fungus Dis. Stone-fruit Trees Austral.: 100. 1902, as '*prunicolum*'.
*Type*: **Australia**, Victoria, Armadale near Melbourne, on partly decayed leaves of *Prunus armeniaca* (= *Armeniaca vulgaris*) (*Rosaceae*), Dec. 1899.
*Lit.*: Saccardo (1906: 575), Braun (2001: 53).
*Ill.*: McAlpine (1902: Figs 89, 90).
*Notes*: Type material is not preserved in VPRI, but description is close to *C. macrocarpum* (J. Cunnington, in litt.) (Braun 2001).

*psidiicola* J.M. Yen, Bull. Trimestriel Soc. Mycol. France 95(3): 188. "1979" 1980.
*Type*: **Hong Kong**, Tai-Yuan-Yu-Tsun, Hsin-Chiai, Kowloon, on living leaves of *Psidium guajava* (*Myrtaceae*), 13 Nov. 1971, Jo-min Yen, No. 71334 (LAM).
*Ill.*: Yen (1980: 187, fig. 2).
*Original diagnosis* (Yen 1980): Maculis irregulariter confluentibus, pallide brunneis. Hyphis internis subepidermicis vel intra cellulis epidermicis, pallide brunneis, ramosis, septatis, 3–7 µm diam. Conidiophoris plerumque fasciculatis, raro solitariis, simplicibus vel ramosis, pallide brunneis, erectis vel flexuosis, 0–5 septatis, 0–3 geniculatis, ad apicem rotundatis et cicatricibus ornatis, 15–70 × 3–5(–6) µm. Hyphis externis, hypophyllis, leviter repentibus, pallide brunneis, septatis, ramosis, 3–5(–6) µm crassis. Conidiis catenatis, ellipsoideis, fusiformibus vel cylindraceis, pallide brunneis, rectis vel leviter curvatis, 0–2(–3) septatis utrinque rotundatis et cicatricibus atrobrunneis ornatis, 5–28 × 3–6 µm.
*Notes*: Type material was not available for a re-examination.

*punctatum* (Sacc.) Sacc., Syll. fung. 4: 355. 1886.
*Type*: **France**, Rouen, Malbranche, on *Euonymus japonicus* (*Celastraceae*).
*Basionym*: *Cladosporium compactum* **punctatum* Sacc., Michelia 2(7): 363. 1881.
*Lit.*: Saccardo (1886: 359).
*Original diagnosis* (Saccardo 1886): Acervulis gregariis punctiformibus; hyphis brevibus subcontinuis, 30 × 4 µm; conidiis acrogenis oblongis, 15 × 5 µm, saepius continuis, olivaceis.
*Notes*: "Affine *Cl. subcompacto* Sacc." (Saccardo 1886). Type material could not be found in herb. Saccardo.

*punctulatum* var. *xylogenum* Fairm., Proc. Rochester Acad. Sci. 6: 131. 1922.
*Type*: **USA**, New York, Lyndonville, on the outside of a cigar box exposed to damp weather, 14 Dec. 1920, C.E. Fairman (associated with *Epicoccum agyrioides*).
*Original diagnosis* (Fairman 1922): Hyphae long, flexuose, septate, often containing a series of globose oil drops, 5–7 µm in width: spores ellipsoid, 1–3-septate, brown, minutely punctulate roughened, 10–20 × 7–8 µm.
*Notes*: Type material could not be found.

*pyriforme* Reichert, Bot. Jahrb. Syst. 56: 721. 1921, as "*pyriformum*".
*Type*: **Egypt**, near Bulak, on cladodes of *Opuntia ficus-indica* (*Cactaceae*), 1822/25, Ehrenberg (B).
*Lit.*: Saccardo (1972: 1338, as "*piriforme* I. Reichert").
*Ill.*: Reichert (1921: tab. 4, fig. 4).
*Original diagnosis* (Reichert 1921): Caespitulis confertis, atris pyriformibus, sub epidermide luxuriantibus, 150–200 µm longis, 60–120 µm latis; hyphis fertilibus fasciculatis, rectis, interdum ramosis, septatis, fuscescentibus, 120–170 µm longis, 2–4 µm latis; conidiis terminalibus, elongatis, ellipsoideis, 2-, raro 3-septatis, vel catenulatis, fuscescentibus, mox deciduis, 5–8 µm longis, 3–5 µm latis.
*Notes*: Status remains unclear.

*qinghaiense* T. Zhang & Z.Y. Zhang, Proceedings of Phyto-pathological Symposium Organized by Phytopathology Laboratory of Yunnan Province 2: 285. 1998, as "*qinghaiensis*".
*Holotype*: **China**, Qinghai, Huzhu, on *Pisum sativum* (*Fabaceae*), 3 Aug. 1989, H. Li & T.F. Li, No. 087 (MHYAU 03925).
*Ill.*: Zhang *et al*. (1998b: 286, fig. 1), Zhang *et al*. (2003: 148, fig. 100).
*Original diagnosis* (Zhang *et al*. 1998b): Maculis irregularibus, flavidis, 0.2–0.5 mm diam. Coloniis olivaceis hypophyllis. In CMA-cultura in 10 diebus ad 25 ºC coloniis 26 mm diam., atro-olivaceis, effusis vel apiculatis, aerobiis hyphis amplis, myceliis immersis vel superficialibus. Conidiophoris plerumque fasciculatis, raro ramosis, rectis vel flexuosis, 0–3-septatis, laevis, pallide brunneis, ad apicem cicatricibus ornatis, 60–120 × 4.0–5.4 µm. Conidiis breviter catenatis, ellipsoideis vel late ellipsoideis, brunneis, verruculosis, 0–3-septatis, cicatricibus ornatis, 10.8–21.6 (15.6) × 5.4–9.5 (5.8) µm.

*ramulosum* Reissek, Sitzungsber. Kaiserl. Akad. Wiss., Math.-Naturwiss. Cl. 7(2): 336. 1851.
*Type*: **Austria**, on pollen of *Pinus sylvestris* (*Pinaceae*).
*Lit*.: Saccardo (1886: 370, 1913a: 1370), Lindau (1907: 833).
*Original diagnosis* (Reissek 1851): Entsteht aus den Inhaltskörnern des Pollens von *Pinus sylvestris*, wenn er auf das aufgerissene Parenchym krautartiger Pflanzentheile gestreut wird, oder in Infusionen sich vorfindet. Die Entwicklung im ersten Falle vollständig, im zweiten theilweise beobachtet. Sie erfolgt, indem sich die Inhaltskörner vergrössern, nach Auflösung der Pollenzelle frei werden, die äusserste Schichte derselben sich zur Membran differenziert, und die Zelle in einen ästigen, sporentragenden Schlauch auswächst.
*Notes*: Reissek (1851): "(*C. entoxylinum* Corda var. ?)". "An diversum a *Cladosporio ramuloso* Desm.?" (Saccardo 1886). "Species omnino dubia, cfr. Lindau l.c." (Saccardo 1913a). Type material could not be traced. Status remains unclear.

*raphanicola* Opiz, Seznam: 117. 1852, *nom. nud*.
*Type*: **Czech Republic**, on *Raphanus* ? (*Brassicaceae*).
*Lit*.: Saccardo (1886: 370, as "*raphanicolum*"), Lindau (1907: 832), Kupka (1918: 156).
*Notes*: Type is not preserved at PRM. Kupka (1918): "Von dem variablen *C. herbarum* kaum verschieden...".

*sambuci* Brunaud, Champ. Charente-Infer. 1892: 38. 1892.
*Type*: **France**, Saintes, on leaves of *Sambucus nigra* (*Adoxaceae*).
*Lit*.: Saccardo (1895: 620).
*Original diagnosis* (Saccardo 1895): Maculis brunneis; acervulis sparsis v. confluentibus; hyphis olivaceis, septatis, interdum ramosis; conidiis subfusiformibus, olivaceis, primitus continuis, dein 1–3-septatis, 15–30 × 5–8 µm, septis haud constrictis.
*Notes*: Zhang *et al*. (2003) reported a collection on *Sambucus williamsii* from China determinated as *Cladosporium sambuci*, but the conidia of the Chinese collection were described to be much narrower, 2.6–5.1 µm.

*savastani* Carbone, Atti Ist. Bot. Univ. Pavia, Ser. 2, 14: 322. 1914.
*Type*: **Italy**, Pavia, isolated from sausage ["in botulis (Salame crudo)"].
*Lit*.: Saccardo (1931: 799).
*Original diagnosis* (Carbone 1914): Effusum, atro-olivaceum. Hyphis sterilibus crassis, quasi torulosis, septatis, dilute olivaceis, 7–10 µm diam; fertilibus erectis, simplicibus vel ramosis, brunneis, septatis, 100–350 × 4–6 µm; conidiis in hyphis et in ramis insertis, acropleurogenis, ovalibus vel oblong-ellipticis, vel pyriformibus, uniseptatis vel (saepius) continuis, 8–20 × 4–7 µm.
*Notes*: Type material unknown, probably not preserved. Status remains unclear.

*secedens* Fr., Summa veg. Scand. 2: 499. 1849.
*Type*: **Scandinavia**, on rotten Sterea (= *Stereum*).
*Lit*.: Saccardo (1886: 368).
*Original diagnosis* (Fries 1849): Caespites formut irregulars, effuses densos, fuscoolivaceos, fibris creclis simplicibus, aequalibus, undique septatis pellucidis, sporidiis 2, 5-septatis, septis dein secedentibus.
*Notes*: Type material not found. Status remains unclear.

*simplex* Schwein., Trans. Amer. Philos. Soc., N.S., 4(2): 277. 1832.
*Type*: **USA**, Pennsylvania, Bethlehem, on fallen leaves of *Fraxinus* sp. (*Oleaceae*), No. 2606 (PH 1020415).
*Lit*.: Saccardo (1886: 360).
*Original diagnosis* (Schweinitz 1832): C. floccis simplicibus, nigris, fere omnino septatis, ceterum in aversa pagina tam approximates, ut sistent maculam parvam, tenuissimum. Ceterum erectis, minutissimis. Sporidiis adhaerentibus, satis crebris, et ad basin floccorum hinc inde disperses, concoloribus.
*Notes*: The taxonomic status of this species is quite unclear since the type material is too meagre for a final conclusion. It was not possible to find sufficient fructification for a re-evaluation of this species. The original description (Schweinitz 1832) is too brief and non-informative for any conclusions about the status of this fungus.

*smilacis* (Schwein.) Fr., Syst. mycol. 3(2): 369. 1832.
*Syntypes*: **USA**, Salem, Bethlehem, in the epidermis of *Smilax rotundifolia* (*Smilacaceae*), (PH 01020424, 01020425).
*Basionym*: *Dematium smilacis* Schwein., Syn. fung. Carol. sup.: 102. 1822.
*Lit*.: Saccardo (1886: 367).
*Original diagnosis* (Fries 1832): Fasciculatum, erumpens, incanum, fibris, contiguis hyalino-pellucidis, apice sublobatis, stromate junctis.
*Notes*: Status remains unclear. No *Cladosporium* found, type material in bad condition. Zhang *et al*. (2003) cited a collection on *Smilax china* from Shaanxi, China.

*solutum* Link, Sp. pl., 6(1): 39. 1824.
*Type*: **Egypt**, near Sjut, on stems of *Hibiscus esculentus* (≡ *Abelmoschus esculentus*) (*Malvaceae*), Oct., Ehrenberg.
≡ *Cladosporium herbarum* b *solutum* (Link) Rabenh., Krypt.-Fl. 1: 113. 1844.
≡ *Cladosporium herbarum* var. *solutum* (Link) Sacc., Syll. fung. 4: 351. 1886.
*Lit*.: Prasil & de Hoog (1988: 53, as "*C. herbarum* var. *solutum*").
*Original diagnosis* (Link 1824): Cl. thallo effuso, floccis dense aggregatis obscure viridibus leviter adnatis, sporidiis globosis et ovalibus concoloribus.
*Notes*: Authentic material is not preserved in herb. B, so the identity of the species cannot be established (Prasil & de Hoog 1988). In Oudemans (1923), *Ricinus communis* (*Euphorbiaceae*) is given as host.

*stenosporum* Berk. & M.A. Curtis, Grevillea 3(27): 107. 1875.
*Type*: **USA**, South Carolina, on *Stylosanthes* sp. (*Fabaceae*), No. 2067 and on leaves of *Malus* sp. (*Rosaceae*), No. 2529 (not in herb. K).
*Lit*.: Saccardo (1886: 352).
*Original diagnosis* (Berkeley 1875): Floccis continuis deorsum fuscis; sporis angustis.
Flocci unbranched, darker below, slender, articulated, springing from a decumbent mycelium; spores oblong, narrow.
*Notes*: Bubák (1916) examined material of *Acrotheca dearnessiana* Sacc. sent to him by J. Dearness and thought it to be *Cladosporium stenosporum*. *Acrotheca dearnessiana* is a synonym of *Fusicladium pyrorum* (Schubert *et al*. 2003; Crous & Braun 2003). Zhang *et al*. (2003) reported and illustrated a collection determinated as *C. stenosporum* from Zhejiang, China on *Pyrus calleryana*.

*stercorarium* Corda, Icon. fung. 1: 14. 1837.
*Type*: **Czech Republic**, on bird dung.
*Lit*.: Saccardo (1886: 369), Lindau (1907: 831).

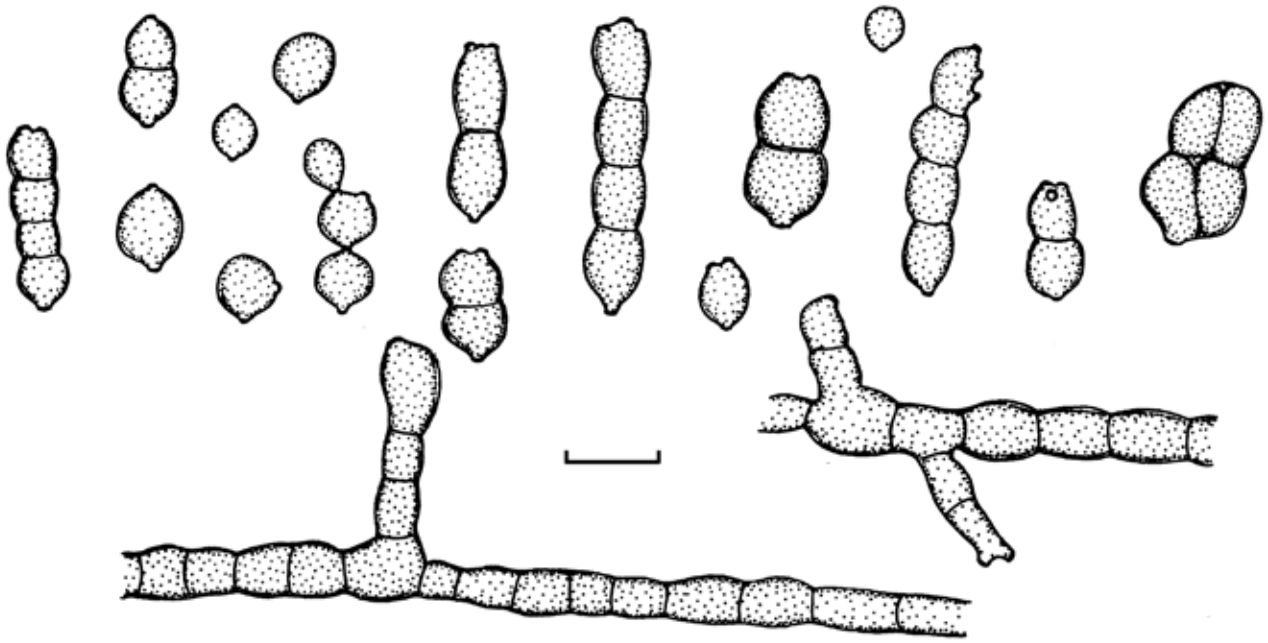

**Fig. 399.** *Cladosporium stromatum* (B 700006714). Conidiogenous cells and conidia. Scale bar = 10 µm. K. Bensch *del.*

*Ill.*: Corda (1837: tab. 3, fig. 205).
*Original diagnosis* (Corda 1837): Acervulis subeffusis, olivaceis, glaucescentibus; floccis erectis, simplicibus vel ramosis, pauciseptatis, curtis, olivaceo-cinereis; sporis simplicibus oblongis, concoloribus, in floccos tenuissimos concatenatis.
*Notes*: Type material is not preserved in herb. PRM.

*stercoris* Speg., Anales Mus. Nac. Buenos Aires, Ser. 2, 6: 338. 1899.
*Type*: **Argentina**, Parque de La Plata, on old rabbit dung, May 1888.
*Lit.*: Saccardo (1902: 1059), Farr (1973: 251).
*Original diagnosis* (Spegazzini 1899): Glomerulosum sparsum viridi-olivaceum, hyphis decumbentibus subtorulosis, conidiis ellipsoideis didymis. Acervuli pulvinulati crassiusculi compactiusculi hemisphaerici v. elongati (2–5 mm diam.) subvelutini intense virescente-olivacei: hyphae repentes longiusculae flexuosae laxe ramulosae dense intertextae graciles (5 µm crass.) chlorinae crebre septulatae, ad septa plus minusve constrictae, articulis subcuboideis, hinc inde papillato-apiculatae; conidia pleurogena ellipsoidea v. obovata (12–15 µm long = 5–6 µm crass.) 1-septata, ad septum constrictula, loculo infero saepius minore, laevia chlorina.
*Notes*: No type material at LPS.

*straminicola* Pidopl. & Deniak, in Pidoplichko, Gribnaya Flora Grubykh Kormov: 269. 1953, *nom. inval*.
*Type*: **Ukraine**, on straw and on hay.
*Ill.*: Pidoplichko (1953: 269, fig. 70).
*Notes*: Type material probably not preserved. Status remains unclear.

*strobilanthis* H.J. Lu, Y.L. Liu & Z.Y. Zhang, Mycosystema 22: 49. 2003.
*Holotype*: **China**, Shaanxi Prov., Xian, on living leaves of *Strobilanthes cusia* (*Acanthaceae*), 29 Aug. 1989, T.F. Li & H. Li (MHYAU 07908).
*Original diagnosis* (Lu *et al.* 2003): Maculae amphigenae, suborbiculares, ellipticae, griseo-viriduae vel pallide brunneae, margine atro-brunneae, 0.4–10 mm diam. Caespituli saepe hypophylli, punctiformes, griseo-atrobrunnei. Mycelium immersum. Conidiophora solitaria, erecta, 1–3-septata, pallide brunnea. Cicatrices conidiales conspicuae, fuscae, 5.1–139.8 × 2.6–7.7 µm. Ramoconidia 0–1-septata, olivacea, ad apicem denticulata, cicatricibus, 11.8–18.5 × 3.1–3.9 µm. Conidia catenata, longe ellipsoidea, fusiformia, non-septata, pallide olivacea, hila leniter incrassata.

*stromatum* Preuss, Deutschl. Fl. 3(26): 25. 1848. Figs 399, 400.
*Type*: **Germany**, Hoyerwerda, on wood of *Pinus* sp. (*Pinaceae*), Preuss (B 700006714).
*Lit.*: Saccardo (1886: 352, 355), Lindau (1907: 811), Ferraris (1912: 339), Oudemans (1919: on *Eutypa lejoplaca*, 1920: on *Juglans regia*, 1921: on *Acer campestris*), Heuchert *et al.* (2005: 57).
*Ill.*: Preuss (1848: tab. 13).
*Original diagnosis* (Preuss 1848): Stroma communiter convexum; floccis ramosis, lanosis, irregulariter septatis, subintricatis fuscis; sporis apice concatenatis copiosis, globosis, simplicibus, vel di- vel polydymis, oblongis, concoloribus.
*In vivo*: On wood. *Colonies* small, subcircular, pustulate, becoming confluent, dense, caespitose, pale grey-brown to dark-brown, velvety. *Mycelium* superficial, hyphae branched, septate, 1.5–4 µm wide, subhyaline, thin-walled, somewhat dimorphic, becoming wider and more thick-walled, 4.5–8 µm wide, more or less constricted at septa, smooth or almost so to somewhat rough-walled, thick-walled. *Conidiophores* solitary, very short, as lateral outgrowths of plagiotropous, wider, thick-walled hyphae. *Conidiogenous cells* integrated, terminal, with a single or few apical conidiogenous loci, protuberant, 1–1.5(–2) µm diam. Conidia catenate, in unbranched or branched chains, globose, subglobose, ovoid, broadly ellipsoid to oblong or somewhat irregular, 3–35 × 3–9 µm, 0–3-septate, often distinctly constricted at septa, subhyaline or pale yellowish, smooth or almost so, thick-walled, apex rounded with up to three apical hila, hila protuberant, conspicuous, 1–1.5(–2) µm diam, thickened and darkened-refractive.
*Notes*: The status of *C. stromatum* remains unclear. SEM examinations showed *Cladosporium*-like conidiogenous loci and

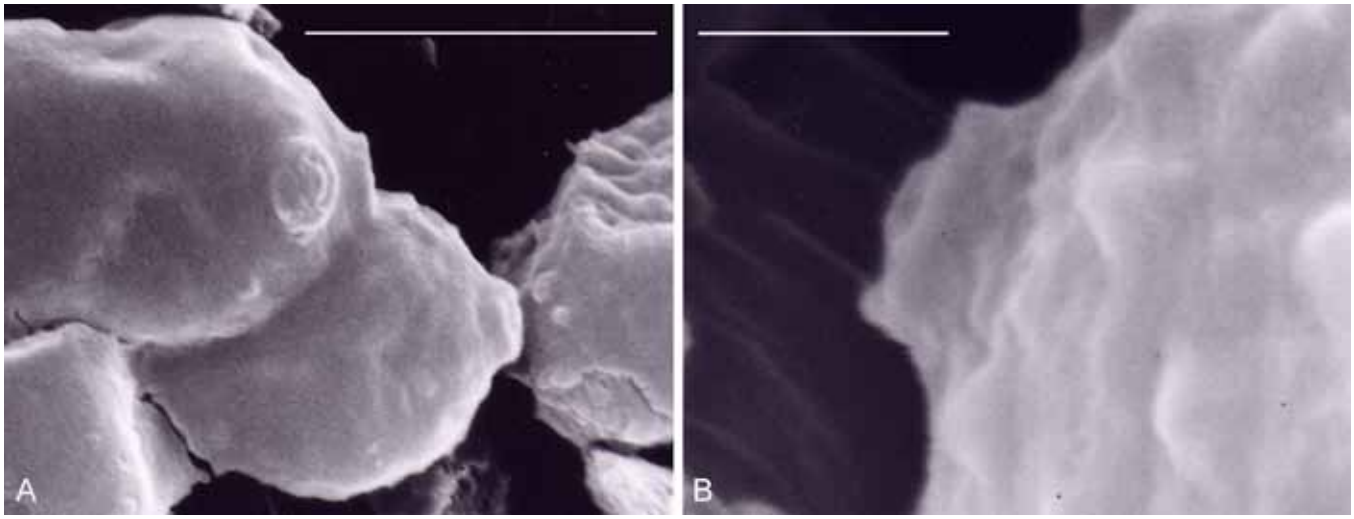


**Fig. 400.** *Cladosporium stromatum* (B 700006714). A–B. Details of the scar structure on conidia. Scale bars = 1 (B), 5 (A) µm.

scars (see Fig. 400), but the morphology is quite distinct from *Cladosporium*. It requires further examinations and molecular data are urgently needed to clarify the status of this species.

*subcompactum* Roum. & P. Karst. → *compactiusculum*.

*subcompactum* Sacc., Syll. fung. 4: 361. 1886.
*Type*: **France**, Rouen, Letendre, on dead stems of *Consolida ajacis* (≡ *Delphinium ajacis*) (*Ranunculaceae*).
≡ *Cladosporium compactum* Sacc., Michelia 2(6): 127. 1880, *nom. illeg.*, non *C. compactum* Berk. & M.A. Curtis, 1875.
*Lit.*: Lindau (1907: 825), Ferraris (1912: 344, 1914: 884), Oudemans (1921), Gonzáles-Fragoso (1927: 203).
*Original diagnosis* (Saccardo 1886): Caespitulis erumpentibus, compactiusculis, olivaceis, 1/3–1/2 mm. diam.; hyphis fasciculatis, simplicibus furcatisve, eseptatis, 70–90 × 6–7 µm, melleo-olivaceis; conidiis rhombeo-fusoideis, 10–14 × 6–7 µm, 1-septatis, non constrictis, concoloribus.
*Notes*: Type could not be found, probably not preserved.

*subfusoideum* McAlpine, Fungus Dis. Citrus Trees Austral.: 79. 1899.
*Type*: **Australia**, Victoria, Wandin Yallok, on fruits of *Citrus medica* (*Rutaceae*), Sep. 1898 and New South Wales, Parramatta, Feb. 1899, Cairnes.
*Lit.*: Saccardo (1902: 1058).
*Ill.*: McAlpine (1899: pl. 5, figs 21–22).
*Original diagnosis* (McAlpine 1899): Greyish-brown scab, overspreading green or yellow lemon, mostly on one side, cracking and becoming covered in patches with dusky layer. Hyphae ascending, dark olive, septate, very sparingly branched, average 4 µm thick. Conidia produced at apex, similarly coloured to hyphae or paler, 1–3-septate, not constricted at septa, smooth, fusiform or subfusoid, 12–15 × 3.5–4 µm.
*Notes*: Types are lost, no specimen in VPRI. "Type details agree with *Diplodia citricola* McAlpine (in part)" (personal communication with J. Cunnington / I. Pascoe).

*sycophilum* Farneti, Atti Ist. Bot. Univ. Pavia, Ser. 2, 8: 517. 1904, as "*sicophilum*".
*Type*: **Italy**, Pavia, on living fruits of *Ficus carica* (*Moraceae*).
*Lit.*: Saccardo (1906: 576), Lindau (1907: 821), Ferraris (1912: 347).
*Original diagnosis* (Farneti 1904): Caespitulis solitariis, sparsis, minutis, inaequalibus, bruneis; hyphis geniculatis, vel assurgentibus, simplicibus, septatis, ad septa constrictis, bruneis in acervulum torulosum aggregatis, 35–80 × 4.5 µm diam.; conidiis acrogenis, oblongis, uniseptatis, dilute fuscescentibus, diaphanis, 5–10 × 4 µm diam.
*Notes*: In Oudemans (1920) *Morus alba* is given as a further host. Type could not be traced.

*syringae* Montem., Riv. Patol. Veg., Ser. 2, 1915: 226. 1915.
*Type*: **Italy**, Montubeccaria, Pavia, on leaves of *Syringa vulgaris* (*Oleaceae*).
*Lit.*: Saccardo (1931: 793).
*Original diagnosis* (Saccardo 1931): Amphigenum; caespitulis sparsis, brunneis, in stromate epidermico vel subepidermico insertis; hyphis fasciculatis, simplicibus, flexuosis, septatis, fuscidulis, summo subhyalinis, 60–80 × 3–4 µm; conidiis brunneis vel olivaceis, 1–2-septatis, cylindricis, levibus, 15–20 × 3 µm.

*tabaci* Oudem., Beih. Bot. Centralbl. 11: 538. 1902.
*Type*: **Netherlands**, Bussum, on decaying leaves of *Nicotiana tabacum* (*Solanaceae*), Aug. 1901, C.J. Koning (L).
= *Cladosporium nicotianae* Oudem., Ned. Kruidk. Arch., Ser. 3, 2(3): 769. 1902.
*Lit.*: Saccardo (1906: 576), Lindau (1907: 829).
*Original diagnosis* (Oudemans 1902a): Hyphis caespitosis, erectis, divergentibus, simplicibus, flexuosis, subnodosis, septatis, avellaneis (Sacc. Chrom. No. 7). Conidiis acrogenis, ellipticis, 8 × 5–4 µm, primo hyalinis, denique avellaneis, 1-septatis.
*Specimen examined*: **Cuba**, Prov. Remedios, Antilles, on *Nicotiana tabacum*, Dr. C. Preißecker, Krypt. Exs. 1628 (B 700006719, HBG, M).
*Notes*: The type of *C. nicotianae* [Netherlands, Amerongen, on decaying leaves of *Nicotiana tabacum*, Jul. 1901, C.J. Koning (L).] only consists of two drawings, and the description is rather brief [(Oudemans 1902b): Hyphes en touffes médiocrement denses, en partie diffuses, en partie dressées, simples, flexueuses, à peine noueuses couleur noisette (Sacc. No. 7), 150–170 × 20 µm, terminées par une conidie elliptique, 8 × 4–5 µm, d'abord hyaline, plus tard couleur noisette, ordinairement 1-septée.], and the drawings are so poor that this species was regarded as doubtful [a nomen dubium] (de Vries 1952).

A single collection from herb. B determinated as *C. tabaci* has been examined but proved to be quite distinct from the original description given above by having hyaline scolecosporous conidia and typical conspicuously thickened and darkened, planate

conidiogenous loci and hila belonging to the *Cercospora*-type. The fungus examined belongs to *Cercospora apii s. lat.*

*tenerrimum* Link, Sp. pl. 6(1): 41. 1824.
*Type*: **Germany**, Berlin, on rotting bark, Link (B 700006720).
*Lit.*: Saccardo (1886: 355), Lindau (1907: 831).
*Original diagnosis* (Link 1824): Cl. thallo effuse, floccis dense aggregatis albis, sporidiis globosis.
*Notes*: Type material contains various saprobic hyphomycetes, but no true *Cladosporium* has been found.

*tetrapanacis* D.X. Wu & Z.Y. Zhang, Mycosystema 22: 48. 2003.
*Holotype*: **China**, Shaanxi Prov., Xian, on living leaves of *Tetrapanax papyrifer* (*Araliaceae*), 29 Aug. 1989, T.F. Li (MHYAU 07906).
*Ill.*: Wu & Zhang (2003: 49, fig. 1).
*Original diagnosis* (Wu & Zhang 2003): Maculae amphigenae, suborbiculares, brunneae vel griseo-albidae, centro griseo-brunneae, 0.8–5.5 mm diam., margine pallide flavido-ochraceae. Caespituli hypophylli, griseo-fusci. Conidiophora solitaria, erecta, septata, geniculata, atro-brunnea, 35.1–75.6 × 2.7–4.1 µm. Ramoconidia 0–1-septata, pallide brunnea, ad apicem denticulata vel conspicue cicatricosa, 6.8–21.6 × 3.2–4.9 µm. Conidia catenata, ellipsoidea vel fusiformia, 0(–1)-septata, sporarum cicatrices visibiles, 6.5–13.5 × 3.2–4.9 µm.

*teucrii* Y.L. Liu & Z.Y. Zhang, Plant Diseases and Their Control: 101. 1998.
*Holotype*: **China**, Hubei, Wuchang, on living leaves of *Teucrium viscidum* (*Lamiaceae*), 24 Sep. 1980, J.Y. Li & T.Y. Zhang, No. 41007 (MHYAU 03954).
*Ill.*: Liu & Zhang (1998: 102, fig. 1), Zhang *et al.* (2003: 168, fig. 116; pl. 13, fig. 3).
*Original diagnosis* (Liu & Zhang 1998): Foliorum macula amphigena, subcircularis, brunnea vel pallide olivaceo-grisea, marginatis fuligenea prominula, hypophylla fulva, 2–3 mm diam. Conidiophora solitaria, erecta, 50–89 × 4.3–6.9 µm. Cellulosa conidiogena in conidiophora incorporta, sympodiala, cicatricia conspicuis. Ramoconidia continua, laevia, pallide brunnea, apice denticulata, 8.2 × 3.1 µm. Conidia catenata, ellipsoidea, continua, pallide brunnea, sporarum cicatricia visibilia, 3.1–9.8 × 2.6–2.8 µm.

*theobromicola* Av.-Saccá, Bol. Agric. (São Paulo) 21: 59. 1920, as "*theobromicolum*".
*Type*: **Brazil**, on *Theobroma cacao* (*Malvaceae*).
*Ill.*: Averna-Saccá (*l.c.*: figs 3–5).
*Original diagnosis* (Averna-Saccá, *l.c.*): Nas folhas atacadas (fig. 3, a) primeiramente se nota o empardecimento do ápice, que, aos poucos, seguindo as margens, attinge até 2/3 da lamina; raramente chega até á base. Estas manchas augmenttam e mudam de côr, tendo no fim uma coloração cinzenta ou branca. São quebradiças e cobertas por uma intensa efflorescencia granulosa, fina, preta, formada pelos orgãos de fructificação do fungo. As folhas assim atacadas, estando em ambiente humido, mostram uma efflorescencia cotonilhosa, branca, devido á intensa formação dos esporos. As folhas ficam, durante algum tempo, presas aos ramos, mas depois se desarticulam e cáem. Como se vê, o *Cladosporium* em questão poderá produzir ao cacaueiro graves prejuizos. No caso em exame a sécca apical descendente das folhas e o concomitante desenvolvimento do *Cladosporium* são frequentes nas plantas já atacadas pela gommose, ao que confirma ainda uma vez a theoria de Comes sobre as causas que determinam os phenomenos da *Brusca* nas plantas cultivacas. Nos tecidos atacados se nota um mycelio relativamente grosso, primeiro hyalino, depois pardo, ramificado, septado, que invade os elementos do parenchyma elaborante e do respiratorio, envolve e atravessa as cellulas e finalmente emitte touceiras de conidiophoros (fig. 4r) formadas por 3 a 15 conidiophoros, divergentes, sinuosos ou rectos, septados fuliginosos, tendo um crescimento apical muito accentuado, ligeiramente reentrantres em relação dos septos. No ápice dos conidiophoros se formam, agamicamente, os conidios. Elles são cylindricos ou ovaes, com ápices arredondados, muito ligeiramente curvados (fig. 4a), hyalinos (13 a 17.5 × 4.5 a 8 microns), alguns continuos, outros uniseptados, com conteúdo homogeneo e parede relativamente grossa. Germinam facil e rapidamente (fig. 5n, s, g) produzindo um ou dois tubos de germinação, um da cada loculo, primeiro continuo, depois setado, ramificado.

*tortuosum* Fr., Summa veg. Scand. 2: 499. 1849.
*Type*: **Scandinavia**, on wood of *Quercus* (*Fagaceae*).
*Lit.*: Saccardo (1886: 354).
*Original diagnosis* (Fries 1849): Dignoseitur fibris elongatis tenellis, intricatis, flexuosis, opacis, remote septatis, sporidiis globosis, raro septatis, sed in ramulos concatenatis, dein liberis fibris inspersis et sic Dematio affine.
*Notes*: Type material could not be found. Status remains unclear.

*transchelii* Pidopl. & Deniak, Mikrobiol. Zhurn. 5(2): 188, 194. 1938, *nom. inval*.
*Type*: **Ukraine**, from stalks of *Zea mays* (*Poaceae*).
*Lit.*: Pidoplichko (1953: 273).
*Ill.*: Pidoplichko & Deniak (1938: 188, fig. 5).
*Notes*: Type material probably not preserved. Status remains unclear.

*transchelii* var. *semenicola* (Pidopl. & Deniak) Pidopl. & Bilai, in Pidoplichko, Gribnaya Flora Grubykh Kormov: 274. 1953, *nom. inval*.
*Type*: **Ukraine**, on grains of oats.
≡ *Cladosporium viridiolivaceum* var. *semenicola* Pidopl. & Deniak ?
*Notes*: Type material probably not preserved. Status is unclear. It is unknown where the authors published this variety of *C. viridiolivaceum* Pidopl. & Deniak.

*transchelii* var. *viridi-olivacearum* (Pidopl. & Deniak) Pidopl. & Bilai, in Pidoplichko, Gribnaya Flora Grubykh Kormov: 274. 1953, *nom. inval*.
*Type*: **Ukraine**, isolated from rotting apples (*Malus* sp., *Rosaceae*).
*Basionym*: *Cladosporium viridiolivaceum* Pidopl. & Deniak, Mikrobiol. Zhurn. 5(2): 187, 194. 1938, as "*viridi-olivaceum*", *nom. inval*.
*Ill.*: Pidoplichko & Deniak (1938: 187, fig. 4).
*Notes*: Type material probably not preserved. Status remains unclear.

*tuberculatum* Fr., Summa veg. Scand. 2: 499. 1849.
*Type*: **Scandinavia**, on ostioli of *Cytospora leucosperma* (anamorphic fungus).
*Original diagnosis* (Fries 1849): *C. tuberculatum* sistit minuta, hemisphaerica tubercula, colorae griseofusco, fibris tenellis curtis pellucidis sursum septatis, sporidiis simplicibus l. uniseptatis.
*Notes*: No material seen; status remains unclear.

*typharum* f. *minor* Brunaud, Bull. Soc. Bot. France 36: 340. 1889.
*Type*: **France**, Rochefort, on leaves of *Typha latifolia* (*Typhaceae*).
*Lit*.: Saccardo (1899: 1081), Oudemans (1919).
*Original diagnosis* (Brunaud 1889): Conidies oblongues, 1-septées, olivacées, à deux gouttelettes, long. 15–16, larg. 8.
*Notes*: Type material could not be found.

*ulmariae Grognot*, in Roumeguère, Fungi Sel. Gall. Exs., Cent. XXXVII, No. 3697. 1886.
*Type*: France, on *Spiraea ulmaria* (= *Filipendula ulmaria* subsp. *ulmaria*) (*Rosaceae*), Roumeguère, Fungi Sel. Gall. Exs. 3697 (e.g., FH).
*Lit*.: Saccardo (1895: 621).
*Notes*: Doubtful species. A mixture of several saprobic hyphomycetes, incl. *Cladosporium* (some conidia agree with those of *C. herbarum*). Large, expanded stromata are developed. Most conidiophores are broken or without any scars, some conidiophores are *Periconiella*-like and a few are subdenticulate. The original description is very brief, only describing 'brown, cylindrical, 3-septate conidia'. It is imposssible to interprete what Roumeguère intended to describe.

*umbrinum* Fr., Syst. mycol. 3(2): 372. 1832.
*Type*: **France**, Montagne, on *Agaricus olearius* (*Agaricales*).
= ? ***Cladosporium herbarum*** (Pers. : Fr.) Link, Ges. Naturf. Freunde Berlin Mag. Neuesten Entdeck. Gesammten Naturk. 7: 37. 1816.
*Lit*.: Saccardo (1886: 369), Lindau (1907: 807), Oudemans (1919), Heuchert *et al*. (2005: 57).
*Original diagnosis* (Fries 1832): *C. umbrinum*, caespitibus effusis, contiguis tenuibus velutinis umbrinis, fibris brevibus flexis, sporidiis glomeratis. Densa et contigua sericea tela fungos obducit forte huic debetur phosphorescenti *Ag. olearius*. Fibrae contiguae, simplices l. ramosae, colore peculiari olivaceo-umbrino insignes. Sporidia conglomerata ut in Botrytide, sed certe hujus generis est species. Synonymon dubium, ill. Auctor ipse de genere dubiat. Ad *Agaricum olearium* in Gallis meridionali, Montagne (v. s.).
*Specimen examined*: **Germany**, original label: "*Botrytis pulvinata*, Persoon", *ex herb*. Link (B 700006764, holotype of *Botrytis pulvinata* Link).
*Notes*: In the original description of *C. umbrinum*, Fries (1832) cited *Botrytis pulvinata* as possible synonym (with question mark). Saccardo (1886) listed *C. umbrinum*, but cited *Botrytis pulvinata* as synonym without question mark. Type material of *B. pulvinata* has been examined and proved to be synonymous with *Cladosporium herbarum*. *Cladosporium umbrinum* is very probably a synonym of the latter species as well. Saccardo (1886) and Lindau (1907) recorded *C. umbrinum* on *Pleurotus olearius*, fruit bodies of other mushrooms and honeycombs of wasps from Belgium, France and Germany. *Agrocybe praecox* was listed as host of this species from Armenia and the Ukraine (Osipjan 1975). On the web-side "biodiversity.ac.psiweb.com", *C. umbrinum* has been listed from the Ukraine on "*Agaricales* (Fam. indet.)" and *Lactarius* sp.

*uniseptosporum* Matsush., Icones Microfungorum a Matsushima Lectorum: 36. 1975.
*Type*: **Japan**, Chiba, Kiyozumi Exp. Forest, Univ. Tokyo, on rotten wood, Oct. 1967 (Matsush. herb. 2147).
*Lit*.: Ho *et al*. (1999: 142).
*Ill*.: Matsushima (1975: pl. 59, fig. 3), Ho *et al*. (1999: 143, fig. 48).
*Original diagnosis* (Matsushima 1975): In b/c- et CMA-culturis: Coloniae tarde crescentes, coactae, olivaceae, margine restrictae, reversione atrofuscae. Mycelium ex hyphis ramosis, septatis, hyalinis-modice brunneis, 1–3 µm crassis compositum. Conidiophora solitaria, dense erecta, simplicia, rigida, septata, (20–)40–90 µm longa, 2.5–3.5 µm crassa, spice sympodialiter prolifera cicatricosa, sinuolata, inferne brunnea sursum pallide brunnea. Conidia catenas breves (usque ad 4) simplices vel ramosas formantia, cylindro-ellipsoidea, 1-septata, laevia, sicca, 5.5–10 × 2.5–3 µm, capitulum laxum radiatum olivaceum producentia.
*Notes*: Type material could not be available. Status remains unclear.

*urediniphilum* Speg., Anales Mus. Nac. Hist. Nat. Buenos Aires 31: 438–439. 1923.
*Holotype*: **Paraguay**, Asunción, Puerto Sajonia, on sori of *Uredo cyclotrauma* (*Uredinales*) on leaves of *Zygia latifolia* var. *communis* (= *Pithecolobium cauliflorum*) (*Fabaceae*), Oct. 1919, C. Spegazzini (LPS). *Permanent slide*: IMI 87163b.
*Lit*.: Deighton (1969), Saccardo (1972: 1340), Farr (1973: 252), Sutton (1973: 40), Heuchert *et al*. (2005: 58).
*Ill*.: Sutton (1973: 41, fig. 19 B).
*Original diagnosis* (Spegazzini 1923): Velutinum olivaceum mycelio in acervulis procurrente, hyphis tenuibus sursum, ad acervulorum margines praecipue, exertis pluriseptatis, olivaceis, simplicibus vix flexuosis, articulo supremo obsolete alterneque denticulato, denticulis conidiiferis: conidia elliptica v. subcylindracea, parva, utrimque plus minusve rotundata, continua v. 1-septata, laevia, hyalina v. vix fumosa.
*Notes*: In additional notes Spegazzini (1923) described the conidiophores and conidia as follows: Conidiophores 100–200 × 4–5 µm, 4–10-septate, without any constrictions at the septa; conidia 6–10 × 4–5 µm. Sutton (1973) examined the type material of this species and deposited a permanent slide at IMI. He described a species with verruculose surface sculpture, more conspicuous than in *C. gallicola*, and he stressed that the type collection was very meagre, without any intact conidiophores and only few conidia. Additional specimens of *C. urediniphilum* are not known, and the type material is too scarce for a final conclusion about the status of this species and its relation to *C. uredinicola* and other uredinicolous *Cladosporium* species.

*uvarum* McAlpine, Add. fungi vine Australia: 47. 1898.
*Type*: **Australia**, on berries dried up and shrunken of *Vitis vinifera* (*Vitaceae*).
*Lit*.: Saccardo (1899: 1079).
*Ill*.: McAlpine (1898: figs 72–74).
*Original diagnosis* (Saccardo 1899): Effusum, olivaceum, crassiusculum; hyphis sterilibus nodulosis, septatis, ramosis, flavo-viridulis brunneisque, 4–15 µm cr., hinc inde inflatis; hyphis fertilibus, atro-virentibus, septatis, apicibus obtusis v. subtenuatis, pallidioribus, 5.5–6 µm cr.; conidiis polymorphis globosis, ovoideis v. elongatis v. piriformibus, 10–19 × 4–9 µm, olivascenti-brunneis, 1–2-septatis v. continuis, levibus.
*Notes*: Type material or any other samples not seen. Status remains unclear. Zhang *et al*. (2003) reported the species on *Vitis vinifera* from Shaanxi, China.

*venturioides* Sacc., Nuovo Giorn. Bot. Ital., N.S., 22: 71. 1915.
*Type*: **Malta**, Zebbih, on faded or dead branches of *Amaranthus caudatus* (*Amaranthaceae*), Jan. 1914, No. 643.
*Lit*.: Saccardo (1931: 796).
*Original diagnosis* (Saccardo 1915a): Caespitulis in maculis fuscescentibus matricis gregariis, punctiformibus, venturioideis

nigris; hypostromate hemisphaerico irregulariter celluloso, fuligineo, 35 µm diam., hyphis conidiophoris ad hoc radiantibus, teretiusculis, variae longitudinis, 30–50 × 2.7–3 µm, sursum denticulatis, subcontinuis fuligineis; conidiis ex elliptico fusoideis, variae longitudinis, 14 × 4.5, v. 6–9 × 3.7–4.5 µm, olivaceo-fuscis, continuis v. rarius 1-septatis, levibus, rarius intermixtis ramoconidiis 1–2-apiculatis.
*Notes*: The following authentic material from PAD has been examined: on a dead leaf of *Amaranthus* sp., Malta, Jan. 1914, C. Gatto, No. 501 (PAD). This collection contains a single dead leaf of *Amaranthus* and possesses another number. Thus it does not fully agree with data from the type collection. The collection examined contains several saprobic imperfect fungi, but a *Cladosporium* agreeing with the original description could not be traced. Zhang *et al*. (2003) reported the species on *Amaranthus caudatus* (China, Zhejiang) and *A. tricolor* (China, Hubei). Type material of this species was not found.

*venturioides* var. *citricola* Sacc., Nuovo Giorn. Bot. Ital., N.S., 22: 72. 1915.
*Type*: **Malta**, Imtahleb, on leaves ("in foliis morientibus") of *Citrus* ×*aurantium* (*Rutaceae*), C. Balzan, 1014, no. 501.
*Lit*.: Saccardo (1931: 796).
*Original diagnosis* (Saccardo 1915a): Hypostromate 40–50 µm diam.; conidiophoris 80–90 × 4–5 µm; conidiis plerumque continuis, brevioribus, 5–7 × 2.5 µm, olivaceis.
*Notes*: No type material could be found at PAD.

*viride* (Fresen.) Z.Y. Zhang & T. Zhang, Proceedings of Phytopathological Symposium Organized by Phytopathology Laboratory of Yunnan Province 2: 306. 1998.
*Type*: On rotten fruits of *Vitis* (*Vitaceae*).
*Basionym*: *Penicillium viride* Fresen., Beitr. Mykol. 1: 21. 1850.
≡ *Hormodendrum viride* (Fresen.) Sacc., Syll. fung. 4: 311. 1886.
*Ill*.: Fresenius (1850: tab. 3, figs 16-19), Zhang *et al*. (2003: 175, fig. 122).
*Original diagnosis* (Fresenius 1850): Aus einer liegenden Basis aufrechte ästige Fäden, welche an der Spitze des Hauptstammes und der Aeste sich in dichotomen Sporenketten abgliedern. Sporen länglich und eiförmig, meist mit zwei runden Tröpfchen gezeichnet.
*Notes*: Type material not preserved. Recorded from China (Jiangxi) on *Vitis balanseana*.

*viridiolivaceum* Pidopl. & Deniak → *transchelii* var. *viridiolivacearum*.

*viridiolivaceum* var. *semenicola* Pidopl. & Deniak → *transchelii* var. *semenicola*.

*vitis-frutigeni*, *in herb*.
*Specimen*: **USA**, North Carolina, Wayneville, on fruit of *Vitis labrusca* (*Vitaceae*), 17 Sep. 1890, G.E. Boggs (BPI 427626, M-0057767).
*Notes*: Fruiting superfial. A true *Cladosporium s. str*. (*C. cladosporioides*-like, but conidiophores strongly geniculate-sinuous). Status remains unclear.

*zeae* Lobik, Trudy Severo-Kavkazsk. Inst. Zashch. Rast. 1(2): 41. 1933, *nom. illeg*., non C. zeae Peck, 1894.
*Type*: **Former USSR**, Caucasus, on *Zea mays* (*Poaceae*).
*Notes*: Type material could not be traced, probably not preserved.

*zizyphi* [*Macrosporium*] Bacc., Ann. Bot. (Rome) 14(3): 140. 1917.
*Type*: "**Eritrea**, on leaves of *Ziziphus spina-christi* (*Rhamnaceae*), a Cheren in maggio 1914", Baldrati n. 25 (FI, IMI 98898, ex-type slide).
*Notes*: Type material was examined by F.C. Deighton, who supposed that this species could be a *Cladosporium*. He compared it with *Trichosporum simplex* Sacc., deposited in IMI as *Cladosporium spinae-christae* Deighton, *ined*.

## *Heterosporium*

The epithets are alphabetically listed. The generic name, *i.e.*, *Heterosporium*, is omitted. *Heterosporium* was monographed by David (1997), *i.e.*, this list is mainly based on his examinations.

*alhagi* ("*alhaginis*") Koshk. & Frolov, Mikofl. Koped-Daga i Karakumov: 156. 1973, *nom. inval.*
*Type*: **Turkmenistan**, Kutom, on dry stems of *Alhagi* sp. (*Fabaceae*), 6 Jul. 1967 (not preserved).
*Lit.*: David (1997: 129).
*Notes*: This species was published as "*ad int.*" and described in Russian.

*allii* var. *funkiae* Massa, Ann. Mycol. 10: 298. 1912.
*Type*: **Italy**, Piemont, Crescentino, on dry flower stems of *Funkia* (*Hosta*) sp. (*Asparagaceae*), 9 Nov. 1903, Massa (location unknown).
*Lit.*: David (1997: 129).
*Notes*: Based on the original description (conidia 20–25 × 7–10 µm, 1–3-septate) probably identical with *Cladosporium macrocarpum*.

*allii* var. *minutum* Maire, Mém. Soc. Sci. Nat. Phys. Maroc 45: 136. 1937.
*Type*: **Morocco**, Moyen Atlas, Arzou, on *Polygonatum odoratum* (*Asparagaceae*), without date, R. Maire (MPU?).
*Lit.*: David (1997: 129).
*Notes*: This variety was compared with *H. allii* var. *polygonati* [conidiophores 60–100 µm long, conidia 14–20(–24) × 8–11 µm]. Var. *minutum* possibly refers to *Cladosporium macrocarpum*.

*allii* var. *polygonati* Oudem., Nederl. Kruidk. Arch., Ser. III, 2: 315. 1900.
*Holotype*: **Netherlands**, Gelderland, Apeldoorn, Nunspeet, on *Polygonatum multiflorum* (*Asparagaceae*), 2 Oct. 1899, C.A.G. Beins (L).
*Lit.*: David (1997: 129).
*Notes*: The type material contains *Alternaria* sp., *Cladosporium herbarum*, and *Curvularia* sp.

*allii* var. *sisyrinchii* Speg. ex Sacc., Syll. fung. 10: 659. 1892.
*Holotype*: **Argentina**, near Wallamantu, on rotting leaves of *Sisyrinchium* sp. (*Iridaceae*), May 1882, Spegazzini (LPS?).
*Lit.*: David (1997: 130).

*beckii* Bäumler, Verh. K. K. Zool.-Bot. Ges. Wien 43: 292. 1893.
*Type*: **Austria**, Niederösterreich, Währing, on the surface of the rind of *Cucurbita* sp. (*Cucurbitaceae*), Feb. ?1893 (location unknown).
*Lit.*: David (1997: 130).
*Notes*: Conidiophores densely packed from a stroma; conidia kidney-shaped (David 1997, citing sources). In David's (1997) opinion probably not a species of *Cladosporium*.

*betae* Dowson, Mycol. Centralbl. 2: 3. 1913.
*Type*: **Germany**, Hamburg, on leaves of *Beta vulgaris* (*Amaranthaceae*), Oct. 1911, Klebahn (location unknown).
*Lit.*: David (1997: 130).
*Notes*: Probably belonging to the *Cladosporium herbarum* complex, maybe *C. macrocarpum* (conidia 13–24 × 6–12 µm, 1–2-septate).

*caraganae* Vasyag., Izv. Akad. Nauk Kazakh. SSR, Ser. Biol., 1813: 101. 1957.
*Type*: **Kazakhstan**, Karagandinskaya Oblast, Ostraya Mt. and Lake Saricul, on *Caragana frutex* (*Fabaceae*), 4 Jul. 1953 and 6 Jul. 1954 (AA?).
*Lit.*: David (1997: 131).
*Notes*: Description resembling *Cladosporium macrocarpum*, but generic affinity unclear.

*celastrinum* Tilak, Curr. Sci. 32: 422. 1963.
*Holotype*: **India**, Maharashtra, Daulatabad, on dead stems of *Celastrus paniculatus* (*Celastraceae*), 20 Feb. 1963, S.T. Tika (herb. Marathwada Univ., not available).
*Lit.*: David (1997: 131).
*Notes*: Possibly identical with *Dendryphiella vinosa*.

*centaureae* Ranoj., Ann. Mycol. 8: 398. 1910.
*Type*: **Serbia**, Belgrade, Topcider, on dry stems of *Centaurea apiculata* subsp. *spinulosa* (≡ *C. spinulosa*) (*Asteraceae*), 26 Mar. 1910, Ranojevic (location unknown).
*Lit.*: David (1997: 132).
*Notes*: Conidiophores from a stroma; conidia sometimes clavate (David 1997, citing sources). Status unclear.

*cercosporoides* ("*cercosporoide*") Speg., Bol. Acad. Nac. Ci., Córdoba 11: 305. 1888.
*Holotype*: **Argentina**, Tierra del Fuego, I. de los Estados, on dying leaves of *Agrostis magellanica* (*Poaceae*), Feb. 1882, Spegazzini (LPS?).
*Lit.*: David (1997: 132).
*Notes*: Probably not belonging to *Cladosporium*.

*elmeri* Syd. & P. Syd., Leafl. Philipp. Bot. 9: 3132. 1925.
*Syntype*: **Philippines**, Luzon, Sorsogon Prov., Irosin (Mt. Bulusan), on *Ochrosia apoensis* (*Apocynaceae*), Apr. 1915 [? 1916], Elmer 14968 & 14969 (location unknown).
*Notes*: David (1997) examined syntype material from K and NY (Elmer 14969), which was, however, devoid of any fungal fructification agreeing with the original description (in hypophyllous cushions, conidiophores short, 15–38 µm, conidia at first 0–1-septate, 20 µm long, later 2–5-septate, up to 50 × 5–7 µm).

*eremostachydis* Golovin, Trudy Sredneaziats. Gosud. Univ., N.S., 14(5): 25. 1950.
*Type*: **Tadzhikistan**, Pamir, Dschauschongoz, on stems of *Eremostachys* sp. (*Lamiaceae*), 10 Aug. 1935, ?Golovin (location unknown).
*Lit.*: David (1997: 132).
*Notes*: Status unclear, probably no a member of *Cladosporium*.

*eucalypti* Ellis & Everh., Proc. Acad. Nat. Sci. Philadelphia 1894: 381. 1894.
*Holotype*: **USA**, California, on *Eucalyptus* sp. (*Myrtaceae*), 28 Nov. 1893, A.J. McClatchie 542 (NY).
*Lit.*: David (1997: 132).
*Notes*: Based on the original description, this species could be identical with *Cladosporium macrocarpum*, but David's examination showed rather "*Fumago*-like" crusts with smaller conidia.

*gracile* var. *muscari* ("*muscaridis*") Pat., Énum. champ. Tunisie: 18. 1892.
*Type*: **Tunisia**, Kroussiah, without locality and date, on leaves of *Muscari comosum* (*Asparagaceae*) (location unknown).
*Lit.*: David (1997: 133).
*Ill.*: Patouillard (1892: pl. II, fig. 10).
*Notes*: According to David (1997), this variety is probably a true, *Heterosporium*-like *Cladosporium* species, but rather similar to *C. ornithogali*. However, type material could not be traced. This variety was not listed in Pfister (1977). Koshkelova (1977) recorded it from southern Turkmenistan on *Gladiolus italicus* (= *G. segetum*) (*Iridaceae*) and *Muscari leucostomum*.

*graminis* McAlpine, Proc. Linn. Soc. New South Wales 1904: 122. 1904.
*Holotype*: **Australia**, Victoria, Melbourne, St. Kilda, on *Ammophila arenaria* (*Poaceae*), 14 Sep. 1903, D. McAlpine (VPRI 2673).
*Lit.*: David (1997: 133).
*Notes*: The type material consists of a mixture of a *Stemphylium* and a true *Cladosporium* with catenate conidia, *ca.* 18–30 × 9–12(–14) µm.

*graminum* Rostr., Handb. Læren Plantesygd. Landbr. Havebr. Skovbr.: 607. 1902.
*Type*: On *Dactylis glomerata* and *Triticum aestivum* (*Poaceae*), details unknown (location unknown, neither at C nor CP).
*Lit.*: David (1997: 134).
*Notes*: Type material could not be traced, and the original description is very brief and barely diagnostic (conidiophores knotted, brown, conidia long, brown, echinulate, 3–4-septate). Lind (1913) suggested that this species was identical to *Cladosporium graminis* (= *C. herbarum*), which is very probable.

*groenlandicum* Allesch., Bibl. Bot. 42: 54. 1997.
*Type*: **Greenland**, Umanak, on dead leaves of *Papaver nudicaule* (*Papaveraceae*), 18 Jun. 1892, Allescher (location unknown, not at M).
*Lit.*: David (1997: 134).
*Notes*: Allescher's type material could not be located. David (1997) examined material deposited under this name by Potebnia (PAD), which could be identified as *Cladosporium macrocarpum*.

*lallemantiae* ("*lallemantii*") Khokhr., Bolez. Vredit. Maslichnykh Kul'tur 1(2): 33. 1934.
*Holotype*: **Russia**, Gor'kyi Oblast, Novgorod, near Vjatka, Agrobiological Station nurseries, on *Lallemantia* sp. (*Lamiaceae*), 17 Aug. 1931, F. Fokin (LEP).
*Lit.*: David (1997: 134).
*Notes*: David (1997) examined type material and found a mixture of several fungi, including *Alternaria alternata*, *Cladosporium herbarum* and *Oidium* sp. The original description was probably based on *Alternaria* conidiophores and *Cladosporium* conidia.

*laricis* Cooke & Massee, Grevillea 16: 80. 1888.
*Type*: **UK**, Norfolk, without detailed location, on leaves of *Larix decidua* (*Pinaceae*), without date and collector (location unknown, not at K).
*Lit.*: David (1997: 135).
*Notes*: Identity unclear, but in any case not belonging to *Cladosporium s. str.*

*lobeliae* Speg., Revista Fac. Agron. Univ. Nac. La Plata, Ser. 2, 6: 188. 1910.
*Holotype*: **Chile**, Cerro Alegre de Valparaiso, on *Lobelia excelsa* (= *L. salicifolia*) (*Campanulaceae*), [1908], Spegazzini (LPS?).
*Lit.*: David (1997: 135).
*Notes*: According to David (1997), synonymous with *Cladosporium macrocarpum*.

*lonicerae* Negru, Trudy Bot. Inst. Akad. Nauk SSSR, Ser. 2, Sporov. Rast. 12: 223. 1959.
*Type*: **Romania**, Cluj, on living and dead stems of *Lonicera tatarica* and *L. sullivantii* (*Caprifoliaceae*), 22 May 1956, ?Negru (location unknown).
*Lit.*: David (1997: 135).
*Notes*: According to David (1997), very probably identical with *Cladosporium macrocarpum*.

*luci* Chevaug., Encycl. Mycol. 28: 94. 1956.
*Type*: **Senegal** (Sefa), Ivory Coast (Adiopodoumé) and tropical Africa (without any locality), on stems and young branches of *Manihot esculenta* (= *M. utilissimus*) (*Euphorbiaceae*), *Crotalaria retusa* (*Fabaceae*) and *Citrus* sp. (*Rutaceae*) (location unknown, not at PC, possibly at ABI, but not seen).
*Lit.*: David (1997).
*Notes*: According to David (1997), probably not belonging to *Cladosporium s. str.*, but rather cercosporoid (*Passalora,* incl. *Phaeoramularia*).

*medicaginis* Karimov, Trudy Bot. Inst. Akad. Nauk SSSR, Ser. 2, Sporov. Rast. 11: 129. 1956.
*Type*: **Uzbekistan**, Tashkent, on leaves of *Medicago sativa* (*Fabaceae*), 19 Aug. 1952, Karimov (location unknown).
*Lit.*: David (1997).
*Notes*: Based on the original description and illustration, this species is probably a synonym of *Cladosporium macrocarpum*. It was also reported from Turkmenistan by Koshkelova (1977).

*onobrychidis* Chevassut, Bull. Féd. Mycol. Dauphiné-Savoie 27: 9. 1987, *nom. inval*.
*Type*: **France**, Dauphiné-Savoie, Doucy, on *Onobrychis viciifolia* (*Fabaceae*), 11 Jun. 1986, H. Robert (location unknown).
*Lit.*: David (1997: 136).
*Notes*: Based on the original description, this species is probably a synonym of *Cladosporium herbarum*.

*phragmitis* Sacc., Rev. Mycol. (Toulouse) 6: 37. 1884 [as "(Opiz) Sacc."].
*Holotype*: **Belgium**, Ardennes, on *Phragmites australis* (*Poaceae*), without date, Libert, Reliqu. libertianae 382 (PAD).
= *Cladosporium phragmitis* J. Opiz, Seznam: 117. 1852, *nom. inval.*, non *C. phragmitis* J. Opiz ex Oudem., 1892.
*Lit.*: David (1997: 137).
*Notes*: The complicated nomenclature and history of the confusion of the names involved were discussed by David (1997), who found in the type collection a typical "*Fumago*", *i.e.*, a mixture of *Aureobasidium pullulans* and *Cladosporium*.

*phragmitis* var. *inflorescentiae* Bubák, Ann. Mycol. 13: 34. 1915.
*Holotype*: **Czech Republic**, Mähr. [Hranice] Weisskirchen, Becawa [Becva] River, [illegible], on *Phalaris arundinacea* (*Poaceae*), Sep.

1911, F. Petrak (BPI 802191).
*Lit*.: David (1997: 137).
*Notes*: According to David (1997), a typical "*Fumago*", *i.e.*, a mixture of *Aureobasidium pullulans* and *Cladosporium*.

*polymorphum* Nicolas & Aggéry, Bull. Soc. Hist. Nat. Toulouse 58: 139. 1939.
*Type*: **France**, Toulouse, Botanic Garden and garden of the University of Toulouse, on leaves of *Viburnum odoratissimum* (*Adoxaceae*), without date and collector (location unknown, TL?).
*Lit*.: David (1997: 138).
*Notes*: Based on the original description, possibly *Cladosporium herbarum*.

*savulescui* E. Radul. & Negru, in Bontea *et al*. (Eds.), Omagiu lui Traian Sâvulescu: 651. 1959.
*Type*: **Romania**, Cluj, Botanic Garden, on leaves of *Thalictrum minus* (*Ranunculaceae*), 10 Sep. 1956, without collector (location unknown).
*Lit*.: David (1997: 138).
*Notes*: Each conidiophore, consisting of a short side branch of a hypha, produces a single apical conidium (David 1997, citing sources). Not *Cladosporium s. str.*, but status unclear.

*stenhammariae* Rostr., Tillæg til 'Groenlands Svampe 1888': 630. 1891.
*Holotype*: **Greenland**, Kaersut, on leaves of *Mertensia maritima* (*Boraginaceae*), 4 Aug. 1888, S. Hansen (C).
*Lit*.: David (1997: 138).
*Notes*: The type material was examined by J. David, who found the specimen to be depauperate, severely damaged by insects. Based on the original description, this species was probably identical with *Cladosporium herbarum* or *C. macrocarpum*.

*symphoricarpi* Ranoj., Ann. Mycol. 3: 398. 1910.
*Type*: **Serbia**, Belgrade, on twigs of *Symphoricarpos racemosus* (*Caprifoliaceae*), 3 Jan. 1910, N. Ranojevic (BPI 1108751).
*Lit*.: David (1997: 138).
*Notes*: The type material proved to be a member of the *Cladosporium herbarum* complex, either *C. herbarum s. str.* or *C. macrocarpum* (conidiophores nodulose, conidia verruculose, 11.5–25 × 6.5–9 µm).

*tupae* Speg., Revista Fac. Agron. Univ. Nac. La Plata, Ser. 2, 6: 188. 1910.
*Holotype*: **Chile**, Valdivia, on leaves of *Lobelia bridgesii* (*Campanulaceae*), without date [1908], Spegazzini (LPS?).
*Lit*.: David (1997: 139).
*Notes*: Not examined, status unknown.

*umbelliferarum* Jacz., Opred. grib. 2: 293. 1917.
*Lectotype* (designated by David 1997): **Russia**, St. Petersburg, Hortus Botanici Petropolitani, on stems of an unknown umbellifer (*Apiaceae*), 1883, Korjinski (LEP).
*Lit*.: David (1997: 139).
*Notes*: J. David examined type material of this fungus and found a mixture of an *Alternaria* and a member of the *Cladosporium herbarum* complex (very probably *C. herbarum s. str.*).

*vellosoanum* Speg., Anales Mus. Nac. Hist. Nat. Buenos Aires, Ser. 3, 20: 442. 1910.
*Holotype*: **Argentina**, Jujuy, Orán, on leaves of *Mimosa velloziana* (*Fabaceae*), Mar. 1905, ?Spegazzini (LPS?).
*Lit*.: David (1997: 139).
*Notes*: According to the original description, this species is "extremely unlikely" to be a member of the genus *Cladosporium s. str.* (David 1997).

*xanthosomatis* ("*xanthosomae*") Gonz. Frag. & Cif., Publ. Estac. Agron. Moca, Ser. B, Bot., 11: 53. 1928, *nom. inval*.
*Lit*.: David (1997: 140).
*Notes*: This name was invalidly published, introduced as "*ad int*.". It is probable that this name was the remnant of an earlier description of *Helminthosporium xanthosomatis*, which was introduced in the same paper. The collection details agree to those for *Cercospora xanthosomatis*.

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## INDEX OF FUNGAL NAMES

Arranged according to epithets and then genera. Synonymised names are italicized and page numbers of main entries for true *Cladosporium* species are bolded. A superscript asterisk (*) points to pages with illustrations, a superscript c ($^{c}$) to pages with a cladogram, a superscript t ($^{t}$) to pages with a table and a superscript k ($^{k}$) to pages with a key to genera or species.

The following abbreviations are used for more frequently occurring genera.
Abbreviations: A. = Anungitopsis, Al. = Alternaria, Amphi. = Amphitrichum, Asp. = Asperisporium, C. = Cladosporium, Csp. = Cercospora, Csporid. = Cercosporidium, Cladophial. = Cladophialophora, D. = Davidiella, Dem. = Dematium, Dendr. = Dendryphiella, Didym. = Didymellina, Ex. = Exosporium, F. = Fusicladium, Fusiclad. = Fusicladosporium, H. = Heterosporium, Helm. = Helminthosporium, Horm. = Hormodendrum, M. = Mycosphaerella, Megaclad. = Megacladosporium, Met. = Metulocladosporiella, Mycovel. = Mycovellosiella, N. = Napicladium, O. = Oidium, P. = Pseudocercospora, Pass. = Passalora, Pen. = Penidiella, Phaeo. = Phaeoramularia, Pleosp. = Pleospora, Poll. = Pollaccia, R. = Ramularia, Scol. = Scolicotrichum, Spadic. = Spadicoides, St. = Stenella, Stig. = Stigmina, T. = Torula, Trim. = Trimmatostroma, V. = Venturia, X. = Xylohypha, Z. = Zasmidium.

**B**



**C**

**M**



**N**

**U**



**V**

## INDEX TO HOSTS AND SUBSTRATES