

## Cercosporoid fungi (*Mycosphaerellaceae*) 2. Species on monocots (*Acoraceae* to *Xyridaceae*, excluding *Poaceae*)

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**Abstract:** Cercosporoid fungi (formerly *Cercospora s. lat.*) represent one of the largest groups of hyphomycetes belonging to the *Mycosphaerellaceae* (*Ascomycota*). They include asexual morphs, asexual holomorphs, or species with mycosphaerella-like sexual morphs. Most of them are leaf-spotting plant pathogens with special phytopathological relevance. In the first part of a new monographic work, cercosporoid hyphomycetes occurring on other fungi (fungicolous species), on ferns (pteridophytes) and gymnosperms were treated. This second part deals with cercosporoid fungi on monocots (*Liliopsida*; *Equisetopsida*, *Magnoliidae*, *Lilianae*), which covers species occurring on host plants belonging to families arranged in alphabetical order from *Acoraceae* to *Xyridaceae*, excluding *Poaceae* (cereals and grasses) which requires a separate treatment. The species are described and illustrated in alphabetical order under the particular cercosporoid genera, supplemented by keys to the species concerned. A detailed introduction, a survey of currently recognised cercosporoid genera, a key to the genera concerned, and a discussion of taxonomically relevant characters were published in the first part of this series. *Neopseudocercospora*, an additional recently introduced cercosporoid genus, is briefly discussed. The following taxonomic novelties are introduced: *Cercospora alpiniigena* sp. nov., *C. neomaricae* sp. nov., *Corynespora palmicola* comb. nov., *Exosporium miyakei* comb. nov., *E. petersii* comb. nov., *Neopseudocercospora zambiensis* comb. nov., *Passalora caladiicola* comb. nov., *P. streptopi* comb. nov., *P. togashiana* comb. nov., *P. tranzschelii* var. *chinensis* var. nov., *Pseudocercospora beaucarnea* comb. nov., *P. constrictoflexuosa* comb. et stat. nov., *P. curcucicola* sp. nov., *P. dispori* comb. nov., *P. smilacicola* sp. nov., *P. urariigena* nom. nov., *Zasmidium agavicola* comb. nov., *Z. cercestidis-afzelii* comb. nov., *Z. citri-griseum* comb. nov., *Z. cyrtopodii* comb. nov., *Z. gahnae* comb. nov., *Z. indicum* comb. nov., *Z. liriopes* comb. nov., *Z. mycovellosielloides* sp. nov., *Z. scleriae* comb. nov., *Z. smilacicola* comb. nov., and *Z. thaliae* comb. nov.

### Key words:

*Ascomycota*  
*Cercospora s. lat.*  
*Liliopsida*  
hyphomycetes

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## INTRODUCTION

Cercospora-like fungi represent one of the largest groups of mostly plant pathogenic, leaf-spotting hyphomycetes, causing numerous economically relevant diseases of cultivated plants. The only worldwide monograph of this fungal group, published by Chupp (1954), is badly out of date. A new “Chupp” is urgently required by plant pathologists. Therefore, Braun *et al.* (2013) initiated initiative series of papers to update the monograph of *Cercospora* and allied genera (*Mycosphaerellaceae*), which is being accomplished in a stepwise approach due to the huge size of this fungal group. Sexual morphs (teleomorphs) are included in the descriptions as far as known and proven. *Mycosphaerella s. str.*, which is based on *M. punctiformis*, its type species, is a heterotypic synonym of *Ramularia* (Braun *et al.* 2013). Hence,

the names of sexual morphs described as *Mycosphaerella s. lat.* species are cited as synonyms of the particular species of *Cercospora*, *Passalora*, *Pseudocercospora*, etc. A general introduction, covering all aspects of cercosporoid fungi, ranging from the history of genera to keys to the currently recognised genera, has been published in the first part of this series of monographic contributions together with detailed treatments of species on other fungi (mycophylic taxa), on ferns as well as gymnosperms. The present part is devoted to cercosporoid hyphomycetes on monocots, covering species on hosts belonging to the *Acoraceae* to the *Xyridaceae*, but excluding those occurring on true grasses and cereals (*Poaceae*), which necessitates a separate treatment owing to the numerous species involved. The treatment of cercosporoid fungi on monocots follows the principles outlined in part 1 (Braun *et al.* 2013).

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## MATERIALS AND METHODS

The present work is a compilation based on papers and unpublished data of the authors as well as global literature. Details on methods are to be found in the papers cited. As far as new examinations are concerned, fungal structures have been examined on the base of standard methods of light microscopy, using an Olympus BX50 microscope, with distilled water and lactic acid as media, but without any staining. If possible, measurements of 30 conidia and other structures have been made at a magnification of  $\times 1000$ . All illustrations have been prepared by the first author. The following abbreviations are used: author names follow Brummit & Powell (1992), journals Bridson (2004a, b), and exsiccatae <http://www.botanischestaatssammlung.de/DatabaseClient/IndExs/index.jsp> (IndExs – Index of Exsiccatae). Taxonomy and nomenclature of plant families, genera and species are based on the “Angiosperm Phylogeny Website” (<http://www.mobot.org/mobot/research/apweb/>), Tropicos database (<http://www.Tropicos.org/>), and The Plant List (<http://www.theplantlist.org>).

## SEXUAL MORPHS AND CURRENTLY RECOGNISED CERCOSPOROID GENERA – AN ADDITION

Crous *et al.* (2013b) introduced the new genus *Neopseudocercospora* with its type species *N. terminaliae*, described from Zambia on *Terminalia* sp. This genus is morphologically intermediate between *Pseudocercospora* and *Sporidesmium*, but phylogenetically belongs in *Mycosphaerellaceae* and must thus be considered a true cercosporoid genus.

***Neopseudocercospora*** Crous, *Persoonia* **31**: 219 (2013).

*Type species: Neopseudocercospora terminaliae* Crous, 2013 (i.e. *N. zambiensis* (Deighton) Crous & U. Braun 2014).

***Neopseudocercospora zambiensis*** (Deighton) Crous & U. Braun, **comb. nov.**

Mycobank MB809006

*Basionym: Sporidesmium zambiensis* Deighton, *Mycol. Pap.* **117**: 27 (1969).

*Synonyms: Repetophragma zambiensis* (Deighton) Subram., *Proc. Indian Acad. Sci., B*, **58**: 185 (1992).  
*Pseudocercospora zambiensis* (Deighton) B. Sutton, *Mycopathologia* **125**: 61 (1994)

*Neopseudocercospora terminaliae* Crous, *Persoonia* **31**: 219 (2013).

## Alismataceae

### Cercospora

#### Key to Cercospora species on Alismataceae

- |   |  |   |
|---|--|---|
| 1 | Conidia acicular, base truncate .....  | 2 |
|   | Conidia at least partly obclavate-cylindrical with obconically truncate base ..... | 3 |

*Description:* Hyphomycetes (asexual morphs); *Mycosphaerellaceae*. *Foliicolous*, plant pathogenic. *Mycelium* superficial; hyphae branched, septate, pigmented, smooth-walled. *Stromata* lacking. *Conidiophores* solitary, arising from superficial hyphae, lateral, one-celled or septate, pigmented; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, proliferation percurrent or sympodial and percurrent proliferations mixed, conidiogenous loci truncate, relatively broad, neither thickened nor darkened. *Conidia* solitary, rather sporidesmium/scolecostigmina-like, scolecosporous, pluriseptate, pigmented, rather dark in mass, wall somewhat thickened, hilum broadly truncate, neither thickened nor darkened, but with a minute frill.

*Notes: Neopseudocercospora* is morphologically reminiscent of the genus *Sporidesmium* (*Sordariomycetes*), but belongs to *Mycosphaerellaceae* where it clusters with *Microcyclosporella* and zasmidium-like species (clade 8 in Crous *et al.* 2013a). Due to the unthickened, non-pigmented conidiogenous loci and conidial hila, the type species of *Neopseudocercospora* would be morphologically assignable to *Pseudocercospora*, but phylogenetically it does not belong in the *Pseudocercospora* clade and warrants a genus of its own. Morphologically it differs from most *Pseudocercospora* species by its rather sporidesmium/scolecostigmina-like conidia. Deighton (in Cejp & Deighton 1969) introduced *Sporidesmium zambiensis*, based on material on *Terminalia mollis* collected in Zambia, which Sutton (1994) reallocated to *Pseudocercospora*. This species is conspecific with *Neopseudocercospora terminaliae*. Subramanian (1992) assigned *S. zambiensis* to *Repetophragma*, but that genus is not appropriate for the present species as it is characterised, based on its type species, by having consistently, conspicuously percurrent conidiogenous cells with numerous, dense annellations and didymo- to phragmosporous brown conidia with an almost colourless base. The phylogenetic position of this genus is not yet known, but probably does not lie within *Mycosphaerellaceae*.

## TAXONOMIC TREATMENT

### Cercosporoid species on monocots (*Acoraceae* to *Xyridaceae*)

#### Acoraceae

#### Passalora

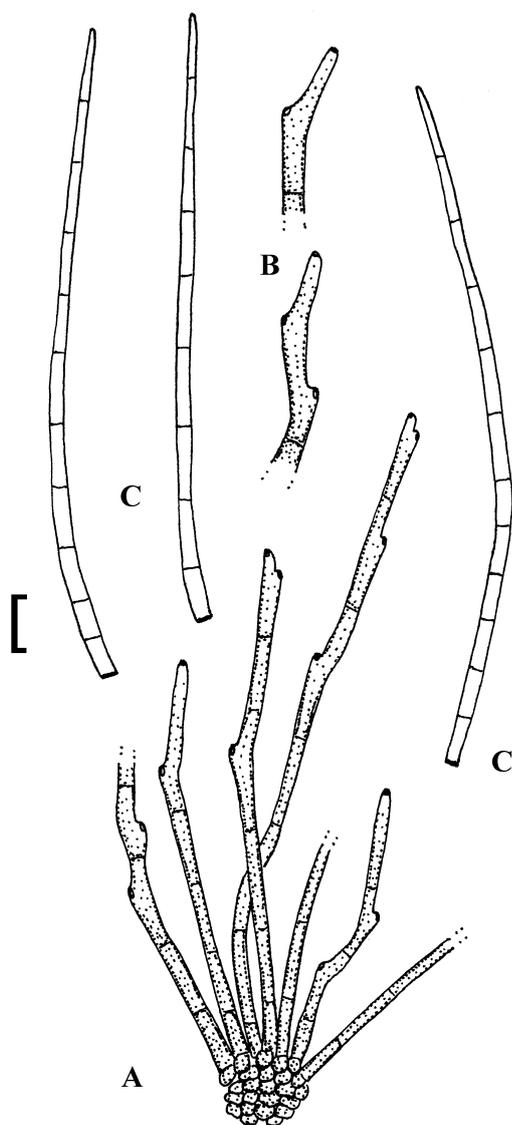
On *Acorus*, see *Passalora acori* (Part 1, fungicolous species).

- 2 (1) Conidiophores relatively short, 10–70  $\mu\text{m}$ ; conidia 40–125  $\mu\text{m}$  long, hila about 2.5–5  $\mu\text{m}$  wide; on *Echinodorus* spp. .... **C. echinodori**  
 Conidiophores longer, > 100  $\mu\text{m}$ ; conidia longer, 80–155  $\mu\text{m}$ , hila about 2.5–3  $\mu\text{m}$  wide; on *Alisma orientale* ..... **C. alismaticola**  
 [If on *Sagittaria montevidensis*, Brazil, morphologically indistinguishable; see *C. apii* s. lat.]
- 3 (1) Stromata lacking; conidiophores to about 320  $\mu\text{m}$  long; on *Echinodorus* spp. .... **C. osiridis**  
 Stromata at least partly developed, 10–40  $\mu\text{m}$  diam ..... 4
- 4 (3) On *Alisma* spp. and *Echinodorus* spp. .... **C. alismatis**  
 On *Sagittaria* spp. .... **C. sagittariae**

### *Cercospora* species on *Alismataceae*

***Cercospora alismaticola*** Z.D. Jiang & P.K. Chi, in Chi, *Fungal Diseases of Cultivated Medicinal Plants in Guangdong Province*: 97 (1994); also *J. S. China Agric. Univ.* **15**: 17 (1994).

(Fig. 1)



**Fig. 1.** *Cercospora alismaticola* (based on Chi 1994: 97, fig. 88). **A.** Conidiophore fascicle. **B.** Conidiophore tips. **C.** Conidia. Bar = 10  $\mu\text{m}$ .

*Literature:* Zhuang (2001), Crous & Braun (2003: 51).

*Illustration:* Chi (1994: 97, fig. 88).

*Description:* Leaf spots amphigenous, circular, 2–5 mm diam, reddish brown, centre later becoming greyish white. *Caespituli* amphigenous. *Mycelium* internal. *Stromata* small, subglobose, about 10–40  $\mu\text{m}$  diam, pigmented. *Conidiophores* fasciculate, 3–20, loose, arising from stromata, erect, straight, unbranched, 2–8 times geniculate, somewhat narrowed towards the apex, 100–177  $\times$  4–6  $\mu\text{m}$ , 3–5-septate, brown, thin-walled, smooth; conidiogenous cells integrated, terminal and intercalary, with thickened and darkened conidiogenous loci. *Conidia* solitary, acicular, straight to curved, 80–155  $\times$  3–4  $\mu\text{m}$ , pluriseptate, hyaline, apex pointed, base truncate, about 2.5–3  $\mu\text{m}$  wide, with thickened and darkened hilum.

*Holotype:* **China:** Guangdong: Guangzhou, on *Alisma orientale* [*A. plantago-aquatica* var. *orientale*], *Alismataceae*, Nov. 1988, Z. D. Jiang (hb. S. China Agric. Univ., Guangzhou).

*Host range and distribution:* Only known from the type collection.

*Notes:* This species belongs to the *Cercospora apii* s. lat. complex.

***Cercospora alismatis*** Ellis & Holw., *J. Mycol.* **1**: 63 (1885).  
 (similar to Fig. 3)

*Literature:* Saccardo (1886: 478), Vassiljevsky & Karakulin (1937: 221), Chupp (1954: 28), El-Gholl *et al.* (1992: 265), Crous & Braun (2003: 51).

*Exsiccatae:* Ellis & Everh., *Fungi Columb.* 597. Ellis & Everh., *N. Amer. Fungi* 3191.

*Description:* Leaf spots amphigenous, subcircular to angular-irregular, 2–15 mm diam, brown to greyish brown, margin indefinite or darker. *Caespituli* amphigenous. *Mycelium* internal. *Stromata* almost lacking or 10–40  $\mu\text{m}$  diam, substomatal, brown. *Conidiophores* in small to moderately large fascicles, arising from internal hyphae or stromata, through stomata, erect, straight, subcylindrical to geniculate or somewhat sinuous, mostly unbranched, 15–180  $\times$  4–7  $\mu\text{m}$ , septate, pale yellowish green, olivaceous to medium

olivaceous-brown, paler towards the tip, thin-walled, smooth; conidiogenous cells integrated, terminal, 10–50 µm long, sympodial, with thickened and darkened conidiogenous loci, 2–2.5 µm diam. *Conidia* solitary, obclavate(-subcylindrical), straight to curved, 50–160 × (3–)4–6 µm, 3- to pluriseptate, hyaline or subhyaline, thin-walled, smooth, apex obtuse to subacute, base obconically truncate, 2–3 µm wide, hila somewhat thickened and darkened.

**Holotype: USA:** Iowa: Decorah, on *Alisma* sp., 29 Jul. 1884, Holway (NY 00830162).

**Host range and distribution:** On *Alisma* (*plantago-aquatica*, *subcordatum*, *triviale*, *Alisma* sp.), *Echinodorus* (*subalatus* [*intermedius*], *Echinodorus* sp. ["*alismatis*"]), *Alismataceae*, Asia (Singapore), North America (USA, California, Delaware, Iowa, Indiana, Minnesota, Montana, Nebraska, New York, Wisconsin, Texas), West Indies (Dominican Republ., Haiti).

**Notes:** This is a true *Cercospora* s. str. close to *C. apii* s. lat., but distinct by having obclavate-cylindrical conidia, (3–)4–6 µm wide. Older records of *C. alismatis* on *Sagittaria* spp. belong to *C. sagittariae*. *Cercospora alismatis* and *C. sagittariae* are morphologically very close. Inoculation experiments, cultures and data of molecular sequence analyses are necessary to prove if a single or two genuine species are involved. The record of *C. alismatis* on *Echinodorus intermedius* from Singapore refers to a collection deposited at BPI on imported plants intercepted at California.

***Cercospora apii* Fresen. s. lat. (sensu Crous & Braun 2003: 35).**

**Literature:** Soares et al. (2009: 404).

**Host range and distribution:** On *Sagittaria montevidensis*, *Alismataceae*, South America (Brazil, Rio de Janeiro).

**Notes:** Soares et al. (2009) found a collection of *Cercospora* on *Sagittaria montevidensis* characterised by having consistently acicular conidia that can be referred to as *C. apii* s. lat., at least tentatively.

***Cercospora echinodori* Chupp, *Monograph of Cercospora*: 28 (1954).**  
(Similar to Fig. 1)

**Literature:** Chupp (1954: 28), El-Gholl et al. (1992: 265), Crous & Braun (2003: 169).

**Description:** *Leaf spots* subcircular to somewhat angular-irregular, 2–12 mm diam or confluent and larger, centre grey, margin darker, brown to blackish, indistinctly zonate. *Caespituli* amphigenous, fine, dark. *Mycelium* internal. *Stromata* substomatal or immersed, 10–40 µm diam, subglobose to somewhat irregular, medium brown. *Conidiophores* in small to moderately large fascicles, loose to dense, arising from stromata, through stomata or erumpent, erect, straight, subcylindrical to somewhat geniculate-sinuous, unbranched, 10–70 µm long, (2.5–)4–6.5 µm wide below and 2–5 µm

wide above, pale olivaceous to medium brown, septate, thin-walled, smooth; conidiogenous cells integrated, terminal, occasionally intercalary, 10–30 µm long, conidiogenous loci thickened and darkened, 2–2.5 µm diam. *Conidia* solitary, acicular, 40–125 × 2.5–5 µm, pluriseptate, hyaline, thin-walled, smooth, apex subobtuse to pointed, base truncate, 2.5–5 µm wide, hila somewhat thickened and darkened.

**Holotype: Haiti:** Etange, Saumatre, on *Echinodorus cordifolius*, 12 Apr. 1920, C. Leonard (CUP 39740). **Isotype:** BPI 4360474.

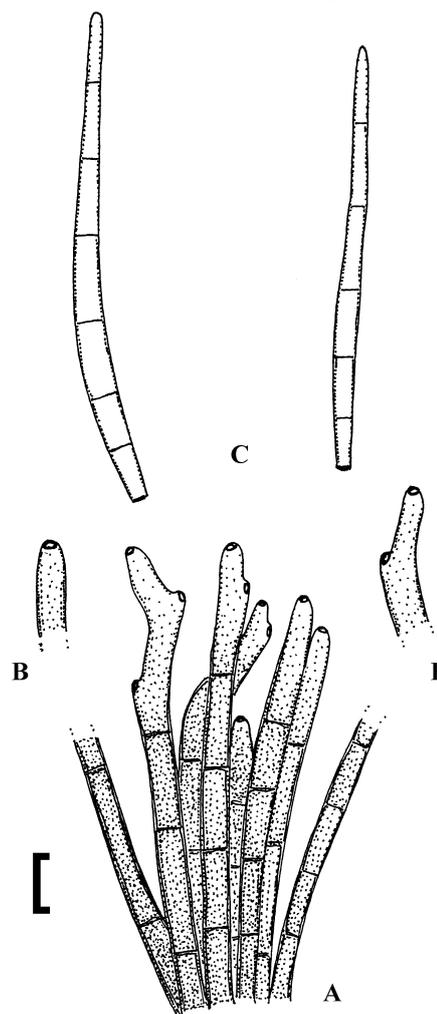
**Host range and distribution:** On *Echinodorus* (*berteroi*, *cordifolius* [*ovalis*]), *Alismataceae*, West Indies (Cuba, Haiti).

**Notes:** This species belongs to the *Cercospora apii* s. lat. complex.

***Cercospora osiridis* El-Gholl, Proffer & T.S. Schub., *Mycotaxon* 43: 266 (1992); as "*osirisae*".**  
(Fig. 2)

**Literature:** Crous & Braun (2003: 300)

**Illustration:** El-Gholl et al. (1992: 270, figs 1–4).



**Fig. 2.** *Cercospora osiridis* (FLAS F55631). **A.** Conidiophore fascicle. **B.** Conidiophore tips. **C.** Conidia. Bar = 10 µm.

**Description:** Leaf spots amphigenous, circular to irregular, 1–14 mm diam, necrotic, brown, with chlorotic halo. *Caespituli* epiphyllous. *Mycelium* internal. *Stromata* lacking. *Conidiophores* in small to moderately large fascicles (6–22), loose to dense, erect, arising from immersed hyphae, simple or occasionally branched, subcylindrical or 1–6 times geniculate in the upper part, rather long, to 318 µm or even longer, width rather uniform, 3.5–6 µm, pluriseptate, medium brown, wall slightly thickened, smooth; conidiogenous cells integrated, mostly terminal, conidiogenous loci thickened and darkened. *Conidia* solitary, obclavate, (20–)30–80(–130) × (3–)4–6(–9) µm, 3–7(–12)-septate, hyaline or subhyaline, thin-walled, smooth, apex obtuse, base obconically truncate, hila somewhat thickened and darkened.

**Holotype:** USA: Florida: Ft. Lauderdale, on *Echinodorus uruguayensis*, June 1990 (FLAS F55631). **Ex-type culture:** ATCC 76111.

**Host range and distribution:** On *Echinodorus (uruguayensis [osiris], Echinodorus sp.)*, *Alismataceae*, Asia (Singapore), North America (USA, California).

**Notes:** Material of this species on *Echinodorus sp.* from Singapore, intercepted in the Port of Los Angeles, is deposited as BPI 744439.

***Cercospora sagittariae* Ellis & Kellerm., J. Mycol. 2: 1 (1886).**

(Fig. 3)

**Synonym:** *Cercosporella macrospora* Bres., *Hedwigia* 36: 201 (1896) [*lectotype* (designated by Braun 1995):

**Germany:** Saxony: Königstein, on *Sagittaria sagittifolia*, 2 Sep. 1895, Krieger, *Fungi Saxon. Exs.* 1298 (HAL)].

**Literature:** Saccardo (1886: 479), Lindau (1910: 87), Vassiljevsky & Karakulin (1937: 221), Chupp (1954: 29), Katsuki (1965: 8), El-Gholl *et al.* (1992: 265), Braun (1995: 111), Braun & Mel'nik (1997: 91), Crous & Braun (2003: 362), Guo *et al.* (2005: 25), Soares *et al.* (2009: 404–406), Kamal (2010: 83).

**Illustrations:** Guo *et al.* (2005: 26, fig. 8), Soares *et al.* (2009: 405, fig. 3).

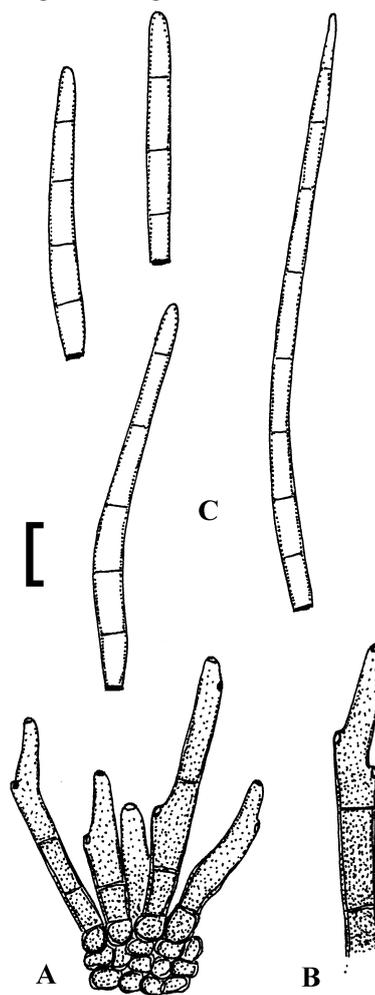
**Exsiccatae:** Ellis & Everh., *Fungi Columb.* 693. Ellis & Everh., *N. Amer. Fungi* 1502. Krieger, *Fungi Saxon. Exs.* 1298. Jaap, *Fungi Sel. Exs.* 50. Petrak, *Crypt. Exs.* 4102. Petrak, *Mycoth. Gen.* 1319. Poelt & Scheuer, *Reliqu. Petrak.* 2801.

**Description:** Leaf spots amphigenous, circular to somewhat elliptical-oval or irregular, 3–12 mm diam, occasionally confluent, sometimes vein-limited, straw-coloured, greyish brown to brown, margin brown or with yellowish halo. *Caespituli* amphigenous, mainly epiphyllous, punctiform, dark or greyish white by abundant sporulation. *Mycelium* internal. *Stromata* lacking or small, substomatal or immersed, 10–25 µm diam, brown, composed of swollen hyphal cells, rounded to angular in outline, 4–8 µm diam. *Conidiophores* in small to moderately large fascicles, mostly 2–15, loose

to rather dense, arising from internal hyphae or stromata, through stomata or erumpent, erect, straight to slightly curved or geniculate-sinuuous, unbranched, (20–)30–80(–150) × 4–8 µm, 0–4(–8)-septate, pale olivaceous to olivaceous-brown, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, about 10–30 µm long, conidiogenous loci 1–3(–4) per cell, somewhat thickened and darkened, 2–3 µm diam. *Conidia* solitary, acicular to obclavate-cylindrical, (15–)25–110(–150) × (2–)3–5.5(–6) µm, (0–)3–8-septate, hyaline, thin-walled, smooth, apex obtuse to pointed, base truncate to short obconically truncate, 2–3 µm wide, hila somewhat thickened and darkened.

**In vitro** (Soares *et al.* 2009): **Colonies** on PDA with compact aerial mycelium, felty, smoke-grey to grey-olivaceous with white sectors, periphery irregular, reaching 2–2.4 cm diam after 10 d, reverse dark green, with distinct pale sectors; on OA aerial mycelium sparse, cottony, white to smoke-grey, periphery irregular, 1.7–2 cm diam after 10 d; on MEA as on OA, reaching 2 cm diam after 10 d, reverse olivaceous-black; cultures not sporulating.

**Lectotype (designated here, MycoBank MBT178175):** USA: Kansas: Manhattan, on *Sagittaria variabilis*, Sep. 1884, W. A. Kellerman 681 (BPI 440960). **Isolectotype:** Ellis & Everh., *N. Amer. Fungi* 1502, e.g. CUP, OSC.



**Fig. 3.** *Cercospora sagittariae* (BPI 440960). **A.** Conidiophore fascicle. **B.** Conidiophore tip. **C.** Conidia. Bar = 10 µm.

**Host range and distribution:** On *Sagittaria* (*arifolia*, *cuneata*, *intermedia*, *lancifolia*, *latifolia*, *montevidensis* subsp. *montevidensis*, *montevidnesis* subsp. *calycina* [*Lophotocarpus calycinus*], *rigida*, *sagittifolia*, *trifolia*, *variabilis*, *Sagittaria* sp.), *Alismataceae*, Asia (China, India, Japan, Korea), Europe (Czech Republic, Germany, Hungary, Latvia, Romania, Russia (European part), Ukraine), North America (Canada; USA, Delaware, Florida, Iowa, Illinois, Kansas, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Nebraska, New York, Oklahoma, Pennsylvania, South Dakota, Texas, Vermont, Virginia, West Virginia, Wisconsin), Central and South America (Argentina, Costa Rica), Oceania (Hawaii), West Indies (Cuba, Puerto Rico, Virgin Islands).

**Notes:** A true *Cercospora* s. str. distinct from *C. apii* s. lat. by rather broad conidiophores and obclavate-cylindrical conidia.

### *Pseudocercospora*

A single species.

***Pseudocercospora arthrospora*** D.J. Soares, R.W. Barreto & U. Braun, *Mycologia* **101**: 409 (2009). (Fig. 4)

**Illustration:** Soares et al. (2009: 410, fig. 6).

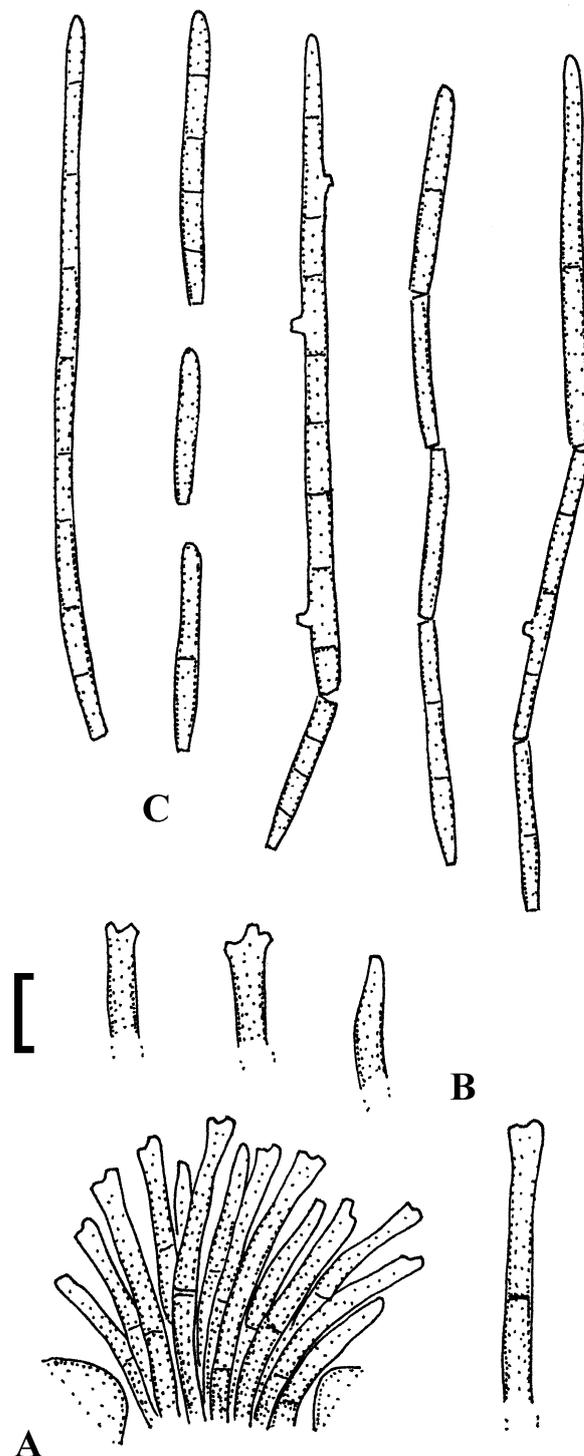
**Description:** Leaf spots amphigenous, circular to irregular, initially formed as raised, small, brown dots surrounded by a yellow margin, later forming larger necrotic areas, brown with small grey refracting dots in the centre corresponding to sporulating colonies. *Caespituli* epiphyllous, dense. *Mycelium* internal; hyphae branched, 2–3 µm wide, septate, smooth, hyaline to pale olivaceous. *Stromata* lacking or only with a few swollen hyphal cells. *Conidiophores* in well-developed, dense fascicles, erect, straight to somewhat curved, subcylindrical, not geniculate, unbranched, 20–40 × 2–4 µm, 1–3-septate, pale olivaceous to olivaceous-brown, thin-walled, smooth; conidiogenous cells integrated, terminal, 10–20 µm long, subhyaline, conidiogenous loci indistinct to subdenticulate, 1–3 per cell, 1–2.5 µm diam, but wall not or barely thickened and not darkened. *Conidia* at first intact, later disarticulating in fragments (arthroconidia occasionally *in vivo* but often *in vitro* formed), also forming secondary conidia in branched chains, obclavate, cylindrical, straight to curved, 20–190 × 1.5–3.5 µm, hyaline or subhyaline, thin-walled, smooth, apex obtuse, base truncate to short obconically truncate, 1–2.5 µm wide, hila neither thickened nor darkened.

**In vitro:** Colonies on PDA slow-growing, reaching 2 cm after 10 d, sporulating abundantly, velvety to chamois-like, reverse black at centre, pale to dark grey towards the margin; on OA aerial mycelium sparse, flat, with irregular margin, light grey, reverse grey; on MEA like on OA.

**Holotype:** **Brazil:** Santa Catarina: Forquilha, SC 448, rice field at road side, on *Sagittaria montevidensis*, 21 Apr. 2005, D. J. Soares (VIC 30505).

**Host range and distribution:** On *Sagittaria montevidensis*, *Alismataceae*, South America (Brazil, Paraná, Rio de Janeiro, Santa Catarina).

**Notes:** This species is unusual due to its disarticulating hyaline or subhyaline conidia, which is a character rarely encountered in *Pseudocercospora*.



**Fig. 4.** *Pseudocercospora arthrospora* (VIC 30505). **A.** Conidiophore fascicle. **B.** Conidiophore tips. **C.** Conidia. Bar = 10 µm.

**Amaryllidaceae (incl. *Allioideae*, syn. *Alliaceae*)*****Cercospora*****Key to *Cercospora* species on Amaryllidaceae**

- 1 Conidia obclavate-cylindrical, base truncate to somewhat obconically truncate, 20–220 × 4–8 µm;  
on *Scardoxus* spp., South Africa ..... **C. haemanthi**  
Conidia acicular or short cylindrical, base truncate ..... 2
- 2 (1) Conidia small, 45–50 × 3.5–4 µm, usually 4-septate, cylindrical, ends rounded; on *Allium nigrum*, Europe  
..... see **Cercospora sancti-marini** (doubtful, excluded and insufficiently known species)  
Conidia acicular, much longer ..... 3
- 3 (2) Stromata very large, 64–112 µm diam; conidiophores very long, to 640 µm; on *Amaryllis belladonna*, India  
..... **C. amaryllidicola**  
Stromata smaller, to 70 µm diam; conidiophores usually much shorter ..... 4
- 4 (3) Conidia narrow, 20–285 × 2–3.5 µm; on *Crinum asiaticum*, India ..... **C. crinicola**  
Conidia broader, (2–)3–7.5 µm; on other hosts ..... 5
- 5 (4) Stromata lacking or small; on *Allium* spp. .... **C. duddiae**  
Stromata well-developed, 25–70 µm diam ..... 6
- 6 (5) Conidiophores very long, 160–405 µm; conidia to 435 µm long; on *Allium cepa*, Brazil ..... **C. riofranciscana**  
Conidiophores shorter, 30–90 µm long; conidia 60–120 µm long; on other hosts of the *Amaryllidaceae* ..... **C. amaryllidis**

***Cercospora* species on Amaryllidaceae**

***Cercospora amaryllidicola*** R.C. Rajak, *Mycotaxon*  
**10**: 457 (1980); as "*amaryllicola*".

(Fig. 5)

*Literature*: Crous & Braun (2003: 55), Kamal (2010: 16).

*Illustration*: Rajak (1980: 458, fig. 2).

*Description*: Leaf spots olivaceous-brown to greyish brown, halo indistinct, infections at first at the tip, developing downwards, die-back observed. *Caespituli* amphigenous, effuse, greyish black. *Mycelium* internal. *Stromata* well-developed, globose, 64–112 µm wide, dark brown to greyish black. *Conidiophores* fasciculate, 6–15, erect, straight to flexuous, subcylindrical to geniculate, unbranched, 225–640 × 5–7 µm, pluriseptate, olivaceous-brown to brown, paler towards the tip, wall somewhat thickened, smooth; conidiogenous cells integrated, terminal or occasionally intercalary, with distinct conidiogenous loci, thickened and darkened. *Conidia* solitary, acicular-filiform, 70–450 × 4–6.5 µm, 6–25-septate, hyaline, thin-walled, smooth, apex pointed, base truncate or somewhat narrowed at the base, hila thickened and darkened.

*Holotype*: **India**: Madhya Pradesh: Jabalpur, Tagore garden, on *Amaryllis belladonna*, Jan. 1978, R. C. Rayak (K(M) IMI 225290).

*Host range and distribution*: On *Amaryllis belladonna*, *Amaryllidaceae*, Asia (India).

*Notes*: A true *Cercospora* s. str. distinct from *C. apii* s. lat. by having very long conidiophores, to 640 µm, and wider conidia, 72–450 × 4–6.5 µm.

***Cercospora amaryllidis*** Ellis & Everh., *J. Mycol.* **3**: 14 (1887).

(Similar to Fig. 1)

*Literature*: Saccardo (1892: 653), Lindau (1910: 91), Vassiljevsky & Karakulin (1937: 223), Chupp (1954: 36), Braun (1991: 295), Crous & Braun (2003: 55).

*Illustration*: Braun (1991: 295, plate 4, fig. 25 B).

*Description*: Leaf spots lacking or pale, diffuse or subcircular to irregular, 1–5 mm diam. *Caespituli* amphigenous, often epiphyllous, visible as minute black dots. *Mycelium* internal. *Stromata* well-developed, large, 30–70 µm diam, dark brown, composed of swollen hyphal cells, 5–12 µm diam, round to angular in outline, large stromata often rupturing the epidermis, erumpent. *Conidiophores* in moderately large to large fascicles, 10–35, loose to dense, arising from stromata, erumpent, erect, straight, subcylindrical to geniculate-sinuuous, unbranched, 30–90 × 4–7 µm, septate, olivaceous-brown, yellowish brown to medium brown, thin-walled, smooth; conidiogenous cells integrated, terminal, rarely intercalary or conidiophores reduced to conidiogenous cells, 10–25 µm long, with thickened and darkened conidiogenous loci, about 1.5–3 µm diam. *Conidia* solitary, acicular, straight to curved, 60–120 × (2–)3–5 µm, indistinctly pluriseptate, hyaline, thin-walled, smooth, apex pointed, base truncate or only slightly narrowed at the very

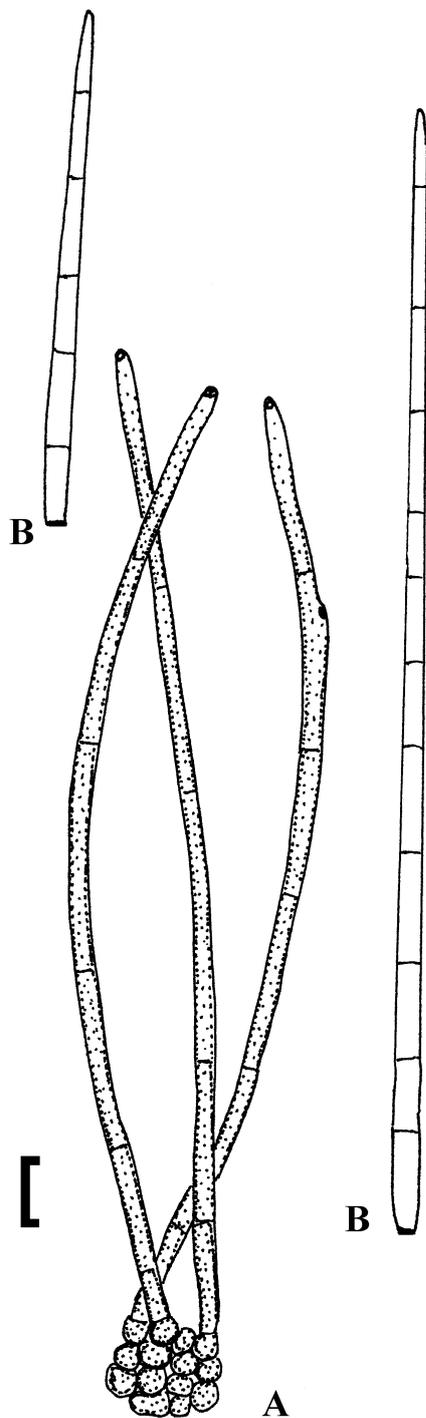


Fig. 5. *Cercospora amaryllidicola* (K(M) 225290). A. Conidiophore fascicle. B. Conidia. Bar = 10  $\mu$ m.

base, about 1.5–3  $\mu$ m wide, hila somewhat thickened and darkened.

**Holotype:** USA: Louisiana: on *Amaryllis* sp., 26 Jul. 1886, Langlois 589 (NY 1840467). **Isotype:** BPI 432570. **Topotype:** BPI 432569 (collected 18 Nov. 1885).

**Host range and distribution:** On *Agapanthus* sp., *Amaryllis* (*belladonna*, *Amaryllis* sp.), *Cephyranthes chloroselen* (*Cooperia drummondii*), *Cyrthanthus elatus* (*Amaryllis purpurea*), *Hippeastrum* sp., *Hymenocallis* sp.,

*Amaryllidaceae*, Europe (Germany, Italy), North America (USA, Alabama, Florida, Louisiana, Texas), South America (Colombia), Central America and West Indies (Bermuda, Cuba, El Salvador, Panama, Puerto Rico, Virgin Islands).

**Notes:** The type specimen of *C. amaryllidis* is a mixed sample, containing *C. amaryllidis* (a true *Cercospora*), and a *Pseudocercospora* sp. Chupp (1954) confused the issue by describing characters of the *Pseudocercospora* sp. Braun (1991: 295) confined the name *C. amaryllidis* to the true *Cercospora* s. str. and published a redescription. Records of *C. amaryllidis* on *Manfreda maculosa* (*Asparagaceae*) are doubtful. Furthermore, it is not quite clear if all other records of this species are based on correct determinations and refer to true *C. amaryllidis* or rather to *Pseudocercospora* spp.

***Cercospora crinicola*** R.K. Srivast., N. Srivast. & A.K. Srivast., *Proc. Natl. Acad. Sci. India*, B, **64**: 107 (1994); as "*criniicola*".  
(Similar to Fig. 1)

**Literature:** Crous & Braun (2003: 143), Kamal (2010: 36).

**Illustration:** Srivastava et al. (1994: 106, fig. 1).

**Description:** Leaf spots amphigenous, circular to oblong, 2–20 mm diam, various shades of brown or red. *Caespituli* amphigenous, mainly hypophyllous. *Mycelium* internal. *Stromata* subglobose, 35–50  $\mu$ m diam, substomatal, reddish brown to almost black. *Conidiophores* in dense fascicles, arising from stromata, through stomata, erect, straight, curved to geniculate-sinuuous, unbranched, about 50–180  $\times$  3–6  $\mu$ m, septate, light brown; conidiogenous cells integrated, terminal and intercalary, with thickened and darkened conidiogenous loci. *Conidia* solitary, acicular, shorter conidia sometimes more cylindrical, straight to somewhat curved, about 20–285  $\times$  2–3.5  $\mu$ m, 1–28-septate, hyaline, thin-walled, smooth, apex subacute to obtuse, base truncate with somewhat thickened and darkened hilum.

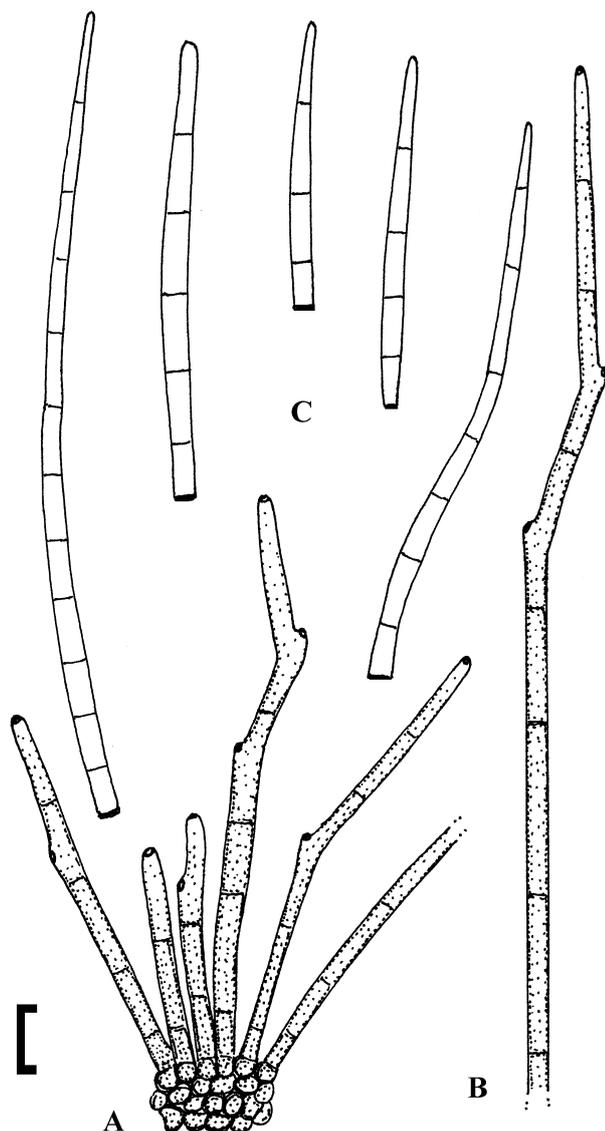
**Holotype:** India: Uttar Pradesh: Gorakhpur, Botanical Garden of the University, on *Crinum asiaticum*, *Amaryllidaceae*, Feb. 1992, R. K. Srivastava (GPU, Gorakhpur University, 1401). **Isotype:** HCIO 30933.

**Host range and distribution:** Only known from the type collection.

**Note:** A true *Cercospora* s. str. belonging to the *C. apii* s. lat. complex.

***Cercospora duddiae*** Welles, *Phytopathology* **13**: 362 (1923).  
(Fig. 6)

**Literature:** Vassiljevsky & Karakulin (1937: 297), Chupp (1954: 346), Narain & Saksena (1971: 134), Ellis (1976: 271), Little (1987c), Chi (1994: 208), Braun & Mel'nik (1997: 57), Crous & Braun (2003: 167), Guo et al. (2005: 176–177), Kamal (2010: 42).



**Fig. 6.** *Cercospora duddiae* (BPI 436011). **A.** Conidiophore fascicle. **B.** Conidiophore. **C.** Conidia. Bar = 10  $\mu$ m.

**Illustrations:** Narain & Saksena (1971: 135, figs 1–2), Ellis (1976: 271, fig. 205 B), Little (1987c: unnumbered figure), Chi (1994: 209, fig. 230), Guo *et al.* (2005: 177, fig. 124).

**Description:** *Leaf spots* varying on different hosts, but usually beginning as chlorotic spots, circular to oblong, 0.5–6 mm diam, pale brownish, brown, greyish brown or with dingy grey centre, margin indistinct, yellow or somewhat darker. *Caespituli* amphigenous, usually forming an olivaceous fruiting layer. *Mycelium* internal. *Stromata* lacking or small aggregations of swollen hyphal cells, brown. *Conidiophores* in small to moderately large fascicles, mostly 2–15, loose to moderately dense, arising from internal hyphae or small stromatic aggregations of hyphal cells, through stomata or erumpent, erect, straight, subcylindrical to somewhat geniculate-sinuous, unbranched, (15–)40–180(–475)  $\times$  4–8  $\mu$ m, 0–8-septate, light brown to olivaceous-brown, paler towards the tip, thin-walled, smooth; conidiogenous cells integrated, terminal or intercalary, short conidiophores sometimes reduced to conidiogenous cells, about 10–30  $\mu$ m long, with a single or several thickened

and darkened conidiogenous loci. *Conidia* solitary, acicular, short conidia sometimes subcylindrical, 25–150(–250)  $\times$  (2.5–) 3–5(–7.5)  $\mu$ m, usually 3–16-septate, hyaline, thin-walled, smooth, apex acute to subobtuse, base truncate or only slightly attenuated at the very base, mostly 2–4  $\mu$ m wide, hila thickened and darkened.

**Syntypes:** **Philippines:** *Laguna:* Los Baños, on *Allium cepa* and *A. sativum*, *C. B. Welles* (not traced, probably not preserved). **Neotype (designated here,** MycoBank MBT178132): **Philippines:** *Laguna:* College, on *Allium cepa*, 6 Oct. 1959, *A de Dios* (BPI 436011).

**Host range and distribution:** On *Allium* (*ascalonicum*, *cepa*, *fistulosum*, *porrum*, *sativum*, *schoenoprasum*, *tuberosum*, *Allium* sp.), *Amaryllidaceae* (*Allioideae*, syn. *Alliaceae*), Africa (Mauritius, Nigeria, Sierra Leone, Somalia, Tanzania, Togo, Uganda), Asia (Brunei, Cambodia, China, India, Indonesia, Malaysia, Myanmar, Oman, Papua New Guinea, Philippines, Russia, Far East, Sabah, Thailand, Yemen), Australia, Caucasus (Azerbaijan, Georgia), North America (Mexico), Oceania (Palau, Samoa, Vanuatu), West Indies (Barbados, Cuba, Jamaica).

**Note:** A true *Cercospora* s. str. with relatively wide conidia (4–6  $\mu$ m).

***Cercospora haemanthi*** Kalchbr., *Grevillea* 9: 24 (1881). (Fig. 7)

**Literature:** Saccardo (1886: 477), Chupp (1954: 37), Crous & Braun (1996: 276; 2003: 209).

**Description:** *Leaf spots* amphigenous, circular to somewhat angular-irregular, 3–12 mm diam, pale tan to dark olivaceous, margin indefinite or narrow, reddish. *Caespituli* amphigenous, punctiform, pustulate, blackish, scattered. *Mycelium* internal. *Stromata* substomatal, well-developed, 20–80  $\mu$ m diam, dark brown. *Conidiophores* in small to usually large fascicles, loose to mostly dense, sometimes almost coremioid, arising from stromata, through stomata, erect, straight to slightly geniculate, usually unbranched, 20–150  $\times$  4–7  $\mu$ m, aseptate to pluriseptate, pale to medium olivaceous-brown, wall thin to slightly thickened, smooth; conidiogenous cells integrated, terminal, occasionally conidiophores reduced to conidiogenous cells, 15–50  $\mu$ m long, conidiogenous loci conspicuous, thickened and darkened, 3–4  $\mu$ m diam. *Conidia* solitary, cylindrical-obclavate, 20–220  $\times$  4–8  $\mu$ m, pluriseptate, mostly with 4–10 septa, hyaline, thin-walled, smooth, apex obtuse, base truncate to somewhat obconically truncate, 3–4  $\mu$ m wide, hila thickened and darkened.

**Lectotype (designated here,** MycoBank MBT178133): **South Africa:** *Cape Province:* on *Scadoxus puniceus*, Jan. 1875, *MacOwan 1020* (B 700016004). **Isolectotypes:** B 700016005, 700016006.

**Host range and distribution:** On *Scadoxus* (*membranaceus*, *multiflorus*, *puniceus* [*Haemanthus natalensis*]), *Amaryllidaceae*, Africa (Ethiopia, South Africa).

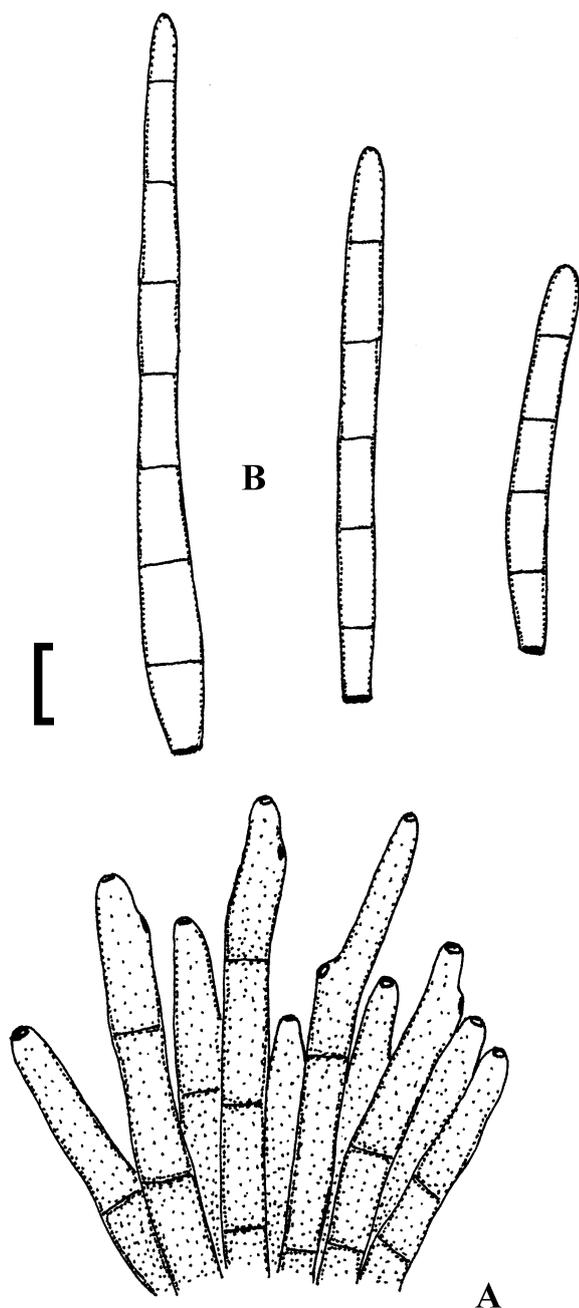


Fig. 7. *Cercospora haemanthi* (B, holotype). A. Conidiophore fascicle. B. Conidia. Bar = 10 µm.

Note: A true *Cercospora* s. str. distinct from *C. apii* s. lat. by having much wider obclavate-cylindrical conidia.

***Cercospora riofranciscana*** Bezerra & Peres, *Publ. Inst. Micol. Univ. Recife* **450**: 9 (1965). (Fig. 8)

Literature: Crous & Braun (2003: 356).

Illustration: Batista et al. (1965: 20, fig. 6).

Description: Leaf spots numerous, elliptical or oblong, at first brown, later dark, 0.5–4 mm diam. Mycelium internal; hyphae inter- and intracellular, hyphal cells 7.5–18.5 × 3.5–

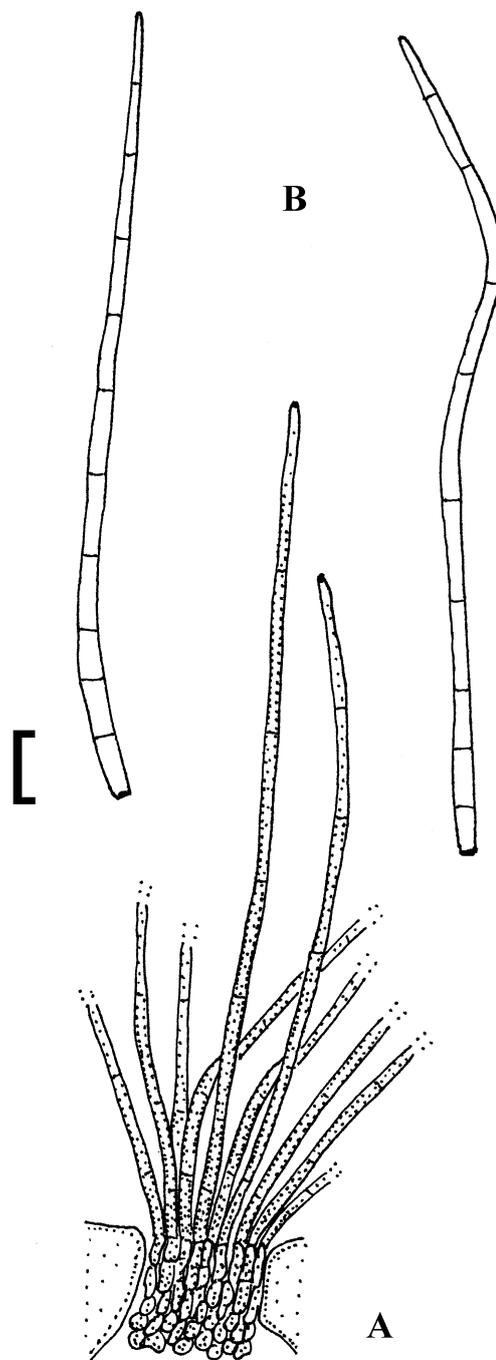


Fig. 8. *Cercospora riofranciscana* (IMUR 46193). A. Conidiophore fascicle. B. Conidia. Bar = 10 µm.

5.5 µm. Stromata intraepidermal, 25–65 µm diam, brown. Conidiophores fasciculate, subcylindrical-filliform, non-geniculate, unbranched, 160–405 × 3.5–7.5 µm, pluriseptate, brown; conidiogenous cells integrated, terminal, usually with terminal truncate, thickened and darkened conidiogenous locus. Conidia solitary, acicular, straight to curved, 120–435 × 3.5–4 µm, pluriseptate, hyaline, thin-walled, smooth, apex pointed, base truncate, hila thickened and darkened.

Holotype: **Brazil**: Pernambuco: Rio São Francisco, Belém de Maria, on *Allium cepa*, 26 May 1965, A. Lustosa Sobrinho (IMUR 46193).

*Host range and distribution:* On *Allium cepa*, *Amaryllidaceae* (*Allioideae*, syn. *Alliaceae*), South America (Brazil).

### **Doubtful, excluded and insufficiently known species**

***Cercospora sancti-marini*** (Sacc.) Vassiljevsky, in Vassiljevsky & Karakulin, *Fungi Imperfecti Parasitici (Hyphomycetes)* 1: 197 (1937).

*Basionym:* *Cercosporina sancti-marini* Sacc., *Atti Mem. Accad. Sci. Lett. Arti Padova* 33: 178 (1917).

*Synonym:* *Cercospora sancti-marini* (Sacc.) Chupp, *Monograph of Cercospora*: 353 (1954).

*Literature:* Saccardo (1931: 908), Chupp (1954: 353), Crous & Braun (2003: 364).

*Description:* Leaf spots indistinct. Colonies sparingly effuse, brown. Mycelium internal. Stromata present. Conidiophores mildly geniculate, unbranched, 60–70 × 4.5 µm, very pale olivaceous, paler towards the tip. Conidia cylindrical, 45–50 × 3.5–4 µm, usually 4-septate, hyaline, ends rounded.

*Holotype:* **San Marino:** Dogama, on *Allium nigrum*, *Amaryllidaceae* (*Allioideae*, syn. = *Alliaceae*) [not traced].

*Host range and distribution:* Only known from the type collection.

*Notes:* This species is insufficiently known. Type material of this species is not preserved in Saccardo's herbarium at PAD.

## ***Pseudocercospora***

### **Key to *Pseudocercospora* species on *Amaryllidaceae***

- 1 Conidiophores narrow, 1.5–2.5 µm; conidia 9–39 × 1.5–3.5 µm; on *Zephyranthes rosea*, India ..... ***P. indica***  
 Conidiophores wider, 2.5–6(–8) µm; conidia longer and broader, 20–125 × 2–6 µm;  
 on various hosts of the *Amaryllidaceae* ..... ***P. pankratii***

### ***Pseudocercospora* species on *Amaryllidaceae***

***Pseudocercospora indica*** D. Gupta, Padhi & Chowdhry, *Sci. Cult.* 48: 112 (1982). (Fig. 9)

*Illustration:* Gupta *et al.* (1982: 112, figs 1–2).

*Description:* Leaf spots amphigenous, linear, starting at the tip, proceeding downwards, extending to 10–65 mm in length, yellowish brown, margin black. *Caespituli* hypophyllous, punctiform, dark. Mycelium internal. Stromata well-developed, large, immersed, subglobose to globose, 45–75 µm diam, dark brown. Conidiophores numerous, in dense fascicles, almost sporodochial, arising from stromata, erect, straight, subcylindrical, barely geniculate, unbranched, 9–36 × 1.5–2.5 µm, deep olivaceous-brown, 0–2-septate, thin-walled, smooth; conidiogenous

The present description is based on the original publication and Chupp (1954). Without any material it is even unclear if this species represent a true *Cercospora* s. str.

***Cercospora victorialis*** Thüm., *Hedwigia* 21: 172 (1882).

*Synonyms:* *Cladosporium alliicola* H.D. Shin & U. Braun, *Korean J. Mycol.* 23: 141 (1995) [*holotype:* **Korea:** Suwon, on *Allium victorialis*, 3 Sep. 1993, H. D. Shin (KUS 12597); *isotype:* HAL 1533 F.

***Cladosporium victorialis*** (Thüm.) U. Braun & H.D. Shin, in Braun & Mel'nik, *Trudy Bot. Inst. im. V.L. Komarova* 20: 101 (1997).

*Literature:* Saccardo (1886: 477), Vassiljevsky & Karakulin (1937: 297), Chupp (1954: 355), Braun & Mel'nik (1997: 101), Crous & Braun (2003: 422), Schubert (2005: 148–149), Bensch *et al.* (2012: 288).

*Illustrations:* Shin & Braun (1995: 140–141, figs 1–2), Braun & Mel'nik (1997: fig. 71), Schubert (2005: 149, fig. 72, pl. 33, figs A–D), Bensch *et al.* (2012: 288–289, figs 338–339).

*Lectotype* (designated by Braun, in Braun & Mel'nik 1997): **Russia:** West Siberia, Mt Kerlygan, on *Allium victorialis*, Martjanov (LE 404551). *Isolectotype:* LE 404552.

*Host range and distribution:* On *Allium* (*cepa*, *sativum*, *victorialis* [*ochotense*]), *Amaryllidaceae* (*Allioideae*, syn. *Alliaceae*), Asia (Japan, Korea, Russia) South America (Brazil).

cells integrated, terminal or conidiophores reduced to conidiogenous cells, conidiogenous loci inconspicuous, unthickened, not darkened. Conidia solitary, obclavate-cylindrical, straight to curved, short and narrow, (9–)12–39 × 2–3.5 µm, 2–5-septate, pale to medium olivaceous-brown, thin-walled, smooth, apex obtuse, base short obconically truncate, hila unthickened, not darkened.

*Holotype:* **India:** Odisha: Bhubaneswar, botanical garden of the Utkal University, on *Zephyranthes rosea*, *Amaryllidaceae*, 26 Feb. 1978, D. Gupta (HCIO 32865).

*Host range and distribution:* Only known from the type collection.

*Notes:* *Pseudocercospora indica* Deighton (Deighton 1987), described from India on *Uraria picta*, is a homonym and needs a new name: ***Pseudocercospora urariigena*** U. Braun, **nom.**

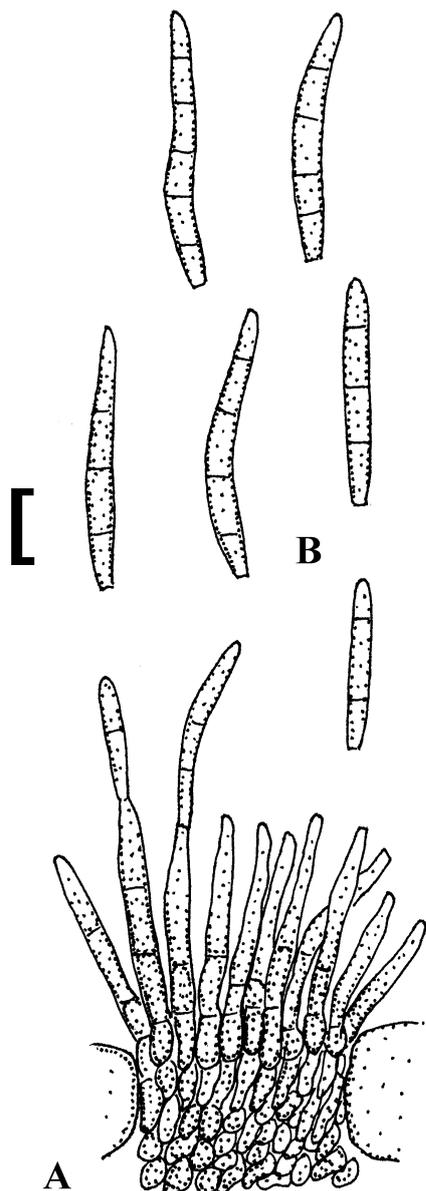


Fig. 9. *Pseudocercospora indica* (based on Gupta et al. 1982; 112, fig 1–2). A. Conidiophore fascicle. B. Conidia. Bar = 10  $\mu$ m.

nov. [MycoBank MB809007. *Basionym*: *Pseudocercospora indica* Deighton, *Trans. Brit. Mycol. Soc.* **88**: 371 (1987).]

***Pseudocercospora pancratii*** (Ellis & Everh.) U. Braun & R.F. Castañeda, *Cryptog. Bot.* **2**: 294 (1991). (Fig. 10)

*Basionym*: *Cercospora pancratii* Ellis & Everh., *J. Mycol.* **3**: 15 (1887).

*Synonyms*: *Cercospora hymenocallidis* Pat., *Bull. Trimestriel Soc. Mycol. France* **28**: 142 (1912) [*holotype*: **Costa Rica**: San José, museum garden, Jul. 1908, "Herb. Inst. Physio-geogr. Nat. costaricensis no. 11", herb. Patouillard 7828 (FH)].

*Cercosporidium hymenocallidis* (Pat.) Sacc., *Syll. Fung.* **25**: 895 (1931).

*Missapplied name*: *Cercospora amaryllidis sensu* Chupp (1954: 36) p.p.

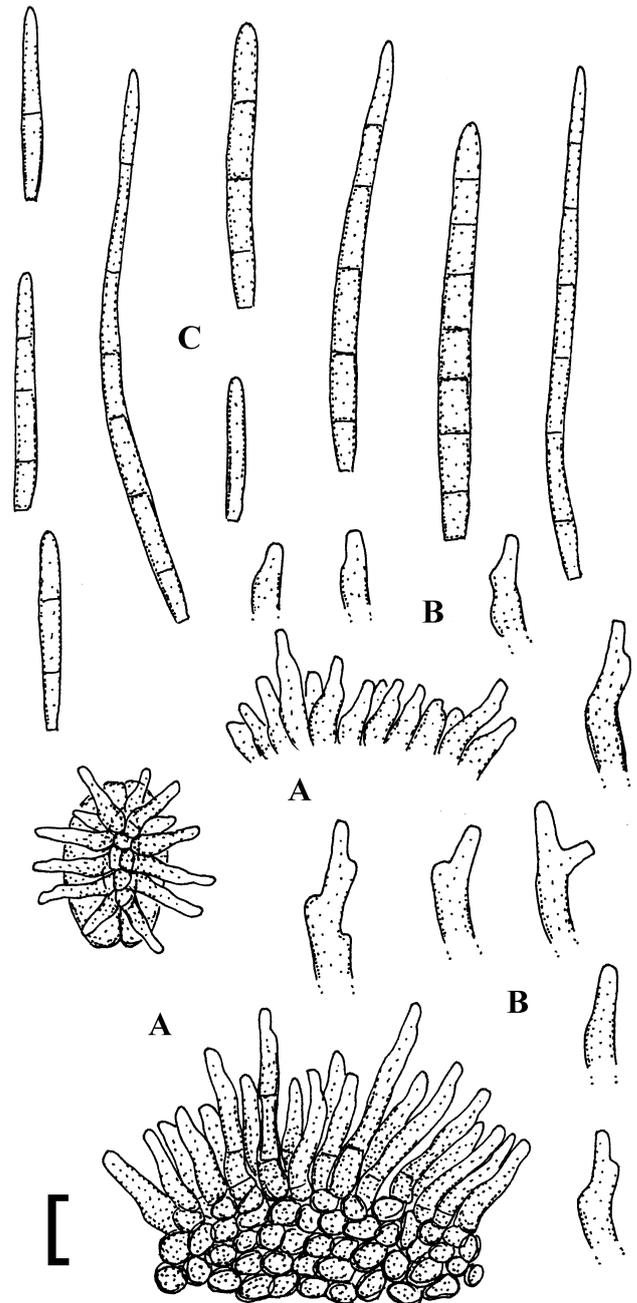


Fig. 10. *Pseudocercospora pancratii* (NY 00838178). A. Conidiophore fascicles. B. Conidiophores. C. Conidia. Bar = 10  $\mu$ m.

*Literature*: Saccardo (1892: 654), Chupp (1954: 37), Vasudeva (1963: 157), Katsuki (1965: 9), Crous & Braun (2003: 306), Kamal (2010: 207), Braun & Urtiaga (2012: 318), Kirschner (2014: 487–488).

*Illustration*: Braun & Castañeda Ruiz (1991: 295, fig. 25 A), Kirschner (2014: 488, fig. 5).

*Description*: *Leaf spots* amphigenous, 1–20 mm diam or sometimes covering large leaf segments, subcircular to irregular, pale, greyish, brown, reddish, occasionally somewhat zonate, margin indefinite or surrounded by a diffuse darker to blackish, sometimes reddish margin. *Caespituli* amphigenous, punctiform, blackish to dingy grey by abundant conidial formation, when abundant in dark grey layers.

*Mycelium* internal; hyphae branched, septate, 1–4 µm wide, hyaline to medium brown, thin-walled, smooth. *Stromata* well-developed, substomatal, 10–80(–125) µm diam, sometimes rupturing the stomata, often somewhat erumpent, brown to dark brown, visible as small black dots. *Conidiophores* in dense, rich fascicles, arising from, stromata, through stomata, straight and subcylindrical-lageniform to strongly flexuous, geniculate-sinuous, simple, rarely branched, 5–50 × 2.5–6(–8) µm, 0(–2)-septate, subhyaline to olivaceous-brown or medium brown, thin-walled, smooth; conidiophores mostly reduced to conidiogenous cells, occasionally with integrated, terminal conidiogenous cells, 5–25 µm long, conidiogenous loci inconspicuous, unthickened, not darkened. *Conidia* solitary, obclavate, subcylindrical, subacicular-filiform, 20–125 × 2–6 µm, 0–10-septate, subhyaline to pale olivaceous, thin-walled, smooth, apex obtuse to subacute, base truncate to short obconically truncate, 1–3.5 µm wide, hila neither thickened nor darkened.

**Holotype:** USA: Louisiana: On *Hymenocallis crassifolia*, June 1886, Langlois 656 (NY 00838178). **Isotype:** BPI 457098.

**Host range and distribution:** On *Agapanthus africanus* [umbellatus], *Ammocharis longifolia* [*Crinum longifolium*], *Crinum* (*americanum*, *asiaticum* var. *japonicum*, *zeylanicum*, *Crinum* sp.), *Hippeastrum* (*punicum* [equestre], *Hippeastrum* sp.), *Hymenocallis* (*arenicola*, *caribaea* [declinata], *coronaria*, *crassifolia*, *latifolia*, *littoralis*, *tubiflora*), *Iris* sp., *Pancratium* sp., *Sprekelia formosissima*, *Amaryllidaceae*, Africa (Kenya), Asia (India, Karnataka; Japan, Myanmar, Taiwan), Central America and West Indies (Barbados, Bermuda, Costa Rica, Cuba, Puerto Rico, Virgin Islands), South America (Brazil, Venezuela), North America (USA, Alabama, Florida, Louisiana, Mississippi, Texas).

**Notes:** Kirschner (2013) observed immature asci in stromata of a collection from Taiwan.

## Zasmidium

A single species.

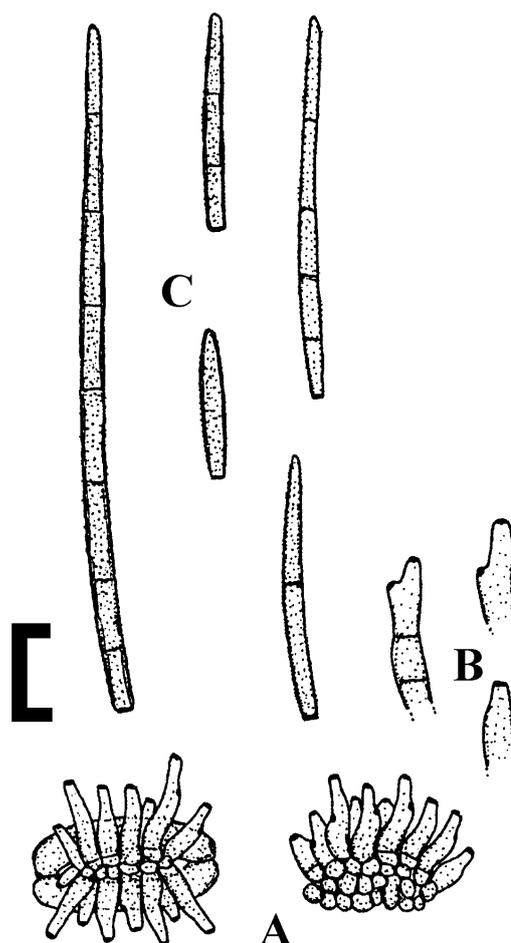
**Zasmidium hymenocallidis** (U. Braun & Crous) U. Braun & Crous, *Schlechtendalia* **20**: 101 (2010). (Fig. 11)

**Basionym:** *Stenella hymenocallidis* U. Braun & Crous, *Mycotaxon* **92**: 403 (2005).

**Illustration:** Braun & Crous (2005: 411, fig. 8).

**Exsiccatae:** Ellis & Everh., North Amer. Fungi 1767.

**Description:** Lesions diffuse, shape and size variable, brown to reddish brown, margin indefinite. *Caespituli* amphigenous, punctiform, scattered, greyish brown. *Mycelium* internal; hyphae branched, septate, 2–5 µm wide, subhyaline, thin-walled, smooth. *Stromata* substomatal, 10–50 µm diam, brown, composed of swollen hyphal cells, 2–7 µm diam, walls somewhat thickened. *Conidiophores* in small to moderately



**Fig. 11.** *Zasmidium hymenocallidis* (NY 01043037). **A.** Conidiophore fascicles. **B.** Conidiophores. **C.** Conidia. Bar = 10 µm.

large fascicles, loose to very dense, arising from stromata, emerging through stomata, erect, straight, subcylindrical-conical to slightly geniculate-sinuous, unbranched, 5–30 × 3–5 µm, 0–2-septate, subhyaline to pale olivaceous-brown, thin-walled, smooth or almost so; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 10–20 µm long, conidiogenous loci conspicuous, somewhat thickened and darkened, 1–2 µm wide. *Conidia* solitary, short conidia ellipsoid-ovoid to short cylindrical, longer conidia cylindrical-filiform, subacicular, occasionally narrowly obclavate-cylindrical, (15–)20–110 × 2.5–4 µm, (0–)1–8-septate, without any constrictions at septa, subhyaline, pale olivaceous to olivaceous-brown, occasionally pale brown, thin-walled, verruculose, apex obtuse to subacute, base truncate to short obconically truncate, 1–1.5 µm wide, hila slightly thickened and darkened.

**Holotype:** USA: Louisiana: Point a la Hache, on living and senescing leaves of *Hymenocallis crassifolia*, June 1886, A. B. Langlois [Ellis & Everh., North Amer. Fungi 1767] (NY 01043037).

**Host range and distribution:** Only known from the type collection.

*Notes:* This is one of the few *Zasmidium* species without any superficial hyphae *in vivo*. However, molecular analyses of comparable species with lacking superficial mycelium revealed that such taxa belong in *Zasmidium* (see Braun et al. 2013, discussion under *Zasmidium*).

## Aponogetonaceae

### *Cercospora*

A single species.

***Cercospora aponogetoncola*** M.S. Pavgi & L. Singh, *Hydrobiologia* **53**: 89 (1977). (Similar to Fig. 1)

*Literature:* Crous & Braun (2003: 62), Kamal (2010: 17).

*Illustration:* Pavgi & Singh (1977: 89, figs 5–8).

*Description:* Leaf spots amphigenous, on floating leaves, subcircular to somewhat angular-irregular, 1–4 mm diam, often confluent, pale olivaceous-brown, margin indistinct to

darker. *Caespituli* amphigenous, dark, punctiform. *Mycelium* internal. *Stromata* substomatal, according to the original description large, about 70–110 µm diam. *Conidiophores* in loose to moderately large fascicles, arising from stromata, through stomata, erect, straight, subcylindrical to slightly geniculate, unbranched, 30–180 × 3.5–7.5 µm, pluriseptate, brown throughout or paler towards the tip, thin-walled, smooth; conidiogenous cells integrated, terminal, about 10–30 µm long, conidiogenous loci thickened and darkened, 2.5–3 µm wide. *Conidia* solitary, acicular, young conidia occasionally somewhat obclavate-cylindrical, 60–280 × 3–5 µm, 5–17-septate, hyaline or subhyaline, very pale greenish olivaceous, thin-walled, smooth, apex obtuse to acute, base truncate, occasionally somewhat obconically truncate, 2–3 µm wide, hilum somewhat thickened and darkened.

*Holotype:* India: Uttar Pradesh: Varanasi, on *Aponogeton crispus*, Aponogetonaceae, 19 Sep. 1969, L. Singh (HClO 31612). *Isotype:* K(M) IMI 174885.

*Host range and distribution:* Only known from the type collection.

*Note:* A true *Cercospora* s. str. close to *C. apii* s. lat.

## Araceae

### *Cercospora*

#### Tabular key to *Cercospora* species on Araceae according to host genera

#### *Alocasia*

A single species ..... **C. alocasiae**

#### *Amorphophallus*

1 Conidia acicular, base truncate ..... **C. amorphophalli**

1 Conidia obclavate-cylindrical, base obconically truncate ..... 2

2 (1) Conidia narrow, 20–100 × 2–3.5 µm, base 1–2 µm wide ..... **C. amorphophallicola**

Conidia broader, 30–140(–230) × 3–7 µm, base 2–3 µm wide ..... **C. chevalieri**

#### *Anchomanes*

1 Leaf spots 1–11 mm diam; conidiophores in dense fascicles, 35–75 µm long, 0–2-septate; conidia obclavate-subcylindrical, 35–90 × 5–6 µm ..... **C. anchomanes**

Leaf spots much larger, 10–30 mm diam; conidiophores in loose to moderately dense fascicles, much longer and pluriseptate, 50–300(–350) µm; conidia cylindrical, rarely obclavate-cylindrical, 30–165 × 4–5.5 µm ..... **C. anchomanicola**

#### *Anthurium*

A single species ..... **C. richardiicola**

#### *Arum*

1 Conidia cylindrical, 10–50 × 3–4 µm, 1–4-septate ..... **C. ari**

Conidia obclavate, 40–70 × 4.5–5 µm, 8–12-septate ..... **C. aricola**

#### *Arisaema*

A single species ..... **C. arisaematis**

#### *Caladium*

1 Conidia acicular, 25–260 × 2.5–5 µm, pluriseptate ..... **C. caladii**

Conidia broadly ellipsoid-ovoid, obovoid to fusiform-subcylindrical, 15–55(–70) × 5–9.5 µm, 2–7-septate  
 ..... *C. verruculosa*

**Calla**

A single species ..... *C. callae*

**Colocasia**

A single species ..... *C. alocasiae*

**Cryptocoryne**

A single species ..... *C. cryptocorynes*

**Epipremnum**

A single species ..... *C. richardiicola*

**Monstera**

A single species ..... *C. monsterae*

**Peltrandra**

A single species ..... *C. callae*

**Philodendron**

A single species ..... *C. apii* s. lat.

**Pistia**

1 Conidia narrowly acicular, short conidia sometimes obclavate-cylindrical, 30–300 × 2–4 µm ..... *C. alocasiae*

Conidia broadly acicular to obclavate-cylindrical, 30–150 × 3–6.5 µm ..... *C. pistiae*

**Plesmonium**

A single species ..... *C. chevalieri*

**Pothos**

A single species ..... *C. bombycina*

**Symplocarpus**

A single species ..... *C. symplocarpi*

**Syngonium**

A single species ..... *C. syngoniicola*

**Typhonium**

A single species ..... *C. typhoniae*

**Xanthosoma**

A single species ..... *C. chevalieri*

**Zantedeschia**

1 Conidia acicular, 25–300 × 2–4 µm, 2–20-septate ..... *C. richardiicola*

Conidia broadly obclavate-cylindrical, 25–110 × 4–8 µm, 2–8-septate ..... *C. callae*

**Cercospora species on Araceae**

**Cercospora alocasiae** Goh & W.H. Hsieh, *Trans. Mycol. Soc. Republ. China* **2**: 86 (1987).

(Similar to Fig. 1)

*Synonyms*: *Cercospora alocasiae* Sawada, *Taiwan Agric. Rev.* **38**: 693 (1942), *nom. inval.* (ICN, Art. 39.1).

*Cercospora colocasigena* S. Narayan, Kharwar, R.K. Singh & Bhartiya, *Kavaka* **25**: 88 (1998) [*holotype*:

**India**: *Uttar Pradesh*: Gorakhpur, on *Colocasia esculenta*, Feb. 1992, S. Narayan (HCIO 419320); *isotype*: GPU 5003.

*Literature*: Chupp (1954: 55), Katsuki (1965: 11), Hsieh & Goh (1990: 28), Guo & Jiang (2000a), Crous & Braun (2003: 52), Guo *et al.* (2005: 34–35), Kamal (2010: 14), Phengsintham *et al.* (2013b: 46).

*Illustrations:* Hsieh & Goh (1990: 29, fig. 15), Narayan et al. (1997: 89, fig. 2), Guo et al. (2005: 35, fig. 15), Phengsintham et al. (2013b: 48, figs 4–5).

*Description:* Lesions indistinct or with distinct leaf spots, 1–25 mm diam, subcircular to somewhat irregular or oblong, brownish to grey or greyish white, sometimes zonate, margin indefinite to distinct, brown. *Colonies* amphigenous, effuse, dark. *Mycelium* internal; hyphae branched, septate, 2–4 µm diam. *Stromata* lacking or relatively small, about 10–30 µm diam, substomatal to immersed, olivaceous-brown. *Conidiophores* solitary or in small to moderately large fascicles, loose to dense, arising from internal hyphae or stromata, through stomata or erumpent, erect, straight, subcylindrical to geniculate, unbranched, 10–200 × 3.5–6 µm, continuous to pluriseptate, olivaceous to brown, paler towards the tip, thin-walled, smooth; conidiogenous cells integrated, terminal, 15–40 µm long, with conspicuous conidiogenous loci, thickened and darkened, about 1.5–2.5 µm diam. *Conidia* solitary, acicular, shorter conidia often somewhat obclavate-subcylindrical, straight to curved, 30–200 × 2–4 µm, about 3–24-septate, hyaline, thin-walled, smooth, apex subobtuse to pointed, base truncate to obconically truncate in shorter conidia, about 1.5–3 µm wide, hila thickened and darkened.

*Holotype:* Taiwan: Taipei, on *Alocasia macrorrhizos*, 27 Apr. 1921, K. Sawada (NTU-PPE [hb. Sawada]).

*Host range and distribution:* On *Alocasia* (*macrorrhizos* [*indica*, *odora*], *Alocasia* sp.), *Arum* sp., *Colocasia esculenta*, *Pistia stratiotes*, *Araceae*, Asia (China, India, Japan, Laos, Myanmar, Nepal, Taiwan), South America (Venezuela), West Indies (Cuba).

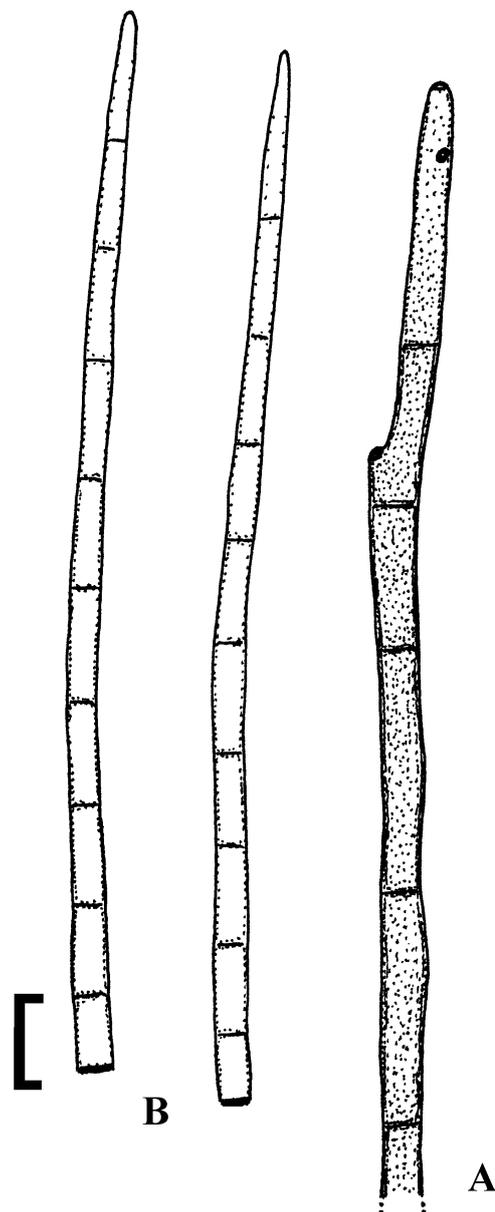
*Notes:* This species belongs to the *Cercospora apii* s. lat. complex. Kamal (2010) examined type material of *C. colocasigena* and reduced it to synonymy with *C. alocasiae*. Authentic collections for *C. alocasiae* Sawada are deposited at BPI (432460, 432461). Thaug (1984) recorded this species from Myanmar on *Arum* sp. Previous records of “*C. caladii*” on *Colocasia esculenta* from China and India belong to the present species.

***Cercospora amorphophalli* Henn., *Hedwigia* 41: 147 (1902).**  
(Fig. 12)

*Synonym:* *Cercospora aracearum* Firdousi, A.N. Rai & K.M. Vyas, *Indian Phytopathol.* 44: 225 (1991) [*holotype:* India: Madhyar Pradesh: Sagar, Gopalpura, South Forest Division, on *Amorphophallus margaritifera*, Aug. 1988, S. A. Firdousi (K(M) IMI 329641)].

*Literature:* Saccardo (1906: 611), Chupp (1954: 56), Boedijn (1961: 412), Katsuki (1965: 11), Guo & Jiang (2000a), Braun (2001a: 431), Crous & Braun (2003: 55, 62), Guo et al. (2005: 36), Kamal (2010: 16, 18).

*Illustrations:* Firdousi et al. (1991: 226, fig. 1), Braun (2001a: 433, fig. 16 B), Guo et al. (2005: 36, fig. 16).



**Fig. 12.** *Cercospora amorphophalli* (B, holotype). **A.** Conidiophores. **B.** Conidia. Bar = 10 µm.

*Description:* Leaf spots amphigenous, circular or subcircular, 1–8 mm diam, pale brownish, grey, greyish white, margin ochraceous to brown. *Caespituli* amphigenous, mostly hypophyllous, delicately punctiform, dark brown to blackish. *Mycelium* internal. *Stromata* lacking or almost so to well-developed, small to moderately large, 10–55 µm diam, substomatal to intraepidermal, yellowish to medium brown or olivaceous-brown. *Conidiophores* loosely fasciculate, about 2–20, arising from internal hyphae or stromata, through stomata or erumpent, erect, straight, subcylindrical to geniculate in the upper portion, unbranched, 8–250 × (2.5–)3–6(–7.5) µm, aseptate to pluriseptate, pale to medium brown or olivaceous-brown throughout or paler towards the tip, thin-walled, smooth; conidiogenous cells integrated, terminal, about 10–30 µm long, with a single to several conspicuously thickened and darkened conidiogenous loci, (2–)3–4 µm diam. *Conidia* solitary, acicular, straight to

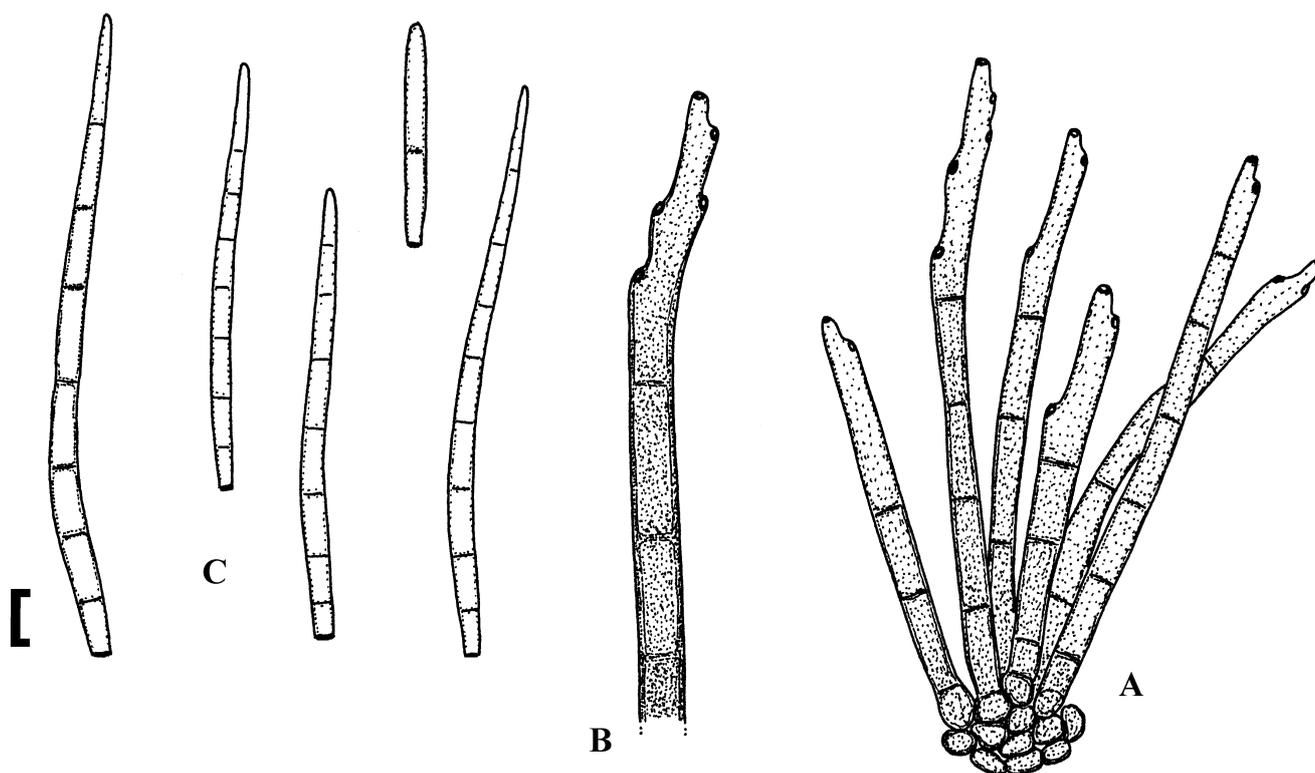


Fig. 13. *Cercospora amorphophallicola* (L 53844). A. Conidiophores. B. Conidia. Bar = 10  $\mu$ m.

somewhat curved, 10–110  $\times$  2–5  $\mu$ m, 3–24-septate, hyaline, thin-walled, smooth, apex pointed, base truncate, 3–4  $\mu$ m wide, hila somewhat thickened and darkened.

**Holotype: Indonesia:** Java: Buitenzorg, on *Amorphophallus* sp., Dec. 1901, Zimmermann (B 700016010).

**Host range and distribution:** On *Amorphophallus* (*paeoniifolius* [campanulatus], *konjac* [rivieri], *margaritifera*, *variabilis*, *Amorphophallus* sp.), Araceae, Africa (Sudan), Asia (China, India, Indonesia, Japan, Philippines, Thailand).

**Note:** This species belongs to the *Cercospora apii* complex.

***Cercospora amorphophallicola*** U. Braun, *Nova Hedwigia* 73: 430 (2001). (Fig. 13)

**Literature:** Crous & Braun (2003: 56).

**Illustration:** Braun (2001a: 433, fig. 16 A).

**Description:** Leaf spots amphigenous, subcircular to angular-irregular, 1–15 mm diam, pale greenish, later pale to dark brown, blackish or reddish brown, finally greyish brown to dingy grey, margin indefinite or with a narrow, dark brown to blackish border or marginal line, sometimes somewhat raised or limited by veins, occasionally with a diffuse halo. *Caespituli* amphigenous, punctiform, dark, mostly scattered. *Mycelium* internal. *Stromata* lacking or small, 10–30  $\mu$ m diam, dark brown, intraepidermal, rarely substomatal. *Conidiophores* in small to moderately large fascicles, loose to dense, arising from

internal hyphae or stromata, mostly erumpent, occasionally emerging through stomata, erect, subcylindrical, in the upper half conspicuously geniculate-sinuuous, unbranched, 20–120  $\times$  3–7  $\mu$ m, pluriseptate throughout, pale to medium dark brown or olivaceous-brown, paler towards the tip, wall somewhat thickened, smooth; conidiogenous cells integrated, terminal, occasionally intercalary, 10–30  $\mu$ m long, conidiogenous loci conspicuous, thickened and darkened, 1–2  $\mu$ m diam. *Conidia* solitary, narrowly obclavate-subcylindrical, 25–100  $\times$  2–3.5  $\mu$ m, 1–8-septate, hyaline or subhyaline, smooth, apex subobtuse to subacute, base obconically truncate to subtruncate, 1–2  $\mu$ m wide, hila thickened and darkened.

**Holotype: Indonesia:** Java: Bogor, Botanical Garden, on *Amorphophallus* sp., May 1950, K. B. Boedijn (L 53844).

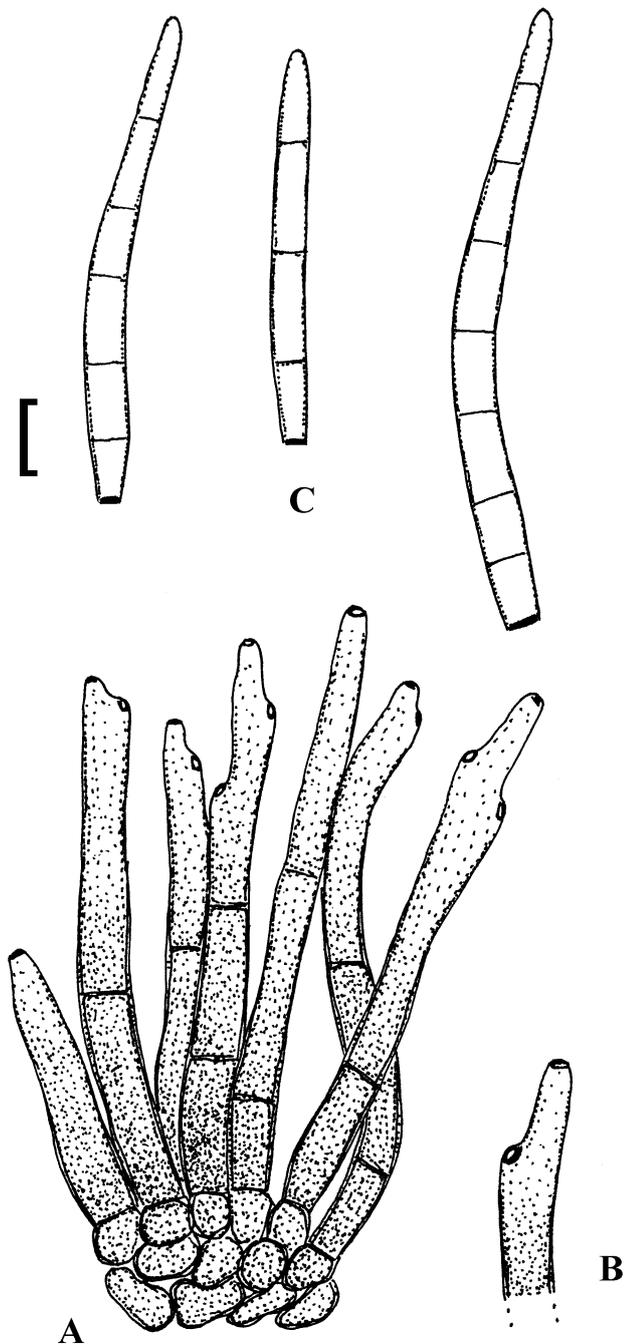
**Host range and distribution:** On *Amorphophallus* sp., Araceae, Asia (Indonesia).

**Note:** This species differs from *C. amorphophalli* in having obclavate-subcylindrical conidia with obconically truncate base and much smaller conidiogenous loci.

***Cercospora anchomanes*** J.M. Yen & Gilles, *Cah. Maboké* 8: 75 (1970). (Fig. 14)

**Literature:** Kranz (1963, as *C. chevalieri*), Crous & Braun (2003: 57).

**Illustration:** Yen & Gilles (1970: 75, fig. 1).



**Fig. 14.** *Cercospora anchomanes* (based on Yen & Gilles 1970: 75, fig. 1). **A.** Conidiophore fascicle. **B.** Conidiophore tip. **C.** Conidia. Bar = 10  $\mu\text{m}$ .

**Description:** *Leaf spots* amphigenous, circular to irregular, 1–11 mm diam, mostly confluent, brown to whitish, border darker brown or yellowish. *Caespituli* amphigenous, usually hypophyllous. *Mycelium* internal. *Stromata* in the stomatal cavity, subglobose, 25–80  $\mu\text{m}$  diam, pigmented. *Conidiophores* in dense fascicles, arising from stromata, through stomata, erect, straight to flexuous or somewhat geniculate, unbranched, 35–95  $\times$  5  $\mu\text{m}$ , 0–2-septate, pale brown, thin-walled, smooth; conidiogenous cells integrated, terminal, conidiogenous loci conspicuous, thickened and darkened. *Conidia* solitary, obclavate-subcylindrical, straight to mostly curved, 35–90  $\times$  5–6  $\mu\text{m}$ , hyaline, thin-walled,

smooth, apex obtuse, base somewhat obconically truncate, hila thickened and darkened.

**Holotype: Gabon:** on *Anchomanes difformis*, 25 Dec. 1969, G. Gilles 30 (not traced).

**Host range and distribution:** On *Anchomanes* (*difformis*, *giganteus*), *Araceae*, Africa (Gabon, Guinea).

**Note:** Type material was expected to be deposited at PC, but could not be traced there.

***Cercospora anchomanicola*** J.M. Yen & Gilles, in Yen, *Bull. Trimestriel Soc. Mycol. France* **90**: 310 (1974). (Fig. 15)

**Literature:** Crous & Braun (2003: 57).

**Illustration:** Yen (1974: 311, fig. 3).

**Description:** *Leaf spots* amphigenous, formed as greenish to greyish discolorations with indistinct margin and yellowish to ochraceous halo, subcircular to somewhat irregular, 10–30 mm diam. *Caespituli* amphigenous, scattered, effuse, punctiform, brown. *Mycelium* internal. *Stromata* substomatal, 20–75  $\mu\text{m}$  diam, subglobose, brown. *Conidiophores* in small to moderately large fascicles, loose to moderately dense, arising from stromata, through stomata, erect, straight, subcylindrical to geniculate-sinuuous, unbranched, 50–300(–350)  $\times$  4–6  $\mu\text{m}$ , pluriseptate throughout, pale olivaceous-brown to brown, paler towards the apex, thin-walled, smooth; conidiogenous cells integrated, terminal or intercalary, 10–40  $\mu\text{m}$  long, conidiogenous loci conspicuous, thickened and darkened, (2–)2.5–3(–3.5)  $\mu\text{m}$  diam. *Conidia* solitary, cylindrical (–obclavate-cylindrical), straight to somewhat curved, 30–165  $\times$  4–5.5  $\mu\text{m}$ , 3–17-septate, hyaline or subhyaline, thin-walled, smooth, apex obtuse, rounded, base truncate to slightly obconically truncate, 2.5–3.5  $\mu\text{m}$  wide, hila thickened and darkened.

**Holotype: Ivory Coast:** Abidjan, on *Anchomanes difformis*, 9 Jul. 1972, G. Gilles (not traced).

**Host range and distribution:** On *Anchomanes difformis*, *Araceae*, Africa (Ivory Coast).

**Notes:** A true *Cercospora* s. str. distinct from *C. apii* s. lat. by having cylindrical to somewhat obclavate-cylindrical conidia. Type material could not be traced at PC, but topotype material, collected in 1973, is deposited in PC (Ivory Coast, Abidjan, on *Anchomanes difformis*, 10 Feb. 1973, G. Gilles, PC), and has been examined. An additional topotype from 1976 is deposited as K(M) IMI 212938.

***Cercospora apii*** Fresen. s. lat. (*sensu* Crous & Braun 2003: 35).

**Literature:** Braun & Urtiaga (2013b).

**Host range and distribution:** On *Philodendron* sp., *Araceae*, South America (Venezuela).

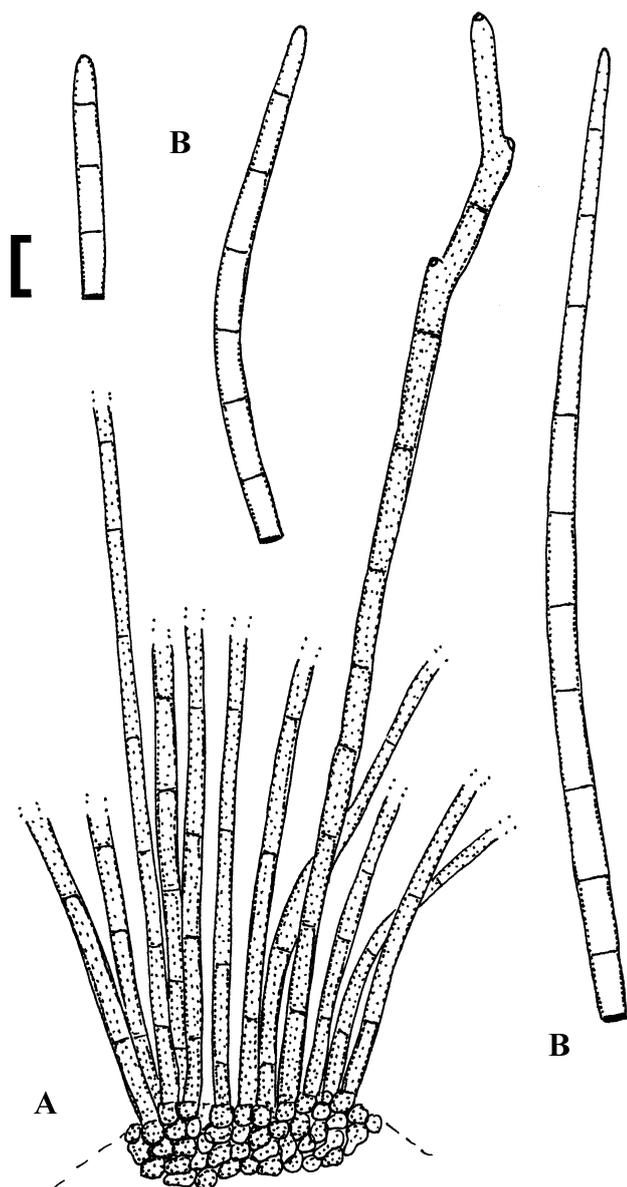


Fig. 15. *Cercospora anchomanicola* (PC, topotype). A. Conidiophore fascicle. B. Conidia. Bar = 10  $\mu$ m.

***Cercospora arisaematis*** F.L. Tai, *Chinese Bot. Soc. Bull.* 2: 47 (1936); as "*arisemae*". (Fig. 16)

*Literature*: Chupp (1954: 56), Katsuki (1965: 11), Hsieh & Goh (1990: 29), Crous & Braun (2003: 65), Guo *et al.* (2005: 37), Kamal (2010: 18), Bhat & Pratibha (2010).

*Illustrations*: Hsieh & Goh (1990: 30, fig. 16), Guo *et al.* (2005: 37, fig. 17).

*Description*: Leaf spots circular or subcircular, 0.5–1.0 mm diam, at first water-soaked, later brown to dingy grey, margin darker brown. *Caespituli* amphigenous, punctiform, dark. *Mycelium* internal. *Stromata* lacking or small, 10–20  $\mu$ m diam, substomatal, brown. *Conidiophores* in small fascicles, 2–9, loose, arising from internal hyphae or stromatic hyphal aggregations, through stomata, erect,

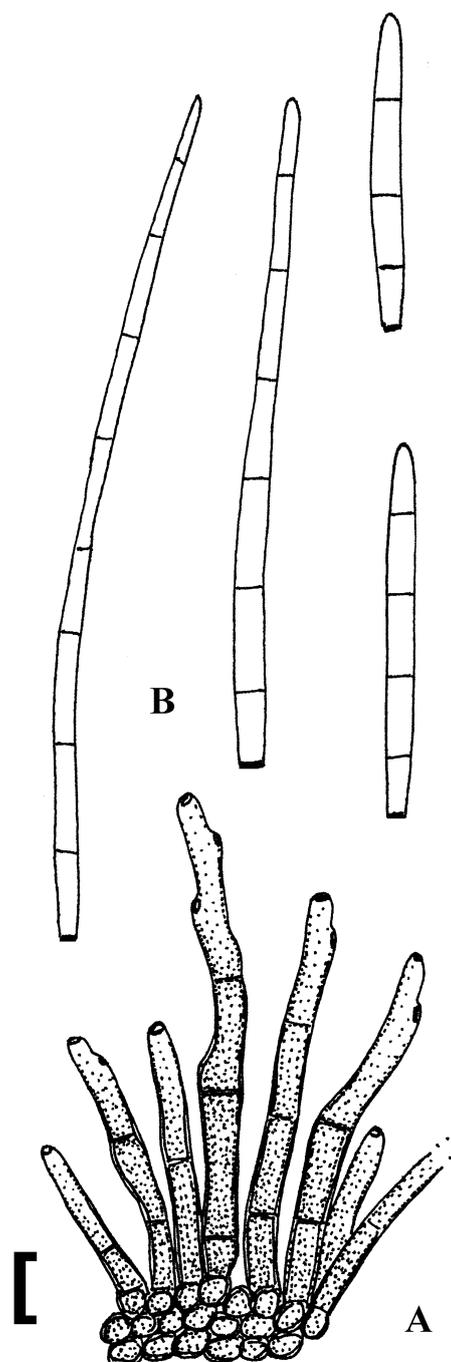


Fig. 16. *Cercospora arisaematis* (HMAS 06993). A. Conidiophore fascicle. B. Conidia. Bar = 10  $\mu$ m.

straight, subcylindrical to geniculate-sinuous, unbranched, 10–140(–425)  $\times$  4–6.5(–8)  $\mu$ m, aseptate to pluriseptate, pale olivaceous to light brown, paler towards the tip, thin-walled, smooth; conidiogenous cells integrated, terminal, sometimes conidiophores reduced to conidiogenous cells, about 10–40  $\mu$ m long, conidiogenous loci thickened and darkened, about 2–3  $\mu$ m diam. *Conidia* solitary, acicular to obclavate-subcylindrical, straight to somewhat curved, 20–130  $\times$  2.5–5  $\mu$ m, 2–15-septate, hyaline or with a very pale olivaceous tinge, thin-walled, smooth, apex subobtuse to subacute, base truncate to obconically truncate, hila thickened and darkened.

**Holotype:** China: Jiangsu: Nanjing, on *Arisaema heterophyllum*, 27 Sep. 1925, T. F. Yu (HMAS 06993).

**Host range and distribution:** On *Arisaema* (*heterophyllum* [ambiguum], *murrayi*, *Arisaema* sp.), *Araceae*, Africa (Uganda), Asia (China, India, Japan, Taiwan).

**Notes:** Records of *C. arisaematis* on *Typhonium roxburghii* [divaricatum] from Mainland China and Taiwan (Hsieh & Goh 1990, Guo & Jiang 2000a) belong undoubtedly to *C. typhonii*.

***Cercospora bombycina*** Chidd., *Sydowia* 13: 154 (1959).

(Fig. 17)

**Synonym:** *Cercospora aracearum* S. Narayan, R.N. Kharwar, R.K. Singh & H.S.G. Rao, *J. Indian Bot. Soc.* 80: 213 (2001), *nom. illeg.* (ICN, Art. 53.1) [**holotype:** India: Uttar Pradesh: on *Pothos scandens*, R. K. Kharwar (HCIO 42013)].

**Literature:** Crous & Braun (2003: 85), Kamal (2010: 24).

**Illustration:** Chiddarwar (1959: plate 4, figs 8–9).

**Description:** Leaf spots amphigenous, angular-irregular, 3–6 mm diam, scattered, pale to medium brown, border distinct, darker brown. *Caespituli* amphigenous, finely punctiform, scattered, dark. *Mycelium* internal. *Stromata* substomatal, moderately large, 15–45 µm diam, compact, brown. *Conidiophores* in small to moderately large fascicles, usually 4–30, arising from stromata, emerging through stomata, loose, straight, subcylindrical to distinctly geniculate-sinuuous, unbranched, 50–130 × 3.5–5 µm, pluriseptate, mostly with 2 to 7 septa, brown, thin-walled, smooth; conidiogenous cells integrated, terminal or intercalary, about 10–30 µm long, conidiogenous loci thickened and darkened, about 1.5–2 µm diam. *Conidia* solitary, obclavate, 50–130 × 3–4.5 µm, 4–12-septate, hyaline, thin-walled, smooth, apex subobtuse to subacute, base obconically truncate, about 1.5–2.5 µm wide, hila somewhat thickened and darkened.

**Holotype:** India: Maharashtra: Pune, on *Pothos scandens*, 22 Oct. 1954, P. P. Chiddarwar 3 (K(M) IMI 83164). **Isotype:** BPI 433778.

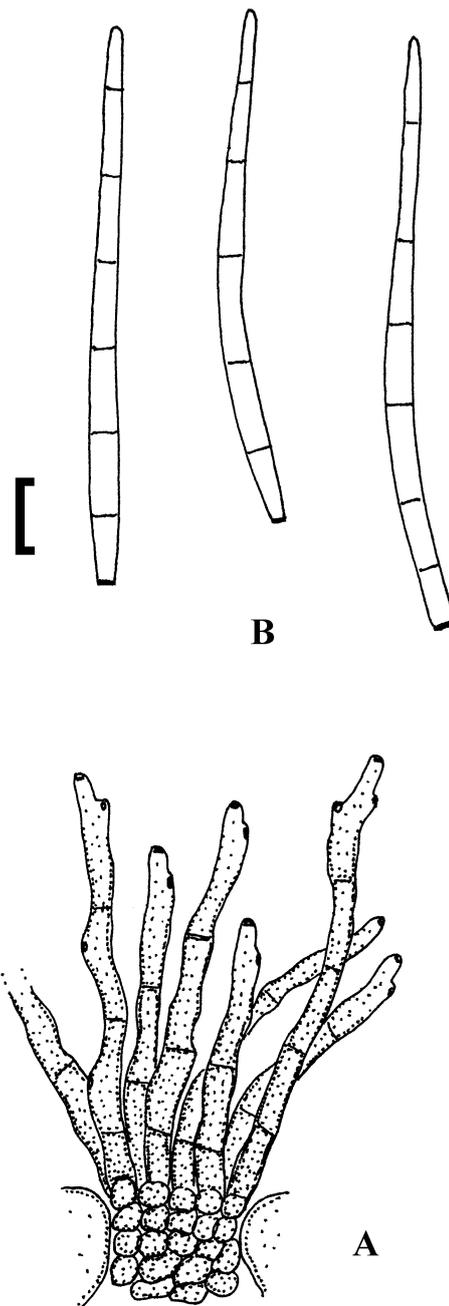
**Host range and distribution:** On *Pothos* (*scandens*, *Pothos* sp.), *Araceae*, Asia (India, Madhya Pradesh, Maharashtra, Uttar Pradesh).

**Note:** A true *Cercospora* s. str. distinct from *C. apii* s. lat. by its obclavate conidia.

***Cercospora caladii*** Cooke, *Grevillea* 8: 95 (1880). (Similar to Fig. 1)

**Literature:** Saccardo (1886: 478), Chupp (1954: 57), Vasudeva (1963: 58), Crous & Braun (2003: 93), Guo et al. (2005: 38), Kamal (2010: 26).

**Illustration:** Guo et al. (2005: 39, fig. 18).



**Fig. 17.** *Cercospora bombycina* (BPI 433778). **A.** Conidiophore fascicle. **B.** Conidia. Bar = 10 µm.

**Description:** Leaf spots circular, 0.5–5 mm diam, dingy grey to brown, margin reddish brown. *Caespituli* amphigenous. *Mycelium* internal. *Stromata* lacking or small, brown. *Conidiophores* in small to moderately large fascicles, 2–12, arising from internal hyphae or small stromata, erect, straight to curved, subcylindrical to somewhat geniculate above, unbranched, 20–475 × 4–6.5 µm, continuous to pluriseptate, pale to medium brown, paler towards the tip, thin-walled, smooth; conidiogenous cells integrated, terminal, conidiogenous loci conspicuous, thickened and darkened, about 2.5–3 µm diam. *Conidia* solitary, acicular, straight to curved, 25–260 × 2.5–5 µm, pluriseptate, hyaline, apex subacute, base truncate, hila thickened and darkened.

**Holotype:** India: Karnataka: Belgaum, on *Caladium* sp., 1879, J. Hobson (K(M) 190717).

**Host range and distribution:** On *Araceae* sp., *Caladium* (*bicolor*, *Caladium* sp.), *Araceae*, Asia (India), South America (Brazil, Honduras), West Indies (Puerto Rico, Virgin Islands).

**Notes:** Records of "*C. caladii*" on *Colocasia esculenta* from Asia (China and India) do not belong to this species. They are excluded and referred to as *C. alocasiae*. *Caladium* (*Caladieae*) on the one hand and *Alocasia/Colocasia* (*Pistia* clade) on the other hand are not closely allied (Nauheimer *et al.* 2012).

***Cercospora callae*** Peck & Clinton, *Rep. (Annual) New York State Mus. Nat. Hist.* **29**: 52 (1876).

(Fig. 18)

**Synonyms:** *Cercospora pachyspora* Ellis & Everh., *Proc. Acad. Nat. Sci. Philadelphia* **1**, **43**: 88 (1891) [lectotype (designated here, MycoBank MBT178134): USA: Delaware: Wilmington, on *Peltandra virginica*, 4 Oct. 1889, *A. Commons*, no. 1013 (NY 1840471)].

*Cladosporium callae* Peck & Clinton, *in herb.*

**Literature:** Saccardo (1886: 478–479; 1892: 654), Vassiljevsky & Karakulin (1937: 222), Chupp (1954: 57), El-Gholl *et al.* (1992: 265), Crous & Braun (2003: 94), Schubert & Braun (2007: 190).

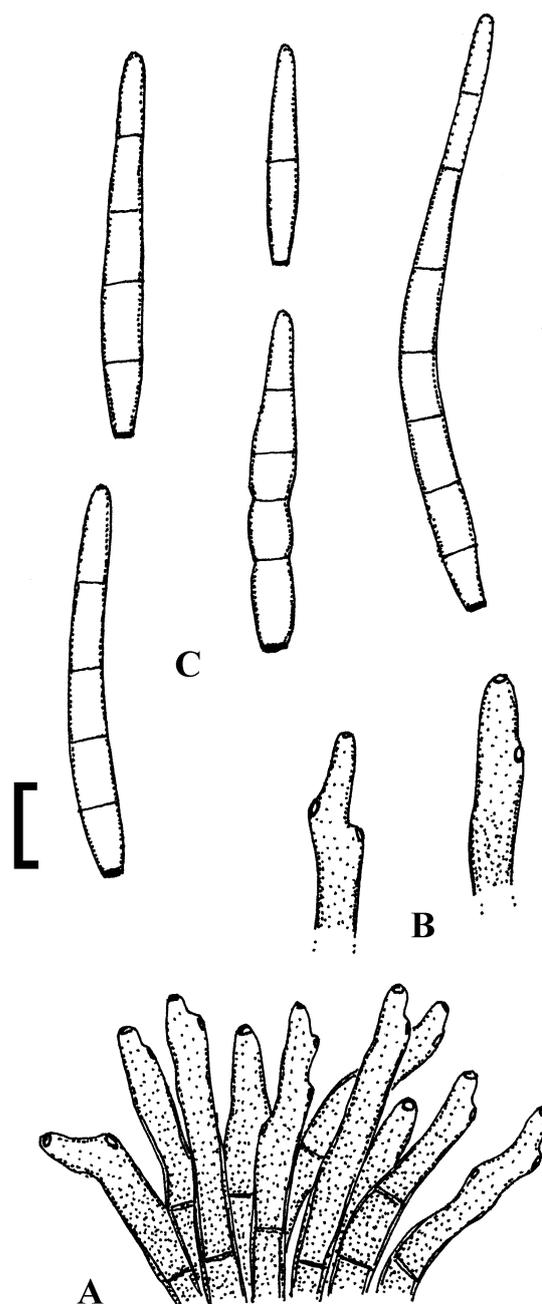
**Illustration:** Schubert & Braun (2007: 191, fig. 1).

**Exsiccatae:** Ellis, *N. Amer. Fungi* 1253.

**Description:** Leaf spots mostly oblong, between veins, sometimes forming larger patches, extending from the mid-rib to the leaf margin, pale greenish, medium brown to blackish, later sometimes dingy grey. *Caespituli* amphigenous, mainly hypophyllous, scattered to dense, forming mouse-grey, downy layers. *Mycelium* internal. *Stromata* substomatal to intraepidermal, 10–60 µm diam, occasionally larger, pale, yellowish green to brownish. *Conidiophores* in small, loose to usually large and dense to very dense fascicles, arising from stromata, emerging through stomata or erumpent, erect, straight to mostly distinctly geniculate-sinuous unbranched, 50–150 × 4–9 µm, aseptate to pluriseptate throughout, pale yellowish to olivaceous-brown, paler towards the tip, thin-walled, smooth; conidiogenous cells integrated, terminal, occasionally conidiophores reduced to conidiogenous cells, conidiogenous loci conspicuous, thickened and darkened, about 2–3 µm wide. *Conidia* solitary, broadly obclavate-cylindrical, 25–110 × 4–8 µm, 2–9-septate, hyaline or subhyaline, thin-walled, smooth, apex obtuse, broadly rounded, base truncate to short obconically truncate, 2–4 µm wide, hila thickened and darkened.

**Holotype:** USA: New York: Buffalo, on *Calla palustris*, G. W. Clinton (NYS).

**Host range and distribution:** On *Calla palustris*, *Peltandra* (*sagittifolia* [*alba*, *glauca*], *virginica*), *Zantedeschia aethiopica*,



**Fig. 18.** *Cercospora callae* (NYS, holotype). **A.** Conidiophore fascicle. **B.** Conidiophore tips. **C.** Conidia. Bar = 10 µm.

*Araceae*, Europe (Belarus), North America (Canada, Ontario; USA, Alabama, Delaware, Florida, Maryland, Massachusetts, Minnesota, Mississippi, New Hampshire, New York, Wisconsin).

**Notes:** A true *Cercospora* s. str. distinct from *C. apii* s. lat. There are three syntypes of *Cercospora pachyspora* in NY [*Commons* 1013 (NY 1840471), *Commons* 1014 (NY 180472) and a third as 1013/1014 (NY 1840473)]. The host of *Commons* 1014 was indicated to be *Alisma plantago-aquatica*, which is, however, doubtful. The three collections have recently been checked by an expert for vascular plants in NY and it turned out that all of them, including *Commons* 1014 on "*Alisma*", belong to *Peltandra virginica*. Syntype material '*Commons* 1013' is designated as lectotype.

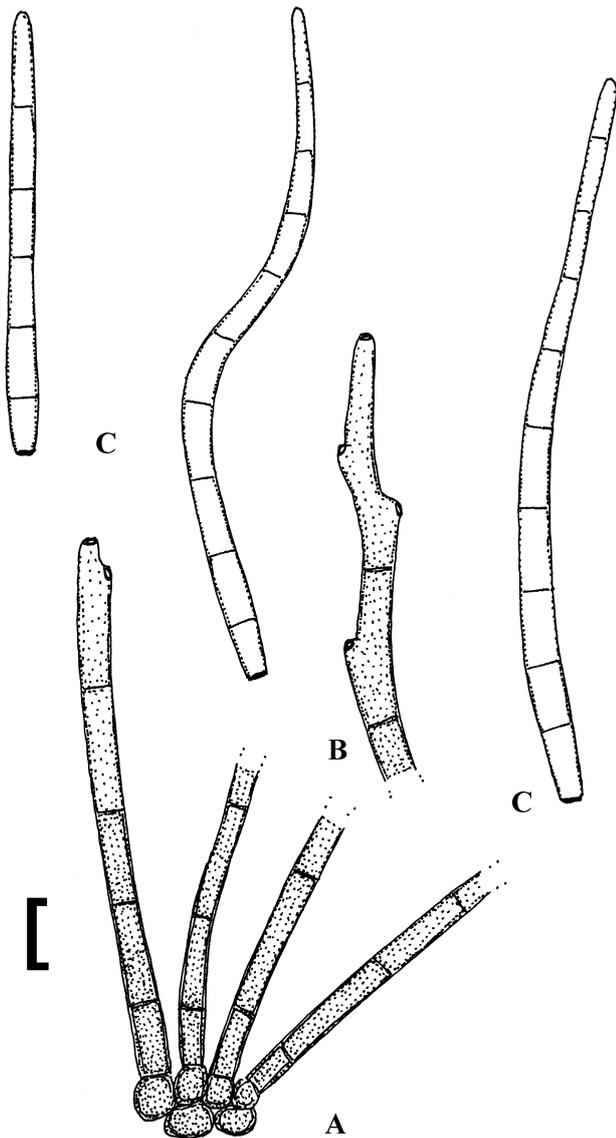


Fig. 19. *Cercospora chevalieri* (FH 7807). A. Conidiophore fascicle. B. Conidiophore. C. Conidia. Bar = 10  $\mu$ m.

***Cercospora chevalieri* Sacc., Syll. Fung. 22: 1431 (1913).**

(Fig. 19)

*Synonyms:* *Cercospora amorphophalli* Pat. & Har., *Bull. Trimestriel Soc. Mycol. France* 24: 15 (1909), *nom. illeg.* (ICN, Art. 53.1).

*Cercosporina chevalieri* (Sacc.) Sacc., *Syll. Fung.* 25: 896 (1931).

*Literature:* Saccardo (1913: 1431), Chupp (1954: 58), Ellis (1976: 244), Crous & Braun (2003: 119), Kamal (2010: 31).

*Illustration:* Ellis (1976: 245, fig. 184).

*Description:* *Leaf spots* amphigenous, subcircular to angular-irregular, small, yellowish to ochraceous, brown or greyish white, margin narrow, darker brown to blackish. *Caespituli* amphigenous, but mainly hypophyllous, punctiform to dense, dark. *Mycelium* internal. *Stromata* substomatal to immersed, subglobose, dark brown, 20–60  $\mu$ m diam.

*Conidiophores* in small, loose to large and dense fascicles, arising from stromata, through stomata or erumpent, erect, straight to mostly distinctly to strongly geniculate-sinuous, unbranched, 50–150  $\times$  4–8  $\mu$ m, pluriseptate throughout, pale olivaceous to mid pale brown throughout, wall thin to slightly thickened, smooth; conidiogenous cells integrated, terminal and intercalary, about 10–35  $\mu$ m long, conidiogenous loci thickened and darkened, about 2–3  $\mu$ m diam. *Conidia* formed singly, broadly obclavate to obclavate-cylindrical, 30–140(–230)  $\times$  3–7  $\mu$ m, 3–14(–24)-septate, hyaline or subhyaline, thin-walled, smooth, apex obtuse, base obconically truncate, 2–3  $\mu$ m wide, hila thickened and darkened.

*Holotype:* **Sudan:** Territoir de L'Oubangui, at Mission Chari, Lake Tchad, on *Amorphophallus* sp., 15 Oct. 1902, A. Chevalier, no. 5744 (FH 7807).

*Host range and distribution:* On *Amorphophallus paeoniifolius* [*campanulatus*], ?*Plesmonium margaritifera*, ?*Xanthosoma* sp., *Araceae*, Africa (Gabon, Ghana, Ivory Coast, Nigeria, Sierra Leone, Sudan, Togo, Uganda), Asia (India, Maharashtra, Madhya Pradesh), South America (Venezuela).

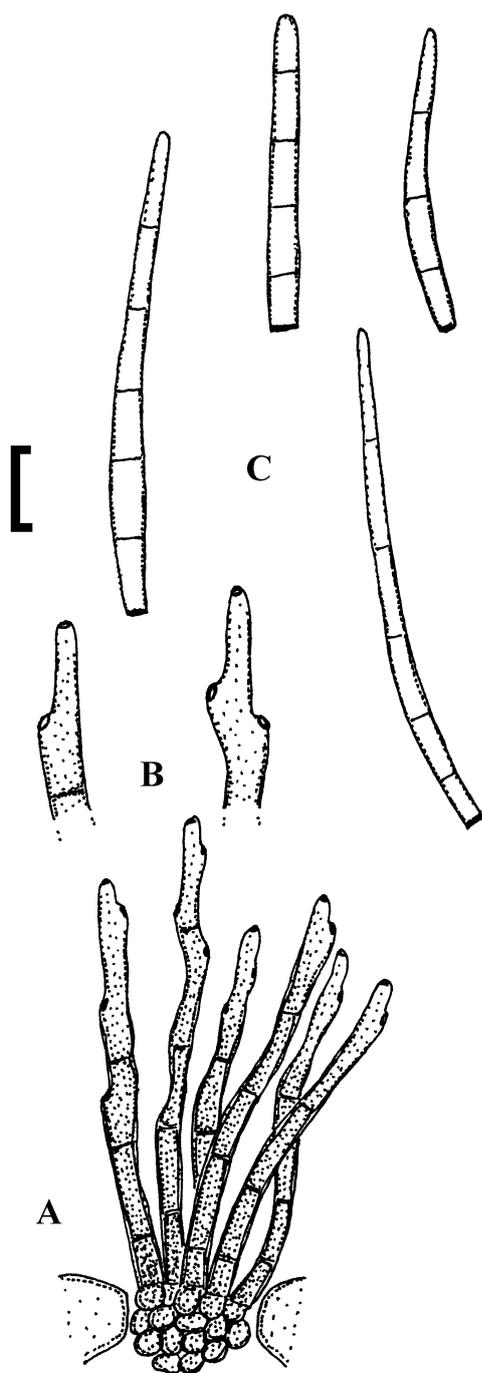
*Notes:* A true *Cercospora* s. str. distinct from *C. apii* s. lat. However, records of this species on hosts belonging to *Anchomanes*, *Plesmonium* and *Xanthosoma* spp. are unclear, unproven and possibly based on misidentifications. A record on *Anchomes difformis* from Guinea (Kranz 1963) belongs undoubtedly to *C. anchomanes*. Ellis (1976) described pale olivaceous conidia. However, conidia in the type material and other collections examined are hyaline or subhyaline, i.e. with a pale greenish tinge.

***Cercospora cryptocorynes* Chidd., *Mycopathol. Mycol. Appl.* 17: 75 (1962); as "*cryptocoryneae*".** (Fig. 20)

*Literature:* Crous & Braun (2003: 146), Kamal (2010: 37).

*Illustrations:* Chiddarwar (1962: 74, plate 1, figs 12–14).

*Description:* *Leaf spots* amphigenous, scattered, subcircular, oval to somewhat irregular, 2–25 mm diam, yellowish to ochraceous, pale brownish, finally greyish white, margin darker, brown. *Caespituli* amphigenous, punctiform, dark brown. *Mycelium* internal. *Stromata* substomatal, subglobose to irregular, 20–40  $\mu$ m diam, dark brown. *Conidiophores* in small to moderately large fascicles, 4–40, loose to rather dense, arising from stromata, through stomata, erect, straight, subcylindrical or narrowed towards the apex, not or only slightly geniculate-sinuous, unbranched, 40–160  $\times$  4–8  $\mu$ m, 1–7-septate, pale to medium brown, wall thin to slightly thickened, smooth; conidiogenous cells integrated, terminal and intercalary, about 10–40  $\mu$ m long, with conspicuous conidiogenous loci, 2–3  $\mu$ m diam, thickened and darkened. *Conidia* solitary, obclavate to obclavate-cylindrical, 25–110  $\times$  3.5–5  $\mu$ m, 3–14-septate, distance between septa 5–12  $\mu$ m, hyaline, thin-walled, smooth, apex obtuse to subacute, base usually obconically truncate, occasionally truncate, 2–3  $\mu$ m wide, hila thickened and darkened.



**Fig. 20.** *Cercospora cryptocorynes* (BPI 435386). **A.** Conidiophore fascicle. **B.** Conidiophore tips. **C.** Conidia. Bar = 10  $\mu$ m.

**Holotype:** India: Maharashtra: Pune, Mula (Mutha), river bed, on *Cryptocoryne retrospiralis*, 21 Nov. 1956, P. P. Chiddarwar, no. 26 (K(M) IMI 83187). **Isotypes:** BPI 435386, HCIO.

**Host range and distribution:** On *Cryptocoryne* (*cognata*, *retrospiralis*), Araceae, Asia (India, Maharashtra).

**Note:** A true *Cercospora* s. str. distinct from *C. apii* s. lat. by obclavate-cylindrical conidia.

***Cercospora monsterae*** Narayan, Kharwar & R.K. Singh, *Kavaka* 28–29: 68 (2001). (Similar to Fig. 1)

**Literature:** Kamal (2010: 67).

**Illustration:** Narayan *et al.* (2001: 69, fig. 6).

**Description:** *Leaf spots* amphigenous, subcircular to irregular, 5–53 mm diam, later confluent, covering the whole leaf surface, dark olivaceous to brown on the upper side, brown to blackish below. *Caespituli* amphigenous, effuse. *Mycelium* internal and external; external hyphae branched, septate, subhyaline to olivaceous. *Stromata* well-developed, immersed, substomatal, compact, 25–40  $\mu$ m diam, olivaceous to brown. *Conidiophores* fasciculate, 8–12, arising from stromata, through stomata, erect, straight to geniculate-flexuous, unbranched, about 45–90  $\times$  2.5–4.5  $\mu$ m, 2–5-septate, light olivaceous to olivaceous, thin-walled, smooth; conidiogenous cells integrated, terminal, subcylindrical, with a single terminal locus to sympodial, geniculate, conidiogenous loci conspicuous, thickened and darkened. *Conidia* solitary, acicular, straight to curved, about 55–167  $\times$  2–5.5  $\mu$ m, 7–19-septate, hyaline, thin-walled, smooth, apex subobtuse to pointed, base truncate, hila thickened and darkened.

**Holotype:** India: Uttar Pradesh: Gorakhpur, on *Monstera deliciosa*, Araceae, Mar. 1995, S. Narayan (HCIO 42014).

**Host range and distribution:** Only known from the type collection.

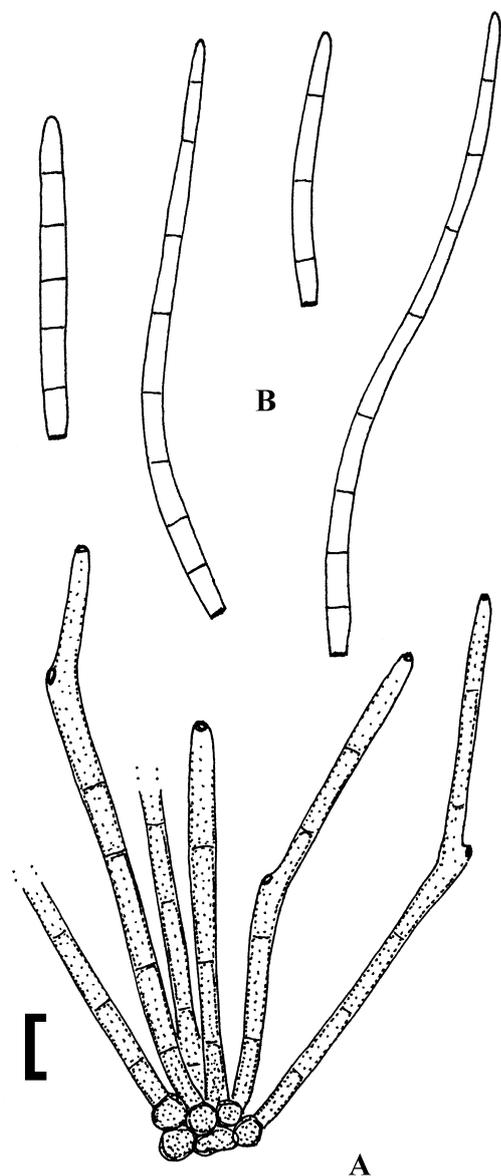
**Note:** This species belongs to the *C. apii* s. lat. complex.

***Cercospora pistiae*** Nag Raj, Govindu & Thirum., *Sydowia* 24: 299 “1970” (1971). (Fig. 21)

**Literature:** Morris & Crous (1994: 327), Barreto *et al.* (1999), Crous & Braun (2003: 326), Guo *et al.* (2005: 39), Kamal (2010: 76).

**Illustrations:** Govindu *et al.* (1971: 300, fig. 7), Morris & Crous (1994: 327, fig. 4), Barreto *et al.* (1999: 82, fig. 1), Guo *et al.* (2005: 39, fig. 18).

**Description:** *Leaf spots* amphigenous, subcircular, elliptical to irregular, 2–15 mm diam, yellowish to brown, often within chlorotic streaks or areas to 40 mm diam, sometimes confluent, severely attacked leaves sometimes becoming necrotic or causing shot-hole symptoms. *Caespituli* amphigenous, mainly epiphyllous, punctiform, dark. *Mycelium* immersed; hyphae branched, septate, brownish, about 1.5–6  $\mu$ m wide. *Stromata* lacking or only with small aggregations of swollen hyphal cells. *Conidiophores* solitary or in small to moderately large fascicles, about 2–15, loose to dense, arising from internal hyphae or small aggregations of swollen hyphal cells, through stomata or erumpent, erect, straight, subcylindrical to somewhat geniculate-sinuuous, unbranched, 10–295  $\times$  3–8.5  $\mu$ m, conidiophores mostly 1–10-septate or occasionally with more septa, olivaceous-brown to brown, paler towards the apex, sometimes subhyaline at the very tip, wall thin to somewhat thickened, smooth; conidiogenous



**Fig. 21.** *Cercospora pistiae* (BPI 439744). **A.** Conidiophore fascicle. **B.** Conidia. Bar = 10  $\mu$ m.

cells integrated, terminal or intercalary, about 10–80  $\mu$ m long, conidiogenous loci conspicuous, thickened and darkened, about 2–4  $\mu$ m diam. *Conidia* solitary, broadly acicular to obclavate (-subcylindrical), straight to curved, 30–150  $\times$  3–6.5  $\mu$ m, 1–14-septate, hyaline, thin-walled, smooth, apex obtuse to subacute, base truncate to somewhat obconically truncate, about 2.5–4  $\mu$ m wide, hila thickened and darkened.

**Holotype: India:** Kerala: Ernakulam, on *Pistia stratiotes*, 11 Dec. 1964, T. R. Nag Raj (MYSP Herb. 803)

**Host range and distribution:** On *Pistia stratiotes*, *Araceae*, Africa (Ghana, South Africa), Asia (China; India, Kerala), Australia, South America (Brazil, Venezuela).

**Notes:** This species does not belong to the *C. apii* s. lat. complex. It differs in having subacicular to obclavate (-cylindrical), relatively broad conidia. Material deposited as

BPI 439744 (India, “Emakulam”, 21 Jul. 1964, Nag Raj) is very probably topotype material.

***Cercospora richardiicola*** G.F. Atk., *J. Elisha Mitchell Sci. Soc.* **8**: 51 (1892); as “*richardiaecola*”. (Similar to Fig. 1)

**Literature:** Saccardo (1892: 653), Chupp (1954: 60), Boedijn (1961: 413), Crous & Braun (1996: 305), Vieira & Barreto (2004), Nakashima et al. (2007: 266), Groenewald et al. (2013: 160).

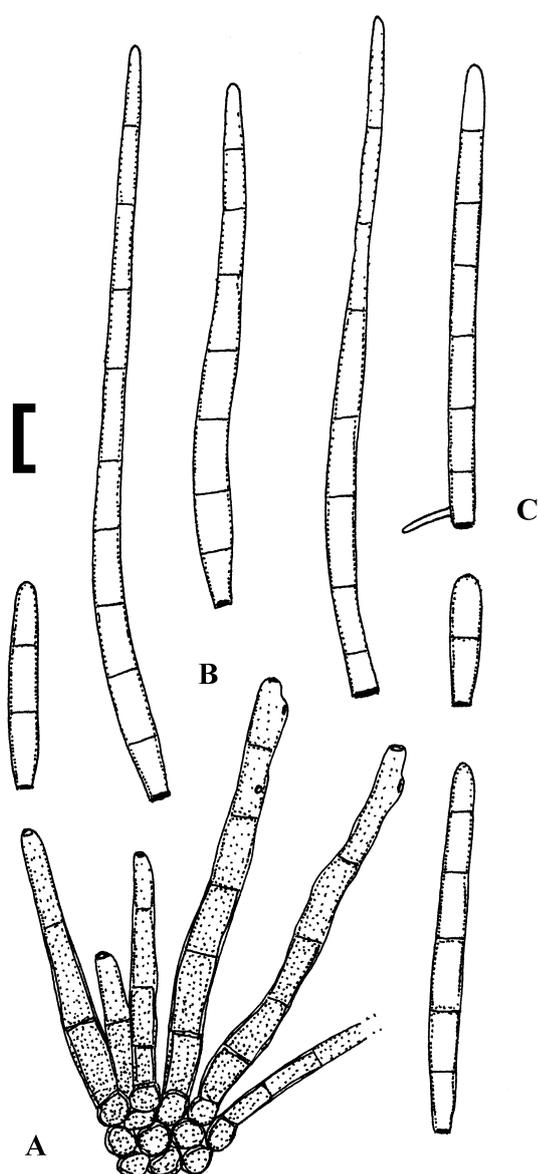
**Description:** *Leaf spots* amphigenous, circular to somewhat irregular, about 2–8 mm diam, dark olivaceous, brown to reddish brown, sometimes with paler centre. *Caespituli* amphigenous. *Mycelium* internal. *Stromata* lacking or small, substomatal, 10–20  $\mu$ m diam, brown. *Conidiophores* solitary or in small, loose fascicles, about 2–15, arising from internal hyphae or small hyphal aggregations, through stomata, erect, straight, subcylindrical to somewhat geniculate, unbranched or only rarely branched, about 20–400  $\times$  (2–)3–7  $\mu$ m, aseptate to usually pluriseptate, pale olivaceous to brown throughout or paler towards the tip, wall somewhat thickened, smooth; conidiogenous cells integrated, terminal and intercalary, conidiophores rarely reduced to conidiogenous cells, 10–40  $\mu$ m long, conidiogenous loci thickened and darkened, 1.5–3.5  $\mu$ m diam. *Conidia* solitary, acicular, 25–300  $\times$  2–4  $\mu$ m, 2–20-septate, hyaline, thin-walled, smooth, apex pointed or subobtuse, base truncate, occasionally slightly obconically truncate, 2–3.5  $\mu$ m wide, hila thickened and darkened.

**Holotype: USA:** Alabama: Lee County, Auburn, on *Zantedeschia aethiopica*, 7 Sep. 1891, G. F. Atkinson (CUP-A-2111).

**Host range and distribution:** On *Anthurium* sp., *Epipremnum aureum*, *Zantedeschia (aethiopica [Richardia africana], albomaculata [angustiloba, melanoleuca], elliotiana, rehmannii, Zantedeschia* sp.), *Araceae*, Africa (Ethiopia, Sierra Leone, South Africa, Zimbabwe), Asia (China [Hong Kong], Indonesia, Japan, Malaysia, Thailand), USA (Alabama, Florida, Gulf states, Mississippi), Central and South America, West Indies (Colombia, Guatemala, Puerto Rico, Virgin Islands).

**Notes:** This species belongs to the *Cercospora apii* s. lat. complex. Groenewald et al. (2013) included cultures based on Japanese material on *Zantedeschia* sp. (MAFF238210) in molecular studies of *Cercospora* s. str. species and found that this collection belongs to a clade of an obviously plurivorous *Cercospora* comprising other isolates from *Tagetes erecta*, *Fuchsia  $\times$  hybrida*, *Osteospermum* sp. and *Gerbera  $\times$  hybrida*. However, the application of the name *C. richardiicola* is only tentative as this species was described from North America, but American collections were not included in the phylogenetic studies.

***Cercospora symplocarpi*** Peck, in Thüm., *Mycoth. Univ.*, Cent. VII, no. 669 (1877). (Fig. 22)



**Fig. 22.** *Cercospora symplocarpi* (HAL, Thüm., Mycoth. Univ. 669). **A.** Conidiophore fascicle. **B.** Conidia. **C.** Conidium with basal germ tube. Bar = 10  $\mu$ m.

**Literature:** Saccardo (1886: 477), Vassiljevsky & Karakulin (1937: 225), Chupp (1954: 60), Crous & Braun (2003: 394).

**Exsiccatae:** Barthol., Fungi Columb. 4008. Ellis, N. Amer. Fungi 1295. Ellis & Everh., N. Amer. Fungi 95. Sydow, Fungi Exot. Exs. 97. Thüm., Mycoth. Univ. 669.

**Description:** *Leaf spots* amphigenous, subcircular to angular-irregular, 2–8 mm diam, dark olivaceous to reddish brown, centre sometimes paler. *Caespituli* amphigenous, punctiform, scattered, dark brown. *Mycelium* internal. *Stromata* almost lacking to well-developed, substomatal to intraepidermal, 10–60  $\mu$ m diam, brown, composed of swollen hyphal cells, rounded to somewhat irregular in outline, 3–8  $\mu$ m diam. *Conidiophores* in small to moderately large fascicles, loose to usually dense, arising from internal hyphae or stromata, through stomata or erumpent, erect, straight, subcylindrical, subclavate or slightly narrowed

towards the apex, slightly geniculate-sinuuous, unbranched, 10–60(–70)  $\times$  4–8  $\mu$ m, 0–3-septate, pale to medium brown throughout, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 10–40  $\mu$ m long, conidiogenous loci conspicuous, slightly thickened and somewhat darkened-refractive, usually several per cell, non-protuberant, more or less lying planely on the wall of the cell, about 2–3  $\mu$ m wide. *Conidia* solitary, obclavate-subcylindrical, occasionally subacicular, 40–150  $\times$  3.5–7  $\mu$ m, 3–12-septate, distance between septa 5–20  $\mu$ m, hyaline or subhyaline, i.e. with a pale greenish tinge, occasionally very pale olivaceous, thin-walled, smooth, apex obtuse to subacute, base short obconically truncate, occasionally subtruncate, 2–2.5  $\mu$ m wide, hila somewhat thickened and darkened-refractive.

**Lectotype (designated here, MycoBank MBT178176):** USA: New York: West Albany, on *Symplocarpus foetidus*, Jul. 1877, C. H. Peck (NYS). **Isolectotypes:** Thüm., Mycoth. Univ. 669 (e.g. BPI 441828, CUP 041363, DAOM, HAL, MICH 15373).

**Host range and distribution:** On *Symplocarpus foetidus*, Araceae, North America (Canada; USA, Connecticut, Delaware, Indiana, Maryland, Massachusetts, Michigan, Minnesota, New Jersey, New Mexico, New York, Pennsylvania, Virginia, West Virginia, Wisconsin).

**Notes:** A true *Cercospora* s. str. distinct from *C. apii* s. lat. by its broadly obclavate-cylindrical, sometimes not quite colourless conidia and non-protuberant conidiogenous loci lying planely on the wall of the conidiogenous cells which are less thickened and darkened than in common *Cercospora* species. This species is morphologically somewhat intermediate between *Cercospora* s. str. and *Passalora*, but we prefer to maintain it in *Cercospora*, at least tentatively. The generic affinity of this species has to be proven by means of molecular sequence analyses.

***Cercospora syngoniicola*** U. Braun & Urtiaga, *Mycosphere* 4: 593 (2013). (Fig. 23)

**Illustration:** Braun & Urtiaga (2013b: 594, fig. 1).

**Description:** *Leaf spots* amphigenous, subcircular to angular-irregular, 2–18  $\mu$ m diam, yellowish, ochraceous, brownish, olivaceous-brown, greyish to medium brown, later with paler centre, greyish brown to greyish white, with narrow darker border or diffuse brownish halo, occasionally somewhat zonate. *Caespituli* amphigenous, mostly epiphyllous, finely punctiform, dark. *Mycelium* internal. *Stromata* lacking or small, substomatal or immersed aggregations of swollen hyphal cells, 10–30  $\mu$ m diam, olivaceous-brown, cells 2.5–11  $\mu$ m diam. *Conidiophores* solitary or in small to large fascicles, 2–30, arising from internal hyphae or stromata, erumpent, loose to dense, erect, straight, subcylindrical or attenuated towards the tip to distinctly geniculate-sinuuous, unbranched, 10–130  $\times$  3–9  $\mu$ m, 0–5-septate, pale to medium olivaceous-brown or yellowish brown, thin-walled, smooth; conidiogenous cells integrated, terminal or

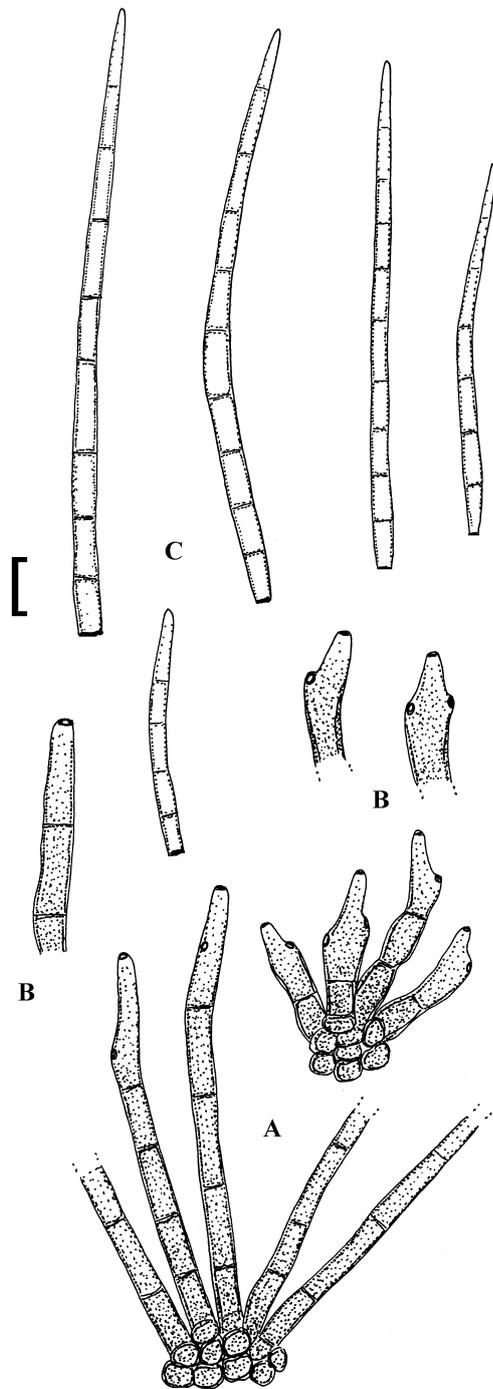


Fig. 23. *Cercospora syngoniicola* (K(M) 180153). A. Conidiophore fascicles. B. Conidiophore tips. C. Conidia. Bar = 10  $\mu$ m.

conidiophores reduced to conidiogenous cells, 10–40  $\mu$ m long, conidiogenous loci conspicuous, (1.5–)2–3.5(–4)  $\mu$ m diam, thickened and darkened, occasionally subdenticulate. *Conidia* solitary, acicular to distinctly obclavate or obclavate-subcylindrical, 25–120  $\times$  3–6  $\mu$ m, 2–10-septate, distance between septa 5–20  $\mu$ m, hyaline, thin-walled, smooth, apex obtuse to subacute, base truncate to distinctly obconically truncate, 2–3.5  $\mu$ m wide, hila thickened and darkened.

**Holotype:** **Venezuela:** Lara: Duaca, on living leaves of *Syngonium* sp., Nov. 1993, R. Urtiaga (K(M) 180153).

**Host range and distribution:** On *Syngonium* sp., Araceae, South America (Honduras, Venezuela).

**Notes:** Two collections from Honduras on “*Nephtytis* sp.” (rather *Syngonium* sp.) deposited as “*Cercospora verruculosa*” have been examined (BPI 442251, 442252). They agree well with *C. syngoniicola*.

***Cercospora typhonii*** Munjal, Lal & Chona, *Indian Phytopathol.* **13**: 148 (1960).  
(Similar to Fig. 1)

**Literature:** Crous & Braun (2003: 414), Kamal (2010: 96).

**Illustration:** Munjal et al. (1960: 148, fig. 2).

**Description:** *Leaf spots* circular or subcircular, scattered to confluent, 2–9 mm diam, yellowish green, centre verdigris, border yellowish, broad. *Caespituli* amphigenous, mostly epiphyllous. *Mycelium* internal. *Stromata* small, to about 25  $\mu$ m diam, globose, dark brown. *Conidiophores* few, loose to numerous and dense, arising from stromata, erect, straight, subcylindrical to somewhat geniculate, 15–85  $\times$  4–6  $\mu$ m, width irregular, pluriseptate, pale to olivaceous-brown, paler towards the tip, thin-walled, smooth; conidiogenous cells integrated, usually terminal, conidiogenous loci conspicuous, about 2–3  $\mu$ m diam, thickened and darkened. *Conidia* solitary, acicular, straight to somewhat curved, about 25–130  $\times$  3–4  $\mu$ m, pluriseptate, hyaline, thin-walled, smooth, apex acute, base truncate, about 2.5–3  $\mu$ m wide, hila thickened and darkened.

**Holotype:** **India:** West Bengal: Calcutta, on *Typhonium trilobatum*, 2 Nov. 1939, A. K. Ghosh (HCIO 26616).

**Host range and distribution:** On *Typhonium* (*flagelliformum*, *roxburghii* [*divarigatum*], *trilobatum*), Araceae, Asia (China, India, Malaysia, Taiwan).

**Notes:** A true *Cercospora* s. str. close to *C. apii* s. lat., but distinct by having relatively short conidiophores (type material was not available, but Indian material from K(M) IMI examined).

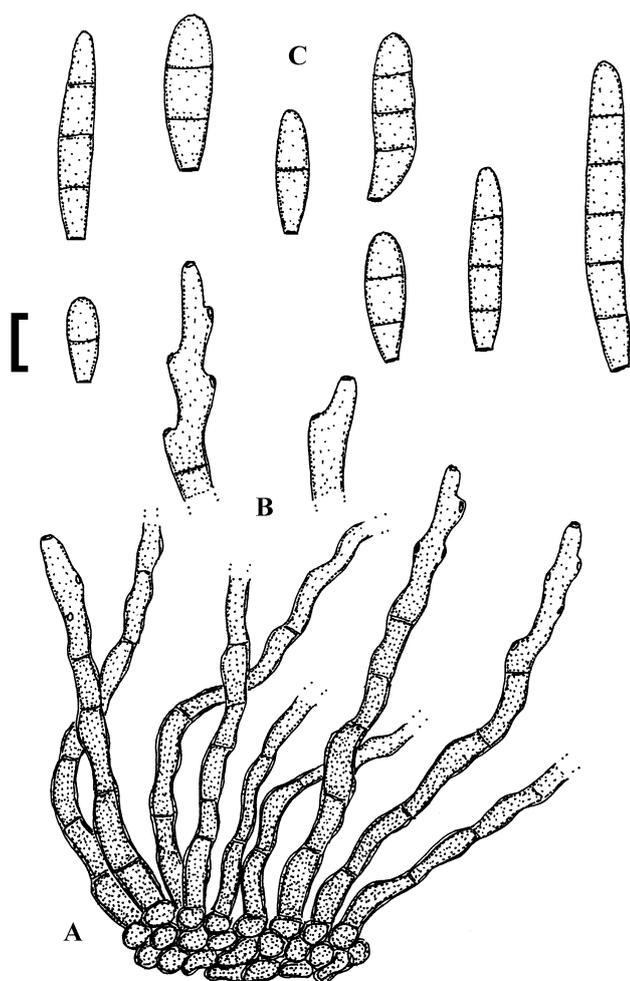
***Cercospora verruculosa*** F. Stevens & Solheim, *Mycologia* **23**: 397 (1931).  
(Fig. 24)

**Synonyms:** *Helminthosporium caladii* F. Stevens, *Trans. Illinois Acad. Sci.* **10**: 209 (1917) [*lectotype* (designated here, MycoBank MBT178177): **Puerto Rico:** Mayaguez, on *Caladium bicolor*, 27 Oct. 1913, F. L. Stevens 3860 (BPI 428776). *Isolectotypes:* BPI 428777, 845005; K, PC], non *Cercospora caladii* Cooke, 1880.

*Cercosporidium caladii* (F. Stevens) Deighton, *Mycol. Pap.* **112**: 32 (1967).

*Passalora caladii* (F. Stevens) Poonam Srivast., *J. Living World* **1**: 113 (1994), *comb. inval.* (ICN, Art. 41.4).

*Passalora caladii* (F. Stevens) U. Braun & Sivap., *Fungal Diversity* **3**: 10 (1999).



**Fig. 24.** *Cercospora verruculosa* (BPI 428776). **A.** Conidiophore fascicle. **B.** Conidiophore tips. **C.** Conidia. Bar = 10  $\mu$ m.

**Literature:** Chupp (1954: 60), Boedijn (1961: 413), Deighton (1967: 32), Saccardo (1972: 1386), Crous & Braun (2003: 93), Piepenbring (2006), Kamal (2010: 111).

**Illustration:** Deighton (1967: 33, fig. 17).

**Description:** *Leaf spots* amphigenous, circular to angular-irregular, 2–40 mm diam, straw-coloured, brown, dull brown, later greyish brown to grey with brown to dark brown border, sometimes zonate. *Caespituli* mostly hypophyllous, scattered to aggregated, punctiform, medium to dark brown. *Mycelium* internal; hyphae branched, septate, 2.5–4  $\mu$ m wide, subhyaline or pale, thin-walled, smooth. *Stromata* substomatal, 10–50  $\mu$ m diam, subglobose, brown. *Conidiophores* fasciculate, to 25, loose to mostly dense, arising from stromata, through stomata, erect, straight, subcylindrical to distinctly geniculate-sinuuous, rhachis-like, unbranched, 30–135(–250)  $\times$  3.5–8  $\mu$ m, sparingly septate, yellowish to pale olivaceous-brown, thin-walled, smooth; conidiogenous cells integrated, terminal, occasionally intercalary, about 10–50  $\mu$ m long, conidiogenous loci conspicuous, thickened and darkened, 2–3  $\mu$ m diam. *Conidia* solitary, broadly ellipsoid-ovoid, obovoid, fusiform, subcylindrical, 15–55(–70)  $\times$  5–9.5  $\mu$ m, 2–7-septate, hyaline or subhyaline, thin-walled, smooth, apex broadly rounded,

base rounded to short obconically truncate, 2–3.5  $\mu$ m wide, hila somewhat thickened and darkened.

**Holotype:** **Trinidad:** St. Augustine, on *Caladium* sp., 13 Aug. 1932, F. L. Stevens 829 (ILL 15793).

**Host range and distribution:** On *Caladium* (*bicolor*, *Caladium* sp.), *Colocasia* (*esculenta* [*antiquorum*]), *Xanthosoma* (*sagittifolia*, *Xanthosoma* sp.), *Araceae*, Asia (Brunei, India), Central and South America, West Indies (Panama, Puerto Rico, Trinidad and Tobago, Venezuela, Virgin Islands).

**Notes:** This species has hitherto been considered a member of *Passalora*. However, results of molecular sequence analyses have shown that passalora-like species with hyaline conidia rather pertain to *Cercospora* s. str. (Groenewald *et al.* 2013, Braun *et al.* 2013). Therefore, this species is now better treated under the latter genus. Since the name *Cercospora caladii* is preoccupied, a reallocation of *Helminthosporium caladii* to *Cercospora* is not possible and the name *C. verruculosa* (heterotypic synonym of *H. caladii*) has to be applied to this species.

#### **Doubtful, excluded and insufficiently known species**

*Cercospora ari* (Fautrey) Vasyag., in Shvartsman *et al.*, *Fl. Spor. Rast. Kazakhstan* 8(2): 252 (1975).

**Basionym:** *Ramularia ari* Fautrey, *Rev. Mycol.* 17: 71 (1895).

**Literature:** Saccardo (1895: 605), Vassiljevsky & Karakulin (1937: 54), Braun (1995: 250), Braun & Mel'nik (1997: 40), Crous & Braun (2003: 65).

**Illustration:** Braun (1995: 247, fig. 230 b).

**Exsiccatae:** Roum., *Fungi Sel. Exs.* 6181.

**Description:** *Leaf spots* amphigenous, subcircular to irregular, 2–4 mm diam, membranous, brownish to grey. *Caespituli* epiphyllous. *Mycelium* internal. *Stromata* lacking or small. *Conidiophores* in small fascicles, subcylindrical, straight, 20–65  $\times$  3–6  $\mu$ m, 0–1-septate, brown; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, conidiogenous loci conspicuous, thickened and darkened. *Conidia* solitary, cylindrical, 10–50  $\times$  3–4  $\mu$ m, 1–4-septate, hyaline, apex obtuse to subacute, base truncate, about 2–3  $\mu$ m wide, slightly thickened and darkened.

**Lectotype** (designated by Braun 1995): **France:** Côte-d'Or, on *Arum maculatum*, May 1892, Fautrey, Roum., *Fungi Sel. Exs.* 6181 (PC). **Isolectotypes:** Roum., *Fungi Sel. Exs.* 6181.

**Host range and distribution:** On *Arum* (*maculatum*, *korolkowii*), *Araceae*, Central Asia (Kazakhstan), Europe (France, Italy).

**Notes:** A true *Cercospora* s. str., but type material too poor for a final conclusion about the status of this species (see Braun 1995).

*Cercospora aricola* Sacc., *Ann. Mycol.* **11**: 548 (1913).  
*Synonym: Cercosporina aricola* (Sacc.) Sacc., *Syll. Fung.* **25**: 896 (1931).

*Literature:* Chupp (1954: 56), Crous & Braun (2003: 65), Guo et al. (2005: 278).

*Description:* Leaf spots conspicuous, on both sides, but more evident below, 2–4 mm diam, white, margin ochraceous to brown. *Caespituli* hypophyllous. *Mycelium* internal. *Stromata* present. *Conidiophores* 50–90 × 5–6 µm, more or less straight, mostly 1-septate, brown, slightly but closely denticulate above. *Conidia* solitary, obclavate, often curved, 40–70 × 4.5–5 µm, 8–12-septate, without constrictions, subhyaline, apex acute, base obconically truncate.

*Holotype: Mexico:* Vera Cruz, on unknown member of *Araceae*, *S. Bonansea* [Fungi Mexicani 14] (PAD).

*Host range and distribution:* On unknown member of *Araceae*, *Typhonium giganteum*, *Araceae*, Asia (China), North America (Mexico).

## Passalora

### Key to *Passalora* species on *Araceae*

- 1      *Stromata* present, 10–60 µm diam; conidiophores fasciculate; conidia solitary; on *Colocasia* ..... **P. colocasiae**  
        *Stromata* absent; conidiophores solitary; conidia catenate; on *Caladium* ..... **P. caladiicola**

### *Passalora* species on *Araceae*

***Passalora caladiicola*** (Chupp) U. Braun, **comb. nov.**  
 Mycobank MB809008.

*Basionym: Cercospora caladiicola* Chupp *Monograph of Cercospora*: 57 (1954); as "*caladicola*".

*Synonym: Cercospora caladii* Henn., *Hedwigia* **48**: 17 (1908), *nom. illeg.* (ICN, Art. 53.1).

*Literature:* Saccardo (1931: 868), Chupp (1954: 57), Crous & Braun (2003: 93–94).

*Description:* Leaf spots minute, formed as dark brown to black specks, 0.5–1.5 mm diam. *Caespituli* hypophyllous. *Stromata* lacking. *Conidiophores* solitary, mostly formed as lateral branches of procumbent threads, or in groups of 2–3, irregular in outline, but not geniculate, 10–25 × 3–5 µm, or even as large as 85 × 7 µm, pale olivaceous-brown, when longer paler and narrower towards the tip; small scars at bluntly rounded tips. *Conidia* catenate, cylindrical, 10–50 × 3–6 µm, 1–5-septate, pale olivaceous, ends rounded.

*Holotype: Brazil:* São Paulo, on *Caladium* sp., *Araceae*, 14 Mar. 1902, A. Puttemans 476 (B, but currently lost).

*Host range and distribution:* Only known from the type collection.

*Notes:* This species is insufficiently known. The present description is based on the original description. Type material was not available for re-examination. It is also unclear if Chinese material on *Typhonium giganteum*, assigned to *C. aricola*, is actually conspecific. Guo et al. (2005) described conidiophores of 44–92 × 4–6 µm and conidia of 35–80 × 3.5–4.5 µm.

***Cercospora callae* f. *aethiopica*** Gonz. Frag., *Bol. Soc. Esp. Hist. Nat.* **233**: 326 (1923).

*Literature:* Saccardo (1972: 1370).

*Holotype: Spain:* Madrid, Botanical Garden, on *Zantedeschia aethiopica*, *Araceae*, 4 Jan. 1922, F. Riofrio 6162 (MA).

*Notes:* Not belonging to *C. callae* and *Cercospora* at all, but rather a sporidesmium-like fungus.

*Notes:* This species is insufficiently known. Its type material, previously preserved at B, was sent as loan to Brazil in 1997 and has been lost. The present description is based on the original publication and Chupp (1954). However, the combination of superficial hyphae with solitary conidiophores, visible conidiogenous loci (scars) and cylindrical catenate conidia strongly suggests a mycovellosiella-like species that has to be assigned to *Passalora*.

***Passalora colocasiae*** (Höhn.) U. Braun, in Braun et al., *New Zealand J. Bot.* **37**: 308 (1999).

(Fig. 25)

*Basionym: Cercospora caladii* var. *colocasiae* Höhn., *Sitzungsber. Kaiserl. Akad. Wiss., Math.-Naturwiss. Cl., Abt. 1*, **116**: 150 (1907).

*Synonyms: Cercospora colocasiae* (Höhn.) Chupp, *Monograph of Cercospora*: 58 (1954).

*Mycosphaerella alocasiae* Syd. & P. Syd., *Philipp. J. Sci.* **8**: 195 (1913) [*syntypes: Philippines:* Luzon, Manila, on *Alocasia macrorhizon*, Dec. 1911, Graff, Syd., *Fungi Exot. Exs.* 30 (e.g. BPI 607294, 607296; CUP; L)].

*Sphaerella alocasiae* (Syd. & P. Syd.) Trotter, *Syll. Fung.* **24**: 850 (1928).

*Literature:* Saccardo (1913: 1431), Chupp (1954: 58), Vasudeva (1963: 87), Sivanesan (1984: 185), Crous & Braun (2003: 132), Aptroot (2006: 31–32), Kamal (2010: 113).

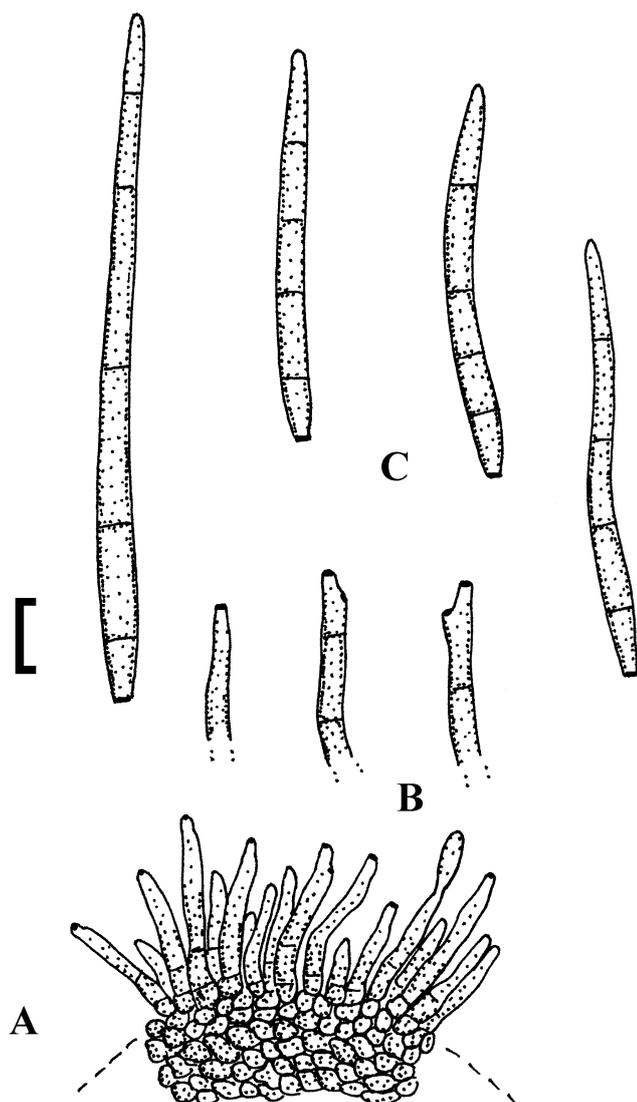


Fig. 25. *Passalora colocasiae* (CUP 39261). A. Conidiophore fascicle. B. Conidiophores. C. Conidia. Bar = 10  $\mu$ m.

Illustrations: Sivanesan (1984: 186, fig. 94), Aptroot (2006: 10, fig. 36).

*Exsiccatae*: Rehm, *Ascomyc.* 2060. Syd., *Fungi Exot. Exs.* 30.

*Description*: *Leaf spots* amphigenous, subcircular to somewhat angular-irregular, 2–8 mm diam, centre pale ochraceous to brownish, margin narrow to moderately wide, darker, dingy greyish brown to dark brown. *Caespituli* amphigenous, punctiform, scattered to dense, dark brown. *Mycelium* internal; hyphae sparingly branched, septate, pigmented. *Stromata* substomatal, small to moderately large, subglobose, 10–60  $\mu$ m diam, pigmented, composed of swollen hyphal cells, 2–8  $\mu$ m diam. *Conidiophores* in small to moderately large fascicles, arising from stromata, through stomata, loose to dense, erect, straight to curved, subcylindrical to attenuated towards the tip, usually not geniculate-sinuous, occasionally slightly so, unbranched, 5–35  $\times$  2–5  $\mu$ m, sometimes swollen at the very base, to 8  $\mu$ m wide, 0–2(–3)-septate, pale olivaceous to light brown, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 10–25  $\mu$ m long, conidiogenous loci conspicuous, slightly thickened and darkened, 1–2  $\mu$ m diam. *Conidia* solitary, obclavate (-cylindrical), fusiform, (15–)25–60(–100)  $\times$  2–5  $\mu$ m, (0–)1–5(–6)-septate, subhyaline to pale olivaceous or light brown, thin-walled, almost smooth to verruculose, apex obtuse to subacute, base obconically truncate, 1–2.5  $\mu$ m wide, hila slightly thickened and darkened.

*Sexual morph*: *Ascomata* pseudothecial, in the centre of leaf spots, numerous, dense, immersed, globose, blackish, ostium 18–25  $\mu$ m diam; *asci* fasciculate, saccate to cylindrical, 35–52  $\times$  10–16  $\mu$ m, paraphysate, 8-spored, distichous to tristichous; *ascospores* narrowly pyriform, 16–22  $\times$  3–5.5  $\mu$ m, with a single median septum, hyaline, ends obtuse.

*Holotype*: **Samoa**: on living leaves of *Colocasia esculenta*, 1905, *Rehinger* 2297 (FH). *Isotype*: CUP 39261.

*Host range and distribution*: On *Alocasia (macrorrhizos, Alocasia sp.)*, *Colocasia (esculenta [antiquorum])*, *Colocasia sp.*, *Araceae*, Asia (Brunei, India, Indonesia, Malaysia, Nepal, Papua New Guinea, Philippines), Oceania (Fiji, Guam, Niue, Samoa, Solomon Islands, Tonga).

## *Pseudocercospora*

### Key to *Pseudocercospora* species on *Araceae*

- 1 Conidia short clavate-turbinate, 20–35  $\times$  10–14.5  $\mu$ m, (1–)3(–5)-septate; on *Colocasia* ..... **P. colocasiae**  
Conidia much narrower, < 10  $\mu$ m; on other hosts ..... 2
- 2 (1) Mycelium internal and external, superficial; stromata lacking; conidiophores fasciculate and solitary, arising from superficial hyphae, to 300  $\mu$ m long; conidia cylindrical, 40–80  $\times$  4–4.5  $\mu$ m;  
on *Amorphophallus* ..... **P. protensa**  
Mycelium internal; superficial hyphae lacking; stromata developed; conidiophores much shorter, 5–80  $\mu$ m;  
conidia obclavate-cylindrical, filiform or subacicular, if cylindrical then conidia wider, 6–9  $\mu$ m;  
on other hosts ..... 3
- 3 (2) Conidia mostly cylindrical, 20–50  $\times$  6–9  $\mu$ m, 1–3(–4)-septate; on *Alocasia* ..... **P. alocasiicola**  
Conidia narrower, 2–5.5  $\mu$ m, (0–)1–12-septate; on other hosts ..... 4

- 4 (3) Conidia narrowly obclavate to cylindrical-filiform,  $40\text{--}110 \times 2\text{--}4 \mu\text{m}$ , 4–12-septate; on *Aglaonema* ..... **P. bruneiensis**  
 Conidia shorter and wider, to  $75 \times 5.5 \mu\text{m}$ , 0–8-septate; on other hosts ..... 5
- 5 (4) Conidiophores  $5\text{--}25 \times 3\text{--}6 \mu\text{m}$ ; conidia obclavate-cylindrical, hila  $2\text{--}2.5 \mu\text{m}$  wide; on *Colocasia* ..... **P. aracearum**  
 Conidiophores narrower,  $5\text{--}25 \times 2\text{--}4 \mu\text{m}$ ; conidia obclavate-cylindrical to subacicular, hila  $1\text{--}2 \mu\text{m}$  wide;  
 on *Montrichardia* ..... **P. montrichardiae**

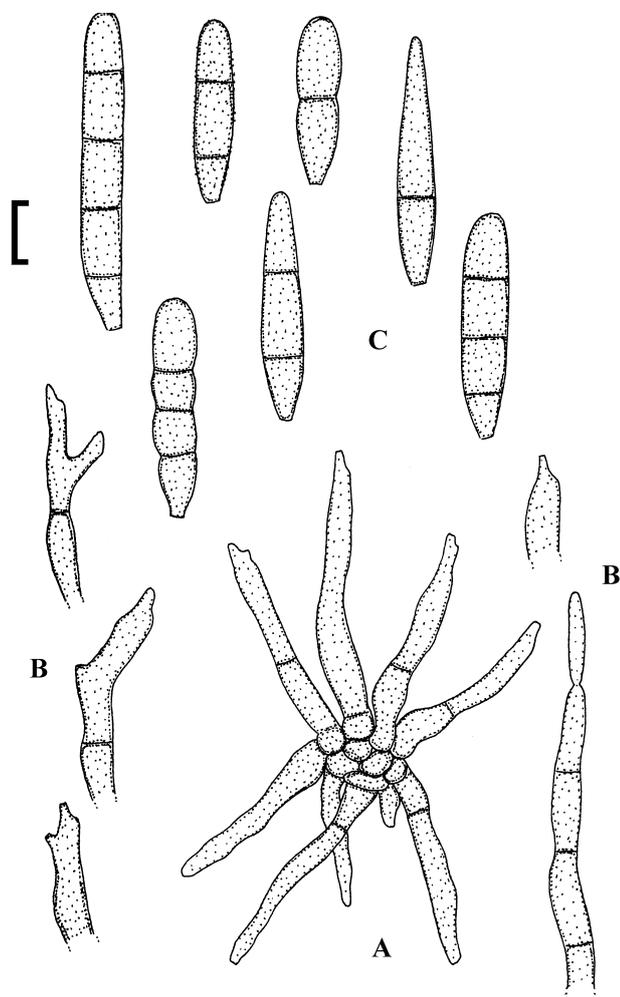


Fig. 26. *Pseudocercospora alocasiicola* (PDD 49041). A. Conidiophore fascicle. B. Conidiophore tips. C. Conidia. Bar = 10  $\mu\text{m}$ .

### *Pseudocercospora* species on Araceae

***Pseudocercospora alocasiicola*** U. Braun & McKenzie, *New Zealand J. Bot.* **37**: 306 (1999). (Fig. 26)

*Illustration*: Braun et al. (1999: 307, fig. 7).

*Description*: *Leaf spots* amphigenous, subcircular to irregular, 1–15 mm diam, at first brownish, dark greyish brown to blackish or violet-black, margin indefinite, later with pale greyish brown to dingy greyish centre and dark margin, dark brown to blackish or violet-black. *Caespituli* hypophyllous, punctiform, scattered to subgregarious, dark brown to blackish. *Mycelium* internal; hyphae septate, branched, pigmented. *Stromata*

intraepidermal, occasionally substomatal, small to expanded, planate, composed of swollen hyphal cells, more or less angular, thick-walled, 3–10  $\mu\text{m}$  diam. *Conidiophores* in small to moderately large fascicles, loose, occasionally solitary, arising from stromata, erumpent, erect, straight and subcylindrical to geniculate-sinuuous, unbranched or occasionally branched, 15–80  $\times$  3–8  $\mu\text{m}$ , continuous to pluriseptate throughout, occasionally with constrictions at septa, olivaceous to medium dark brown, tips often paler, wall thin to somewhat thickened, smooth; conidiogenous cells integrated, terminal, occasionally intercalary, conidiogenous loci inconspicuous to subconspicuous by being frequently subdentate, but always unthickened and not darkened. *Conidia* solitary, usually cylindrical, some conidia subclavate, short conidia sometimes obclavate or broadly fusiform, 20–50  $\times$  6–9  $\mu\text{m}$ , 1–3(–4)-septate, not or only slightly constricted at septa, pale olivaceous to dingy olivaceous-brown, thin-walled, almost smooth to faintly rough-walled, apex obtuse, rounded, base rounded to somewhat obconically truncate or with denticle-like protuberance, hilum unthickened, not darkened.

*Holotype*: **Vanuatu**: Efate, Teouma, on living leaves of *Alocasia macrorrhizos*, Araceae, 21 Nov. 1983, E. H. C. McKenzie (PDD 49041).

*Host range and distribution*: Only known from the type collection.

***Pseudocercospora aracearum*** U. Braun & McKenzie, in Braun et al. *New Zealand J. Bot.* **37**: 308 (1999). (Fig. 27)

*Illustration*: Braun et al. (1999: 307, fig. 9).

*Description*: *Leaf spots* subcircular, 4–6 mm diam, brownish, margin indefinite, but often with a greenish halo. *Caespituli* amphigenous, punctiform, dark brown. *Mycelium* internal; hyphae septate, branched, pigmented. *Stromata* well-developed, intraepidermal, erumpent, subglobose, 20–40  $\mu\text{m}$  diam, brown, composed of swollen hyphal cells, 2.5–6  $\mu\text{m}$  diam. *Conidiophores* usually in small fascicles, loose to dense, arising from stromata, erumpent, erect, straight, occasionally curved, subcylindrical or attenuated towards the tip, slightly geniculate-sinuuous, 5–25  $\times$  3–6  $\mu\text{m}$ , 0–2-septate, subhyaline to pale olivaceous, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 5–20  $\mu\text{m}$  long, conidiogenous loci inconspicuous, unthickened, not darkened. *Conidia* solitary, obclavate-subcylindrical, fusiform, 20–75  $\times$  (3–)4–5(–5.5)  $\mu\text{m}$ , 1–8-septate, subhyaline to pale olivaceous, thin-walled, smooth, apex usually obtuse, occasionally subacute,

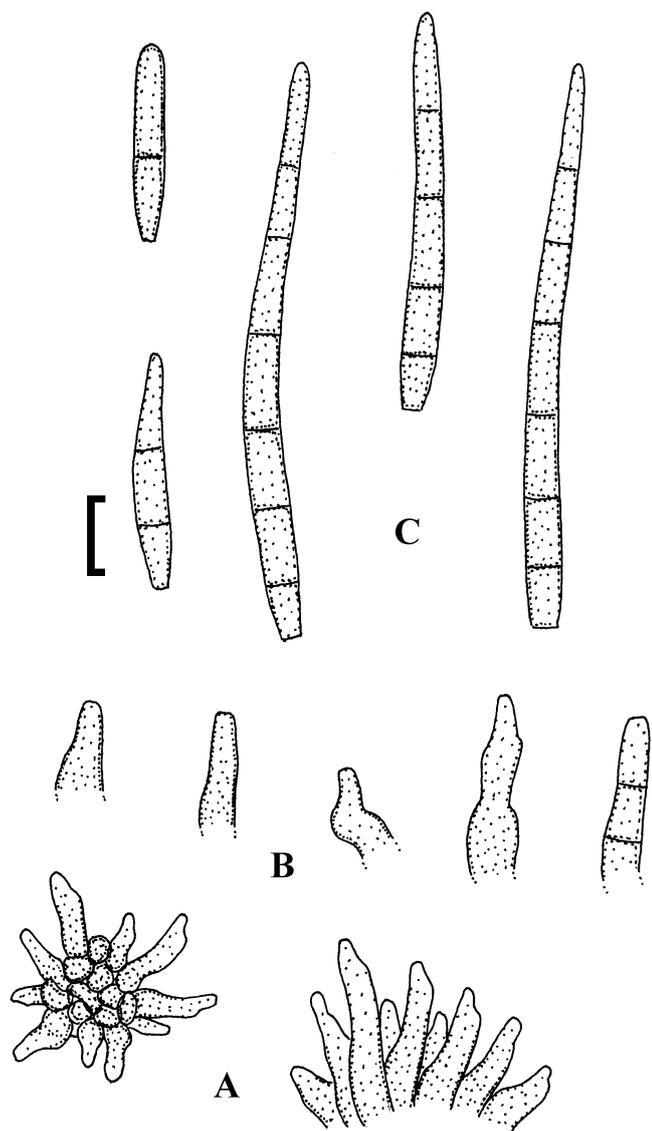


Fig. 27. *Pseudocercospora aracearum* (PDD 60364). A. Conidiophore fascicles. B. Conidiophores. C. Conidia. Bar = 10 µm.

base obconically truncate, occasionally truncate in cylindrical conidia, mostly 2–2.5 µm wide, hila neither thickened nor darkened.

**Holotype:** Vanuatu: Santos, Sarete, on *Colocasia esculenta*, Araceae, 14 Feb. 1985, E. H. C. McKenzie (PDD 60364).

**Host range and distribution:** Only known from the type collection.

***Pseudocercospora bruneiensis*** U. Braun & Sivap., *Fungal Diversity* 3: 11 (1999). (Fig. 28)

**Illustration:** Braun & Sivapalan (1999: 12, fig. 7).

**Description:** Leaf spots amphigenous, subcircular to somewhat irregular, 3–15 mm diam, dingy greyish green, grey or greyish white, margin narrow, darker, dingy olivaceous to dark greyish brown. *Caespituli* amphigenous,

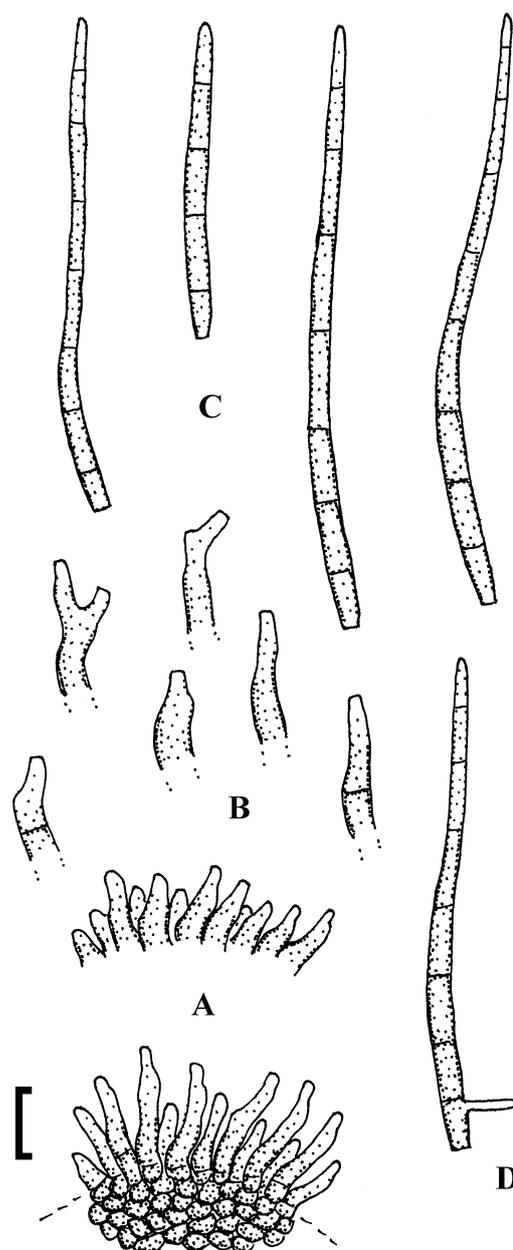


Fig. 28. *Pseudocercospora bruneiensis* (HAL 1596 F). A. Conidiophore fascicles. B. Conidiophores. C. Conidia. Bar = 10 µm.

mostly hypophyllous, punctiform to subeffuse, dingy greyish olivaceous to brownish. *Mycelium* internal; hyphae sparingly branched, pigmented, forming small to well-developed stromata, substomatal, 10–50 µm diam, brown, composed of swollen hyphal cells, 2–7 µm diam. *Conidiophores* in dense fascicles, usually numerous, arising from stromata, emerging through stomata, erect, straight, cylindrical, conical or flexuous, geniculate-sinuuous, simple or occasionally branched, 5–40 × 2–5 µm, 0–1-septate, pale olivaceous to medium olivaceous-brown, tips often somewhat paler, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 5–30 µm long, conidiogenous loci inconspicuous, rounded to truncate, unthickened, not darkened. *Conidia* solitary, narrowly obclavate or cylindrical-filiform, 40–110 × 2–4 µm,

pluriseptate, mostly with 4–12 septa, subhyaline to pale olivaceous, thin-walled, smooth, apex usually subacute, base obconically truncate or occasionally truncate, 1.5–3  $\mu\text{m}$  wide, hila neither thickened nor darkened, conidia rarely with a subbasal lateral branchlet which possibly represents a germ tube.

**Holotype: Brunei:** Rimba, on *Aglaonema* sp., *Araceae*, 28 Aug. 1996, A. Sivapalan 7747 (HAL 1596 F).

**Host range and distribution:** Only known from the type collection.

***Pseudocercospora colocasiae*** Deighton, *Mycol. Pap.* **140**: 17 (1976).  
(Fig. 29)

**Literature:** Matsushima (1985), Goh & Hsieh (1990: 30), Guo & Hsieh (1995: 22), Guo et al. (1998: 35–36).

**Illustrations:** Deighton (1976: 18–19, figs 5–6), Matsushima (1985: fig. 298), Goh & Hsieh (1990: 31, fig. 17), Guo & Hsieh (1995: 25, fig. 23), Guo et al. (1998: 35, fig. 23).

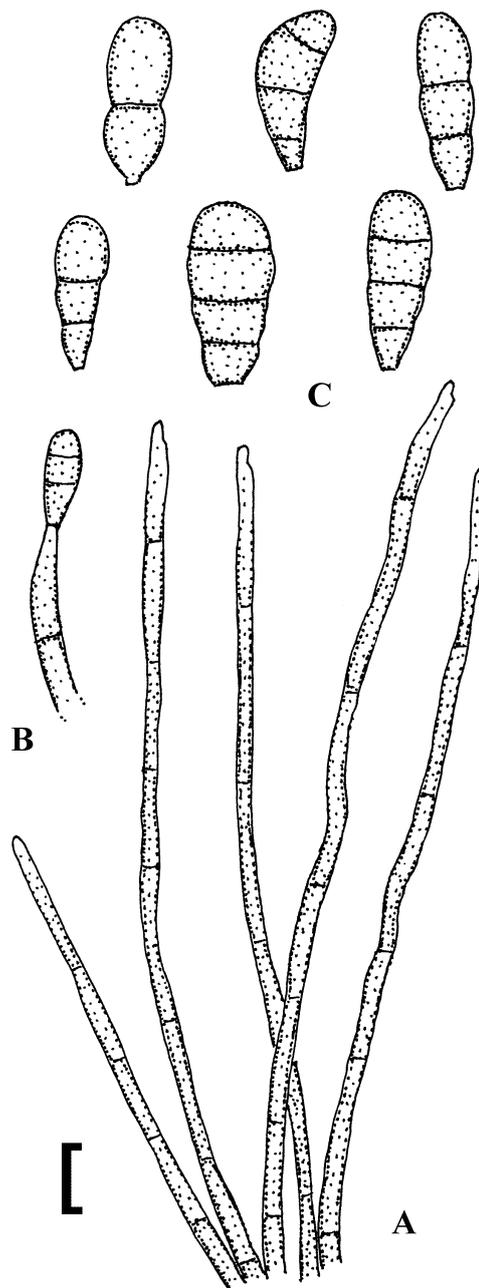
**Description:** *Leaf spots* indistinct, forming subcircular pale discolorations, to 10 mm diam, centre sometimes turning greyish with age, margin indefinite. *Caespituli* amphigenous, mainly hypophyllous, effuse, thin, medium to dark olivaceous. *Mycelium* internal; hyphae branched, septate, subhyaline, 1.5–4  $\mu\text{m}$  wide. *Stromata* none. *Conidiophores* in loose fascicles, to 9, arising from internal hyphae, through stomata, erect, cylindrical-filiform, flexuous, somewhat sinuous, barely geniculate, unbranched, rarely with lateral branchlets, swollen at the very base, 50–425  $\times$  4–7  $\mu\text{m}$ , pluriseptate throughout, medium dark olivaceous, somewhat paler towards the tip, thin-walled, smooth or somewhat rough-walled above; conidiogenous cells integrated, terminal, proliferations sympodial and percurrent, annellations not very conspicuous, conidiogenous loci inconspicuous or visible as truncate apex, 2.5–4  $\mu\text{m}$  wide, sometimes subdentate, but always unthickened and not darkened. *Conidia* solitary, short clavate-turbinate, mostly straight, rarely somewhat curved or asymmetric, 20–35  $\times$  10–14.5  $\mu\text{m}$ , (1–)3(–5)-septate, pale olivaceous, thin-walled, almost smooth to faintly rough-walled, apex broadly rounded, base obconically truncate, 2–3.5  $\mu\text{m}$  wide, hila neither thickened nor darkened.

**Holotype: Solomon Islands:** Hauhui, Malaite, on *Colocasia esculenta*, 1 June 1959, A. Johnston (K(M) IMI 77190).

**Host range and distribution:** On *Colocasia esculenta*, *Araceae*, Asia (Bangladesh, Indonesia [Prov. Papua], Myanmar, Taiwan), Oceania (Samoa, Solomon Islands).

***Pseudocercospora montrichardiae*** (Henn.) U. Braun & F.O. Freire, *Cryptog. Mycol.* **23**: 313 (2002).  
(Fig. 30)

**Basionym:** *Cercospora montrichardiae* Henn., *Hedwigia* **48**: 115 (1909).



**Fig. 29.** *Pseudocercospora colocasiae* (K(M) IMI 77190). **A.** Conidiophore fascicle. **B.** Conidiophore tip with conidium. **C.** Conidia. Bar = 10  $\mu\text{m}$ .

**Literature:** Saccardo (1931: 869), Chupp (1954: 59), Crous & Braun (2003: 281).

**Illustration:** Braun & Freire (2002: 314, fig. 20).

**Description:** *Leaf spots* amphigenous, subcircular to angular-irregular, 1–15 mm diam, yellowish to ochraceous, finally greyish brown to greyish white, margin indefinite or narrow and darker, often vein-limited. *Caespituli* amphigenous, punctiform, dark brown. *Mycelium* internal. *Stromata* variable, almost absent to well-developed, substomatal, 10–70  $\mu\text{m}$  diam, olivaceous to yellowish brown or dark brown. *Conidiophores* in small to large fascicles, often almost sporodochial, loose to dense, arising from stromata, emerging through stomata,

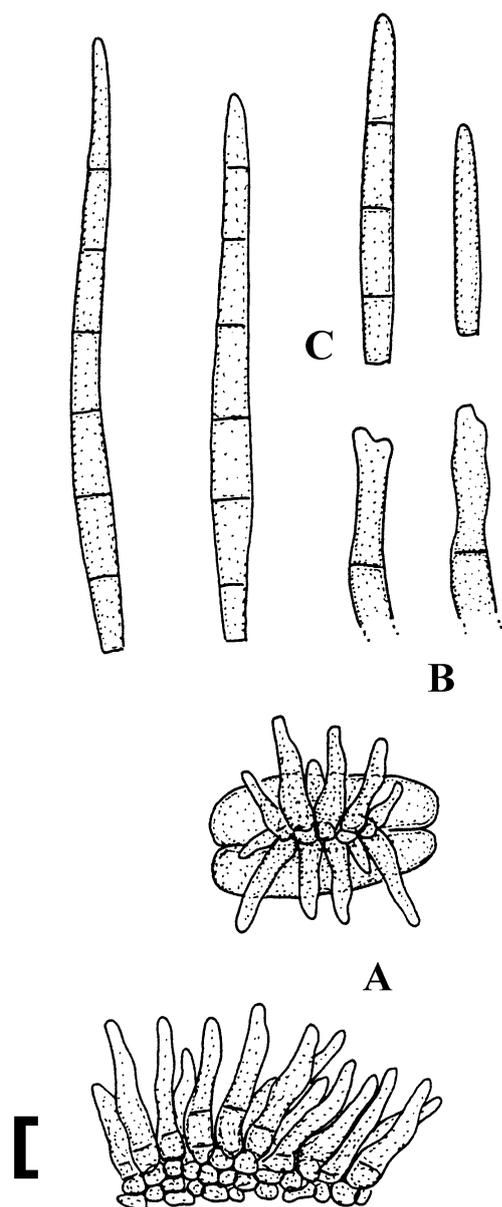


Fig. 30. *Pseudocercospora montrichardiae* (S-F37470). A. Conidiophore fascicles. B. Conidiophores. C. Conidia. Bar = 10  $\mu$ m.

erect, straight, subcylindrical-conical to strongly geniculate-sinuuous, unbranched or occasionally branched, 5–25  $\times$  2–4  $\mu$ m, 0–2-septate, subhyaline to pale olivaceous, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 5–20  $\mu$ m long, conidiogenous loci inconspicuous to subdentate, but always unthickened, not darkened. *Conidia* solitary, narrowly obclavate-subcylindrical, subacicular, (8–)15–70  $\times$  2.5–5.5  $\mu$ m, (0–)1–7-septate, subhyaline to olivaceous, thin-walled, smooth, apex obtuse to subacute, base truncate to obconically truncate, 1–2  $\mu$ m wide, hila unthickened, not darkened.

*Lectotype* (designated by Braun & Freire 2002): **Brazil**: Para: Ilha das Oncas, on *Montrichardia arborescens*, Oct. 1903, Huber 96 (S-F37470).

*Host range and distribution*: On *Montrichardia* (*arborescens*, *linifera*), *Araceae*, South America (Brazil).

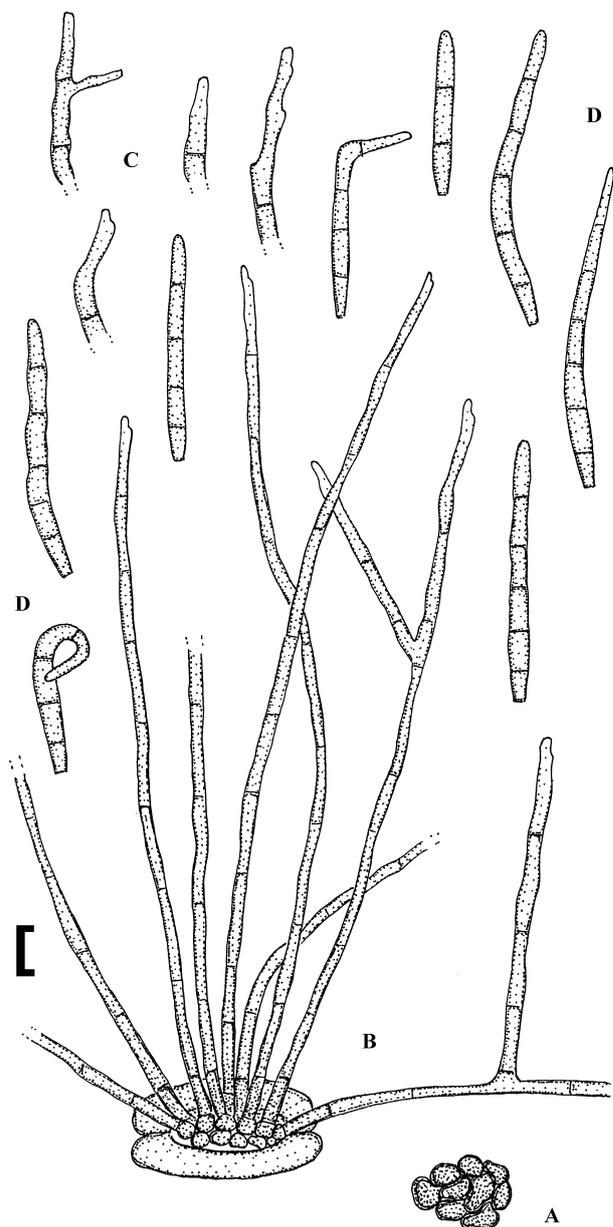


Fig. 31. *Pseudocercospora protensa* (B 70014865). A. Stroma. B. Conidiophore fascicle and superficial hypha with conidiophore emerging through a stoma. C. Conidiophore tips. D. Conidia. Bar = 10  $\mu$ m.

***Pseudocercospora protensa*** (Syd.) Deighton, *Mycol. Pap.* **140**: 150 (1976). (Fig. 31)

*Basionym*: *Cercospora protensa* Syd., *Ann. Mycol.* **28**: 446 (1930).

*Literature*: Chupp (1954: 59), Boedijn (1961: 413), Crous & Braun (2003: 336–337).

*Description*: Leaf spots formed as indistinct yellowish to brownish discolorations on the upper leaf surface, 3–10 mm diam, later expanded, larger, sometimes affecting almost entire leaves. *Caespituli* hypophyllous, punctiform to confluent, effuse, later visible as large patches or layers, loose to dense, dark olivaceous to brown. *Mycelium*

internal, occasionally with a few procumbent threads growing like superficial hyphae, sometimes even with lateral conidiophores. *Stromata* lacking or only with small stromatic aggregations of swollen hyphal cells, substomatal, 10–25 µm diam, brown, individual cells subglobose, 2.5–6 µm diam, with somewhat thickened walls. *Conidiophores* in small to moderately large, loose fascicles, arising from internal hyphae or stromatic hyphal aggregations, emerging through stomata, occasionally solitary, arising from decumbent threads, erect, straight to flexuous, variously curved to somewhat geniculate-sinuous, simple or branched, branchings not rare, long, 60–300 × 2.5–6 µm, width uniform or somewhat attenuated towards the tip, plainly pluriseptate throughout, cells (5–)10–20(–30) µm long, pale to medium olivaceous-brown or yellowish brown, paler towards the apex, tips sometimes subhyaline, thin-walled, smooth; conidiogenous cells integrated, terminal, sometimes intercalary, 10–25 µm long, sympodial, conidiogenous loci inconspicuous or visible as truncate tips or lateral shoulders formed by sympodial proliferation, but always unthickened and not darkened. *Conidia* solitary, cylindrical to obclavate-cylindrical, straight to curved, often strongly curved, sigmoid or occasionally

even uncinata to subspirally twisted, outline and width often somewhat irregular, 20–80 × 3–6.5 µm, 2–9-septate, pale yellowish, greenish, olivaceous to olivaceous-brown, thin-walled, smooth, apex subacute to obtuse, rounded, base subtruncate to usually short obconically truncate or gradually attenuated towards the base, 1.5–2.5 µm wide, hila unthickened, not darkened.

*Lectotype* (designated here, MycoBank MBT178135): **Philippines:** *Province Laguna:* Los Baños, on *Amorphophallus paeoniifolius*, 1 Oct. 1912, C. F. Baker 322 (S-F37711). *Isolectotype:* B 700014865.

*Host range and distribution:* On *Amorphophallus* (*paeoniifolius* [*campanulatus*], *variabilis*, *Amorphophallus* sp.), *Araceae*, Asia (Indonesia, Malaysia, Papua New Guinea, Philippines).

*Notes:* An additional collection deposited as *C. protensa* on *Amorphophallus* sp. has been examined and confirmed (North Borneo, 1 Sep. 1959, A. Johnston NB 28, K(M) IMI 78759).

## Zasmidium

### Key to *Zasmidium* species on *Araceae*

- 1 Superficial hyphae not developed *in vivo*; conidiophores only fasciculate; conidia formed singly, obclavate, 30–60 × 3–4 µm; on *Cercestis afzelii*, Africa ..... **Z. cercestidis-afzelii**  
Superficial hyphae developed *in vivo*, with or without solitary conidiophores ..... 2
- 2 (1) Conidia catenate, small, 4–20 × 2–3 µm, 0–1-septate; on *Cercestis congoensis*, Africa ..... **Z. deightoniana**  
Conidia consistently solitary or solitary as well as catenate, much longer and pluriseptate ..... 3
- 3 (2) Superficial hyphae formed *in vivo*, but conidiophores only fasciculate, solitary conidiophores arising from superficial hyphae lacking; conidia to 350 µm long; on *Homalomena* spp., Asia ..... **Z. extremorum**  
Solitary conidiophores arising from superficial hyphae formed *in vivo*; conidia much shorter, only to 140 µm; on other hosts ..... 4
- 4 (3) *Stromata* lacking; on *Anthurium* or *Cercestis* ..... 5  
*Stromata* developed; on *Alocasia* or *Colocasia* ..... 6
- 5 (4) Conidiophores solitary; conidia solitary, obclavate-cylindrical to filiform; on *Anthurium* sp., Asia ..... **Z. anthuricola**  
Conidiophores solitary as well as fasciculate; conidia catenate, cylindrical or subcylindrical; on *Cercestis congoensis*, Africa ..... **Z. cercestidis**
- 6 (4) Hyphae regularly nodulose; conidia solitary as well as catenate; on *Colocasia esculenta* ..... **Z. colocasiae**  
Hyphae not or only rarely with swellings; conidia mostly solitary; on *Alocasia* spp. .... **Z. alocasiae**

### *Zasmidium* species on *Araceae*

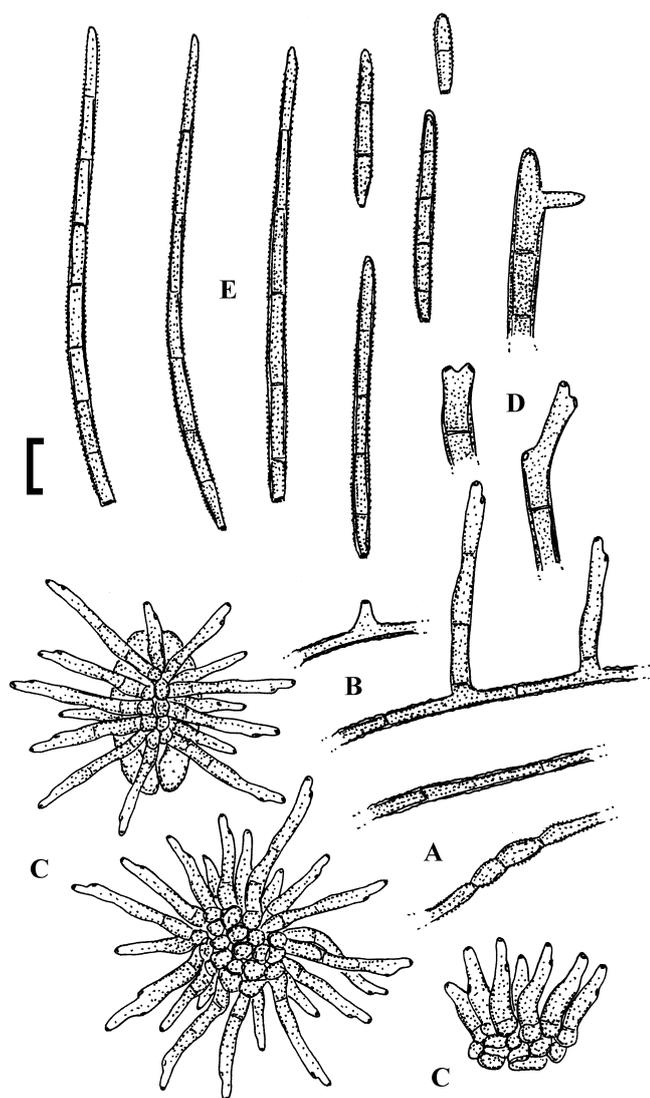
***Zasmidium alocasiae*** (Sarbjana & Chattopadh.)  
Kamal, *Cercosporoid Fungi of India*: 237 (2010).  
(Fig. 32)

*Basionym:* *Stenella alocasiae* Sarbjana & Chattopadh., *J. Mycopathol. Res.* **29**: 33 (1991).

*Literature:* Braun & Sivapalan (1999: 23), Guo (2010).

*Illustration:* Sarbjana & Chattopadhay (1991: 34, fig. 2).

*Description:* *Leaf spots* amphigenous, subcircular to somewhat irregular, scattered to confluent, 2–18 mm diam, at first pale greenish, later pale greyish brown to greyish white, sometimes zonate, margin mostly darker, narrow to moderately broad, dark brown, reddish brown or blackish brown, sometimes with yellowish halo. *Caespituli* amphigenous, scattered to confluent, punctiform, dark brown, blackish brown, later



**Fig. 32.** *Zasmidium alocasiae* (K(M) IMI 284569). **A.** Superficial hyphae. **B.** Superficial hyphae with conidiophores. **C.** Conidiophore fascicles. **D.** Conidiophores. **E.** Conidia. Bar = 10 µm.

greyish brown by abundant sporulation. *Mycelium* internal and external; superficial hyphae emerging through stomata, sparingly branched, septate, occasionally with constrictions at septa and swellings, 1–3 µm wide, subhyaline to pale olivaceous, thin-walled, verruculose. *Stromata* substomatal, subglobose to somewhat irregular, 10–65 µm diam, yellowish brown, medium brown to dark brown, cells 2–8 µm diam. *Conidiophores* in small to moderately large fascicles, 3–30, loose to moderately dense, arising from stromata, through stomata, and solitary, arising from superficial hyphae, lateral, rarely terminal, erect, straight, subcylindrical or somewhat attenuated towards the tip, somewhat sinuous and geniculate near the tip, unbranched, very short conidiophores arising from superficial hyphae sometimes peg-like, aseptate, 5–200 × 2–5 µm, 0–15-septate, pale olivaceous to yellowish or olivaceous-brown to brown, wall thin to somewhat thickened, smooth or almost so; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, conidiogenous loci conspicuous, thickened and darkened, 1–1.5 µm diam. *Conidia* mostly solitary, occasionally catenate,

cylindrical, filiform, narrowly obclavate, 10–140 × 2–4 µm, 1- to pluriseptate, subhyaline, pale olivaceous, olivaceous-brown or pale brownish, thin-walled, verruculose, apex subacute or obtuse, base subtruncate to short obconically truncate, 1–2.5 µm wide, hila somewhat thickened and darkened.

**Holotype:** **India:** West Bengal: Baruipur, on *Alocasia macrorrhizos*, 28 Dec. 1983, K. K. Sabajna PCC 3469 (K(M) IMI 284569).

**Host range and distribution:** On *Alocasia* (*macrorrhizos* [*indica*], *Alocasia* sp.), *Araceae*, Asia (Brunei, ?China, India, West Bengal).

**Notes:** Braun & Sivapalan (1999) discussed a collection on *Colocasia* sp. from Brunei, which was morphologically somewhat intermediate between *Stenella alocasiae* and *S. colocasiae*. The conidia are much longer in comparison to *S. alocasiae* (20–140 × 2–4 µm), pluriseptate and consistently formed singly. The identity of material on *Alocasia* sp. recorded and described from Hainan (Guo 2001c) is unclear. The conidiophores have been described to be 4–6.5 µm wide and the conidia are said to be catenate, cylindrical, to 195 µm long.

**Zasmidium anthuriicola** (U. Braun & C.F. Hill) Crous & U. Braun, *Persoonia* **23**: 104 (2009).

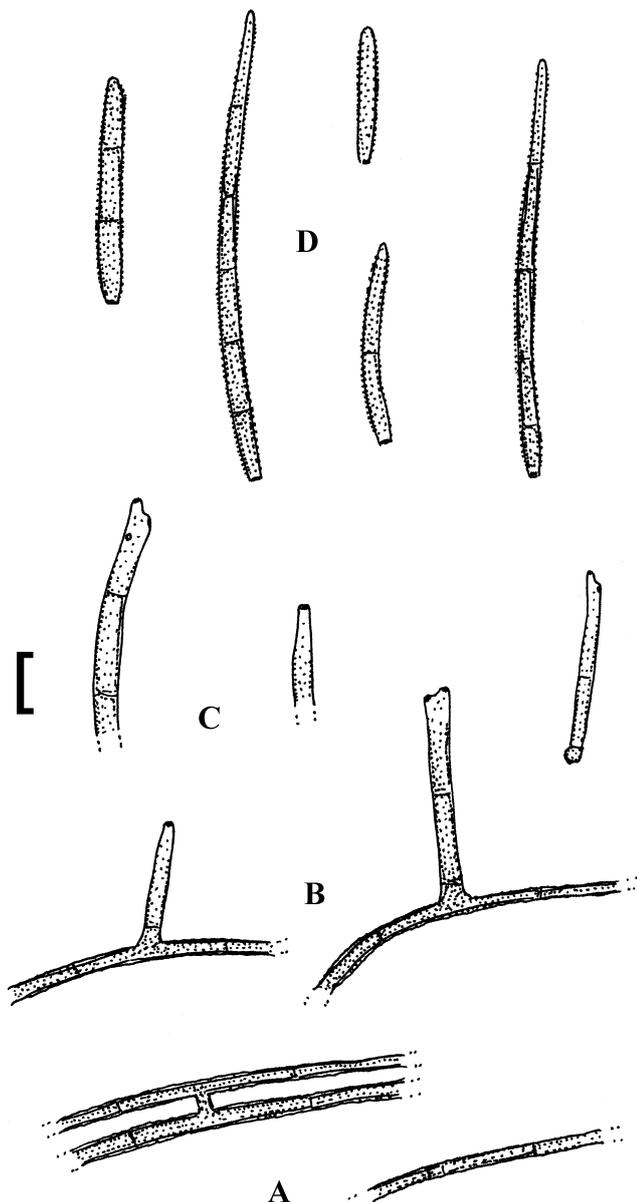
(Fig. 33)

**Basionym:** *Stenella anthuriicola* U. Braun & C.F. Hill, in Braun *et al. Fungal Diversity* **22**: 33 (2006).

**Illustration:** Braun *et al.* (2006: 29, fig. 9).

**Description:** Lesions formed as sharply delineated brown discolorations on leaves, to 5 mm wide, with abundant superficial mycelium. *Colonies in vitro* (prune extract agar) olivaceous-grey (top), and olivaceous-black (bottom), with regular to slightly irregular, smooth margin. *Mycelium* effuse; hyphae sparingly branched, mostly straight, occasionally anastomosing, 1–3(–5) µm wide, septate, subhyaline, pale to medium brown or olivaceous-brown, thin-walled, verruculose. *Stromata* lacking. *Conidiophores* solitary, arising from plagiotropous hyphae, lateral, occasionally terminal, erect, straight, neither geniculate nor sinuous, unbranched, subcylindrical or slightly attenuated towards the apex, occasionally swollen at the base, 10–60 × 2–4 µm, 0–3(–4)-septate, pale olivaceous to olivaceous-brown, often paler towards the tip, thin-walled, smooth to verruculose, especially in the lower half; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 10–30 µm long, conidiogenous loci conspicuous, 0.75–1.5 µm diam, thickened and darkened. *Conidia* solitary, narrowly obclavate-cylindrical, filiform, 10–90 × 2–3 µm, 0–6-septate, subhyaline to pale olivaceous, thin-walled, verruculose, apex obtuse to subacute, base short obconically truncate, 1 µm wide, hila somewhat thickened and darkened.

**Holotype:** **Thailand:** intercepted at Auckland International Airport, New Zealand (imported from Thailand), on *Anthurium* sp., *Araceae*, 3 Aug. 2005, C. F. Hill (HAL 1870 F). *Ex-type culture:* CBS 118742.



**Fig. 33.** *Zasmidium anthuricola* (HAL 1870 F). **A.** Superficial hyphae. **B.** Superficial hyphae with conidiophores. **C.** Conidiophores. **D.** Conidia. Bar = 10 µm.

**Host range and distribution:** Only known from the type collection.

**Note:** Crous et al. (2009c) analysed this species by means of molecular methods and confirmed its phylogenetic position.

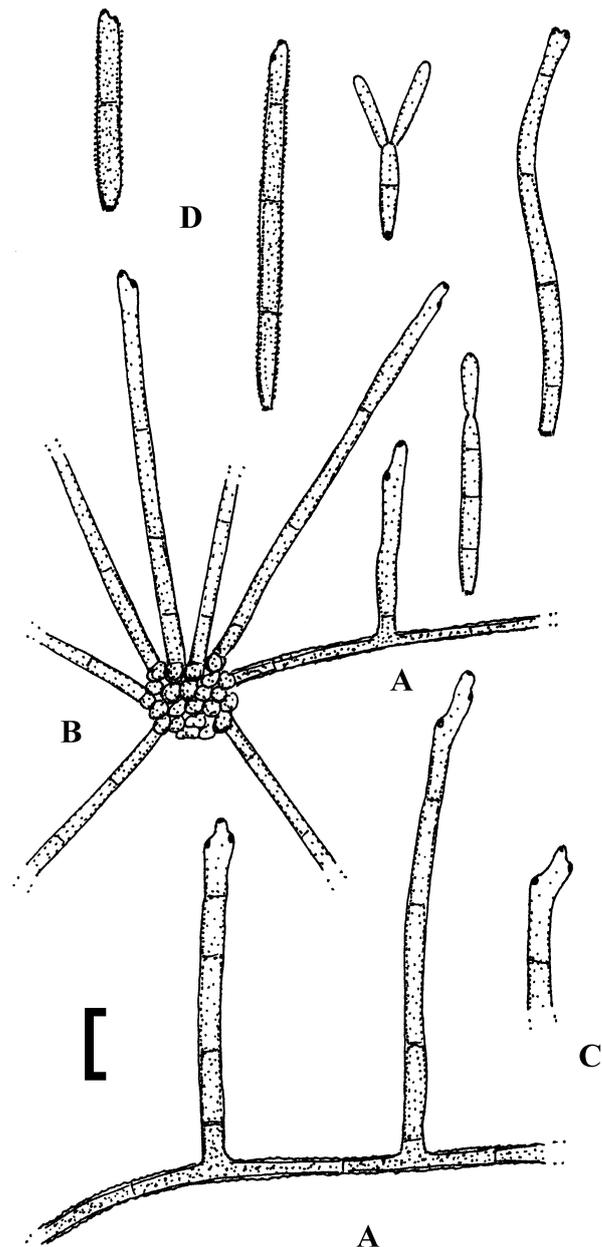
***Zasmidium cercestidis*** (J.M. Yen & Gilles) U. Braun, *Schlechtendalia* **20**: 100 (2010). (Fig. 34)

**Basionym:** *Cercospora cercestidis* J.M. Yen & Gilles, in Yen, *Bull. Trimestriell Soc. Mycol. France* **91**: 92 (1975).

**Synonym:** *Stenella cercestidis* (J.M. Yen & Gilles) Deighton, *Mycol. Pap.* **144**: 53 (1979).

**Literature:** Crous & Braun (2003: 116).

**Illustration:** Yen (1975: 91, fig. 2).



**Fig. 34.** *Zasmidium cercestidis* (K(M) IMI 212936). **A.** Superficial hypha with solitary conidiophores. **B.** Conidiophore fascicle. **C.** Conidiophore tip. **D.** Conidia. Bar = 10 µm.

**Description:** *Leaf spots* amphigenous, scattered, oval to irregular, 5–20 mm diam, brownish, surrounded by a yellowish halo, margin indistinct. *Caespituli* amphigenous. *Mycelium* internal and external; superficial hyphae emerging through stomata, branched, septate, 2–2.5 µm wide, pale brown to brown, wall thin and rough. *Stromata* lacking or only formed as small substomatal aggregations of swollen hyphal cells, brown. *Conidiophores* in small to moderately large, loose fascicles, emerging through stomata or solitary, arising from superficial hyphae, lateral, erect, straight, subcylindrical, barely geniculate, unbranched, 20–105 × 3–4 µm, 0–8-septate, brown, paler towards the tip, thin-walled, smooth or almost so; conidiogenous cells integrated, terminal, 10–30 µm long, sympodial, conidiogenous loci conspicuous, 1–2(–5) per cell, somewhat thickened and darkened. *Conidia* catenate, in

simple or branched chains, cylindrical or subcylindrical, 8–75 × 2–3 µm, 0–7-septate, pale olivaceous-brown, wall thin, rough, ends rounded, truncate or short obconically truncate, 1–2 µm wide, hila thickened and darkened.

**Holotype: Ivory Coast:** Abidjan, Forêt de Yapo, on *Cercestis afzelii*, 10 Feb. 1974, G. Gilles PCI 93 (K(M) IMI 212936).

**Host range and distribution:** On *Cercestis afzelii*, *Araceae*, Africa (Ivory Coast).

**Notes:** The status of the type material is not quite clear, but the collection deposited at K is the only material that could be traced. Therefore, it is assumed that the material now in K represents the holotype.

**Zasmidium cercestidis-afzelii** (J.M. Yen & Gilles) U.

Braun, **comb. nov.**

MycoBank MB809009

(Fig. 35)

**Basionym:** *Cercospora cercestidis-afzelii* J.M. Yen & Gilles, in Yen, *Bull. Trimestriel Soc. Mycol. France* **91**: 93 (1975).

**Literature:** Crous & Braun (2003: 116).

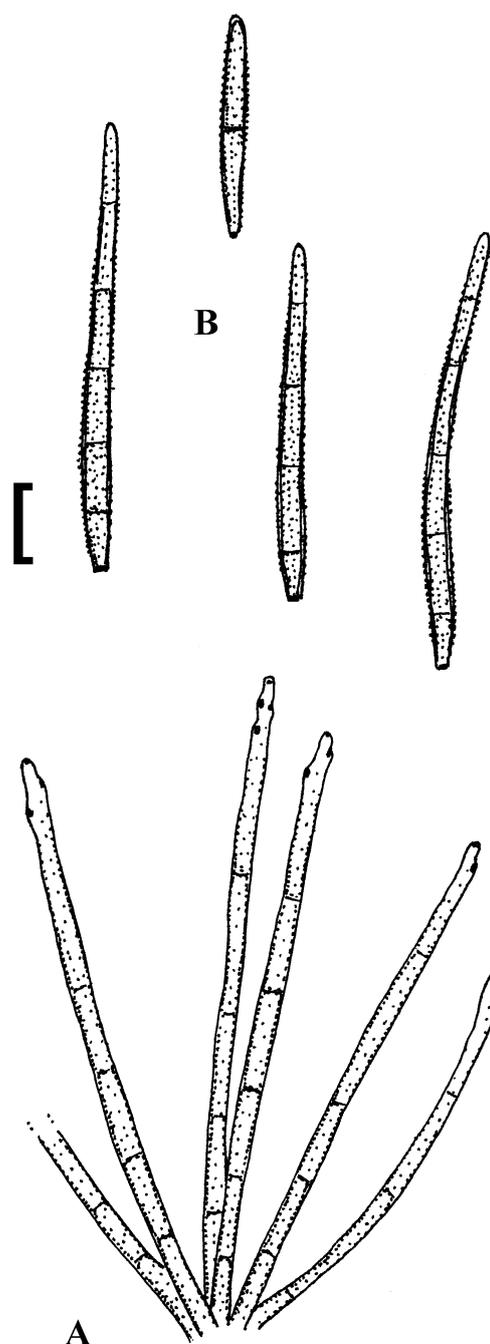
**Illustration:** Yen (1975: 93, fig. 3).

**Description:** Leaf spots amphigenous, scattered, circular to somewhat irregular, 1–4 mm diam, brown to dark brown, with dark margin. *Caespituli* amphigenous. *Mycelium* internal. *Stromata* lacking or very small, only formed as aggregations of a few swollen hyphal cells, substomatal. *Conidiophores* in loose fascicles, 2–24, arising from internal hyphae or hyphal aggregations, erect, straight, subcylindrical, barely geniculate, unbranched, 35–85 × 3–4 µm, 1–7-septate, pale brown, paler towards the tip, thin-walled, smooth; conidiogenous cells integrated, terminal, 10–30 µm long, with 1–3 conspicuous conidiogenous loci, somewhat thickened and darkened, about 1–2 µm diam. *Conidia* solitary, obclavate, 30–60 × 3–4 µm, 1–6(–7)-septate, pale olivaceous-brown, wall thin and verruculose, apex obtuse to subacute, base obconically truncate, about 1–2 µm diam, hila somewhat thickened and darkened.

**Holotype: Ivory Coast:** Abidjan, Forêt de Yapo, on *Cercestis afzelii*, *Araceae*, 10 Feb. 1974, G. Gilles PCI 94 (K(M) IMI 212936).

**Host range and distribution:** Only known from the type collection.

**Notes:** Deighton (1979) supposed that *Cercospora cercestidis-afzelii* might be a synonym of *Stenella cercestidis*, although the leaf spots are quite distinct and superficial mycelium is not formed. We prefer to maintain two species and consider *C. cercestidis-afzelii* as one of the *Zasmidium* species without formation of superficial hyphae *in vivo*. With regard to the unclear status of the type collection see notes under *Z. cercestidis*.



**Fig. 35.** *Zasmidium cercestidis-afzelii* (K(M) IMI 212936). **A.** Conidiophore fascicle. **B.** Conidia. Bar = 10 µm.

**Zasmidium colocasiae** (Sarbjana & Chattopadhy.)

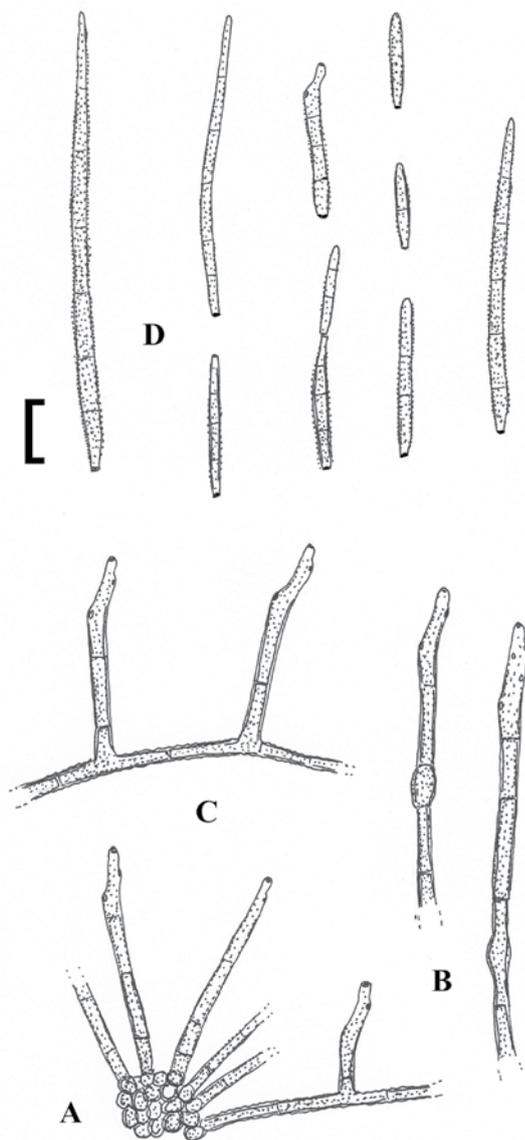
Kamal, *Cercosporoid Fungi of India*: 240 (2010).

(Fig. 36)

**Basionym:** *Stenella colocasiae* Sarbjana & Chattopadhy., *J. Mycopathol. Res.* **29**: 35 (1991).

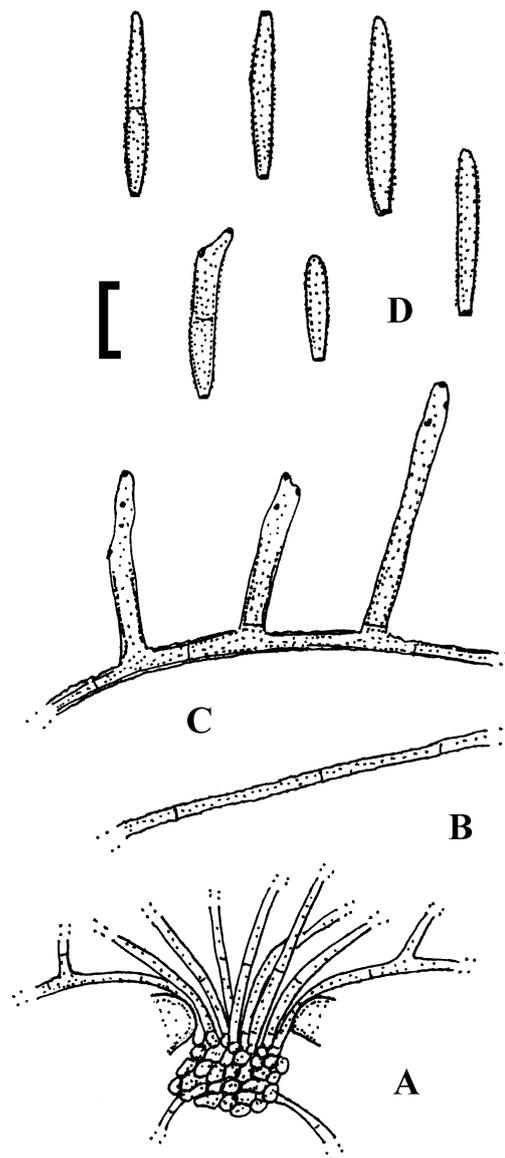
**Illustration:** Sarbjana & Chattopadhyay (1991: 36, fig. 3).

**Description:** Leaf spots amphigenous, circular, 2–10 mm diam, at first small, with brown centre and light brown halo, later turning greyish white, surrounded by a somewhat raised dark brown border, to 1 mm wide, occasionally with shot-hole symptoms. *Caespituli* amphigenous, punctiform, blackish, unevenly scattered. *Stromata* epiphyllous, well-developed,



**Fig. 36.** *Zasmidium colocasiae* (K(M) IMI 311131). **A.** Conidiophore fascicle. **B.** Conidiophores. **C.** Solitary conidiophores arising from a superficial hypha. **D.** Conidia. Bar = 10  $\mu$ m.

substomatal, 10–50  $\mu$ m diam, composed of swollen hyphal cells, brown. *Mycelium* internal and external; superficial hyphae profusely branched, septate, 2–4.5  $\mu$ m wide, pale olivaceous to brownish, thin-walled, verruculose, nodulose, with conspicuous swellings formed in regular intervals. *Conidiophores* in small, loose fascicle, arising from stomata, fascicles only formed on the upper leaf surface, and solitary, arising from superficial hyphae, lateral and terminal, erect, straight to somewhat curved, subcylindrical to somewhat geniculate-sinuuous above, unbranched, occasionally with intercalary swellings, rarely with percurrent rejuvenation, 15–115  $\times$  2.5–5  $\mu$ m, 1–5-septate, brown, paler towards the tip, wall somewhat thickened, smooth or almost so; conidiogenous cells integrated, terminal, conidiogenous loci conspicuous, somewhat thickened and darkened, 0.8–1.5  $\mu$ m diam. *Conidia* solitary, occasionally two in a short chain, ellipsoid-ovoid, subcylindrical-fusiform to narrowly obclavate, straight to curved, 5–100  $\times$  2–4  $\mu$ m, 0–5-septate, pale olivaceous, thin-walled, smooth to faintly rough, apex



**Fig. 37.** *Zasmidium deightonianum* (K(M) IMI 7735). **A.** Conidiophores and hyphae emerging through a stoma. **B.** Superficial hypha. **C.** Superficial hypha with solitary conidiophore. **D.** Conidia. Bar = 10  $\mu$ m.

subacute or subobtuse, base subtruncate to short obconically truncate, 0.8–1.5  $\mu$ m wide, hila almost unthickened to slightly thickened and somewhat darkened-refractive.

*Holotype:* **India:** West Bengal: Ichapur, on *Colocasia esculenta* [antiquorum], Araceae, 10 Sep. 1986, K. K. Sarbajna, PCC 4967 (K(M) IMI 311131).

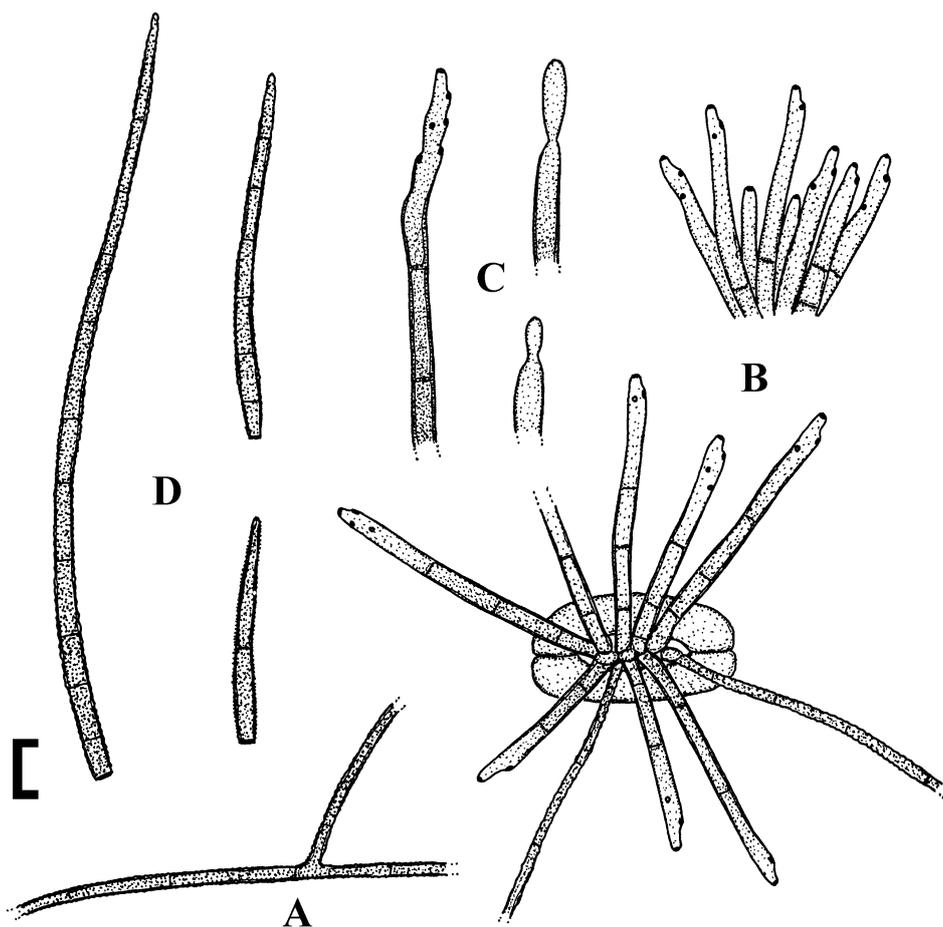
*Host range and distribution:* Only known from the type collection.

***Zasmidium deightonianum*** (U. Braun) U. Braun, *Schlechtendalia* **20**: 100 (2010).

(Fig. 37)

*Basionym:* *Stenella deightoniana* U. Braun, in Braun & Crous, *Mycotaxon* **92**: 404 (2005).

*Synonyms:* *Cladosporium cercestidis* Deighton, *Mycol. Res.* **94**: 570 (1990), non *Zasmidium cercestidis* (J.M. Yen & Gilles) U. Braun, 2010.



**Fig. 38.** *Zasmidium extremorum* (S-F14686). **A.** Superficial hypha. **B.** Conidiophore fascicles. **C.** Conidiophore tips. **D.** Conidia. Bar = 10  $\mu$ m.

*Stenella cercestidis* (Deighton) U. Braun, *Schlechtendalia* **5**: 54 (2000), *nom. illeg.* (ICN, Art. 53.1).

*Illustration*: Deighton (1990: 570, fig. 1).

*Description*: *Leaf spots* amphigenous, circular or subcircular, 1–3 mm diam, greyish, border darker. *Caespituli* amphigenous, thinly effuse, covered with numerous minute darker dots, medium brown. *Mycelium* internal and external; immersed hyphae branched, septate, subhyaline to very pale brownish, 1–2.5  $\mu$ m wide; superficial hyphae emerging through stomata, sparingly branched, septate, subhyaline to medium brown, thin-walled, almost smooth to verruculose, 1–2.5  $\mu$ m wide. *Stromata* substomatal, 10–25  $\mu$ m diam, brown. *Conidiophores* in small to moderately large fascicles, about 10–30, arising from stromata, through stomata, loose to moderately dense, and conidiophores solitary, arising from superficial hyphae, lateral, erect, straight, subcylindrical or somewhat swollen at the tip to somewhat geniculate-sinuous, unbranched, 10–60  $\times$  1.5–3  $\mu$ m, 0–3-septate, pale to medium brown, thin-walled, smooth or almost so; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 10–25  $\mu$ m long, conidiogenous loci conspicuous, about 0.5–1  $\mu$ m diam, thickened and darkened, often numerous and aggregated near the apex. *Conidia* catenate, in simple or rarely branched chains, narrowly ellipsoid-ovoid, subcylindrical, fusiform, 4–20  $\times$  2–3  $\mu$ m, 0–1-septate, pale brownish, thin-walled, verruculose, ends

somewhat pointed to short obconically truncate, 0.5–1  $\mu$ m wide, hila slightly thickened and darkened.

*Holotype*: **Sierra Leone**: Njala (Kori), on *Cercestis congoensis*, 25 Apr. 1934, F. C. Deighton (K(M) IMI 7735).

*Host range and distribution*: On *Cercestis congoensis*, *Araceae*, Africa (Sierra Leone).

***Zasmidium extremorum*** (Syd.) U. Braun, *Schlechtendalia* **20**: 101 (2010).

(Fig. 38)

*Basionym*: *Cercospora extremorum* Syd., *Ann. Mycol.* **15**: 264 (1917).

*Synonym*: *Stenella extremorum* (Syd.) U. Braun, *Nova Hedwigia* **73**: 434 (2001).

*Literature*: Saccardo (1931: 868), Chupp (1954: 59), Boedijn (1961: 413), Crous & Braun (2003: 181).

*Illustration*: Braun (2001a: 435, fig. 19).

*Description*: *Leaf spots* circular, subcircular to elliptic, scattered, often zonate, 2–8 mm diam, centre pale brown, greyish brown to grey, surrounded by a brownish zone and dark margin or marginal line. *Caespituli* hypophyllous, effuse. *Mycelium* internal and external; superficial hyphae emerging through stomata, sparingly branched at right angles or

almost so, 1–3 µm wide, subhyaline to pale olivaceous-brown, thin-walled, verruculose. *Stromata* lacking or almost so or developed and substomatal, small, 10–40 µm diam, brown. *Conidiophores* solitary or in small to moderately large fascicles, loose to moderately dense, arising from internal hyphae or stromata, through stomata (solitary conidiophores arising from superficial hyphae not formed or at least not yet observed), erect, straight to slightly curved or sinuous, non-geniculate or only slightly so near the apex, unbranched, 10–80 × 3–5 µm, 0–6-septate, pale olivaceous, olivaceous-brown, later pale to medium dark brown, paler towards the tip, wall thin to slightly thickened, smooth or almost so; conidiogenous cells integrated, terminal, occasionally conidiophores reduced to conidiogenous cells, about 10–40 µm long, sympodially proliferating, conidiogenous loci conspicuous, 1–1.5(–2) µm diam, barely to very slightly thickened, somewhat darkened or refractive. *Conidia* solitary, cylindrical-filiform, subacicular to

almost obclavate-cylindrical, (15–)40–300(–350) × 2–5 µm, 1- to pluriseptate, pale olivaceous to very pale olivaceous-brown, thin-walled, verruculose to verrucose, apex obtuse to subacute, base truncate to slightly obconically truncate, 1.5–2 µm wide, hila slightly thickened and somewhat darkened-refractive.

*Lectotype* (designated by Braun 2001): **Philippines:** *Prov. Laguna:* Luzon, Los Baños, on *Homalomena philippinensis*, Feb. 1914, C. F. Baker, [Fungi Malayana 521] (S-F14686). *Isolectotypes:* B 700016016; BPI 436255, 436356; CUP 39793, S-F14687.

*Host range and distribution:* On *Homalomena* (*pendula* [*rubra*], *philippinensis*, *Homalomena* sp.), *Araceae*, Asia (Indonesia, Philippines).

## Arecaceae (Palmae)

### Cercospora

#### Key to *Cercospora* species on Arecaceae

- 1 Conidiophores 6.5–8 µm wide; conidia obclavate-cylindrical, 50–155 × 5.5–8 µm, base obconically truncate; on *Raphia farinifera* ..... **C. raphiae**  
Conidiophores narrower, 4–6 µm; conidia acicular, base truncate ..... 2
- 2 (1) Stromata lacking or poorly developed; conidia narrow, 25–120 × 2–4 µm; on *Cocos nucifera* ..... **C. nucifera**  
Stromata well-developed, 10–100 µm diam; conidia wider, 40–320 × 4–5 µm; on *Areca catechu* ..... **C. arecacearum**

#### *Cercospora* species on Arecaceae

***Cercospora arecacearum*** Hidayat & Meeboon, in To-anun et al., *Mycol. Progr.* **8**: 116 (2009). (Similar to Fig. 1)

*Literature:* To-anun et al. (2011: 37), Phengsintham et al. (2013a: 74).

*Illustrations:* To-anun et al. (2009: 117, fig. 1; 2011: 38, fig. 19), Phengsintham et al. (2013a: 75, figs 2–3).

*Description:* Leaf spots circular, 1–7 mm diam, pale to dark brown with medium to dark brown border. *Caespituli* amphigenous, scattered, dark brown. *Mycelium* internal. *Stromata* oval to ellipsoid, 10–100 µm diam, substomatal to intraepidermal, brown, composed of swollen hyphal cells, subglobose, rounded to angular, 6–13 µm diam. *Conidiophores* fasciculate, 2–22, divergent to dense, arising from stromata, through stomata or erumpent, erect, straight to curved, cylindrical, geniculate, unbranched, 45–310 × 4–6 µm, 3–8-septate, distance between septa 8–35 µm, yellowish to medium brown throughout or paler towards the tip, wall 0.5–0.8 µm wide, smooth; conidiogenous cells integrated, terminal, 10–65 µm long, conidiogenous loci thickened and darkened, 2–3 µm diam. *Conidia* solitary, acicular, straight to curved, 40–320 × 4–5 µm, 3- to pluriseptate, hyaline,

thin-walled, smooth, apex pointed, base truncate to slightly obconically truncate, 1.5–3 µm wide, hila somewhat thickened and darkened.

*Holotype:* **Thailand:** *Chiang Mai Province:* Mae Taeng District, T. Pa Pae, Mushroom Research Centre, on *Areca catechu*, 17 Nov. 2006, I. Hidayat (CMU 27946).

*Host range and distribution:* On *Areca catechu*, *Arecaceae*, Asia (Thailand).

*Notes:* To-anun et al. (2009) sequenced the new species and analysed its phylogenetic position. Due to consistently acicular conidia it belongs to the *C. apii* complex.

***Cercospora nucifera*** R.K. Srivast., S. Narayan & A.K. Srivast., *Indian Phytopathol.* **48**: 106 (1995). (Fig. 39)

*Literature:* Crous & Braun (2003: 293), Kamal (2010: 69).

*Illustration:* Srivastava et al. (1995: 106, fig. 1).

*Description:* Leaf spots amphigenous, circular or subcircular, greyish black, 2–20 mm diam. *Caespituli* hypophyllous. *Mycelium* internal; hyphae branched, septate. *Stromata* immersed, poorly developed, pseudoparenchymatous,

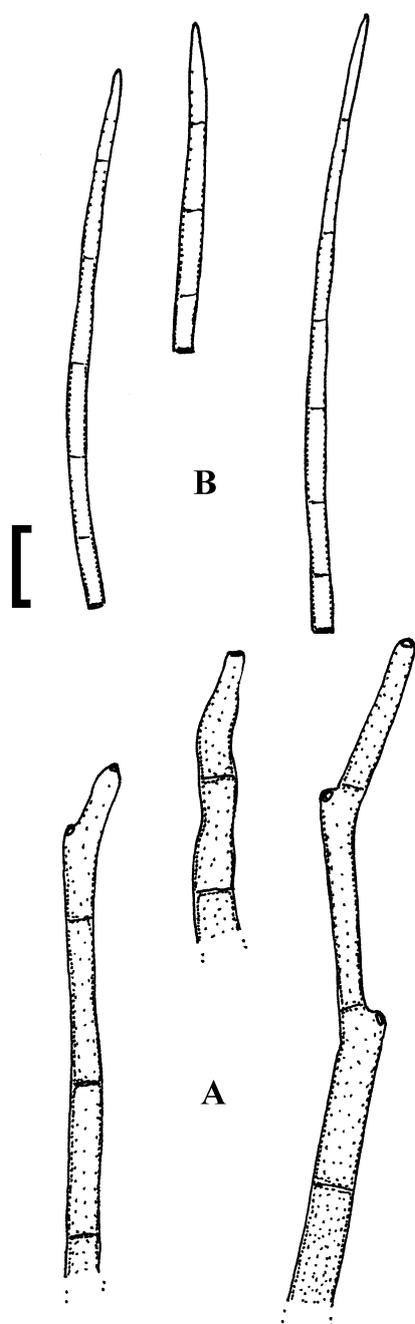


Fig. 39. *Cercospora nucifera* (based on Srivastava *et al.* 1995: 106, fig. 1). A. Conidiophores. B. Conidia. Bar = 10  $\mu$ m.

brown. *Conidiophores* fasciculate, arising from stromatic hyphal aggregations, straight to curved, geniculate-sinuous, rarely branched, about 40–165  $\times$  4–5.5  $\mu$ m, 2–7-septate, pale olivaceous to light brown, wall somewhat thickened, smooth; conidiogenous cells integrated, terminal and intercalary, conidiogenous loci thickened and darkened. *Conidia* solitary, acicular, straight to curved, 25–120  $\times$  2–4  $\mu$ m, 2–8-septate, hyaline, thin-walled, smooth, apex pointed, base truncate, hila thickened and darkened.

**Holotype:** India: Uttar Pradesh: Gorakhpur, on *Cocos nucifera*, Mar. 1990, R. K. Srivastava (GPU 1311, Gorakhpur University, Dept. of Botany, India). **Isotype:** HCIO 30926.

**Host range and distribution:** On *Cocos nucifera*, *Arecaceae*, Asia (India, Uttar Pradesh).

**Note:** This species belongs to the *Cercospora apii* s. lat. complex.

***Cercospora raphiae*** Deighton, *Trans. Brit. Mycol. Soc.* **85**: 741 (1985). (Fig. 40)

**Literature:** Leung *et al.* (1997a), Crous & Braun (2003: 348).

**Illustrations:** Deighton (1987: 741, fig. 2), Leung *et al.* (1997a: 5, fig. a–g).

**Description:** *Leaf spots* amphigenous, subcircular to elliptical, slightly swollen, 4–5  $\times$  1–3 mm, sometimes confluent and larger, 4–40  $\times$  4–5 mm, brown on the upper surface, paler below, centre later ash grey, with darker margin. *Caespituli* amphigenous, mostly epiphyllous, velutinous, dark brown, evenly distributed on leaf spots. *Mycelium* internal; hyphae branched, septate, almost colourless, about 2.5  $\mu$ m wide. *Stromata* immersed to erumpent, 25–115  $\times$  20–55  $\mu$ m, dark brown. *Conidiophores* 2–10 in divergent fascicles, arising from stromata, erumpent, straight or almost so, cylindrical to subclavate, flexuous, but usually not geniculate, unbranched, to 210  $\mu$ m long and 6.5–8  $\mu$ m wide (tips often somewhat swollen, to 10  $\mu$ m wide), pluriseptate, light brown; conidiogenous cells integrated, terminal, conidiogenous loci conspicuous, somewhat thickened and darkened, terminal and lateral, barely prominent, 1.5–2.5  $\mu$ m diam. *Conidia* solitary, obclavate-cylindrical, straight, about 50–155  $\times$  5.5–8  $\mu$ m, 8–16-septate, colourless, smooth, apex obtuse, base obconically truncate, 1.5–2  $\mu$ m wide, hilum thickened and darkened.

**Holotype:** Zimbabwe: Plam block, Mayo, on *Raphia farinifera*, 6 Feb. 1970, A. R. Rothwell (K(M) IMI 147583).

**Host range and distribution:** On *Raphia farinifera*, *Arecaceae*, Africa (Zimbabwe).

#### **Doubtful, excluded and insufficiently known species**

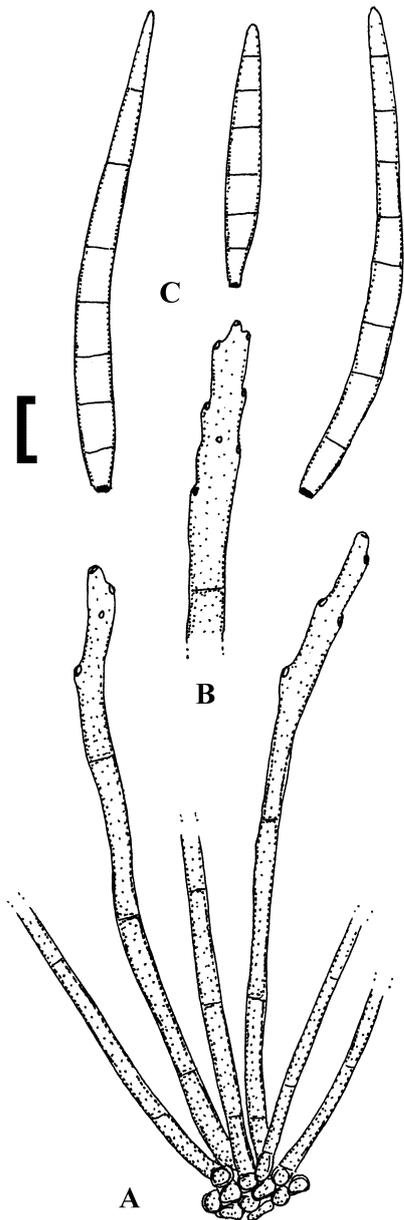
*Cercospora acrocomiae* J.A. Stev., *Rep. (Annual) Insular Agric. Exp. Sta. Puerto Rico (Rio Piedras)* 1916–1917: 89 (1917).

**Synonym:** *Exosporium acrocomiae* (J.A. Stev.) Chupp ex J.A. Stev., *Contrib. Reed Herb.* **23**: 516 (1975).

**Literature:** Chupp (1954: 428), Crous & Braun (2003: 43), Guatimosim *et al.* (2013).

**Illustration:** Guatimosim *et al.* (2013: 63, plate 1).

**Lectotype** (designated by Guatimosim *et al.* 2013): **Puerto Rico:** Rio Pedras, on *Acrocomia media* [aculeata], 14 Feb. 1912, J. R. Johnston [Stevenson 4206] (BPI 432400). **Isolectotypes:** BPI 432402, CUP 39018.



**Fig. 40.** *Cercospora raphiae* (K(M) IMI) 147583. **A.** Conidiophore fascicle. **B.** Conidiophore tip. **C.** Conidia. Bar = 10  $\mu$ m.

**Host range and distribution:** *Acrocomia aculeata* [media], *Arecaceae*, Puerto Rico.

**Note:** This is an *Exosporium* recently re-examined and redescribed by Guatimosim et al. (2013).

*Cercospora calamicola* Henn., *Hedwigia* (Beibl.) **42**: 88 (1903).

**Literature:** Saccardo (1906: 611), Chupp (1954: 428).

**Holotype:** **Australia:** Queensland: Cairns, on *Calamus caryotoides*, May 1902, Pritzel 78 (B 700014861).

**Host range and distribution:** On *Calamus caryotoides*, *Arecaceae*, Australia.

**Notes:** Not a *Cercospora* according to Chupp (1954), but status still unclear. Type material has been examined, but conidiophores and conidia agreeing with the original description, which would allow a reassessment of the generic affinity of this species, have not been found.

*Cercospora elaeidis* Steyaert, *Bull. Soc. Roy. Bot. Belgique* **80**: 35 (1948); as “*elaedis*”.

**Synonym:** *Pseudospiropes elaeidis* (Steyaert) Deighton, *Trans. Brit. Mycol. Soc.* **85**: 739 (1985).

**Literature:** Chupp (1954: 428), Ellis (1976: 278), Mulder & Holliday (1975).

**Illustrations:** Ellis (1976: 277, fig. 211 B), Deighton (1985: 740, fig. 1), Mulder & Holliday (1975: fig., unnumbered).

**Description:** *Leaf spots* amphigenous, subcircular, elliptical to irregular, small, often slightly depressed, brown to dark brown, margin indefinite or with somewhat raised paler border or orange halo. *Colonies* hypophyllous, not very conspicuous. *Mycelium* internal; hyphae branched, about 1.5–3  $\mu$ m wide, septate, thin-walled, subhyaline to brownish. *Stromata* almost lacking or small, 10–30  $\mu$ m diam, immersed, brown. *Conidiophores* in small fascicles, mostly 2–7, occasionally solitary, arising from stromata, through stomata, erect, straight, subcylindrical to somewhat geniculate-sinuuous, unbranched, about 100–350  $\times$  5–9  $\mu$ m, base often somewhat swollen, pluriseptate, medium to dark brown, wall somewhat thickened, smooth; conidiogenous cells integrated, terminal, to 80  $\mu$ m long, with a single to several conspicuous conidiogenous loci, circular, 2.5–4  $\mu$ m diam, often somewhat prominent, with a conspicuous central pore. *Conidia* solitary, obclavate to broadly acicular, in longer conidia apical portion gradually attenuated towards the tip, rostrate, straight to curved, 40–185  $\times$  5–9  $\mu$ m, (1–)4–12-septate, pale golden brown, tips often paler, thin-walled, almost smooth to faintly verruculose, apex obtuse, base truncate to obconically truncate, 2–4  $\mu$ m wide, hila somewhat thickened and darkened.

**Holotype:** **Democratic Republic of Congo:** Kodoro, on *Elaeis guineensis*, 19 Nov. 1942, Steyaert (INÉAC “Herbario Division de Phytopathologie de l’Institut National pour l’étude Agronomique du Congo Belge”, B.141[332]; not traced).

**Host range and distribution:** On *Elaeis guineensis*, *Arecaceae*, Africa (Angola, Benin, Cameroon, Congo, Ethiopia, Gabon, Ghana, Guinea, Guinea-Bissau, Ivory Coast, Liberia, Nigeria, São Tomé e Príncipe, Senegal, Sierra Leone, Sudan, Tanzania, Togo, Zimbabwe), Australia, South America and West Indies (Cuba, Netherlands Antilles, Suriname).

**Notes:** This species seems to be confined to *Elaeis guineensis* (Deighton 1985). Records on *Carpentaria* and *Raphia* spp. are wrong and pertain to *Pseudocercospora* species. Other records on *Phoenix* sp. and unidentified palms are doubtful and unproven. The generic affinity of *C. elaeidis* is quite unclear. Due to pigmented conidia, this species has to be excluded from *Cercospora*. Deighton (1985) placed it

in *Pseudospiropes*, but this genus, introduced for saprobic species on wood and bark and distoseptate conidia, is not suitable for this species. A formal inclusion in *Passalora* would be possible, but this genus is still polyphyletic, and verruculose conidia are also not in favour of *Passalora*. New collections, cultures and sequence data are necessary to point out the true generic affinity of this species. It is unclear what happened with the herbarium of the phytopathological division of INÉAC. This institute was closed in December 1962. Type material of *C. elaeidis* is not included in Steyaert's herbarium at BR. Therefore, the designation of a neotype is needed. Collections of this species from Congo now deposited at K have been examined (K(M) IMI56702a and 59521), but they are too meagre and not suitable as neotypes.

*Cercospora licualae* Syd. & P. Syd., *Philipp. J. Sci. (Bot.)* **9**: 188 (1914).

*Synonym: Cercospora virens* Sacc., *Boll. Orto Bot. Regia Univ. Napoli* **6**: 62 (1921) [*syntypes: Singapore*: Straits Settlement, *Licuala* sp., Oct. 1917, C. F. Baker 407 (B 700014863; PAD)].

*Literature*: Saccardo (1931: 872, 885–886), Chupp (1954: 429).

*Syntypes: Philippines*: Palawan, Taytay, on *Licuala spinosa*, Apr. 1913, E. D. Merrill 8748 (S-F20464 [slide K(M) IMI 88990], W).

*Host range and distribution*: On *Licuala (spinosa, Licuala* sp.), *Arecaceae*, Asia (Philippines, Singapore).

*Notes*: Chupp (1954) excluded this species and stated that it does not belong to *Cercospora*, which could be confirmed by our re-examinations of the type collections. The true generic affinity is, however, quite unclear.

*Cercospora palmae-amazonensis* Bat. & Cavalc., *Anais XII Congr. Soc. Bot. Brasil*: 385 (1964).

*Illustration*: Batista & Cavalcanti (1964: 386, fig. 102).

*Description*: *Leaf spots* amphigenous, indeterminate, effuse, brown. *Caespituli* amphigenous, black. *Stromata* oblong, black, 22–25 µm diam. *Conidiophores* fasciculate, 2–10, erect, straight, simple or geniculate, unbranched, 112–250 × 4–5 µm, swollen at the base, 4–7.5 µm diam, 6–10-septate, cells 21–25 × 2.5–5 µm, brown, paler towards the tip, smooth; conidiogenous cells integrated, terminal and intercalary. *Conidia* solitary, obclavate, 40–90 × 2.5–7.5 µm, 6–9-septate, not constricted at the septa, brownish, apex obtuse, base obconically truncate.

*Holotype: Brazil*: Amazonas, Manaus, on an unidentified palm, 17 Feb. 1961, A. C. Batista (IMUR 21246). *Isotypes*: INPA, PC.

*Host range and distribution*: Unidentified palm, *Arecaceae*, South America (Brazil).

*Notes*: Type material of this species has been examined (Fungos do Brasil no. 21246, ex herb. IMUR, PC), but no sporing structure could be found. The identity of this fungus is unclear. It is even uncertain if this species is cercosporoid at all. According to the original drawing it could also be a helminthosporioid fungus.

*Cercospora palmicola* Speg., *Anales Soc. Ci. Argent.* **26**: 72 (1888).

*Synonyms: Drechslera palmicola* (Speg.) F. Anderson, M.V. Bianchinotti & U. Braun, *Schlechtendalia* **5**: 67 (2000).

*Corynespora palmicola* (Speg.) U. Braun, **comb. nov.**

MycoBank MB809010

*Basionym: Cercospora palmicola* Speg., *Anales Soc. Ci. Argent.* **26**: 72 (1888).

*Literature*: Lindau (1910: 88); Vassiljevsky & Karakulin (1937: 317), Chupp (1954: 429), Crous & Braun (2003: 303).

*Exsiccatae*: Roum., *Fungi Sel.* Exs5188.

*Description*: *Leaf spots* amphigenous, elliptical to somewhat irregular, 10–20 mm long and 3–8 mm wide, brownish, confluent. *Caespituli* punctiform, scattered, dark. *Mycelium* internal. *Stromata* developed, composed of swollen hyphal cells, circular in outline, brown. *Conidiophores* in loose to dense fascicles, arising from stromata, erect, straight to curved, subcylindrical to clavate, unbranched, 15–50 × 3–6 µm, aseptate, wall thin to somewhat thickened, brown or olivaceous-brown, smooth; conidiophores reduced to conidiogenous cells, monotretic, with a single terminal minute porus, not darkened or slightly so around the porus, not proliferating. *Conidia* solitary, obclavate-subcylindrical, 40–70 × 6–9 µm, 5–7-distoseptate, appearing thick-walled by distoseptation and reduced lumina, smooth, apex obtuse, broadly rounded, base short obconically truncate, distinctly darkened.

*Lectotype (designated here, MycoBank MBT178178)*:

*Paraguay*: Guarapí, on *Syagrum romanzoffianum* [*Cocos australis*], 19 Oct. 1883, B. Balansa 4070 (LPS 925). *Isolectotype*: B 700016013. *Topotypes*: Roum., *Fungi Sel.* Exs. 5188.

*Host range and distribution*: On *Syagrum romanzoffianum, Phoenix canariensis, Arecaceae*, Europe (Germany, Russia), South America (Paraguay).

*Notes*: The generic affinity of this species is intricate and disputable. The reallocation to *Drechslera* (Anderson *et al.*, in Braun 2000) is doubtful since this genus is characterized by having polytretic, sympodially proliferating conidiogenous cells. Due to monotretic conidiogenous cells and pluridistoseptate conidia with pigmented hila, *C. palmicola* is rather assignable to *Corynespora*, although aseptate, not proliferating conidiophores and less conspicuous pores are unusual in this genus. However, some species with at least rather inconspicuous pores and not percurrently proliferating conidiophores are known in *Corynespora*, e.g. *C. cubensis*

Hol.-Jech. and *C. pseudolmediae* (R.F. Castañeda) Hol.-Jech. (Mercado Sierra et al. 1997).

*Cercospora palmicola* f. *stilbacea* C. Moreau, *Rev. Mycol.* **12**: 38 (1947).

Synonyms: *Helminthosporium stilbaceum* (C. Moreau) S. Hughes, *Mycol. Pap.* **48**: 38 (1952).

*Exosporium stilbaceum* (C. Moreau) M.B. Ellis, *Mycol. Pap.* **82**: 38 (1961).

Literature: Chupp (1954: 429), Ellis (1971: 403).

Illustrations: Moreau (1947: 39, figs 1–3), Ellis (1971: 401, fig. 274B).

Type: **Republic of Congo**: Etoumbi, Fort Rousset, on *Elaeis guineensis*, Mar. 1947, M. A. Bachy (probably not preserved).

Host range and distribution: On *Elaeis* (*guineensis*, *Elaeis* sp.), *Arecaceae*, Africa (Congo, Ghana, Guinea, São Tomé and Príncipe, Sierra Leone, Sudan, Tanzania, Zambia), Asia (Malaysia).

*Cercospora virens* – see *Cercospora licualae*

### *Distocercospora*

A single species.

*Distocercospora livistonae* U. Braun & C.F. Hill, in Braun et al., *Fungal Diversity* **22**: 23 (2006).

(Fig. 41)

Illustration: Braun et al. (2006: 24, fig. 3).

Description: Leaf spots amphigenous, subcircular to irregular, 2–15 mm diam, pale to dark brown, finally greyish brown to greyish white, margin indefinite or with a diffuse, irregular darker border. *Caespituli* hypophyllous, finely punctiform, dark brown. *Mycelium* internal. *Stromata* lacking or small, 10–30 µm diam, substomatal, brown. *Conidiophores* in small to moderately large, loose fascicles, arising from internal hyphae or stromata, through stomata, erect, straight, subcylindrical-filiform, usually distinctly geniculate-sinuous, above all in the upper half, unbranched, 40–280 × 3–6 µm, pluriseptate throughout, wall somewhat thickened below, thin-walled towards the apex, pale to medium dark brown or olivaceous-brown, smooth; conidiogenous cells integrated, terminal and intercalary, 10–30 µm long, proliferation sympodial or occasionally percurrent, conidiogenous loci conspicuous, thickened and darkened, 2–2.5 µm diam. *Conidia* solitary, obclavate, 20–85 × 4–7 µm, indistinctly 2–5-distoseptate, pale olivaceous, outer wall very thin, inner wall to 2 µm thick, almost smooth to distinctly verruculose,

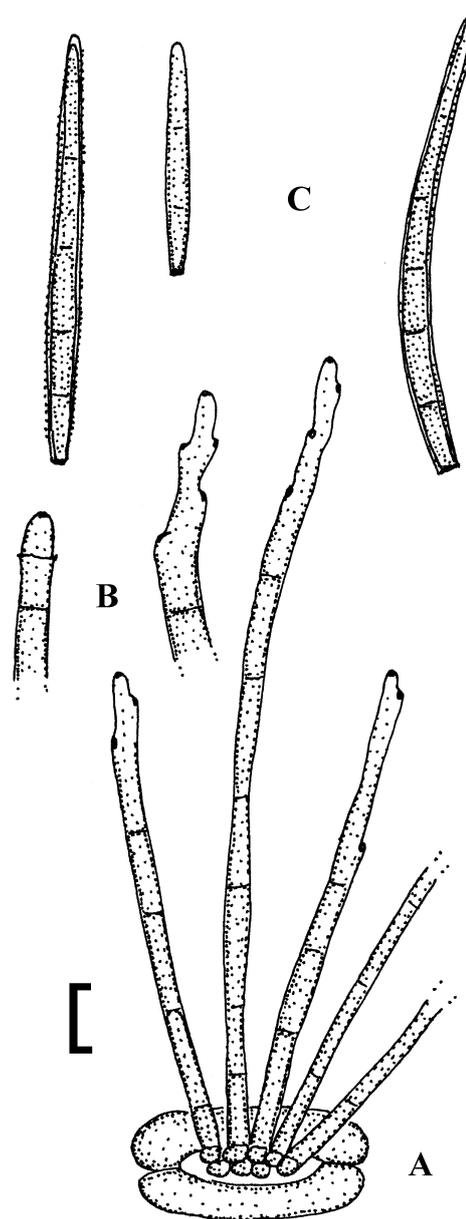


Fig. 41. *Distocercospora livistonae* (HAL 1875 F). A. Conidiophore fascicle. B. Conidiophore tips. C. Conidia. Bar = 10 µm.

apex obtuse or subobtuse, base short obconically truncate, 2–3 µm wide, hila somewhat thickened and darkened.

Holotype: **New Zealand**: Auckland, Manurewa, Auckland Regional Botanic Gardens, Hill Road, on *Livistona chinensis*, 10 Sep. 2005, C. F. Hill 1247 (HAL 1875 F).

Host range and distribution: On *Livistona chinensis* [*boninensis*, *chinensis* var. *boninensis*], *Arecaceae*, Asia (Japan), New Zealand.

**Passalora****Key to *Passalora* species on *Arecaceae***

- 1 Stromata small, 10–30  $\mu\text{m}$  diam; conidia 40–185  $\times$  5–9  $\mu\text{m}$ , (1–)4–12-septate, often rostrate, mostly verruculose, pale golden brown; on *Elaeis guineensis* ..... see ***Cercospora elaeidis*** (excluded and doubtful species)
- Stromata larger, 50–160  $\mu\text{m}$  diam; conidia much shorter (to 70  $\mu\text{m}$ ) and only 1–3-septate, hyaline, subhyaline or brown to olivaceous-brown, smooth ..... 2
- 2 (1) Stromata large, about 85–160  $\mu\text{m}$  diam, *textura intricata*; conidiophores 90–105  $\mu\text{m}$  long, 1–3-septate; conidia cylindrical to somewhat clavate, 8–13  $\mu\text{m}$  wide, pale brown or olivaceous-brown; on *Acrocomia* ..... ***P. acrocomiae***
- Stromata smaller, 50–70  $\mu\text{m}$  diam, *textura angularis*; conidiophores much longer, 60–300  $\mu\text{m}$ , (1–)3–5-septate; conidia obclavate, narrower, 2–7  $\mu\text{m}$  wide, hyaline to subhyaline; on *Syagrus* ..... ***P. eitenii***

***Passalora* species on *Arecaceae***

***Passalora acrocomiae*** Guatimosim & R.W. Barreto, *Mycotaxon* **122**: 64 (2013). (Fig. 42)

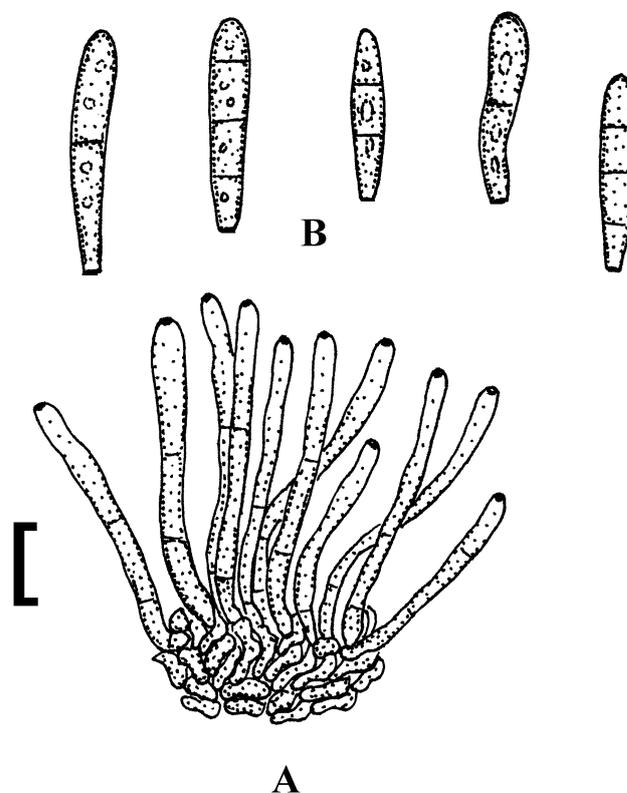
*Illustration*: Guatimosim *et al.* (2013: 65, plate 2).

*Description*: Leaf spots amphigenous, subcircular to elliptical, 0.9–2.3  $\times$  0.3–0.6 cm, with pale centre surrounded by a pale brown border. *Caespituli* hypophyllous. *Mycelium* internal; hyphae branched, 2.5  $\mu\text{m}$  wide, septate, subhyaline. *Stromata* subepidermal, erumpent, subglobose, 100–157  $\times$  87–113  $\mu\text{m}$ , composed of *textura intricata*, pale brown, smooth. *Conidiophores* numerous, to 20, in dense fascicles, arising from stromata, erumpent, erect, straight to somewhat curved-sinuuous, subcylindrical or somewhat enlarged towards the tip, unbranched, 90–105  $\times$  5–7  $\mu\text{m}$ , 1–3-septate, pale brown, thin-walled, smooth; conidiogenous cells integrated, terminal, subcylindrical, 37–55  $\times$  6–8  $\mu\text{m}$ , conidiogenous loci conspicuous, one per cell, discoid, 1.5–4  $\mu\text{m}$  diam. *Conidia* solitary, subcylindrical to slightly clavate, 35–68  $\times$  8–13  $\mu\text{m}$ , 1–3-septate, pale brown or olivaceous-brown, thin-walled, smooth, but apex distinctly roughened, apex rounded, base obconically truncate, 2–4  $\mu\text{m}$  wide, hila somewhat thickened and darkened.

*Types*: **Puerto Rico**: Rio Piedras, on *Acrocomia media*, *Arecaceae*, 15 Jul. 1914, J. A. Stevenson 2090 (BPI 432398). *Isotypes*: BPI 432398, 432401.

*Host range and distribution*: Only known from the type collection.

*Notes*: *Cercospora acrocomiae* was a confused name. The original collections from Puerto Rico (Rio Pietras) contain two different fungal species, an *Exosporium* and a *Passalora*. Guatimosim *et al.* (2013) solved this problem by means of a lectotypification of the name *C. acrocomiae* in the sense of Chupp (1954) with material representing the *Exosporium* (see “Excluded and doubtful species”) and described the *Passlora* as new species.



**Fig. 42.** *Passalora acrocomiae* (BPI 432398). **A.** Conidiophore fascicle. **B.** Conidia. Bar = 10  $\mu\text{m}$ .

***Passalora eitenii*** R.B. Medeiros & Dianese, *Mycotaxon* **51**: 509 (1994). (Fig. 43)

*Illustration*: Medeiros & Dianese (1994: 511, plate 1, A–H).

*Description*: Leaf spots amphigenous, mainly hypophyllous, necrotic, dark brown to black, usually elliptical, rarely confluent, 10–15  $\times$  2–2.5 mm. *Caespituli* hypophyllous, effuse, velutinous, brown. *Mycelium* immersed; hyphae septate, branched, 3–5  $\mu\text{m}$  wide, brown, smooth. *Stromata* substomatal, 50–70  $\mu\text{m}$  diam, brown, cells angular. *Conidiophores* fasciculate, 3–12, arising from stromata, through stomata, erect, cylindrical,

distal end somewhat geniculate-sinuous, unbranched, 60–300 × 5–10 µm, (1–)3–5-septate, brown, smooth, wall somewhat thickened; conidiogenous cells integrated, terminal, sympodially and occasionally percurrently proliferating; conidiogenous loci conspicuous. *Conidia* solitary, obclavate, straight, 27–55 × 2–7 µm, 1–3-septate, mostly 1-septate, hyaline or subhyaline, wall thickened, smooth, apex obtuse,

base obconically truncate, hilum conspicuous.

*Holotype*: **Brazil**: D.F.: Brasilia, on *Syagrus comosa*, *Areaceae*, Nov. 1991, J. C. Dianese (UB, Coll. Mycol. 881).

*Host range and distribution*: Only known from the type collections.

## *Pseudocercospora*

### Key to *Pseudocercospora* species on *Areaceae*

- 1 Stromata large, 20–150 µm diam; conidiophores in sporodochial conidiomata, 10–30 × 4–7 µm, proliferation strictly percurrent, with 0–5 conspicuous annellations; conidia obclavate-cylindrical, 60–150 × 5–10 µm, verrucose; on various palms ..... see **Scolecostigmina palmicola**  
Stromata usually 10–50 µm diam; conidiophores sympodially proliferating or occasionally a few percurrent proliferations mixed with sympodial ones; conidia smooth or almost so ..... 2
- 2 (1) Conidia narrow, 2–4 µm wide, hila 1–2.5 µm wide; on *Copernicia* or *Rhapis* ..... 3  
Conidia broader, 3.5–8 µm, hila wider, 2–5 µm; on other hosts ..... 4
- 3 (2) Conidiophores very short, 5–15 µm, usually aseptate; conidia (10–)15–50(–60) µm long, (0–)1–4(–6)-septate; on *Copernicia* ..... **P. coperniciae**  
Conidiophores 10–30 µm long, 0–2-septate; conidia much longer, 30–160 µm, 0–10-septate; on *Rhapis* ..... **P. rhapsicola**
- 4 (2) Conidiophores very long, to 170 µm, 5–7(–8) µm wide, pluriseptate; conidia obclavate, 40–90 × 5–9 µm; on *Carpentaria* ..... **P. carpentariae**  
Conidiophores shorter, to 100 µm, 2.5–6 µm wide, aseptate or sparingly septate; conidia obclavate-cylindrical to fusiform, narrower, 2.5–6(–7) µm; on other hosts ..... 5
- 5 (4) Leaf spots distinct, variable in shape and size, often oblong, covering large leaf segment or entire leaf blades discoloured; conidial shape very variable, broadly cylindrical, obclavate, fusiform to subacicular or subclavate; on *Howea* and *Rhopalostylis*, New Zealand ..... **P. areacearum**  
Leaf spots lacking; conidia obclavate-cylindrical, rarely fusiform; on *Roystonea*, North America, USA ..... **P. roystoneae**

### *Pseudocercospora* species on *Areaceae*

***Pseudocercospora areacearum*** U. Braun & C.F. Hill, in Braun et al., *Fungal Diversity* 22: 25 (2006). (Fig. 44)

*Illustration*: Braun et al. (2006: 24, fig. 4).

*Description*: Leaf spots conspicuous, variable in shape and size, often oblong, covering large leaf segment or entire leaf blades discoloured, necrotic, straw-coloured, yellowish, ochraceous to dingy brown or greyish brown, margin indefinite. *Mycelium* internal, occasionally with superficial hyphae, emerging through stomata, branched, septate, 1.5–3 µm wide, pale olivaceous, thin-walled, smooth. *Stromata* substomatal, rarely intraepidermal, 10–50 µm diam, rarely confluent and larger, to 90 µm diam, olivaceous-brown, occasionally somewhat erumpent, composed of swollen hyphal cells, 2–6 µm diam. *Conidiophores* in small, loose to moderately large

and dense fascicles, arising from stromata, emerging through stomata, occasionally erumpent, erect, straight, subcylindrical-conical to moderately geniculate-sinuous, usually unbranched, rarely branched, long conidiophores sometimes subclavate, 5–100 × 2.5–6 µm, aseptate or sparingly septate, pale to medium olivaceous or olivaceous-brown, wall thin or only slightly thickened, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 5–40 µm long, mostly with a single conidiogenous locus, determinate, occasionally sympodial, with 2–3 loci, truncate to convex, 2–4 µm wide, unthickened, not darkened. *Conidia* solitary, shape and size variable, broadly cylindrical, obclavate, fusiform to subacicular or subclavate, 20–130 × 3.5–7 µm, 2–20-septate, occasionally somewhat constricted at the septa, subhyaline to pale olivaceous or olivaceous-brown, thin-walled, smooth, fresh conidia with oil droplets, apex obtuse, base truncate or short to long obconically truncate, 2–5 µm wide, hila unthickened, not darkened.

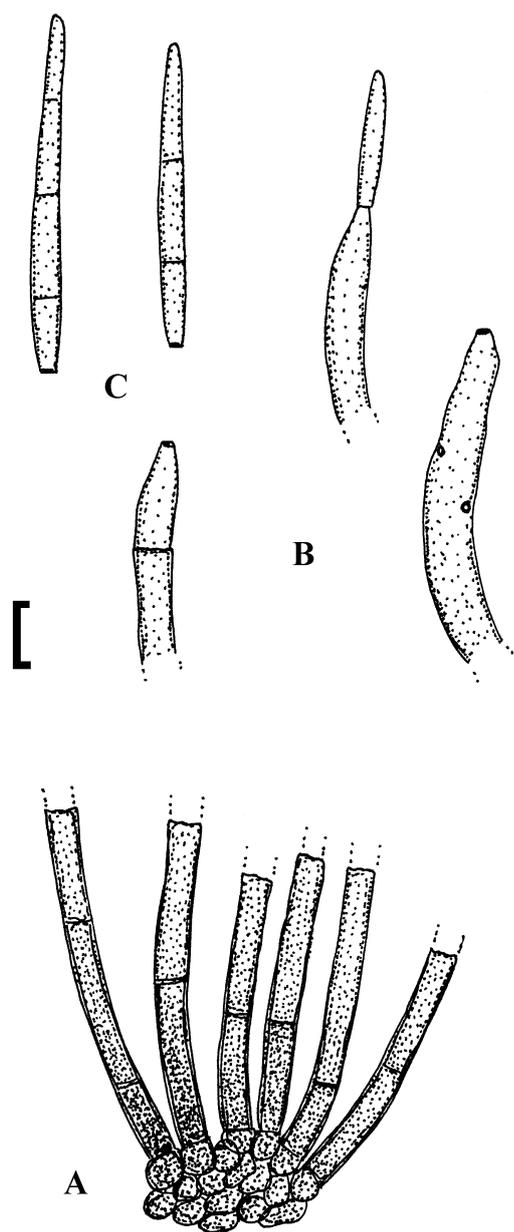


Fig. 43. *Passalora eitenii* (UB, Coll. Mycol. 881). A. Conidiophore fascicle. B. Conidiophore tips. C. Conidia. Bar = 10  $\mu$ m.

**Holotype:** New Zealand: Auckland, St. Johns, Morrin Road, The Atrium, on *Rhopalostylis sapida*, 4 Jul. 2005, C. F. Hill 1209 (HAL 1876 F). *Ex type culture:* CBS 118406.

**Host range and distribution:** On *Howea forsteriana*, *Rhopalostylis* (*baueri* var. *cheesemani*, *sapida*), *Arecaceae*, New Zealand.

***Pseudocercospora carpentariae*** Deighton, *Trans. Brit. Mycol. Soc.* **89**: 403 (1987). (Fig. 45)

**Literature:** Deighton (1985: 742, as *Peudocercospora* sp.), Leung *et al.* (1997b).

**Illustrations:** Deighton (1985: 742, fig. 3; 1987: 403, fig. 1), Leung *et al.* (1997b: 5, fig. a–f).

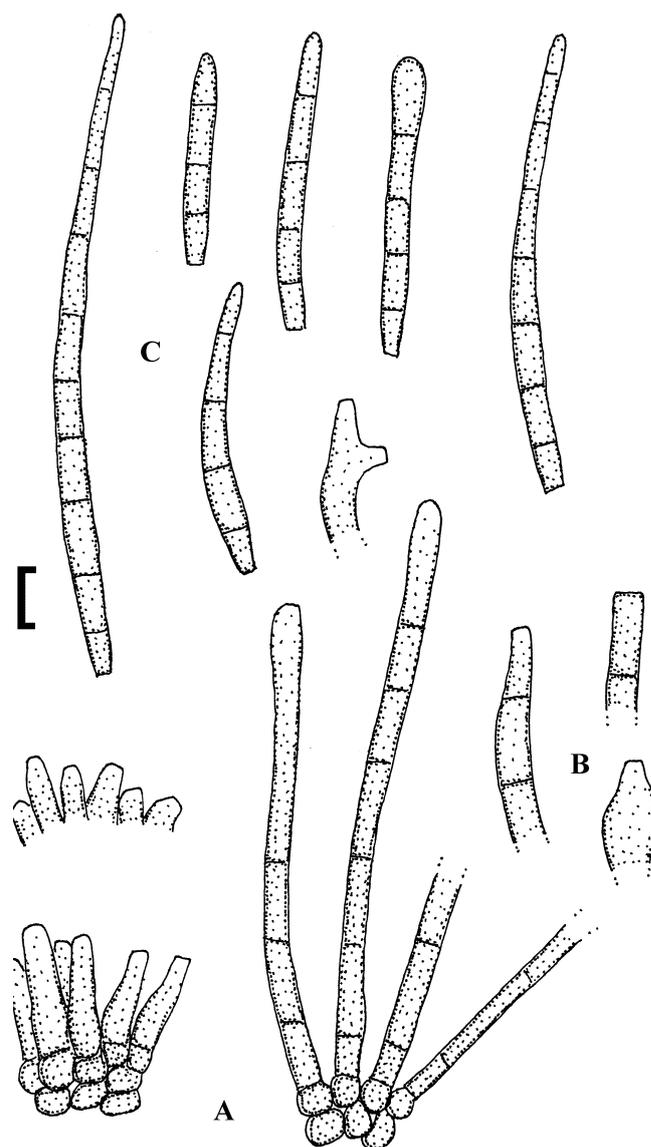


Fig. 44. *Pseudocercospora arecacearum* (HAL 1876 F). A. Conidiophore fascicles. B. Conidiophores. C. Conidia. Bar = 10  $\mu$ m.

**Description:** Leaf spots amphigenous, circular, subcircular to elliptical, to 8 mm long and 2–4 mm wide, dark brown, surrounded by a yellowish halo, about 1 mm wide. *Caespituli* hypophyllous, dark brown, sparsely distributed at the centre. *Mycelium* internal; hyphae branched, septate, 1.5–2.5  $\mu$ m wide, subhyaline. *Stromata* immersed, erumpent, compact, 15–45  $\mu$ m diam, brown. *Conidiophores* in divergent fascicles, 10–20, arising from stromata, erumpent, erect, straight to slightly geniculate-sinuous, unbranched, to 170  $\times$  5–7(–8)  $\mu$ m, pluriseptate, medium brown, wall thin to somewhat thickened, smooth; conidiogenous cells integrated, terminal, conidiogenous loci inconspicuous, sometimes subdentate, but always unthickened and not darkened. *Conidia* solitary, straight to slightly curved, obclavate, 40–90  $\times$  5–9  $\mu$ m, 4–10-septate, pale olivaceous-brown, thin-walled, smooth, apex obtuse to subacute, base short obconically truncate, hilum neither thickened nor darkened.

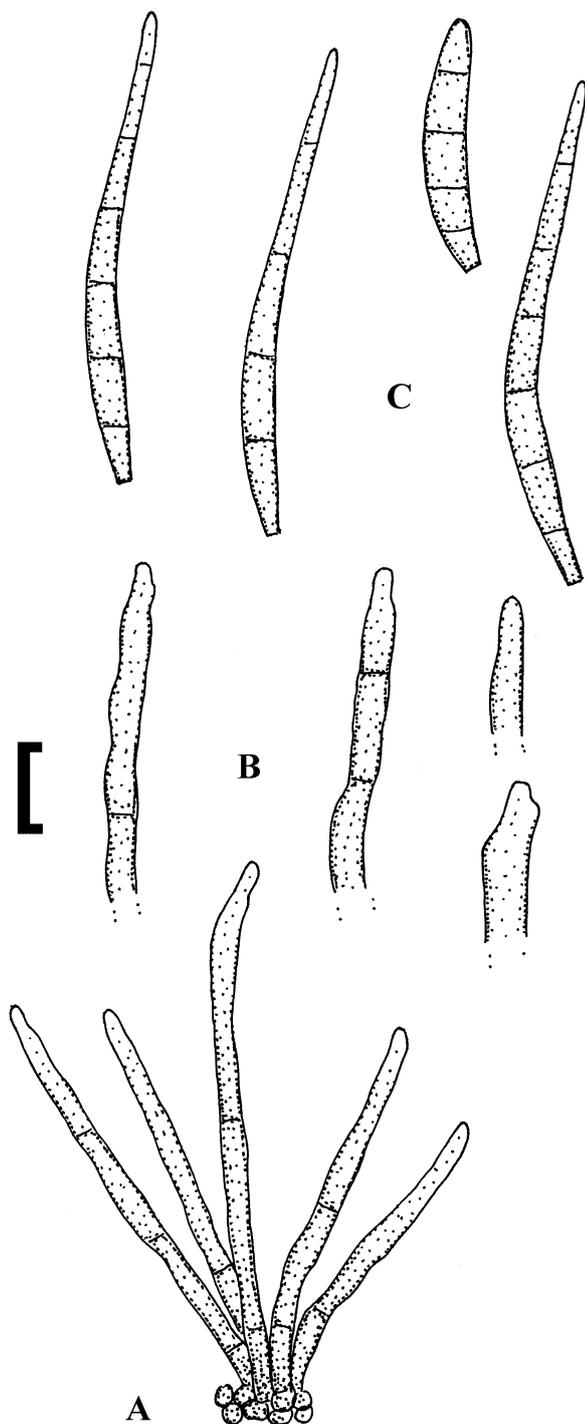


Fig. 45. *Pseudocercospora carpentariae* (K(M) IMI 305079). A. Conidiophore fascicle. B. Conidiophore tips. C. Conidia. Bar = 10  $\mu$ m.

**Holotype:** Australia: Northern Territory: Darwin, on *Carpentaria acuminata*, 14 May 1986, J. Duff & B. Conde (K(M) IMI 305079).

**Host range and distribution:** On *Carpentaria acuminata*, *Arecaceae*, Australia (Northern Territory).

***Pseudocercospora coperniciae*** U. Braun & F.O. Freire, *Cryptog. Mycol.* **23**: 308 "2002" (2003). (Fig. 46)

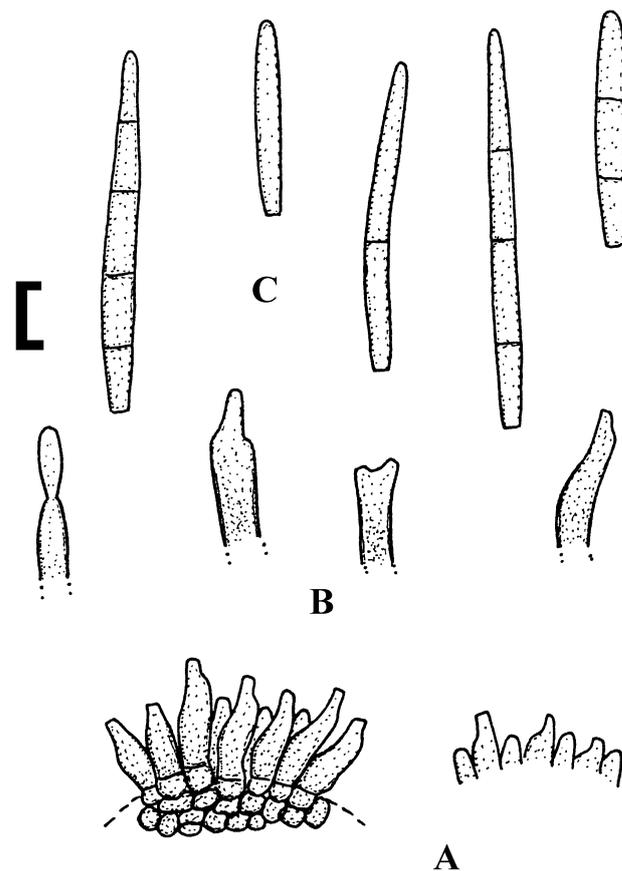


Fig. 46. *Pseudocercospora coperniciae* (HAL 1709 F). A. Conidiophore fascicles. B. Conidiophores. C. Conidia. Bar = 10  $\mu$ m.

**Illustration:** Braun & Freire (2003: 310, fig. 12).

**Description:** Leaf spots amphigenous, subcircular to irregular, 3–15 mm diam or confluent and larger, pale to greyish brown, finally dingy grey, margin indefinite or with a diffuse darker border. *Caespituli* amphigenous, punctiform, loose to dense, dark brown. *Mycelium* internal. *Stromata* substomatal to intraepidermal, 10–30(–40)  $\mu$ m diam, olivaceous-brown. *Conidiophores* in small to moderately large fascicles, loose to moderately dense, arising from stromata, through stomata or erumpent, erect, straight, subcylindrical-conical to moderately geniculate-sinuuous, unbranched, 5–15  $\times$  2–5  $\mu$ m, 0(–1)-septate, pale olivaceous, thin-walled, smooth; conidiophores usually reduced to conidiogenous cells, conidiogenous loci inconspicuous, occasionally subdenticulate, but always unthickened and not darkened. *Conidia* solitary, cylindrical to obclavate-cylindrical, occasionally fusiform, (10–)15–50(–60)  $\times$  2–3.5  $\mu$ m, (0–)1–4(–6)-septate, subhyaline to pale olivaceous, apex obtuse to subacute, base truncate to obconically truncate, 1–2  $\mu$ m wide, hila unthickened, not darkened.

**Holotype:** Brazil: State of Ceará: Cascavall County, Preaoca District, on *Copernicia prunifera*, 28 Feb. 2001, F. O. Freire (HAL 1709 F).

**Host range and distribution:** On *Copernicia prunifera*, *Arecaceae*, South America (Brazil, Ceará).

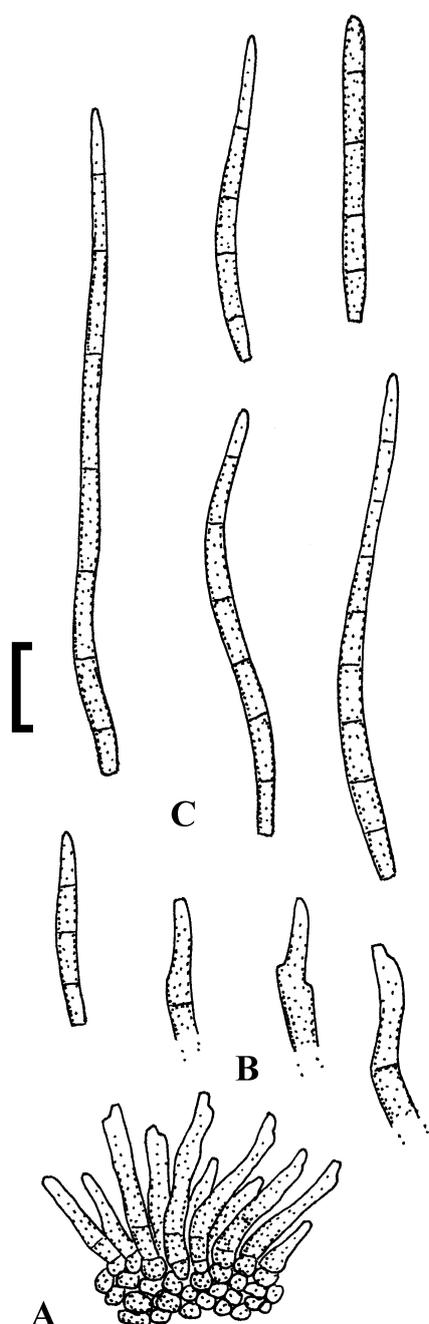


Fig. 47. *Pseudocercospora rhapsicola* (NIAES 10300). A. Conidiophore fascicle. B. Conidiophores. C. Conidia. Bar = 10 µm.

***Pseudocercospora rhapsicola*** (Tominaga) Goh & W.H. Hsieh, *Trans. Mycol. Soc. Republ. China* **4**: 39 (1989).

(Fig. 47)

*Basionym*: *Cercospora rhapsicola* Tominaga, *Trans. Mycol. Soc. Japan* **5**: 57 (1965).

*Literature*: Hsieh & Goh (1990: 258), Guo & Hsieh (1995: 242), Guo *et al.* (1998: 253), Leung *et al.* (1997c).

*Illustrations*: Hsieh & Goh (1990: 258, fig. 198), Guo & Hsieh (1995: 243, fig. 205), Leung *et al.* (1997c: 17, fig. a–c), Guo *et al.* (1998: 253, fig. 210).

*Description*: *Leaf spots* amphigenous, scattered, at first tiny spots, later small irregular patches, pale brown, margin indefinite, with yellowish halo. *Caespituli* amphigenous, punctiform, pale grey. *Mycelium* internal. *Stromata* substomatal, 10–40 µm diam, dark brown. *Conidiophores* in fascicles, 10–20, loose to dense, straight to curved, subcylindrical or attenuated towards the tip, geniculate-sinuuous, unbranched, 10–30 × 2–4 µm, 0–2-septate, pale brown, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, conidiogenous loci inconspicuous, occasionally subdenticulate, unthickened and not darkened. *Conidia* solitary, straight, curved to somewhat geniculate-sinuuous, narrowly obclavate to filiform, 30–160 × 2–4 µm, 0–10-septate, hyaline or subhyaline, thin-walled, smooth, apex subobtuse to subacute, base short obconically truncate, 1–2.5 µm wide, hila neither thickened nor darkened.

*Holotype*: **Japan**: Tokyo, Edogawa, on *Rhapis excelsa*, 12 Jul. 1960, M. Yokohama (NIAES 10300, Herb. National Institute of Agric–Environmental Sciences, Tsukuba, Japan).

*Isotype*: NIAES 10301. *Possible ex-holotype isolates*: MAFF 35042, NBRC 8433, CBS 282.66.

*Host range and distribution*: On *Rhapis* (*excelsa* [*flabelliformis*], *humilis*), *Arecaceae*, Asia (Japan, Korea, Taiwan), North America (USA, California, Florida), Hawaii.

***Pseudocercospora roystoneae*** U. Braun & Crous, *Mycol. Progr.* **2**: 203 (2003). (Fig. 48)

*Illustration*: Braun *et al.* (2003a: 204, fig. 9).

*Description*: *Leaf spots* lacking, indefinite (probably on leaves from seedlings), or with large diffuse discolorations, forming necrotic patches, often large leaf segments or almost entire leaves discoloured, straw-coloured to brown or dingy greyish brown, margin indefinite. *Caespituli* amphigenous, punctiform, scattered, dark brown to black. *Mycelium* internal. *Stromata* substomatal, 10–50 µm diam, brown. *Conidiophores* in small to moderately large fascicles, loose to dense, arising from stromata, emerging through stomata, erect, straight, subcylindrical to strongly geniculate-sinuuous, unbranched, or with short lateral branchlets, 5–60 × 3–6 µm, 0–4-septate, pale olivaceous to medium olivaceous-brown, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 5–25 µm long, conidiogenous loci inconspicuous, unthickened, not darkened. *Conidia* solitary, obclavate-cylindrical to broadly fusiform, 40–100 × (4–)5–6(–7) µm, 4–10-septate, subhyaline to pale olivaceous or olivaceous-brown, thin-walled, smooth, apex obtuse, base obconically truncate, 2–3.5 µm wide, hila neither thickened nor darkened.

*Holotype*: **USA**: Florida: Gainesville, on *Roystonea regia*, *Arecaceae*, 16 May 1957, J. L. Smith (CUP 41024).

*Host range and distribution*: Only known from the type collection.

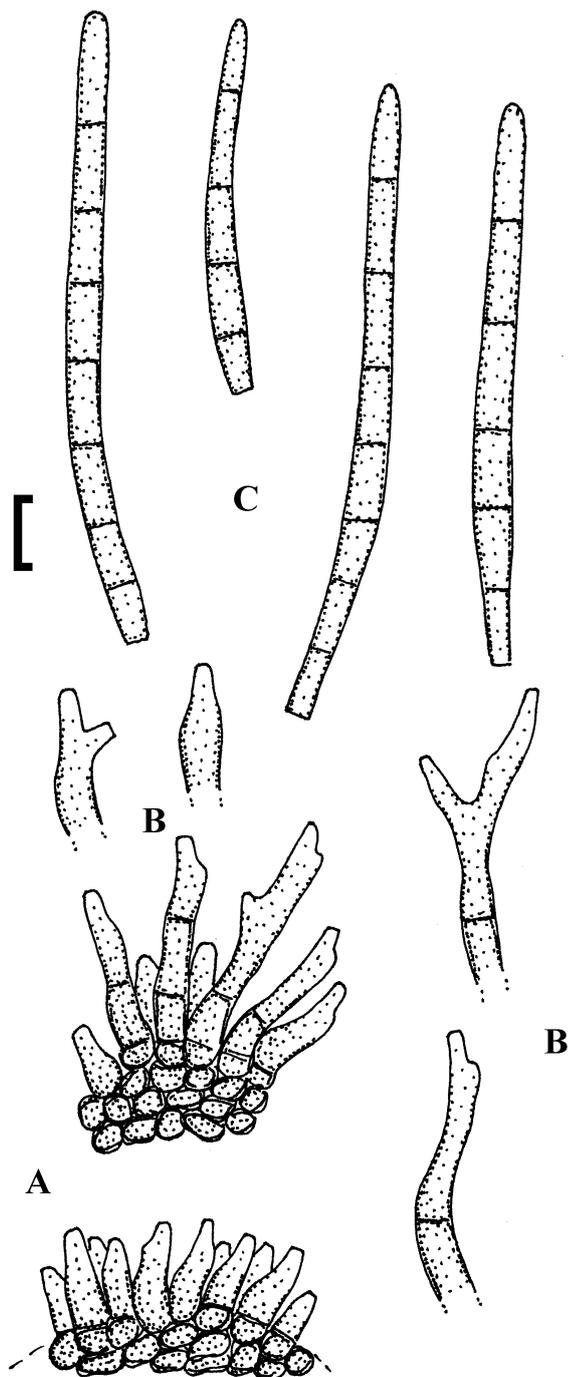


Fig. 48. *Pseudocercospora roystoneae* (CUP 41024). A. Conidiophore fascicles. B. Conidiophores. C. Conidia. Bar = 10 µm.

Note: This species resembles *Pseudocercospora carpentariae*, which differs, in having much smaller stromata, longer conidiophores, to 160 µm and wider conidia, 6.5–8 µm.

### *Scolecostigmina*

A single species.

*Scolecostigmina palmivora* (Sacc.) Kamal,  
*Cercosporoid Fungi of India*: 260 (2010).  
(Fig. 49)

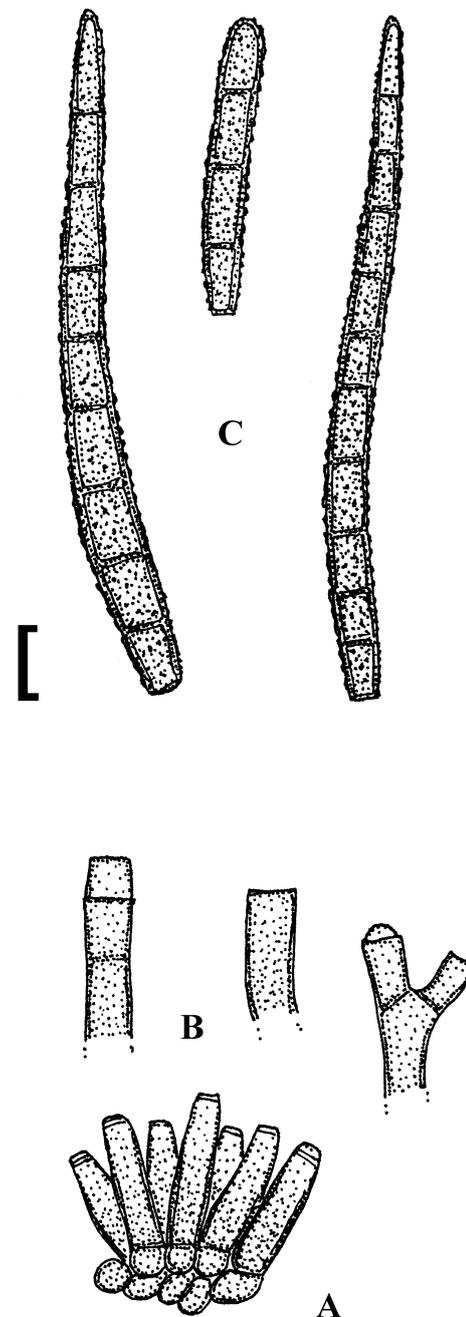


Fig. 49. *Scolecostigmina palmivora* (HAL, Rabenh., Fungi Eur. Exs. 4392). A. Conidiophore fascicle. B. Conidiophores. C. Conidia. Bar = 10 µm.

Basionym: *Exosporium palmivorum* Sacc., *Annual Rep. Missouri Bot. Gard.* **9**: 159 (1898).

Synonyms: *Cercospora palmivora* (Sacc.) Nannizzi, *Atti Reale Accad. Fisiocrit. Siena X*, **2**: 491 (1928).

*Stigmina palmivora* (Sacc.) S. Hughes, *Mycol. Pap.* **49**: 13 (1952).

*Exosporium preisii* Bubák, *Ann. Mycol.* **2**: 400 (1904)  
[lectotype (designated here, MycoBank MBT178136):

**Czech Republic**: *Bohemia*: Krc, near Prague, on *Phoenix reclinata*, 13 Sep. 1901, F. Petrák (BPI 454537);  
*isoelectotypes*: Rabenh., Fungi Eur. 4392 (e.g. B, BPI 439978, LEP, and Vestergr., *Micromyc. Rar. Sel. Praec. Scand.* 471, e.g., BPI 439979, HBG].

*Cercospora preisii* Bubák, *Ann. Mycol.* **2**: 400 (1904), valid alternative name (ICN, Art 36.2).

**Literature:** Saccardo (1892: 653; 1906, 687), Vassiljevsky & Karakulin (1937: 317), Chupp (1954: 429), Ellis (1971: 146), Crous & Braun (1996: 293), Colán *et al.* (2013).

**Illustrations:** Bubák (1904: 401, fig. 20–21), Ellis (1971: 145, fig. 97 D), Kamal (2010: 261, fig. 40), Colmán *et al.* (2014: 849, figs A–E).

**Exsiccatae:** Cif., Mycofl. Doming. Exs. 31. Kabát & Bubák, *Fungi Imp. Exs.* 398. Krypt. Exs. 2530. Petr., *Fl. Bohem. Movar. Exs.* 576. Petr., *Mycoth. Gen.* 631. Rabenh., *Fungi Eur.* 4392. Syd., *Mycoth. Germ.* 200. Vesterg., *Micromyc. Rar. Sel. Praec. Scand.* 471.

**Description:** *Leaf spots* amphigenous, subcircular to somewhat angular-irregular, about 1–10 mm diam, brown or pale, margin indefinite or darker. *Caespituli* amphigenous, punctiform, sometimes confluent, dark, scattered. *Mycelium* internal. *Stromata* well-developed, immersed to erumpent, 20–150 µm diam, dark olivaceous-brown or brown. *Conidiophores* numerous, in dense sporodochial conidiomata, arising from stromata, erect, straight to somewhat curved, cylindrical to subcylindrical, 10–30 × 4–7 µm, aseptate or only septate at the base, medium to dark brown, wall somewhat thickened, smooth to verrucose; conidiogenous cells integrated, terminal or conidiophores usually reduced to conidiogenous cells, 0–5 times percurrently proliferating, with distinct annellations, with a single terminal locus, broad and truncate, locus wall immediately after conidial secession not thickened, but annellations often conspicuous and somewhat darkened. *Conidia* solitary, obclavate-subcylindrical, straight to slightly curved, 60–150 × 5–10 µm, 4–16-septate, medium to dark brown, wall somewhat thickened, verrucose, apex obtuse, broadly rounded, base truncate to somewhat obconically truncate, hilum wall not thicker than lateral walls, with thin-walled somewhat bulging papilla-like projection.

**Lectotype (designated here, MycoBank MBT178137):** USA: Nebraska: Plattsmouth, on *Phoenix canariensis*, Oct. 1897, W. J. Hesser (BPI 454522).

**Host range and distribution:** On *Acoelorrhaphe wrightii*, *Adonia merrillii* [*Veitchia merrillii*], *Syagrum romanzoffianum* [*Arecastrum romanzoffianum*], *Borassus flabellifer*, *Brahea armata*, *Butia capitata*, *Caryota (mitis, urens)*, *Chamaerops humilis*, *Cocos nucifera*, *Corypha* sp., *Howea forsteriana*, *Phoenix (acaulis, canariensis [tenuis], dactylifera, loureiroi [hanceana], reclinata, roebelenii, sylvestris)*, *Rhapis excelsa*, *Roystonea (regia [elata])*, *Sabal palmetto*, *Thrinax* sp., *Washingtonia robusta*, *Arecaceae*, Africa (Ghana, Kenya, South Africa, Zimbabwe), Asia (China, India, Japan, Myanmar, Taiwan), Caucasus (Armenia), Europe (Austria, Czech Republic, Germany), North America (Mexico; USA, Florida, Gulf states, Louisiana, Missouri, Mississippi, Nebraska, New York, Ohio, Texas), Central and South America (Brazil, El Salvador, Nicaragua), West Indies (Cuba, Dominican Republic).

**Notes:** Based on the phylogenetic position of its type species, *Stigmia* has been reduced to synonymy with *Pseudocercospora*. Due to its conidial shape and size, *Stigmia palmivora* is rather scolecostigmia-like, which is supported by its phylogenetic position. Brazilian material of this species has recently been cultivated and sequenced. Results of molecular sequence analyses revealed *Pseudocercospora colombiensis* and *P. irregulariramosa* as closest relatives with 93% ITS nucleotide homology and 98% LSU nucleotide homology. *Pseudocercospora colombiensis* does not cluster within the *Pseudocercospora* s. str. clade, but it belongs to a clade composed of *Pallidocercospora*, *Scolecostigmia*, *Trochophora* and some pseudocercosporoid species (Crous *et al.* 2013). Sequences based on material from Japan (unpublished data) are close to those from Brazil, suggesting that a single widespread species is involved. Type material of this species is not preserved in Saccardo's herbarium at PAD. The designated lectotype, deposited at BPI and denominated as syntype, is the only type material that could be traced.

### Zasmidium

A single species.

**Zasmidium caryotae** (X.J. Liu & Y.Z. Liao) Kamal, *Cercosporoid Fungi of India*: 239 (2010). (Fig. 50)

**Basionym:** *Stenella caryotae* X.J. Liu & Y.Z. Liao, *Acta Microbiol. Sin.* **20**: 119 (1980).

**Literature:** Guo (1999: 358).

**Illustration:** Liu & Liao (1980: 120, fig. 4).

**Description:** *Leaf spots* subcircular, 1–7 mm diam, or oblong, 5–16 × 2–9 mm, dark brown to blackish, sometimes with yellowish border or halo. *Caespituli* amphigenous, mostly hypophyllous. *Mycelium* internal and external; superficial hyphae verruculose. *Stromata* hemispherical, 25–55 µm diam, dark brown. *Conidiophores* in divergent fascicles, arising from stromata, erect, straight to curved, subcylindrical, 0–4 times geniculate, apex truncate to somewhat swollen, unbranched, about 40–290 × 3–6.5 µm, 2–12-septate, olivaceous-brown to medium brown, wall thin to somewhat thickened, smooth, occasionally with percurrent rejuvenations; conidiogenous cells integrated, terminal, sympodial, with several conspicuous conidiogenous loci, thickened and darkened. *Conidia* solitary, obclavate, straight to curved, 30–290 × 5–8 µm, pluriseptate, pale olivaceous-brown, thin-walled, verruculose, apex obtuse to subacute, base truncate to obconically truncate, hila thickened and darkened.

**Holotype: China:** Guangdong: Gaoyang Xian, Dinghuashan, on *Caryota mitis*, 7 Feb. 1958 (HMAS 10262).

**Host range and distribution:** On *Caryota (mitis, Caryota* sp.), *Arecaceae*, Asia (China, Guangdong, Guangxi; India).

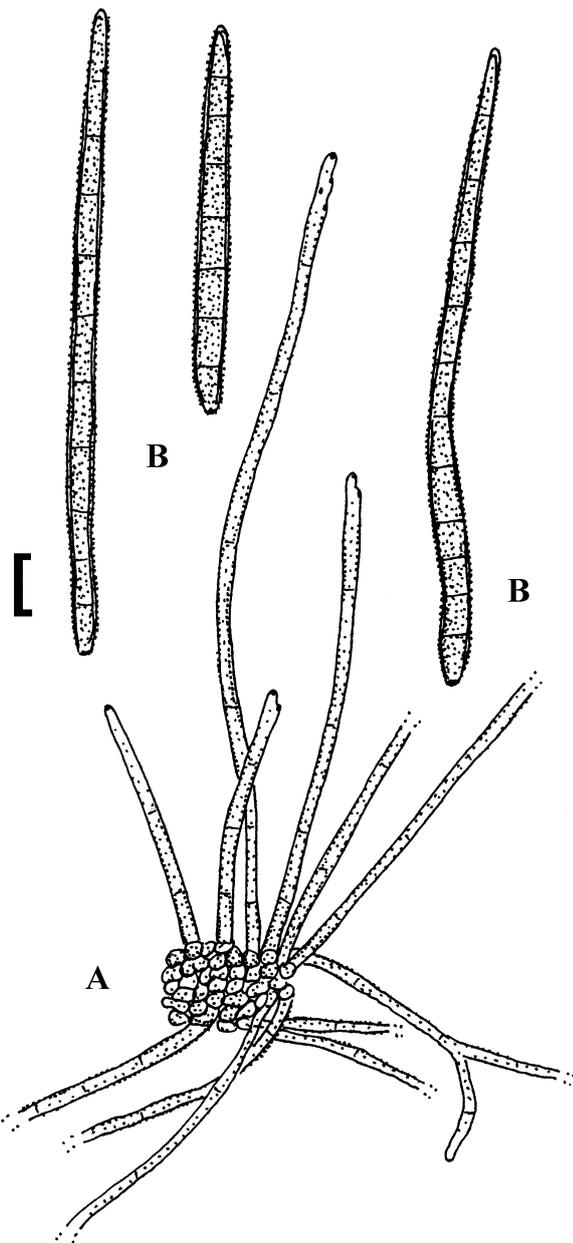


Fig. 50. *Zasmidium caryotae* (HMAS 10262). A. Conidiophore fascicle. B. Conidia. Bar = 10  $\mu$ m.

#### Doubtful, excluded and insufficiently known species

*Stenella caryotae-urentis* R.K. Chaudhary, Tripathi, P.N. Sing & S. Chaudhary, *Indian Phytopathol.* **54**: 228 (2001); as "*caryotae-urentis*".

*Illustration*: Chaudhary et al. (2001: 230, fig. 3)

*Description*: Leaf spots amphigenous, circular to irregular, 1–6 mm diam, dark brown. *Caespituli* amphigenous, effuse, dark brown. *Stromata* lacking. *Mycelium* internal and external; superficial hyphae branched, 2.5–3.5  $\mu$ m wide, septate, light brown, finely verruculose. *Conidiophores* solitary, arising from superficial hyphae, lateral, erect, about 25–75  $\times$  3.5–4  $\mu$ m, 2–4-septate, brown; conidiogenous cells integrated, terminal, cicatrized. *Conidia* solitary or catenate, in simple or branched

chains, subcylindrical-vermiform, 10–100  $\times$  3–5.5  $\mu$ m, 1–11-septate, often constricted at the septa, pale olivaceous, verrucose, apex rounded to subobtusate, base truncate.

*Holotype*: India: Uttar Pradesh: Gorakhpur, on *Caryota urens*, *Areaceae*, May 1997, R. K. Chaudhary (HCIO 42564). *Isotype*: GPU Herb. 5/97.

*Host range and distribution*: Only known from the type collection.

*Notes*: The generic affinity of this species is unclear and has to be proven on the base of a re-examination of type material, which was not available for us. *Stenella caryotae-urentis* was neither cited nor reassessed in Kamal (2010). Details of the conidiogenous loci are not described, and the conidia are rather sirosporium-like.

*Stenella novae-zelandiae* Matsush., *Matsush. Mycol. Mem.* **4**: 18 (1985).

*Illustration*: Matsushima (1985: figs 318, 319).

*Holotype*: New Zealand: near Hari hari, isolated from dead wood, *Areaceae*, 21 May 1983 (MFC-12458).

*Notes*: This species has nothing to do with *Stenella* as well as *Zasmidium* and is not cercosporoid at all. The superficial mycelium is smooth, conidiogenous cells have a geniculate, characteristic zig-zag structure with numerous truncate, unthickened conidiogenous loci and catenate conidia with truncate base and unthickened hila. The generic affinity of this species is quite unclear, but this fungus reminds one of asexual morphs of the *Venturiaceae*, above all *Pseudocladosporium*.

*Stenella palmicola* Matsush., *Matsush. Mycol. Mem.* **4**: 19 (1985).

*Illustration*: Matsushima (1985: fig. 320).

*Holotype*: New Zealand: Waipoua Forest, isolated from dead petioles of *Rhopalostylis sapida*, *Areaceae*, 12 May 1983 (MFC-12291).

*Notes*: This species is quite distinct from *Stenella* and *Zasmidium* and rather pseudocladosporium-like. The mycelium, conidiophores and conidia are smooth-walled, the conidiogenous loci and conidial hila are truncate, neither thickened nor darkened, and the conidia are formed in simple or branched acropatal chains.

*Stenella taiwanensis* Matsush., *Matsushima Mycol. Mem.* **5**: 30 (1987).

*Illustration*: Matsushima (1987: figs 447, 448).

*Holotype*: Taiwan: Nan-Jen-Shan, isolated from a dead rachis of *Areca catechu*, *Areaceae*, 27 Feb. 1986 (MFC-6T196).

Notes: This species is quite distinct from *Stenella* and *Zasmidium*. The conidiophores have a single terminal, broadly truncate, unthickened conidiogenous locus giving

rise to sporidesmium-like conidia formed singly or in short chains. The general habit of this fungus suggests an affinity to the *Sporidesmium* complex.

## Asparagaceae (including Agavaceae, Convallariaceae, and Hostaceae)

### Cercospora

#### Key to Cercospora species on Asparagaceae

- |       |   |                      |
|-------|---|----------------------|
| 1     | Conidia consistently broadly cylindrical or subcylindrical .....  | 2                    |
|       | Conidia acicular-filiform to obclavate-cylindrical .....  | 5                    |
| 2 (1) | Conidia subcylindrical, apex sometimes distinctly swollen; on <i>Agave</i> .....  | <b>C. agavicola</b>  |
|       | Conidia never swollen at the apex; on other hosts .....   | 3                    |
| 3 (2) | Leaf spots indistinct; conidiophores short, 10–35 µm; conidia 15–70 × 3–5.5 µm,<br>(1–)3(–5)-septate; on <i>Yucca</i> .....   | <b>C. floricola</b>  |
|       | Leaf spots distinct; conidiophores much longer, to 350 µm; conidia pluriseptate (1–18); on other hosts .....  | 4                    |
| 4 (3) | Conidiophores very long, to 350 µm; conidia consistently cylindrical, 50–80 × 4–5.5 µm,<br>4–7-septate; on <i>Furcraea</i> , South America .....  | <b>C. fourcroyae</b> |
|       | Conidiophores shorter, to 160 µm; conidia cylindrical to obclavate-cylindrical,<br>20–150 × 4–8 µm, 1–18-septate; on <i>Maianthemum</i> , northern hemisphere .....   | <b>C. maianthemi</b> |
| 5 (1) | Conidia cylindrical to obclavate-cylindrical, rather broad, 20–150 × 4–8 µm; on <i>Maianthemum</i> .....  | <b>C. maianthemi</b> |
|       | Conidia at least partly acicular, i.e. acicular, filiform to obclavate-cylindrical; on other hosts .....  | 6                    |
| 6 (5) | Stromata well-developed, 20–60 µm diam; conidia acicular-filiform to slightly obclavate; on <i>Hosta</i> .....  | <b>C. hostae</b>     |
|       | Stromata lacking or small, 10–30 µm diam, if larger conidia acicular to obclavate-cylindrical;<br>on <i>Asparagus</i> or <i>Polygonatum</i> .....   | 7                    |
| 7 (6) | Leaf spots circular to oblong, between veins, 1–7 mm diam or to 30 mm long,<br>pale brown to dingy grey, with dark purple margin; stromata lacking or small,<br>10–30 µm diam; on <i>Polygonatum</i> .....  | <b>C. chinensis</b>  |
|       | On cladodes and branches, forming small subcircular, oval to elliptical spots, 0.5–4 mm diam,<br>pale brownish, greyish brown to dingy grey, margin brown, reddish brown;<br>stromata always present, 10–40 µm diam or oblong, to 100 µm; on <i>Asparagus</i> ..... | <b>C. asparagi</b>   |

#### Cercospora species on Asparagaceae

**Cercospora agavicola** Ayala-Escobar, *Mycotaxon* 93: 117 (2005).  
(Fig. 51)

Literature: Groenewald *et al.* (2013: 144).

Illustration: Ayala-Escobar *et al.* (2005: 119, figs 2–14).

Description: Leaf spots variable in size and shape, irregular necroses, dingy grey. *Caespituli* punctiform to pustulate, scattered to dense, dark to blackish brown, later grey-brown to greyish white by abundant sporulation. *Mycelium* internal; hyphae solitary or forming lax to dense ropes or planate aggregations of swollen hyphal cells of to 15 µm diam. *Stromata* well-developed, immersed, often somewhat erumpent, 20–150 µm diam or confluent and larger, composed of swollen hyphal cells, 3–8 µm diam, brown.

*Conidiophores* in small to moderately large lax fascicles, erect, divergent, subcylindrical-filiform to flexuous-sinuuous, barely geniculate, unbranched, occasionally with constrictions and swellings, 20–100 × 3–6(–7) µm (to 200 µm long and strongly branched under high humidity in moist chambers), pluriseptate, at first subhyaline, later pale olivaceous, olivaceous-brown or pale brown, often paler towards the tip, thin-walled, smooth; conidiogenous cells integrated, terminal, 10–40 µm long, 1–3 conidiogenous loci, thickened and darkened, 2–3 µm diam, terminal and lateral. *Conidia* solitary, subcylindrical, (35–)40–100(–120) × 3–5.5 µm, (0–)3–8-septate, hyaline, thin-walled, smooth, apex obtuse, sometimes with distinctly swollen tip, base truncate to somewhat obconically truncate, 1.5–2.5 µm wide, hila somewhat thickened and darkened.

*In vitro*: Colonies on all media green to greyish, reaching 20 mm diam within 3 weeks. Sporulation only observed on AA medium after 21 d. *Conidiophores* dense, 231–960 µm long, pluriseptate, with a single terminal conidiogenous locus or to

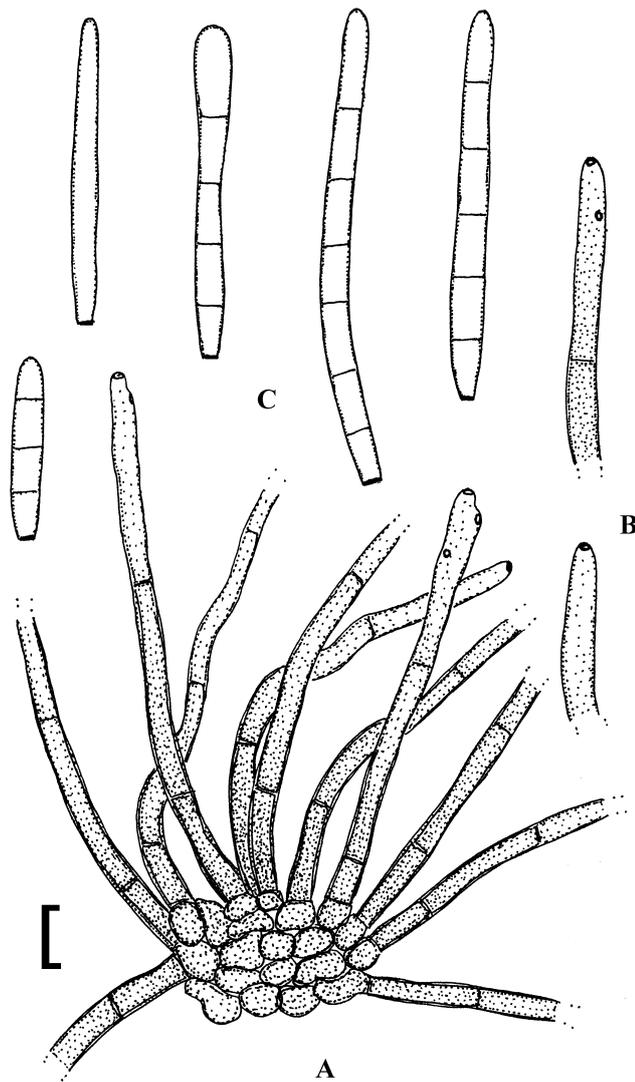


Fig. 51. *Cercospora agavicola* (HAL 1839 F). A. Conidiophore fascicle. B. Conidiophore tips. C. Conidia. Bar = 10  $\mu$ m.

five lateral slightly protruding loci. *Conidia* solitary, cylindrical, straight, 25–120  $\mu$ m long, 2–8-septate, hyaline, apical cell often swollen, subglobose or clavate. Spermogonia formed on OA, exuding masses of hyaline, rod-shaped spermatia, 3–6  $\times$  1–2  $\mu$ m.

**Holotype:** Mexico: State of Guanajuato: Penjamo, on *Agave tequilana*, Asparagaceae, Jan. 2003, V. Ayala-Escobar & Ma. de Jesús Yáñez-Morales (CHAP 166). **Isotype:** HAL 1839 F. **Ex-type culture:** CBS 117292.

**Host range and distribution:** Only known from the type collection.

**Notes:** The position of *C. agavicola* as genetically distinct species has been proven by means of molecular sequence analyses (Groenewald *et al.* (2013)).

### *Cercospora apii* s. lat.

**Notes:** Two collections belonging to the *C. apii* complex have been examined on *Dracaena* spp. (Japan, intercepted at Hawaii, on *Dracaena fragrans* [deremenensis], 7 Aug. 1974, Kunisaki *et al.*, BPI 435828; Mexico, Tamazunchale, on *D. marginata*, 11 June 1982, J. Okamura, BPI 435829). The sample on *Dracaena fragrans* is characterised by having loosely fasciculate, very long, straight, cylindrical, usually non-geniculate conidiophores, to 250  $\times$  3–7  $\mu$ m, pale to medium brown, paler towards the tip, pluriseptate, conidiogenous loci 2.5–4  $\mu$ m diam. The conidia are formed singly, acicular, to 160  $\times$  3–4.5  $\mu$ m, hyaline pluriseptate. The Mexican collection on *D. marginata* differs in having shorter conidiophores, to 80  $\times$  3–8  $\mu$ m, pale to medium olivaceous-brown, with loci 2–3.5  $\mu$ m diam, and narrower conidia, 2–4  $\mu$ m.

### *Cercospora asparagi* Sacc., *Michelia* 1: 88 (1877). (Fig. 52)

**Synonyms:** *Cercospora caulicola* G. Winter, *J. Mycol.* 1: 125 (1885) [**syntypes:** USA: Missouri: Perryville, on *Asparagus officinalis*, Sep. 1883, C. H. Demetrio, Rabenh., Fungi Eur. Exs. no. 3591 (numerous herbaria, e.g. B, G, S)].

*Cercosporina asparagicola* Speg., *Anales Mus. Nac. Hist. Nat. Buenos Aires* 20: 424 (1910) [**holotype:** Argentina: La Plata, botanical garden, on *Asparagus officinalis*, C. Spegazzini (LPS 4966); K(M) IMI 247001 (slide)].

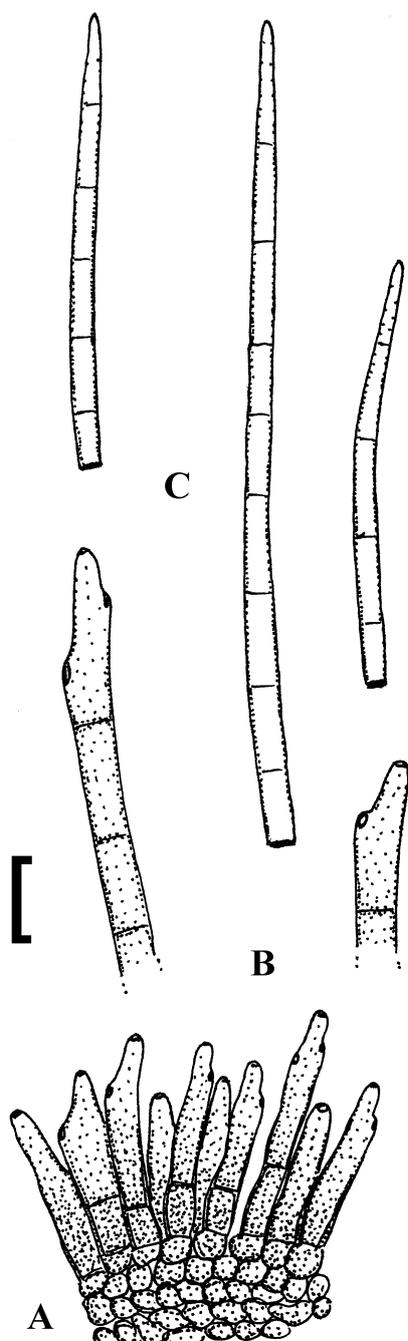
*Cercospora asparagicola* (Speg.) Vassiljevsky, in Vassiljevsky & Karakulin, *Fungi Imperfecti Parasitici (Hyphomycetes)* 1: 296 (1937).

**Literature:** Saccardo (1886: 477), Lindau (1910: 89), Vassiljevsky & Karakulin (1937: 296), Chupp (1954: 343), Vasudeva (1963: 43), Katsuki (1965: 42), Ellis (1976: 270), Sutton & Pons (1980: 203), Hsieh & Goh (1990: 208), Braun & Mel'nik (1997: 40), Braun (2000: 74), Crous & Braun (2003: 68), Phengsintham *et al.* (2013b: 50), Guo *et al.* (2005: 174), Kamal (2010: 18–19), Han *et al.* (2013).

**Illustrations:** Ellis (1976: 271, fig. 205), Hsieh & Goh (1990: 209, fig. 161), Guo *et al.* (2005: 175, fig. 122), Phengsintham *et al.* (2013b: 51, fig. 10–11).

**Exsiccatae:** Sacc., *Mycoth. Ven.* 1052. Rabenh., Fungi Eur. Exs. 3591.

**Description:** On cladodes and branches, forming small subcircular, oval to elliptical spots, 0.5–4 mm diam, pale brownish, greyish brown to dingy grey, margin brown, reddish brown. *Caespituli* amphigenous, punctiform, dark. *Mycelium* internal. *Stromata* small to well-developed, 10–40  $\mu$ m diam, substomatal to immersed, sometimes oblong, to 100  $\mu$ m in length, brown to dark brown, composed of swollen hyphal cells, 3–13  $\mu$ m diam, rounded to angular-irregular in outline. Conidiophores in small to moderately large fascicles, loose to rather dense, arising from stromata, through stomata, erect, straight, subcylindrical to somewhat geniculate-sinuuous above, unbranched, 10–170  $\times$  4–8  $\mu$ m, continuous to pluriseptate, pale to dark olivaceous-brown or medium brown, paler towards the tip, wall thin to slightly thickened,



**Fig. 52.** *Cercospora asparagi* (HAL, Sacc., Mycoth. Ven. 1052). **A.** Conidiophore fascicle. **B.** Conidiophore tips. **C.** Conidia. Bar = 10  $\mu$ m.

smooth; conidiogenous cells integrated, terminal, occasionally conidiophores reduced to conidiogenous cells, 10–30  $\mu$ m long, conidiogenous loci conspicuous, thickened and darkened, 1.5–3  $\mu$ m diam. *Conidia* solitary, acicular to somewhat obclavate-subcylindrical, straight to somewhat curved, 35–150  $\times$  2.5–5  $\mu$ m, 3–12-septate, hyaline, thin-walled, smooth, apex subobtuse to subacute, base truncate to slightly attenuated, 2–3  $\mu$ m wide, hila thickened and darkened.

**Lectotype (designated here,** MycoBank MBT178138): **Italy:** Treviso, on *Asparagus officinalis*, Sep. 1875 (PAD). **Isolectotypes:** Sacc., Mycoth. Ven. 1052 (e.g. BPI 433642, HAL, HBG).

**Host range and distribution:** On *Asparagus* (*densiflorus* [*Protasparagus densiflorus*], *officinalis*, *setaceus* [*plumosus*, *Protasparagus setaceus*]), *Asparagaceae*, Africa (Ghana, Kenya, Malawi, South Africa, Zimbabwe, Zambia), Asia (Brunei, Cambodia, China, India, Israel, Japan, Korea, Laos, Malaysia, Nepal, Pakistan, Taiwan, Thailand), Europe (Italy, Russia, Ukraine), North America (USA, Arkansas, California, Delaware, Florida, Georgia, Illinois, Maryland, North Carolina, Nebraska, New Mexico, Oklahoma, South Carolina, Texas, Virginia), Oceania (Hawaii, Solomon Islands), Central and South America (Argentina, Brazil, Colombia, Honduras, Venezuela), West Indies (Cuba).

**Notes:** A true *Cercospora* s. str. pertaining to the *C. apii* s. lat. complex.

***Cercospora chinensis*** F.L. Tai, *Bull. Chin. Bot. Soc.* **2:** 49 (1936). (Similar to Fig. 1)

**Literature:** Chupp (1954: 343), Crous & Braun (2003: 119), Guo *et al.* (2005: 175), Groenewald *et al.* (2013: 150).

**Illustration:** Guo *et al.* (2005: 176, fig. 123).

**Description:** *Leaf spots* amphigenous, circular to oblong, between veins, 1–7 mm diam or to 30 mm long, pale brown to dingy grey, with dark purple margin. *Caespituli* amphigenous, dark, punctiform. *Mycelium* internal. *Stromata* almost lacking to subglobose, 10–30  $\mu$ m diam, substomatal or immersed, dark brown. *Conidiophores* in small to moderately large fascicles, 2–18, loose to dense, arising from internal hyphae or stromata, through stomata or erumpent, erect, straight, subcylindrical or attenuated towards the tip, geniculate, unbranched or rarely branched, 20–150  $\times$  4–6  $\mu$ m, pluriseptate, medium to dark brown, paler towards the tip, wall somewhat thickened, smooth; *conidiogenous cells* integrated, terminal or intercalary, 10–30  $\mu$ m long, conidiogenous loci thickened and darkened, 2.5–3  $\mu$ m diam. *Conidia* solitary, acicular to somewhat obclavate-cylindrical, straight to slightly curved, (15–)30–220(–300)  $\times$  2–5  $\mu$ m, 2–16-septate, hyaline, thin-walled, smooth, apex subacute, base truncate to obconically truncate, about 2–3.5  $\mu$ m wide, hila somewhat thickened and darkened.

**Holotype: China:** Beijing, on *Polygonatum officinale*, Sep. 1933, L. Shih 1063 (HMAS 06992).

**Host range and distribution:** On *Convallaria majalis*, *Polygonatum* (*humile*, *odoratum* [*officinale*], *Polygonatum* sp.), *Asparagaceae*, Asia (China, Korea).

**Notes:** ‘Sci. Rep. Natl. Tsing Hua Univ., Ser. B, Biol. Sci., 2: 428. 1937’ was given as the literature citation in Chupp (1954), but it actually appeared in a paper the previous year. This species belongs to the *Cercospora apii* complex. The phylogenetic position of this species has recently been examined by Groenewald *et al.* (2013).

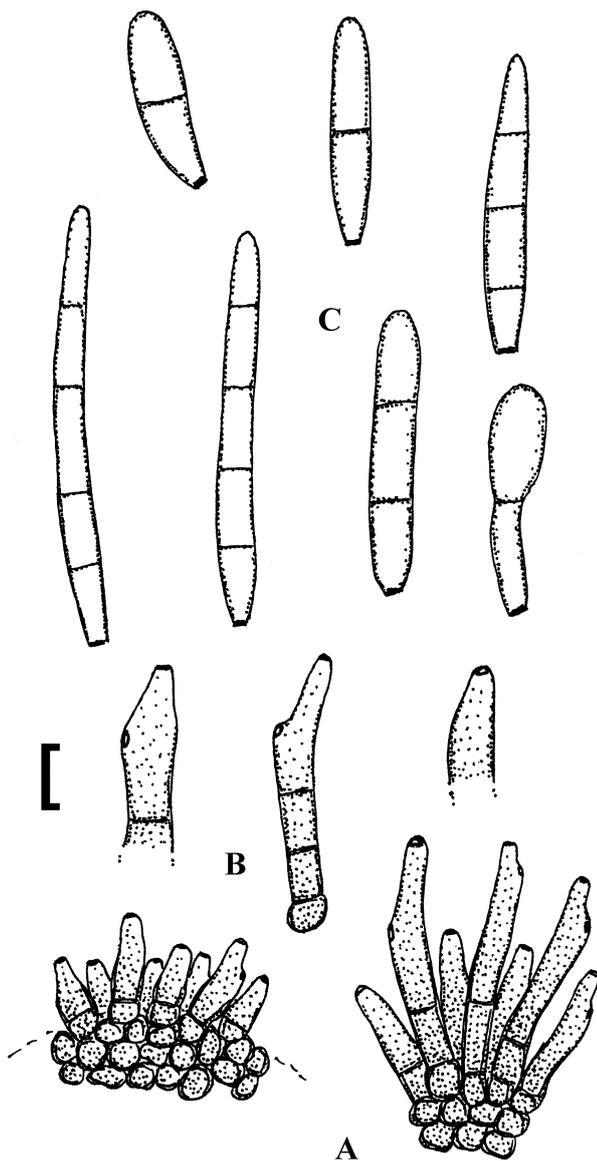


Fig. 53. *Cercospora floricola* (BPI 436450). A. Conidiophore fascicles. B. Conidiophores. C. Conidia. Bar = 10  $\mu$ m.

***Cercospora floricola* Heald & F.A. Wolf, *Mycologia* 3: 17 (1911).**  
(Fig. 53)

*Literature:* Saccardo (1931: 883), Vassiljevsky & Karakulin (1937: 297), Chupp (1954: 346), Crous & Braun (2003: 187).

*Description:* *Leaf spots* indistinct. *Caespituli* formed on scapes, flower pedicels and outer portions of the perianth, effuse, olivaceous to blackish. *Mycelium* internal. *Stromata* formed as loose stromatic aggregations of swollen hyphal cells, 20–60  $\mu$ m diam or confluent and larger, forming irregular layers, immersed, brown. *Conidiophores* in dense to very dense fascicles, arising from stromata, forming layers, erect, straight to slightly curved, subcylindrical, barely to slightly geniculate-sinuous, unbranched, 10–35  $\times$  4–6.5  $\mu$ m, often uniformly short and aseptate or somewhat longer and 0–2-septate, pale or very pale olivaceous-brown, thin-walled, smooth; conidiophores reduced to conidiogenous cells or

conidiogenous cells integrated, terminal, 10–25  $\mu$ m long, conidiogenous loci conspicuous, thickened and darkened, (1.5–)2(–2.5)  $\mu$ m diam. *Conidia* solitary, broadly ellipsoid-ovoid, cylindrical or somewhat obclavate, 15–70  $\times$  3–6  $\mu$ m, 1–4(–5)-septate, hyaline or subhyaline, thin-walled, smooth, apex obtuse, mostly broadly rounded, base truncate to short obconically truncate, (1.5–)2(–2.5)  $\mu$ m wide, hila somewhat thickened and darkened.

*Lectotype (designated here, MycoBank MBT178151): USA:* Texas: Austin, on *Yucca rupicola*, 19 June 1909, F. D. Heald & F. A. Wolf, no. 1438 (BPI 436450). *Isolectotypes:* BPI 436451, CUP 3915.

*Host range and distribution:* On *Yucca rupicola*, *Asparagaceae*, North America (USA, Texas).

*Notes:* This species is characterised by having passalora-like conidia, broadly ellipsoid-ovoid to cylindrical or somewhat obclavate and 1–4-septate, but the conidia are colourless or almost so and the conidiogenous loci agree with those of *Cercospora s. str.* species. Results of molecular sequence analyses showed that such species, as far as the conidia are hyaline, belong in *Cercospora s. str.*

***Cercospora fourcroyae* Obreg.-Bot., *Caldasia* 3: 49 (1941).**  
(Fig. 54)

*Literature:* Chupp (1954: 37), Crous & Braun (2003: 188).

*Description:* *Leaf spots* amphigenous, subcircular to elliptical, 5–35 mm diam, brownish or zonate, with altering zones of green and brown, centre grey and often darkened by the fungal colonies. *Caespituli* amphigenous, punctiform, scattered to dense, dark brown or greyish brown by abundant conidiation. *Mycelium* internal. *Stromata* large, immersed, about 40–125  $\mu$ m diam, dark brown, loosely woven masses to dense stromatic hyphal aggregations composed of swollen hyphal cells, 3–6  $\mu$ m diam, circular to angular in outline, mostly formed as *textura angulata*. *Conidiophores* in large fascicles, arising from stromata, loose to moderately dense, erect, straight to strongly curved-sinuous, but not or only slightly geniculate, rarely forming an almost complete circle, unbranched, length variable, (15–)30–200(–350)  $\times$  3–9  $\mu$ m, plainly pluriseptate, sometimes constricted at the septa, width irregular, pale to medium brown or olivaceous to yellowish brown, wall thin to slightly thickened, to 1  $\mu$ m wide, smooth; conidiogenous loci conspicuous, at bluntly rounded tips or lateral, 2–3.5  $\mu$ m diam, thickened and darkened. *Conidia* solitary, cylindrical-obclavate, straight to curved, 40–80  $\times$  3.5–6  $\mu$ m, 3–7-septate, hyaline or subhyaline, thin-walled, smooth, apex obtuse, base truncate to obconically truncate, 2–3  $\mu$ m wide, hila thickened and darkened.

*Holotype: Colombia:* Santander, San José de Suaita, on *Furcraea foetida* [*gigantea*], 5 Dec. 1937, R. Barrios-Ferrer (CUP 39835).

*Host range and distribution:* On *Furcraea* (*foetida*, *Furcraea* sp.), *Asparagaceae*, South America (Brazil, Colombia).

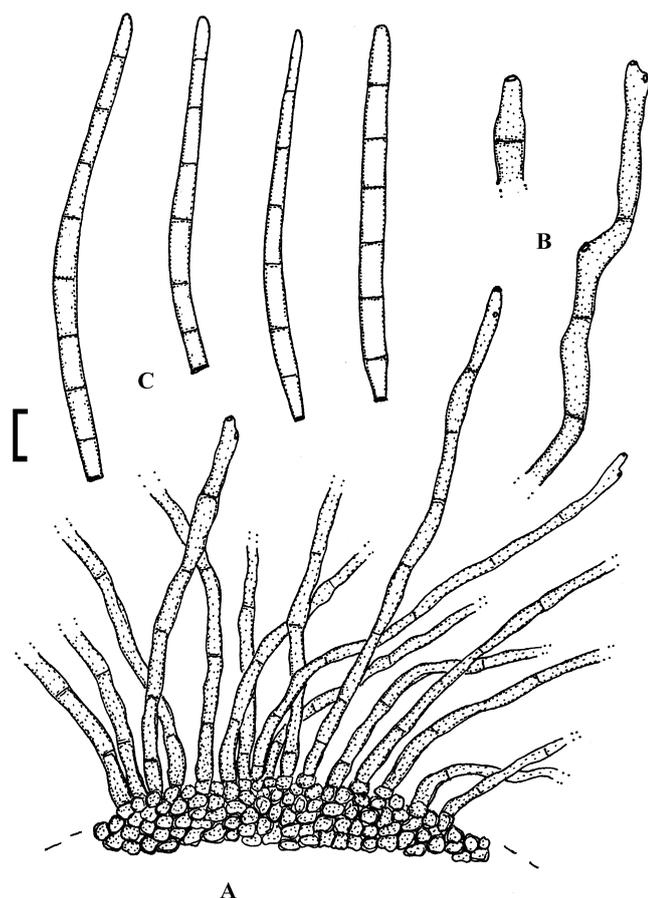


Fig. 54. *Cercospora fourcroyae* (CUP 39835). A. Conidiophore fascicle. B. Conidiophore tips. C. Conidia. Bar = 10  $\mu$ m.

**Notes:** This species belongs in *Cercospora* s. str., but it is quite distinct from *C. apii* s. lat. by its very long conidiophores and obclavate-cylindrical conidia with blunt tips. This species was recorded on *Alstroemeria* sp., *Alstroemeriaceae*, in Brazil (Batista *et al.* 1965: 16, fig. 7; Mendes *et al.* 1998). The corresponding material has been re-examined (on *Alstroemeria* sp., Brazil, D.F., 10 May 1963, E.P. Heringer, IMUR 34448). This sample proved to belong to a species of *Cercospora*, but it was too poorly developed for a final conclusion and detailed description. As *Alstroemeria* pertains to another plant family, it remains doubtful if this collection has been correctly identified.

***Cercospora hostae*** Katsuki, *Ann. Phytopathol. Soc. Japan* 20: 72 (1955).

(Fig. 55)

**Synonym:** *Cercospora hostae* Hori, *Ann. Phytopathol. Soc. Japan* 1(4): 66 (1921); *nom. inval. (nom. nud.)*.

**Literature:** Chupp (1954: 347), Katsuki (1965: 42), Kim & Shin (1999b), Shin & Kim (2001: 71), Guo & Xu (2002), Crous & Braun (2003: 219), Guo *et al.* (2005: 177).

**Illustrations:** Shin & Kim (2001: 72, fig. 27), Guo *et al.* (2005: 178, fig. 125).

**Description:** Leaf spots amphigenous, scattered to confluent, circular or subcircular to somewhat irregular, 1–10 mm diam,

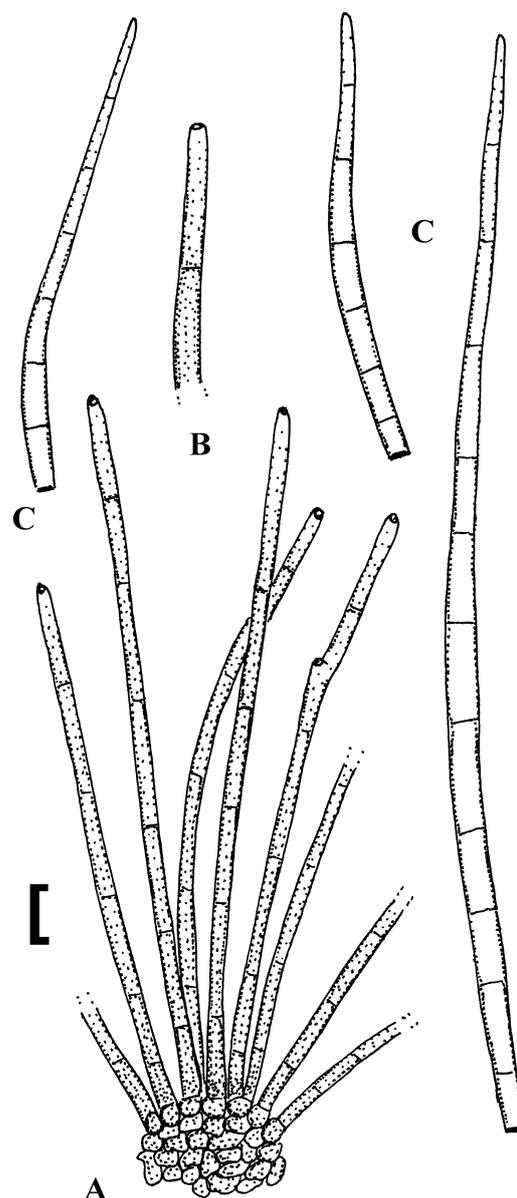


Fig. 55. *Cercospora hostae* (based on Shin & Kim 2001: 72, fig. 27). A. Conidiophore fascicle. B. Conidiophore tip. C. Conidia. Bar = 10  $\mu$ m.

to 20 mm when confluent, at first brown to greyish brown on the upper leaf surface, later greyish brown with narrow reddish brown border, finally centre turning greyish white to white with reddish brown to dark brown border, and pale yellow halo on both sides of the leaf. *Caespituli* amphigenous. *Mycelium* internal; hyphae branched, 2.5–4  $\mu$ m wide, septate, hyaline. *Stromata* small to large, subglobose to globose, immersed or substomatal, 20–60  $\mu$ m diam, dark brown to blackish brown, composed of brown swollen hyphal cells. *Conidiophores* in loose to dense fascicles, 3–20, arising from stromata, through stomata or erumpent, erect, straight to somewhat curved, subcylindrical, barely to slightly geniculate, unbranched, 10–245  $\times$  3.5–6.5  $\mu$ m, width uniform, 0–8-septate, olivaceous-brown, paler towards the tip, wall thin to slightly thickened, smooth; conidiogenous cells integrated, terminal, conidiogenous loci conspicuous, thickened and

darkened, 2–3  $\mu\text{m}$  diam. *Conidia* solitary, acicular-filiform to obclavate-subcylindrical, 25–250  $\times$  2.5–5  $\mu\text{m}$ , 5–14-septate, hyaline, thin-walled, smooth, apex subobtuse or subacute, base truncate to somewhat obconically truncate, about 2–3  $\mu\text{m}$  wide, hila thickened and darkened.

**Holotype:** Japan: Tokyo, Murayama, on *Hosta* sp., 12 Oct. 1952, E. Kurosawa (not preserved).

**Host range and distribution:** On *Hosta* (*plantaginea*, *ventricosa*, *Hosta* sp.), *Asparagaceae*, Asia (China, Japan, Korea).

**Notes:** A true *Cercospora* s. str. close to or belonging to the *C. apii* s. lat. complex. Hori (1921) listed this fungus as new species from Mainland China, but without any descriptions or diagnosis (*nom. nud.*). The type collection cited in Katsuki (1955) is probably not maintained.

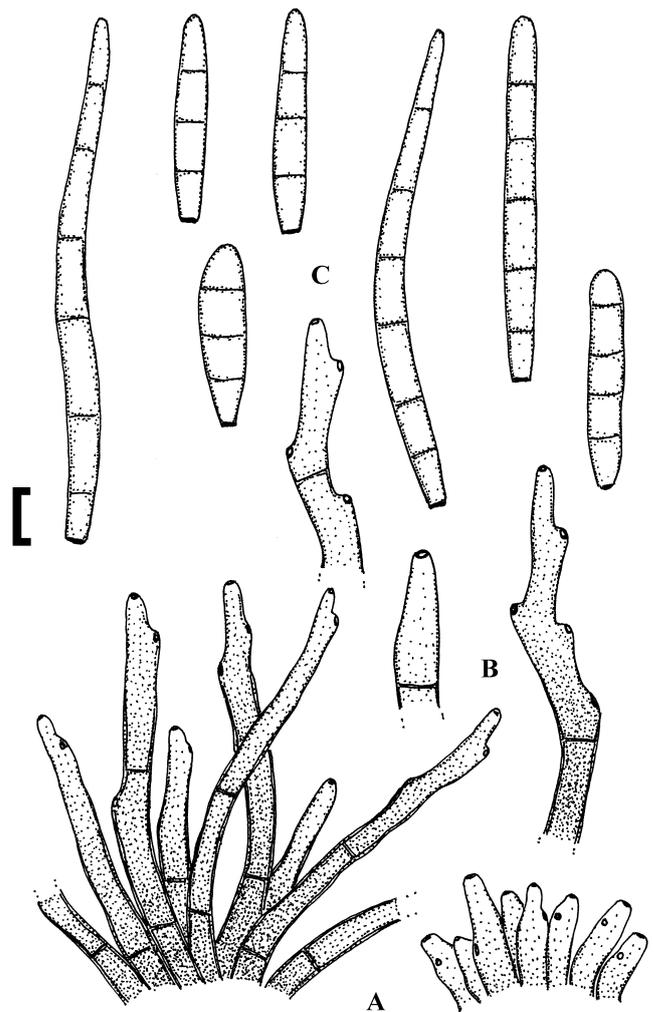
***Cercospora maianthemi*** Fuckel, *Fungi Rhen. Exs., Suppl.*, Fasc. 2, no. 1631 (1866); as "*majanthemi*". (Fig. 56)

**Literature:** Saccardo (1886: 476), Lindau (1910: 89), Vassiljevsky & Karakulin (1937: 298), Chupp (1954: 348), Katsuki (1965: 43), Ellis (1976: 272), Braun & Mel'nik (1997: 71), Crous & Braun (2003: 263).

**Illustrations:** Vassiljevsky & Karakulin (1937: 298, fig. 23), Ellis (1976: 272, fig. 206 B).

**Exsiccatae:** Allesch. & Schnabl, *Fungi Bav.* 499. Barthol., *Fungi Columb.* 4110 (as "*C. subsanguinea*"). Bucholtz & Bondartsev, *Fungi Ross Exs., Ser. B*, 698. Erikss., *Fungi Paras. Scand. Exs.* 191. Fuckel, *Fungi Rhen Exs. Suppl.* 1631. Kabát & Bubák, *Fungi Imperf. Exs.* 50, 599. Kellerm., *Ohio Fungi* 123. Krieger, *Fungi Saxon. Exs.* 448. Petr., *Fl. Bohem. Morav. Exs. Pilze* 1213. Petr., *Fungi Polon. Exs.* 22. Petr., *Mycoth. Carp.* 7. Petr., *Mycoth. Gen.* 1718. Sacc., *Mycoth. Ven.* 1565. Poelt & Scheuer, *Reliqu. Petrak.* 2799. Rabenh., *Fungi Eur. Exs.* 2073, 3590. Scheuer, *Mycoth. Graec.* 251. Siemaszko, *Fungi Bialowiez. Exs.* 98. Syd., *Mycoth. Germ.* 1776, 1777, 2449. Vestergr., *Micromyc. Rar. Sel. Praec. Scand.* 237. Weese, *Eumyc. Sel. Exs.* 499. Wirtgen, *Florae Rhenanae, Ed. Nov., II. Abt.*, 46.

**Description:** *Leaf spots* large, at first circular, later enlarged, covering large leaf segments or almost entire leaves, brownish with yellowish border. *Caespituli* amphigenous, mainly hypophyllous, punctiform to almost pustulate, scattered, effuse to dense, velvety, sooty, olivaceous-brown, dark brown to blackish. *Mycelium* internal. *Stromata* substomatal to immersed, 30–80  $\mu\text{m}$  diam, medium to medium dark brown, sometimes almost blackish brown, composed of swollen hyphal cells, 3–10  $\mu\text{m}$  diam. *Conidiophores* few to numerous in divergent to dense fascicles, straight, subcylindrical to distinctly sinuous or sinuous-geniculate, unbranched, 50–160  $\times$  4.5–7  $\mu\text{m}$ , aseptate to pluriseptate, pale olivaceous to olivaceous-brown, tips paler, darker in mass, wall thin to somewhat



**Fig. 56.** *Cercospora maianthemi* (HAL, Fuckel, *Fungi Rhen Exs. Suppl.* 1631). **A.** Conidiophore fascicles. **B.** Conidiophore tips. **C.** Conidia. Bar = 10  $\mu\text{m}$ .

thickened, smooth; conidiogenous cells integrated, terminal and intercalary or conidiophores reduced to conidiogenous cells, 10–60  $\mu\text{m}$  long, conidiogenous loci conspicuous, thickened and darkened, 2–4  $\mu\text{m}$  diam. *Conidia* solitary, cylindrical to obclavate-cylindrical, short conidia sometimes broadly ellipsoid-obovoid to short cylindrical, 20–150  $\times$  4–8  $\mu\text{m}$ , 1–15-septa, distance between septa 5–20  $\mu\text{m}$ , at first hyaline or subhyaline, later greenish to very pale olivaceous, olivaceous-brown or brownish with age, apex obtuse, rounded, base short obconically truncate, 2–3  $\mu\text{m}$  wide, hila somewhat thickened and darkened.

**Lectotype (designated here, MycoBank MBT178139):** France: Alsace: Jura, Col Amic, on *Maianthemum bifolium*, summer 1866, Morthier [Fuckel, *Fungi Rhen. Exs. Suppl.* 1631] (BPI 438038). **Isolectotypes:** Fuckel, *Fungi Rhen. Exs. Suppl.* 1631 (e.g. FH, G, HAL).

**Host range and distribution:** On *Maianthemum* (*bifolium*, *canadense*), *Asparagaceae*, Asia (Japan, Russia), Europe (Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Italy, Latvia, Lithuania, Netherlands, Poland, Romania, Russia, Sweden,

Switzerland, Ukraine), North America (USA, Michigan, Ohio, Pennsylvania, New York, West Virginia, Wisconsin).

**Notes:** The identity of North American collections on *Maianthemum canadense* has been established. American collections coincide with European samples, at least morphologically. Braun & Mel'nik (1997) examined type material of this species and numerous other samples, and confirmed that the conidia are at first hyaline but become somewhat pigmented with age, i.e. they are rather passalora-like. However, the conidiogenous loci are large, thickened and rather cercospora-like. Therefore, they preferred to maintain this species in *Cercospora* s. str., at least tentatively. Results of molecular sequence analyses are urgently needed to determine the generic affinity of this species.

### **Doubtful, excluded and insufficiently known species**

*Cercospora montenegrina* Bubák, *Bot. Közlem.* **14**: 82 (1915).

**Synonym:** *Cercosporina montenegrina* (Bubák) Sacc., *Syll. Fung.* **25**: 909 (1931).

**Literature:** Vassiljevsky & Karakulin (1937: 296), Chupp (1954: 350), Crous & Braun (2003: 281).

**Description:** Leaf spots linear, 2–3 mm long, dark to black. *Caespituli* amphigenous. *Mycelium* internal. *Stromata* large, pustulate, black. *Conidiophores* in very dense fascicles, arising from stromata, erect, straight to sinuous, narrower towards the tip, neither geniculate nor branched, 20–40 × 5.5–7 µm, septate, pale or very pale olivaceous, paler

towards the tip. *Conidia* solitary, cylindrical-filiform or slightly attenuated towards the tip, straight to curved, 35–55 × 3–3.5 µm, 3–5-septate, hyaline, thin-walled, apex subobtuse, base obconic.

**Holotype:** **Montenegro:** Piva Monastery, on *Anthericum ramosum*, *Asparagaceae*, Jul. 1905, *Rohlena* (BPI 438578).

**Host range and distribution:** Only known from the type collection.

**Notes:** This collection is in poor condition and devoid of any mature conidiophores and conidia. The generic affinity of this species remains unclear. New collections are necessary.

*Cercospora smilacinae* Ellis & Everh., *Bull. Torrey Bot. Club.* **27**: 577 (1900).

**Literature:** Saccardo (1902: 1073), Vassiljevsky & Karakulin (1937: 298), Chupp (1954: 353).

**Holotype:** **USA:** Idaho: Latah Co., on *Maianthemum stellatum* [*Smilacina sessilifolia*], *Asparagaceae*, 1 Jul. 1899, *R. M. Horner* 1293 (NY 838617).

**Notes:** This is a doubtful species. No sporulation has been found in the type collection, which has been annotated by C. G. Shaw (10 Apr. 1967) who stated that he only found *Cylindrosporium smilacinae* Ellis & Everh., and that "*C. smilacinae* is, therefore, probably best considered a synonym of the above". This species was also reported on *Smilax* from Brazil by Mendes *et al.* (1998), which was undoubtedly based on a misidentification.

## **Passalora**

### **Key to *Passalora* species on *Asparagaceae***

- |       |  |                                   |
|-------|--|-----------------------------------|
| 1     | Conidiophores verruculose; conidia medium brown and finely verruculose; on <i>Cordylina</i> .....                        | <b>P. cordylines</b>              |
|       | Conidiophores and conidia smooth or almost so; conidia subhyaline to pale olivaceous or pale brown; on other hosts ..... | 2                                 |
| 2 (1) | Stromata very large, to 180 µm diam; conidia olivaceous to pale brown; on <i>Yucca</i> .....                             | <b>P. yuccae-gloriosae</b>        |
|       | Stromata lacking or smaller, 20–70 µm diam .....   | 3                                 |
| 3 (2) | Stromata lacking or almost so; conidia 18–100 × 2.5–5 µm, brownish; on <i>Ophiopogon japonica</i> .....                  | <b>P. togashiana</b>              |
|       | Stromata well-developed, 20–70 µm diam; conidia 4–8 µm wide, subhyaline to pale olivaceous; on <i>Polygonatum</i> .....  | 4                                 |
| 4 (3) | Conidia 50–85 × 4–6 µm wide, 4–7-septate; on <i>Polygonatum</i> spp., Europe, Caucasus, West Asia .....                  | <b>P. polygonati</b>              |
|       | Conidia broader, 6–8 µm, and only 1–4-septate; on <i>Polygonatum odoratum</i> , Japan, endemic .....                     | <b>P. polygonati-maximoviczii</b> |

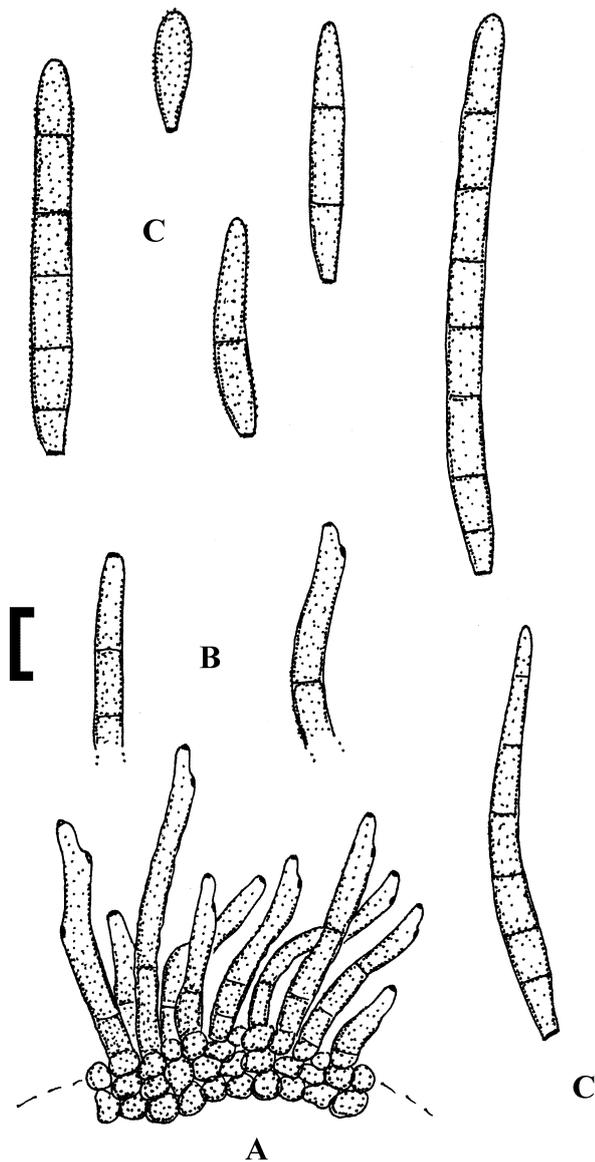


Fig. 57. *Passalora cordylinis* (BPI 435225). A. Conidiophore fascicle. B. Conidiophores. C. Conidia. Bars = 10  $\mu$ m.

### *Passalora* species on Asparagaceae

***Passalora cordylinis*** (Henn.) Crous & M.P.S. Câmara, *Mycotaxon* **68**: 302 (1998).

(Fig. 57)

*Basionym*: *Cercospora cordylinis* Henn., *Hedwigia* **41**: 117 (1902).

*Synonym*: *Cercospora cordylinis* Speg., *Revista Mus. La Plata, Secc. Bot.*, **15**: 45 (1908), *nom. illeg.* (ICN, Art. 53.1) [*lectotype* (designated here, MycoBank MBT178140): **Brazil**: São Paulo, on living leaves of *Corydiline spectabilis* [dracaenoides], Sep 1905, A. Usteri (CUP 39512)].

*Literature*: Saccardo (1906: 611), Chupp (1954: 344), Crous & Braun (2003: 138).

*Illustration*: Crous & Câmara (1998: 301, fig. 2).

*Description*: *Leaf spots* amphigenous, circular, 2–8 mm diam, brown to dark red-brown, with a dark brown to black border, frequently confluent, forming larger patches. *Caespituli* amphigenous, punctiform, dark. *Mycelium* internal; hyphae branched, septate, light brown, 3–4  $\mu$ m wide, thin-walled, smooth to faintly rough. *Stromata* immersed, brown, large, to 100  $\mu$ m diam. *Conidiophores* in dense, large fascicles, arising from stromata, straight, subcylindrical to geniculate-sinuous, unbranched, 30–75  $\times$  3–5  $\mu$ m, 1–7-septate, medium brown, smooth to verruculose, wall thin to somewhat thickened; conidiogenous cells integrated, terminal, 5–30  $\mu$ m long, conidiogenous loci conspicuous, somewhat thickened and darkened, 1–2  $\mu$ m wide. *Conidia* solitary, subcylindrical to obclavate, (25–)45–75  $\times$  (4–)5–6  $\mu$ m, (1–)3–8(–10)  $\mu$ m, pale medium brown, thin-walled, finely verruculose, apex obtuse, base short obconically truncate, 1.5–2  $\mu$ m wide, hila slightly thickened and darkened.

*Lectotype* (designated here, MycoBank MBT178141): **Brazil**: São Paulo, Botanical Garden, on *Corydiline spectabilis*, Mar. 1901, A. Puttemans [Fungi S. Paulensis 286] (BPI 435225).

*Host range and distribution*: On *Corydiline* (*fruticosa* [terminalis], *spectabilis* [dracaenoides], *Corydiline* sp.), *Asparagaceae*, South America (Brazil), North America (USA, Florida), Oceania (Hawaii).

*Notes*: Chupp (1954) described conidia to 175  $\mu$ m long, which have not been found during the course of the re-examination of type material. Type material (Puttemans 286) was previously deposited at B as well, but in 1997 it was sent on loan to Brazil and has been lost.

***Passalora polygonati*** (Rostr.) U. Braun & Crous, in Crous & Braun, *Mycosphaerella and Anam.*: 331 (2003).

(Fig. 58)

*Basionym*: *Cercospora polygonati* Rostr., *Bot. Tidsskr.* **26**: 314 (1905).

*Literature*: Saccardo (1913: 1413), Lindau (1910: 89), Vassiljevsky & Karakulin (1937: 299), Chupp (1954: 352), Braun & Mel'nik (1997: 81), Crous & Braun (2003: 331).

*Description*: *Leaf spots* amphigenous, subcircular, elliptical to somewhat irregular, 1–8 mm diam, centre yellowish, ochraceous or brownish, later becoming pale, greyish white with narrow to broad dark margin, reddish brown to purplish, finally very dark. *Caespituli* hypophyllous, punctiform, scattered to aggregated, dark. *Mycelium* internal. *Stromata* substomatal, about 20–50  $\mu$ m diam, dark olivaceous-brown, composed of swollen hyphal cells, 3–8  $\mu$ m diam. *Conidiophores* in small to usually large fascicles, divergent to dense, arising from stromata, through stomata, erect, straight to usually strongly geniculate-sinuous, unbranched, 25–140  $\times$  4–8  $\mu$ m, (0–)1–6-septate, brown, wall thin to slightly thickened, smooth; conidiogenous cells integrated, terminal and intercalary, about 10–50  $\mu$ m long, conidiogenous loci conspicuous, thickened and darkened, about 2–2.5  $\mu$ m diam.

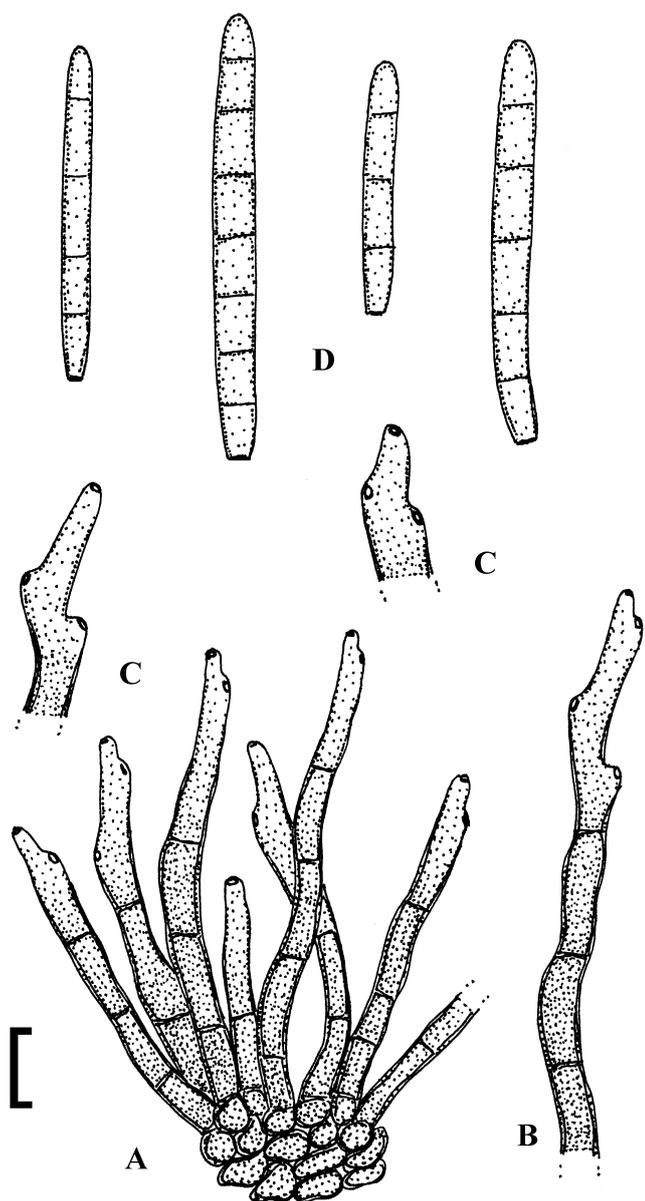


Fig. 58. *Passalora polygonati* (C, holotype). A. Conidiophore fascicle. B. Conidiophore. C. Conidiophore tips. D. Conidia. Bar = 10  $\mu$ m.

*Conidia* solitary, subcylindrical, 50–85  $\times$  4–6  $\mu$ m, 4–7-septate, subhyaline to pale olivaceous, thin-walled, smooth, apex obtuse, broadly rounded, base rounded to short obconically truncate, 2–3  $\mu$ m wide, hila somewhat thickened and darkened.

*Holotype*: Denmark: Jütland: Vendsyssel-Thy, Baggesvogn, on *Polygonatum multiflorum*, 1 Sep. 1902, Rostrup (C).

*Host range and distribution*: On *Polygonatum* (*humile*, *multiflorum*, *orientale*), *Asparagaceae*, Caucasus (Azerbaijan), Asia (Russia), Europe (Denmark, Russia).

*Notes*: Not a *Cercospora* as already emphasized by Chupp (1954). The conidiogenous loci are conspicuous and the conidia are subhyaline to pale olivaceous.

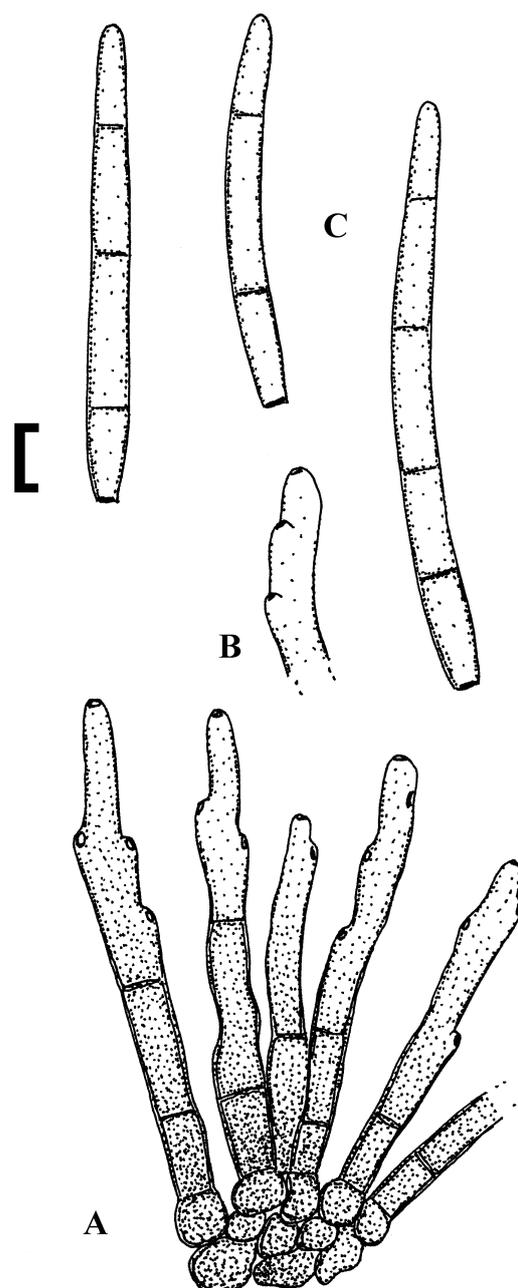


Fig. 59. *Passalora polygonati-maximoviczii* (TNS-F-60888). A. Conidiophore fascicle. B. Conidiophore tip. C. Conidia. Bar = 10  $\mu$ m.

***Passalora polygonati-maximoviczii*** Poonam Srivast., *J. Living World* 1: 117 (1994), *nom. nov.* (as "(Katsuki) Poonam Srivast."). (Fig. 59)

*Basionym*: *Cercosporidium polygonati-maximoviczii* Katsuki, *Trans. Mycol. Soc. Japan* 16: 12 (1975), *nom. superfl.* (ICN, Art. 52.1).

*Synonyms*: *Cercosporapolygonati-maximoviczii* Togashi, *Jap. J. Bot.* 2: 75 (1924) [syntypes: TNS-F-243801–243803].

*Passalora polygonati-maximoviczii* (Togashi) U. Braun & Crous, *Mycosphaerella and Anam.*: 331 (2003), *nom. illeg.* (ICN, Art. 53.1).

*Literature*: Vassiljevsky & Karakulin (1937: 298), Chupp (1954: 353), Katsuki (1965: 43), Braun & Crous (2007: 60).

Illustration: Katsuki & Kobayashi (1975: 12, fig. 8).

**Description:** Leaf spots amphigenous, at first formed as small brown specks, later almost elliptical to irregular, often angular and vein-limited, usually elongated, 5–25 mm long and 1–5 mm wide, on the upper leaf surface pale to greyish brown with purplish brown margin, below dull to greyish brown, sometimes uniformly blackish on both sides. *Caespituli* hypophyllous, punctiform, effuse to dense. *Mycelium* internal. *Stromata* substomatal to immersed, subepidermal, dark brown to blackish, subglobose, 30–70 µm diam. *Conidiophores* in large, divergent to dense fascicles, arising from stromata, through stomata or erumpent, erect, straight to curved, geniculate-sinuous, unbranched, 40–120 × 6–7 µm, 0–4-septate, brown, thin-walled, smooth; conidiogenous cells integrated, terminal and intercalary, sympodially proliferating, conidiogenous loci conspicuous, about 2–2.5 µm diam, terminal and on shoulders caused by sympodial proliferation, somewhat thickened and darkened. *Conidia* solitary, cylindrical to somewhat obclavate-cylindrical, straight to somewhat curved, 45–90 × 6–8 µm, 1–4-septate, pale olivaceous, thin-walled, smooth, apex obtuse, base short obconically truncate to rounded, 2–3 µm wide, hila somewhat thickened and darkened.

**Holotype:** Japan: Niigata Pref.: Kitaonuma-gun, Horinouchi, on *Polygonatum odoratum* var. *pluriflorum*, 8 Jul. 1972, S. Katsuki SK 2635 (TNS-F-60888). **Isotype:** TNS-F-60889 (“SK 2636”).

**Host range and distribution:** On *Polygonatum* (*odoratum* var. *maximoviczii* [maximoviczii], *odoratum* var. *pluriflorum*, *odoratum* var. *thunbergii* [japonicum]) (Asparagaceae), Asia (Japan).

**Notes:** This species is morphologically close to *P. polygonati*, but differs in having 1–4-septate conidia. Katsuki & Kobayashi (1975) considered *Cercospora polygonati-maximoviczii* Togashi a “*nom. seminud.*” and cited it as a synonym of *Cercosporidium polygonati-maximoviczii*, but Togashi’s species was published before 1935 with a full English description and is valid. Katsuki’s species must be considered a superfluous name (*nom. illeg.*). Srivastava (1994) introduced the “new combination” *Passalora polygonati-maximoviczii* with reference to the illegitimate name *Cercosporidium polygonati-maximoviczii*, published with a Latin description, as basionym. Hence, Srivastava’s name has to be considered a new name attributed to Srivastava as author.

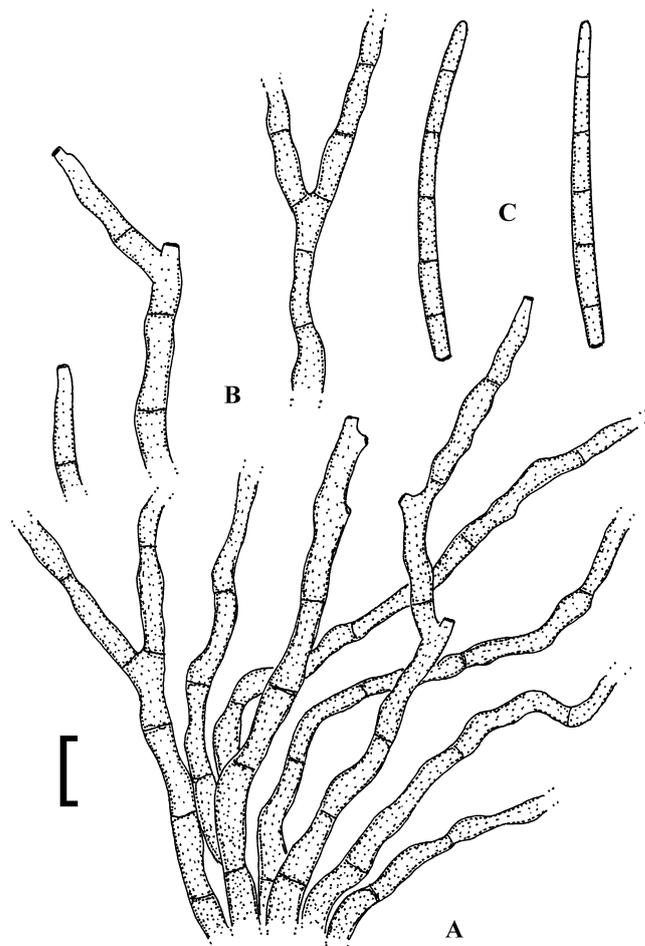
**Passalora togashiana** (Katsuki & Urasawa) C. Nakash., **comb. nov.**  
(Fig. 60)

Mycobank MB809037

**Basionym:** *Cercospora togashiana* Katsuki & Urasawa, *Ann. Phytopathol. Soc. Jap.* **15**: 144 (1951).

**Literature:** Chupp (1954: 355), Katsuki (1965: 43).

**Description:** Leaf spots indistinct or pale brown on the upper side. *Caespituli* amphigenous, mainly hyphophyllous, effuse,



**Fig. 60.** *Passalora togashiana* (TNS-F-243896). **A.** Conidiophore fascicle. **B.** Conidiophore tip. **C.** Conidia. Bar = 10 µm.

grey-olivaceous, vein-limited, covering an area of 4–6 × 0.3–0.5 mm. *Stromata* lacking or small, consisting of a few brown to reddish brown cells, substomatal to immersed. *Conidiophores* solitary or loosely fasciculate, arising from internal hyphae or the upper part of stromata, curved to sharply bent, sinuous, simple or branched, about 60–150 × 3.5–8 µm, pluriseptate, pale brown to reddish brown, darker in mass, wall thin to somewhat thickened, smooth; conidiogenous cells integrated, terminal and intercalary or conidiophores reduced to conidiogenous cells, proliferating sympodially, conidiogenous loci conspicuous, slightly thickened, 2–2.5 µm in diam. *Conidia* solitary, cylindrical to almost obclavate, straight to mostly curved, 18–100 × 2.5–5 µm, 4–8-septate, occasionally constricted at septa, pale to pale brown, smooth, apex obtuse, base rounded to or subtruncate, rounded, hila slightly thickened.

**Holotype:** Japan: Saitama Pref.: Minamisaitama-gun, Niiwamura, on *Ophiopogon japonicus*, 1 Jul. 1950, Y. Urasawa (TNS-F-243896).

**Host range and distribution:** On *Ophiopogon japonicus*, Asparagaceae, Asia (Japan).

*Notes:* Type material of *Cercospora togashiana* has been examined. Solitary conidiophores arising from internal hyphae and pigmented conidia suggest that this is not a member of *Cercospora*. Furthermore, this species has slightly thickened conidiogenous loci and conidial hila. Based on these morphological characters, the present fungus has to be assigned to the genus *Passalora*.

***Passalora yuccae-gloriosae*** Crous, U. Braun & Alfenas, *Mycotaxon* 72: 190 (1999). (Fig. 61)

*Literature:* Deighton (1973: 111–113, as *Cercospora yuccae*).

*Illustrations:* Deighton (1973: 112, fig. 3, as *Cercospora yuccae*), Crous *et al.* (1999: 189, fig. 13).

*Description:* *Leaf spots* amphigenous, subcircular to elliptical, 1–6 mm diam, pale brown, with a darker brown border, surrounded by a thin, red-brown margin. *Caespituli* amphigenous, dark brown, to 200 µm wide and 130 µm high. *Mycelium* internal; hyphae branched, septate, 2.5–4 µm wide, pale brown, smooth. *Stromata* immersed, large, to 180 µm wide and 60 µm high, dark brown. *Conidiophores* in dense, large fascicles, arising from stromata, straight, subcylindrical to geniculate-sinuuous, unbranched, 15–65 × 3.5–6.5 µm, 2–5-septate, pale brown, thin-walled, verruculose; conidiogenous cells integrated, terminal, 15–22 µm long, sympodial, conidiogenous loci thickened and darkened, about 1.5–2.5 µm diam, usually non-protuberant. *Conidia* solitary, subcylindrical to obclavate-cylindrical, straight to somewhat curved, (20–)40–90(–160) × (3.5–)4–5.5(–6) µm, (1–)4–7(–13)-septate, olivaceous to pale brown, thin-walled, smooth or almost so (to very minutely rough-walled), apex obtuse, base obconically truncate, about 2 µm wide, hila somewhat thickened and darkened.

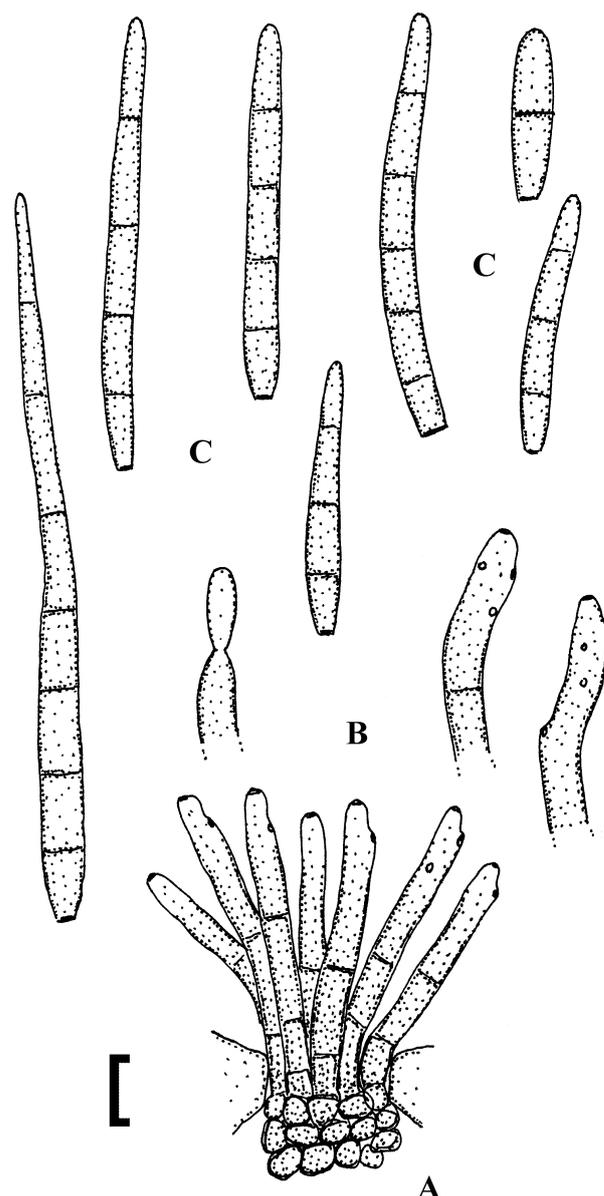
*Holotype:* **Brazil:** São Paulo, Estrada para Lindoia, Socorro, on *Yucca gloriosa* var. *recurvifolia*, 20 Sep. 1939, A. P. Viégas & O. Zagatto (IACM 3108).

*Host range and distribution:* On *Yucca* (*gloriosa* [*recurvifolia*], *Yucca* sp.), *Asparagaceae*, North America (USA, Georgia, North and South Carolina), South America (Brazil).

## *Pseudocercospora*

### Key to *Pseudocercospora* species on *Asparagaceae*

- |       |   |   |
|-------|---|---|
| 1     | Conidiophores in sporodochial conidiomata, arising from large stromata, monopodial, percurrently proliferating, with conspicuous annellations; on <i>Beaucarnea</i> or <i>Yucca</i> ..... | 2                                       |
|       | Conidiophores sympodial, annellations lacking; on <i>Cordyline</i> or <i>Maianthemum</i> .....  | 4                                       |
| 2 (1) | Conidiophores with thin to somewhat thickened walls, verruculose to verrucose, 10–60 × 4–7 µm, 0–6-septate; conidia faintly verruculose, 25–125 × 4–7 µm; on <i>Yucca</i> .....           | see <b><i>Scolecotigmina yuccae</i></b> |
|       | Conidiophores and conidia thin-walled and smooth; on <i>Beaucarnea</i> or <i>Yucca</i> (but then conidia only 2.5–5 µm wide) .....  | 3                                       |



**Fig. 61.** *Passalora yuccae-gloriosae* (IACM 3108). **A.** Conidiophore fascicle. **B.** Conidiophores. **C.** Conidia. Bar = 10 µm.

*Notes:* The name *Cercospora yuccae* has been confused and misinterpreted. A clarification of cercosporoid fungi on *Yucca* spp. was made in Crous *et al.* (1999).

- 3 (2) Conidiophores rather broad, 5–25 × 4–6 μm; conidia 4–8 μm wide; on *Beaucarnea* ..... **P. beaucarnea**  
 Conidiophores narrower, 10–50 × 2.5–5 μm; conidia 3–5(–5.5) μm wide; on *Yucca* ..... **P. concentrica**
- 4 (1) Stromata large, 50–80 μm diam; conidiophores 10–50 × 3–5.5 μm, 0–2-septate;  
 on *Cordyline* ..... **P. cordylines**  
 Stromata smaller, 15–55 μm diam; conidiophores longer and wider, 95–235 × 4–7 μm,  
 7–16-septate; on *Maianthemum* ..... **P. maianthemum**

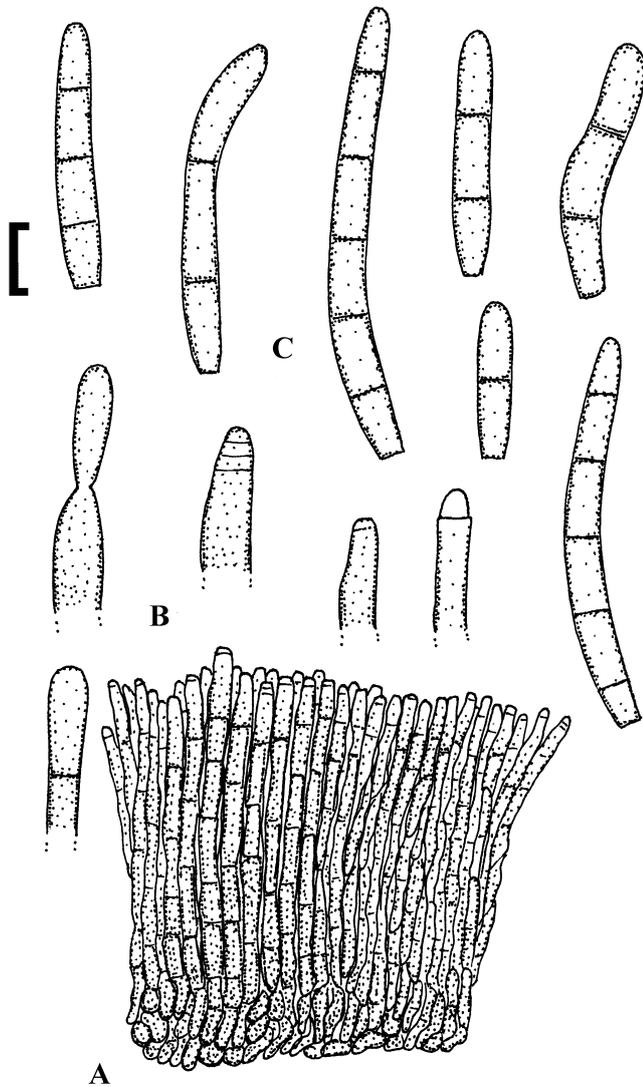


Fig. 62. *Pseudocercospora beaucarnea* (BPI 71905). A. Conidioma. B. Conidiophore tips. C. Conidia. Bar = 10 μm.

### *Pseudocercospora* species on Asparagaceae

***Pseudocercospora beaucarnea*** (Pollack & D.F. Farr) U. Braun, **comb. nov.**

Mycobank MB809011  
(Fig. 62)

*Basionym:* *Stigmina beaucarnea* Pollack & D.F. Farr,  
*Mycotaxon* 8: 193 (1997).

*Illustrations:* Pollack & Farr (1979: 198, figs 2–7, 199, figs 8–13).

*Description:* Leaf spots oblong-ellipsoid, to 8 cm long and 6 mm wide, vein-limited, pale brown, margin reddish brown, centre later becoming straw-coloured. *Conidiomata* amphigenous, punctiform-pustulate to oblong, sporodochial to acervular, deeply immersed, at first circular or elliptical in outline, later elongated or confluent, forming oblong striae to 5 mm long, erumpent, rupturing the epidermis and cuticle. *Mycelium* internal. *Stromata* immersed, consisting of a prosenchymatous stratum of interwoven brown hyphae, surmounted by a saucer-shaped base of pseudoparenchyma consisting of thick-walled, dark brown cells. *Conidiophores* numerous, in large, dense conidiomata, arising from stromata, erumpent, simple or branched, erect, composed of to 11 cylindrical cells, 4–8 × 4 μm, forming columns, darker brown below and paler above, smooth or almost so; conidiogenous cells integrated, terminal, oblong cylindrical, ampulliform to subglobose, 5–25 × 4–8 μm, pale olivaceous, thin-walled, almost smooth to verruculose, percurrently proliferating, with visible annellations, with a single broad terminal locus, 2.5–5 μm wide, neither thickened nor darkened. *Conidia* solitary, obclavate-subcylindrical, straight to curved, 30–75 × 4–8 μm, 0–7-septate, subhyaline to pale olivaceous or olivaceous-brown, thin-walled, smooth or almost so, guttulate, apex obtuse, base truncate to short obconically truncate, 2.5–4 μm wide, hila neither thickened nor darkened.

*Holotype:* USA: Texas: Brownsville (plants from Mexico), on *Beaucarnea recurvata*, 2 June 1977, intercepted by J. Van Valkenburgh, no. 007449 (BPI 71905).

*Host range and distribution:* On *Beaucarnea recurvata*, *Asparagaceae*, North America (Mexico; USA, Texas).

*Notes:* The genus *Stigmina* has been reduced to synonym with *Pseudocercospora*. Due to relatively thin-walled, smooth or almost smooth conidiophores and conidiophores with less conspicuous annellations, *S. beaucarnea* is rather close to the former genus *Cercostigmia* which is also synonymous with *Pseudocercospora*. On the other hand, the large, deeply immersed conidiomata are sporodochial to rather acervular. Among acervular genera, this species could easily be placed in *Colletogloeum* Petr. *Stigmina beaucarnea* resembles *Colletogloeum sissoo* (Syd.) B. Sutton (*C. dalbergiae* (S. Ahmad) Petr.), the type species of *Colletogloeum* which was demonstrated to cluster within the *Mycosphaerellaceae* near to the *Pseudocercospora* complex (Quaedvlieg et al. 2013).

***Pseudocercospora concentrica*** (Cooke & Ellis) U. Braun & Crous, *Mycol. Progr.* 1: 22 (2002).

(Fig. 63)

*Basionym:* *Cercospora concentrica* Cooke & Ellis, *Grevillea* 5: 90 (1877).

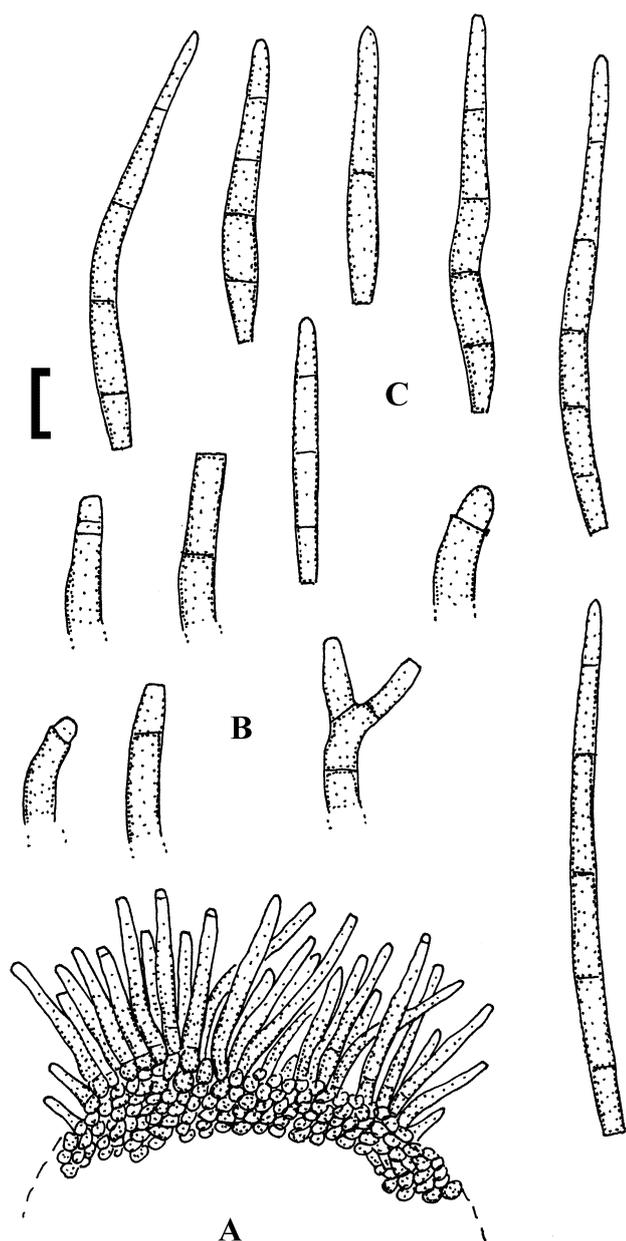


Fig. 63. *Pseudocercospora concentrica* (NY 1102862). A. Conidiophore fascicle. B. Conidiophores. C. Conidia. Bar = 10  $\mu$ m.

*Synonyms:* *Stigmata concentrica* (Cooke & Ellis) Deighton, *Trans. Brit. Mycol. Soc.* **61**: 107 (1973).

*Cercostigmata concentrica* (Cooke & Ellis) U. Braun, *Cryptog. Bot.* **4**: 108 (1993).

*Cylindrosporium angustifoliae* Ellis & Kellerm., *J. Mycol.* **2**: 81 (1886) [*holotype:* USA: Kansas: Manhattan, on *Yucca glauca*, June 1886, Kellerman, no. 838 (NY 883634); K(M) IMI 119447 (slide), NY 883632, 883633 (slides)].

?*Cylindrosporium yuccae* Montemart., *Rivista Patol. Veg.* (Padua) **7**: 231 (1915) [*type:* Italy: Milano, on *Yucca* sp. (probably not preserved)].

?*Mycosphaerella deightonii* M. Morelet, *Bull. Soc. Sci. Nat. Archéol. Toulon & Var.* **205**: 9 (1973), sexual morph [*holotype:* USA: New Jersey: Gloucester Co., Newfield, on *Yucca filamentosa*, 1 June 1874, W. A. Kellerman 2150 (NY 838826); *isotype:* NY 1102861].

*Literature:* Saccardo (1886: 479), Vassiljevsky & Karakulin (1937: 297), Chupp (1954: 344), Sivanesan (1984: 248), Simay (1987), Kobayashi (2007).

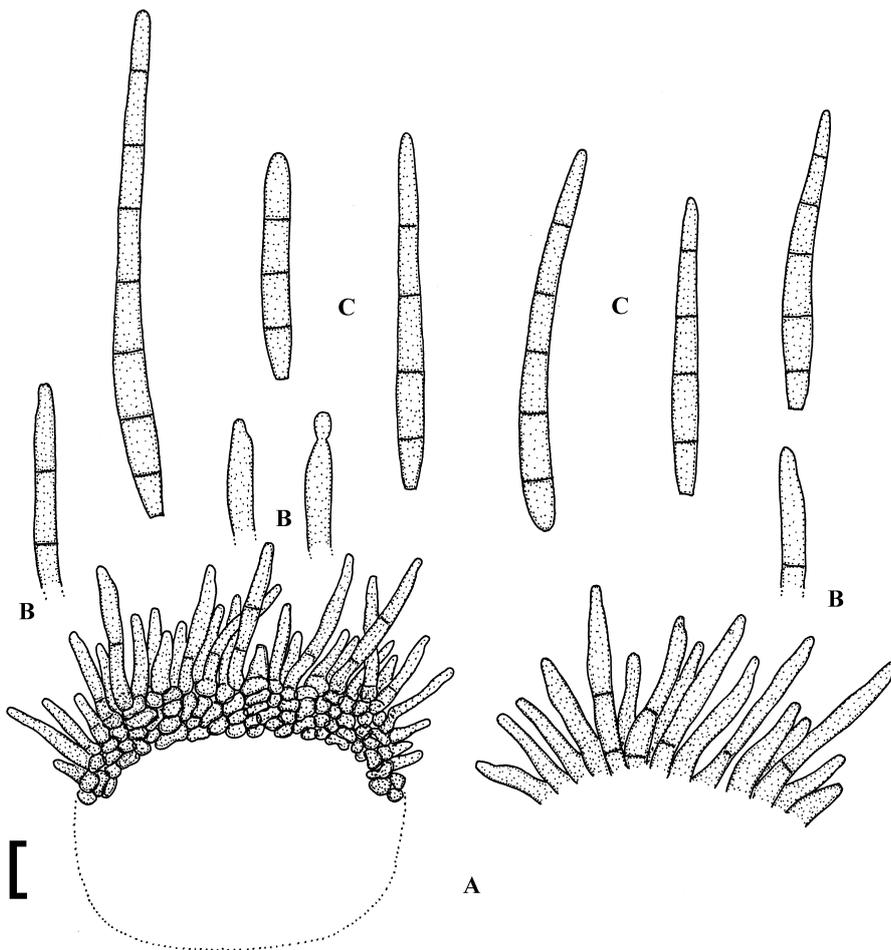
*Illustrations:* Deighton (1973: 108, fig. 1, 110, fig. 2), Sivanesan (1984: 24, fig. 137).

*Description:* Leaf spots amphigenous, also at stems, elliptical, usually to 15 mm diam, occasionally to 40  $\times$  10 mm, later often confluent, brownish to greyish brown, surrounded by a darker brown margin 1–2 mm wide, patches sometimes somewhat sunken with somewhat raised margin, spots less conspicuous on brown necrotic leaves. *Caespituli* amphigenous, punctiform to pustulate, scattered to dense, often in concentric zones, dark brown to blackish, often accompanied by spermogonia and mycosphaerella-like ascomata. *Mycelium* internal; hyphae branched, septate, subhyaline to olivaceous, occasionally darker, above all around stromata, 2–7  $\mu$ m diam. *Stromata* deeply immersed, later erumpent, well-developed, large, 100–500  $\mu$ m wide and 80–300  $\mu$ m high, consisting of a basal prosenchymatous stratum, 25–40  $\mu$ m thick, of interwoven hyphae surrounded by a palisade-like mass of dense, parallel, closely septate, branched hyphae, cells 6–14  $\mu$ m long, pale olivaceous, thin-walled, smooth, giving rise to conidiophores at their distal ends. *Conidiophores* numerous, arising from stromata, loose to usually dense, forming sporodochial conidiomata, erect, straight to somewhat sinuous, but not geniculate, unbranched or only rarely branched, 10–50  $\times$  2.5–5  $\mu$ m, aseptate or only with few septa, pale olivaceous to very pale olivaceous-brown, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 10–30  $\mu$ m long, with a single terminal locus, truncate to slightly convex, monoblastic, determinate to percurrent, with fine annellations. *Conidia* solitary, cylindrical, subcylindrical to obclavate-cylindrical, straight to curved, 20–75(–90)  $\times$  3–5(–5.5)  $\mu$ m, (0–)1–7-septate (*in vitro* conidia to 180  $\mu$ m long and to 10-septate), pale olivaceous, thin-walled, smooth, apex obtuse to subacute, base subtruncate to short obconically truncate, 1.5–3  $\mu$ m wide, hila unthickened, not darkened.

*Lectotype (designated here, MycoBank MBT178142):* USA: New Jersey: Newfield, on *Yucca filamentosa*, 1 June 1874, J. B. Ellis (K(M) 190710). *Isolectotype:* NY 1102862, K(M) IMI 119447 (slide).

*Host range and distribution:* On *Yucca* (*aloifolia*, *brevifolia*, *filamentosa*, *glauca*, *gloriosa*, *guatemalensis*, *Yucca* sp.), *Asparagaceae*, Caucasus (Georgia), Europe (Hungary, Italy, Russia, Switzerland), North America (Mexico; USA, Arizona, Connecticut, Georgia, Iowa, Illinois, Kansas, Mississippi, New Jersey, Oklahoma, Texas, Virginia), West Indies (Puerto Rico, Virgin Islands).

*Notes:* Deighton (1973) cited syntype material deposited at K as “holotype” and material deposited at NY as isotype, which was incorrect as in the original description a holotype designation is lacking and the cited collection comprises several duplicates. Morelet (1973) described *Mycosphaerella deightonii* as sexual morph of *P. concentrica* with the following



**Fig. 64.** *Pseudocercospora cordyline* (B 700014864). **A.** Conidiophore fascicles. **B.** Conidiophores. **C.** Conidia. Bar = 10  $\mu$ m.

brief description: *ascomata* 60–120  $\mu$ m diam; asci 8-spored, 45–52  $\times$  8.5–9  $\mu$ m; ascospores 14.5–19  $\times$  3.5–4  $\mu$ m, hyaline, with a single medium septum. The genetic connection between *M. deightonii* and *P. concentrica* is, however, unproven and unclear. Aptroot (2006: 76 and 12, fig. 247) examined type material and emphasized that *M. deightonii* is morphologically indistinguishable from *Planistromella acervata*. Barr (1996) discussed *M. deightonii* in connection with *P. acervata* as well, but without final conclusion and with reference to smaller ascospores in *M. deightonii*. Crous (in Crous et al. 2011) described *Mycosphaerella valgourgensis* on *Yucca* sp. from France, which forms conidia of similar shape and size. However, this species is genetically distinct from *Pseudocercospora concentrica* (*Mycosphaerella deightonii*) and does not cluster within the *Pseudocercospora* s. str. clade and the *Mycosphaerellaceae* at all. Furthermore, its ascospores are wider and the conidia, only formed *in vitro*, are 45–150  $\mu$ m long and hyaline, only becoming somewhat pigmented and verruculose with age. Records of “*P. concentrica*” from Japan have been established, also by means of molecular sequence analyses, and seem rather to belong to *Mycosphaerella valgourgensis*.

***Pseudocercospora cordyline*** U. Braun,  
*Schlechtendalia* 1: 29 (1998).

(Fig. 64)

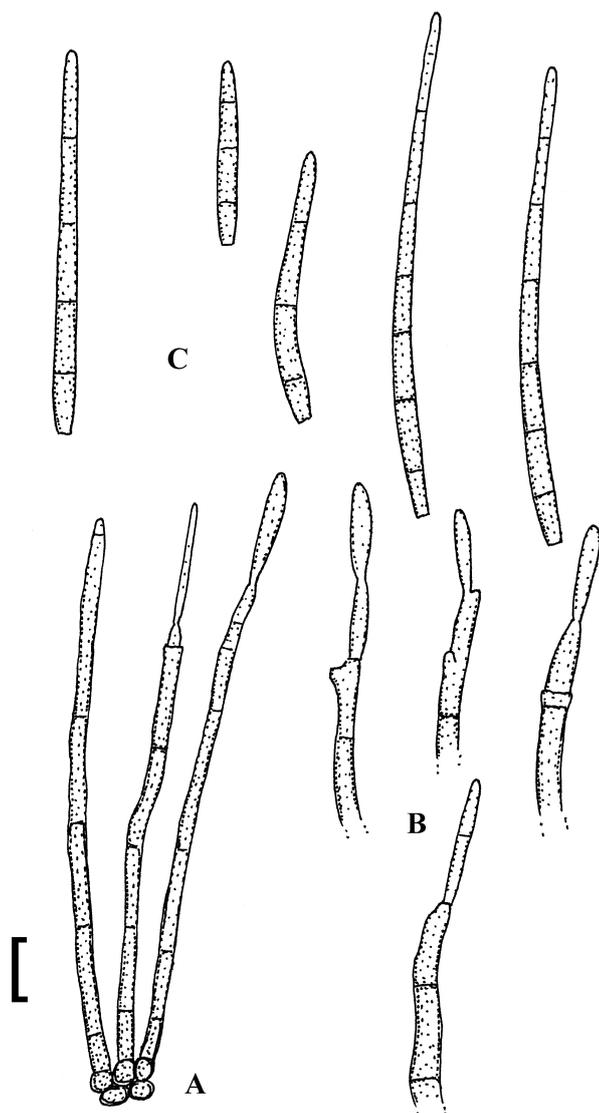
*Literature:* Saccardo (1906: 611), Chupp (1954: 344).

*Illustration:* Braun (1998b: 27, fig. 6).

*Description:* *Leaf spots* amphigenous, subcircular, 2–5 mm diam, tan to dark reddish brown, margin narrow to moderately wide, dark brown to blackish. *Caespituli* amphigenous, punctiform, blackish. *Mycelium* internal. *Stromata* well-developed, 50–80  $\mu$ m diam, dark brown to blackish, immersed to erumpent. *Conidiophores* numerous, in dense fascicles, arising from stromata, erect, straight, subcylindrical to somewhat flexuous, but barely geniculate-sinuuous, unbranched, 10–50  $\times$  3–5.5  $\mu$ m, 0–2-septate, pale olivaceous to medium brown throughout, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 10–25  $\mu$ m long, proliferation sympodial, conidiogenous loci inconspicuous or somewhat refractive, visible in front view as minute circle, but neither thickened nor darkened. *Conidia* solitary, obclavate-cylindrical, (15–)30–80(–100)  $\times$  4–6  $\mu$ m, 2–8-septate, subhyaline to pale olivaceous-brown, thin-walled, smooth, apex usually obtuse, base obconically truncate to rounded, about 2–3  $\mu$ m wide, hila neither thickened nor darkened, occasionally somewhat refractive.

*Holotype:* **Brazil:** São Paulo, Botanical Garden, on living leaves of *Cordyline spectabilis* [*dracaenoides*], 10 Aug. 1905, A. Usteri (B 700014864). *Isotype:* CUP 39513.

*Host range and distribution:* On *Cordyline spectabilis*, *Asparagaceae*, South America (Argentina, Brazil).



**Fig. 65.** *Pseudocercospora maianthemii* (based on Kirschner & Piepenbring 2008: 26–27, figs 5–6). **A.** Conidiophore fascicle. **B.** Conidiophores. **C.** Conidia. Bar = 10  $\mu$ m.

**Notes:** Type material of *Cercospora cordylines* Speg. (Argentina, Santa Catalina, Spegazzini and Brazil, São Paulo, Botanica Garden, Sep. 1905, *Usteri* 14) could not be traced at LPS. Therefore, Braun (1998) described *Pseudocercospora cordylines* as a new species with a collection from B as holotype, which is topotype material of *C. cordylines*, collected in Aug. 1905. However, syntype material of *C. cordylines* has since been found at CUP and proved to be *Passalora cordylines*.

***Pseudocercospora maianthemii*** R. Kirschner, *Mycol. Progr.* **7**: 24 (2008). (Fig. 65)

**Illustrations:** Kirschner & Piepenbring (2008: 26–27, figs 5–6).

**Description:** *Leaf spots* amphigenous, pale to dark brown with irregular margin, confluent to streaks to 40 mm long and 5 mm wide. *Caespituli* hypophyllous. *Mycelium* internal, intercellular; hyphae branched, 2–5  $\mu$ m wide, septate, pale

brown, smooth. *Stromata* substomatal, irregularly shaped, 15–55  $\mu$ m diam, pale to medium brown. *Conidiophores* formed singly or in fascicles of about 15, rarely to 30, arising from stromata, through stomata, erect, straight to somewhat geniculate-sinuuous, unbranched, rather long, (95–)115–190(–235)  $\times$  4–7  $\mu$ m, mostly about 5  $\mu$ m wide, 7–16-septate, distance between septa 4–28  $\mu$ m, dark brown, paler towards the tip, thin-walled, smooth, with percurrent rejuvenations, but not distinctly annellidic at the apex; conidiogenous cells integrated, terminal, pale to medium brown, proliferation sympodial, with 1–2 conidiogenous loci, inconspicuous to visible by being truncate, sometimes denticle-like, but neither thickened nor darkened, 2–3  $\mu$ m diam. *Conidia* solitary, obclavate-cylindrical, straight to slightly curved, (20–)40–75(–90)  $\times$  4–5(–6)  $\mu$ m, tapering to 1.5–2  $\mu$ m towards the tip, (2–)3–5(–7)-septate, very pale but distinctly brown, thin-walled, smooth, apex obtuse to subacute, base obconically truncate, 2–3  $\mu$ m wide, neither thickened nor darkened.

**Holotype:** Panama: Chiriquí Province: Las Nubes, ca. 2.250 m alt., on *Maianthemum gigas* (or *M. paniculatum*), *Asparagaceae*, 25 Feb. 2003, R. Kirschner & J. A. Bernal Vega 1695 (FR). **Isotype:** PMA. **Ex-type culture:** CBS 103099.

**Host range and distribution:** Only known from the type collection.

### ***Scolecostigmina***

A single species.

***Scolecostigmina yuccae*** (Cooke) Crous, U. Braun & Alfenas, *Mycotaxon* **72**: 192 (1999). (Fig. 66)

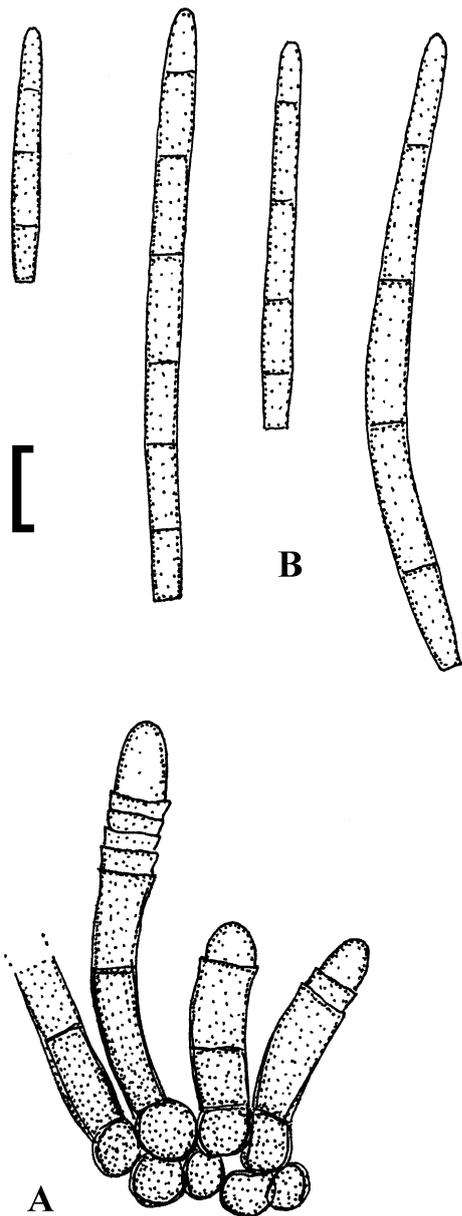
**Basionym:** *Cercospora yuccae* Cooke, *Grevillea* **7**: 35 (1878).

**Literature:** Saccardo (1886: 479), Vassiljevsky & Karakulin (1937: 297), Chupp (1954: 355).

**Illustration:** Crous *et al.* (1999: 189, fig. 14).

**Exsiccatae:** Ravenel, *Fungi Amer. Exs.* 292

**Description:** *Leaf spots* amphigenous, oval to oblong, 8–30  $\times$  2–6 mm, pale to medium brown on the upper surface, grey to medium brown below, margin lighter brown, somewhat raised, lesions occasionally bulging on upper surface. *Caespituli* amphigenous, punctiform, dark brown to blackish. *Mycelium* internal; hyphae branched, hyaline, thin-walled, 1.5–2.5  $\mu$ m wide. *Stromata* immersed, well-developed, subglobose, 25–125  $\mu$ m diam, dark brown. *Conidiophores* numerous, in dense fascicles, arising from stromata, erumpent, forming sporodochial conidiomata, erect, straight, subcylindrical-conical to somewhat curved, not geniculate, unbranched or occasionally branched at the very base, 10–60  $\times$  4–7  $\mu$ m, 0–6-septate, pale to dark brown, wall thin to somewhat thickened, faintly verruculose to verrucose; conidiogenous cells integrated, terminal or conidiophores aseptate, i.e. reduced to conidiogenous

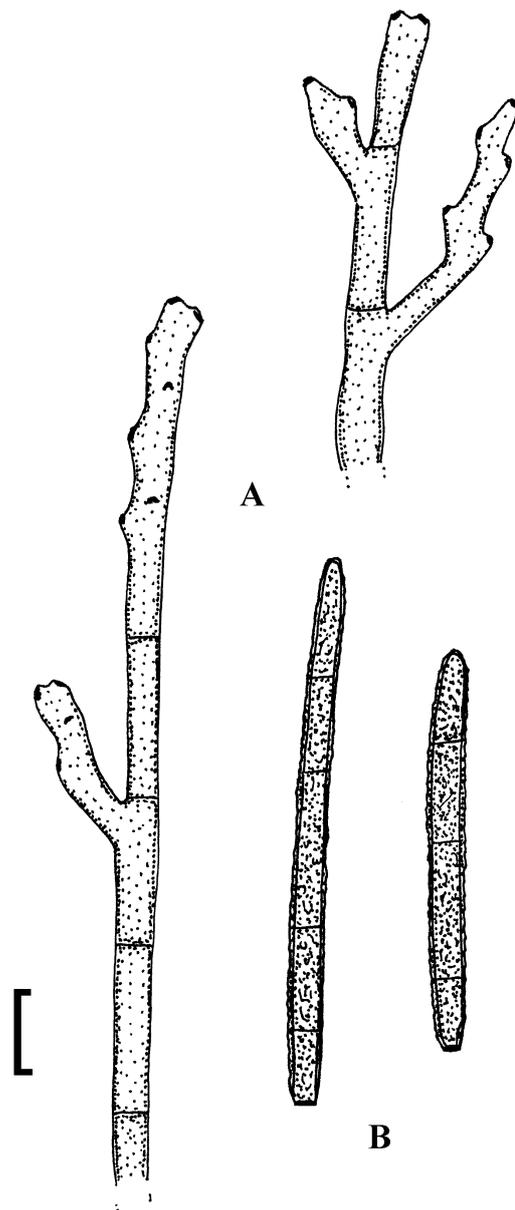


**Fig. 66.** *Scolecstigmia yuccae* (BPI 435122). **A.** Conidiophore fascicle. **B.** Conidia. Bar = 10  $\mu$ m.

cells, 10–25  $\mu$ m long, percurrently proliferating, with a single terminal locus, unthickened, not darkened. *Conidia* solitary, subcylindrical to obclavate, 25–125  $\times$  4–7  $\mu$ m, 1–6-septate, subhyaline, olivaceous to medium brown, thin-walled, faintly verruculose, apex obtuse, base short obconically truncate, hila unthickened, not darkened.

*Lectotype* (designated by Crous et al. 1999): **USA:** Georgia: Darien, on *Yucca* sp., H. W. Ravenel [Ravenel, Fungi Amer. Exs. 292] (BPI 435122). *Isolectotypes*: Ravenel, Fungi Amer. Exs. 292, e.g. CUP, K(M) IMI 119448.

*Host range and distribution:* On *Yucca* (*gloriosa*, *Yucca* sp.), *Asparagaceae*, South America (Brazil), North America (USA, Alabama, Georgia, Kansas).



**Fig. 67.** *Zasmidium agavicola* (INIFAT C87/431). **A.** Conidiophores. **B.** Conidia. Bar = 10  $\mu$ m.

*Notes:* The type species of *Scolecstigmia* has been sequenced and clusters distantly from the *Pseudocercospora* s. str. clade. On the other hand, various other former *Scolecstigmia* species cluster within this clade and belong to *Pseudocercospora*. Hence, the true generic affinity has to be proven on the basis of molecular sequence analyses. In the interim, we prefer to retain the present species in *Scolecstigmia*. “*Cercospora yuccagena* Cooke” is a typographical error for *Cercospora yuccae* Cooke (Chupp 1954: 356).

**Zasmidium****Key to *Zasmidium* species on Asparagaceae**

- 1 Ramularia-like species; conidia catenate, cylindrical to fusiform, 10–55 × 2–6 µm, 0–3(–4)-septate, verruculose; conidiophores fasciculate as well as solitary, arising from superficial hyphae, 20–100 × 2–5 µm, subhyaline, greenish, yellowish, pale olivaceous to reddish brown, almost smooth; on *Maianthemum* ..... **Z. subsanguinea**  
Cercosporoid species; conidia formed singly, much longer, to 600 µm; on other hosts ..... 2
- 2 (1) Stromata lacking; conidiophores solitary, to 100 µm long, verruculose; conidia 170–600 × 7.5–10 µm, 5–55-septate, brown to dark brown, coarsely verruculose; on *Agave* ..... **Z. agavicola**  
Stromata developed, 10–35 µm diam; conidiophores fasciculate as well as solitary, 50–180 µm long, smooth; conidia much shorter and narrower, (8–)12–180 × 2–4 µm, 0–12-septate, subhyaline to pale olivaceous, verruculose; on *Dracaena* ..... **Z. dracaenae**

***Zasmidium* species on Asparagaceae*****Zasmidium agavicola* (R.F. Castañeda & L. García)**U. Braun & R.F. Castañeda, **comb. nov.**

Mycobank MB809038

(Fig. 67)

*Basionym:* *Stenella agavicola* R.F. Castañeda & L. García, *Fungi Cubenses* 3: 13 (1988).*Illustration:* Castañeda (1988: fig. 25).

*Description:* Colonies amphigenous, forming circular, velutinous patches, olivaceous to dark brown. *Mycelium* internal and external; superficial hyphae branched, septate, 2–3 µm wide, brown, smooth to verruculose. *Stroma* lacking. *Conidiophores* solitary, arising from superficial hyphae, erect, straight to curved, geniculate, unbranched or branched, to 100 µm long and 3–4 µm wide at the base, septate, brown, verruculose, rarely smooth; conidiogenous cells integrated, usually terminal, with several conspicuous conidiogenous loci, truncate. *Conidia* solitary, cylindrical-filiform, very long, 170–600 × 7.5–10 µm, 5–55-septate, brown to dark brown, coarsely verruculose, apex obtuse, rounded, base short obconically truncate, hila somewhat thickened and darkened.

*Holotype:* **Cuba:** Prov. Pinar del Río: Soroa, on *Agave* sp., *Asparagaceae*, 24 Jan. 1987, M. González Avila (INIFAT C87/431).

*Host range and distribution:* Only known from the type collection.

***Zasmidium dracaenae* (Hansf.) U. Braun & Crous, *Schlechtendalia* 20: 101 (2010).**

(Fig. 68)

*Basionym:* *Cercospora dracaenae* Hansf., *Proc. Linn. Soc. London* 1942–1943: 56 (1943).*Synonym:* *Stenella dracaenae* (Hansf.) U. Braun & Crous, in Crous & Braun, *Mycosphaerella and Anam.*: 166 (2003).*Literature:* Chupp (1954: 345).

*Description:* Leaf spots variable, irregularly shaped, small, 1–5 mm diam, to very large, to 80 mm diam, pale straw-coloured, yellowish, ochraceous, later brownish with white centre, margin narrow, darker, sometimes with yellowish halo and zonate. *Caespituli* amphigenous, mostly hypophyllous, punctiform to subeffuse, blackish. *Mycelium* internal and external; superficial hyphae branched, mostly at right angles, septate, 1–3 µm wide, hyaline to pale brown, thin-walled, verruculose. *Stromata* substomatal, 10–35 µm diam, occasionally erumpent, brown. *Conidiophores* in small to moderately, large, loose fascicles, 2–25, arising from stromata, through stomata, erect, cylindrical-filiform, setiform, only geniculate-sinuuous near the apex, unbranched, rarely with short branchlets near the tip, about 50–180 × 2–4 µm, pluriseptate throughout, pale to medium brown or olivaceous, paler towards the tip, wall somewhat thickened below, thin above, smooth; conidiogenous cells integrated, terminal, about 10–30 µm long, conidiogenous loci conspicuous, thickened and darkened, about 1 µm diam. *Conidia* solitary, shape and size variable, short conidia narrowly ellipsoid-ovoid to obclavate-cylindrical, long conidia acicular, (8–)12–180 × 2–4 µm, 0–12-septate, hyaline to pale olivaceous, thin-walled, verruculose, apex obtuse to subacute, base truncate or short obconically truncate, 1–1.5 µm wide, hila slightly thickened and darkened.

*Holotype:* **Uganda:** Mukono, on *Dracaena fragrans*, Hansford 1982 (probably not preserved).

*Host range and distribution:* On *Dracaena* (*arborea*, *fragrans* [*ugandensis*], *marginata* hort., *Dracaena* sp.), *Asparagaceae*, Africa (Sierra Leone, Uganda), Asia (Japan), North America (Mexico; USA, Texas).

*Notes:* Type material has not been found. The present description is based on material on *Dracaena arborea* collected by Deighton in 1953 in Sierra Leone (K(M) IMI 53368). Material collected in Japan on *D. fragrans* is deposited as BPI 435828, and another collection from Mexico, intercepted at Brownsville, Texas, USA as BPI 435829. Braun & Sivapalan (1999) described and illustrated *Stenella* sp. on *Dracaena* sp. from Brunei (conidiophores solitary or emerging through

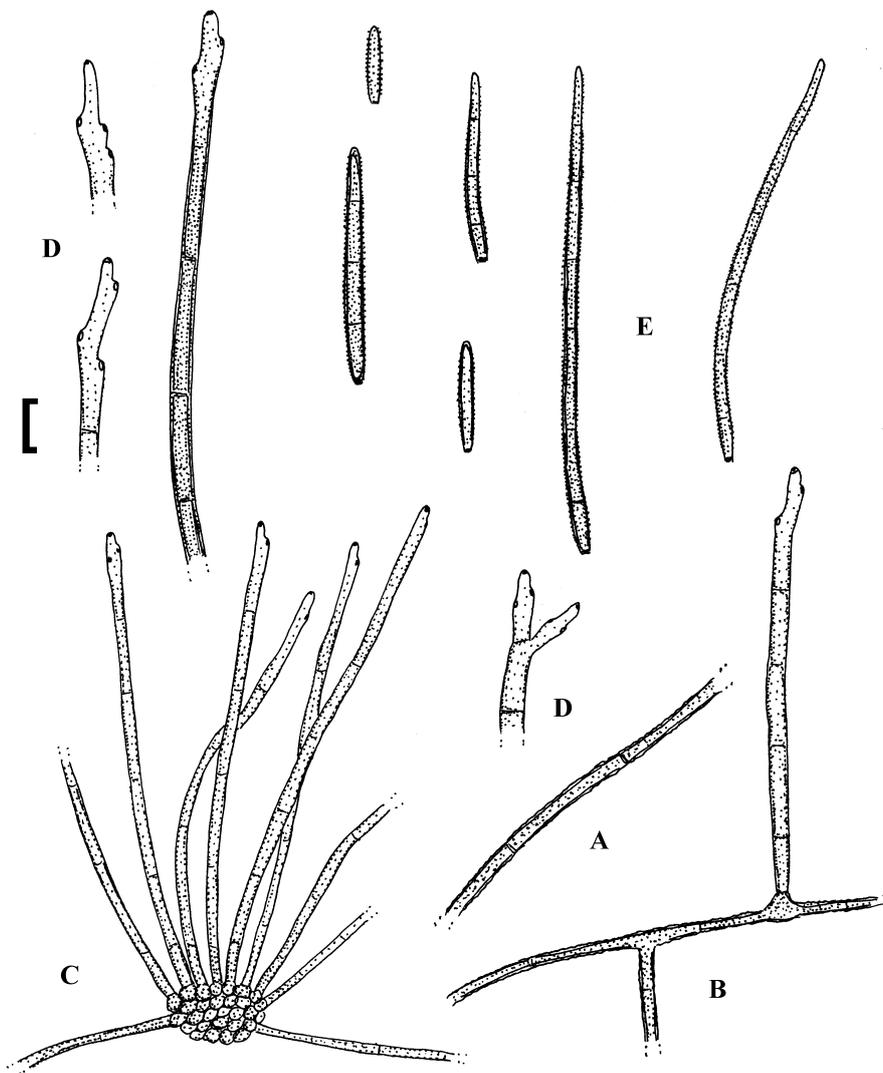


Fig. 68. *Zasmidium dracaenae* (K(M) IMI 53368). A. Hypha. B. hypha with conidiophore. C. Conidiophore fascicle. D. Conidiophore tips. E. Conidia. Bar = 10 µm.

stomata, 10–20 × 1.5–3 µm, 0–1-septate, subhyaline to pale olivaceous; conidia solitary, (5–)10–15(–25) × 1–2 µm, 0–1-septate, subhyaline to pale olivaceous, verruculose). Furthermore, Mall et al. (2013) recorded *Stenella* sp. on *Dracaena marginata* from India (Uttar Pradesh).

**Zasmidium subsanguineum** (Ellis & Everh.) U. Braun, *Schlechtendalia* **20**: 103 (2010). (Fig. 69)

*Basionym*: *Cercospora subsanguinea* Ellis & Everh., *J. Mycol.* **4**: 4 (1888).

*Synonyms*: *Ramularia subsanguinea* (Ellis & Everh.) Karak., in Vassiljevsky & Karakulin, *Fungi Imperfecti Parasitici (Hyphomycetes)* **1**: 117 (1937).

*Ramularia subsanguinea* (Ellis & Everh.) Savile, *Canad. J. Bot.* **35**: 205 (1957).

*Stenella subsanguinea* (Ellis & Everh.) U. Braun, *Cryptog. Bot.* **3**: 242 (1993).

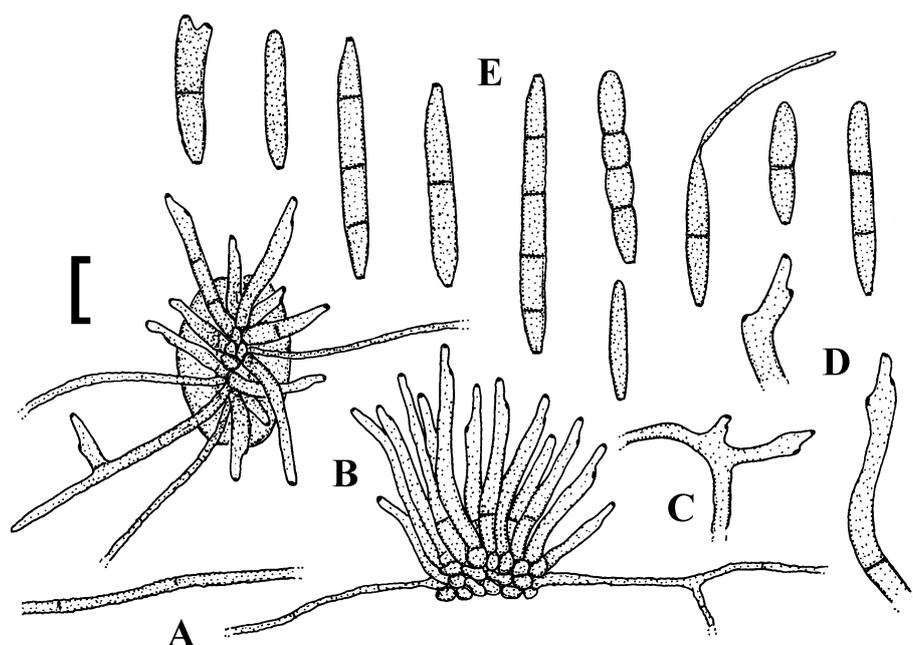
*Ramularia rubicunda* Bres., *Hedwigia* **36**: 200 (1896) [*lectotype* (designated by Braun 1993): **Germany**: Saxony: Polenzthal, 13 June 1884, K. W. Krieger, Krieger, Fungi Saxon. Exs. 1293 (HAL); *isolectotypes*: Krieger, Fungi Saxon. Exs. 1293, e.g. BPI 419014, 4119023.

*Literature*: Saccardo (1892: 655), Vassiljevsky & Karakulin (1937: 217–118), Chupp (1954: 355), Braun (1998: 377).

*Illustrations*: Braun (1993a: 242, fig. 19; 1998: 375, fig. 636).

*Exsiccatae*: Kabát & Bubák, Fungi Imperf. Exs. 90. Krieger, Fungi Saxon. Exs. 1293. Krypt. Exs. 1495. Petr., Fl. Bohem. Morav. Exs. Pilze 1768. Syd., Mycoth. Germ. 2237.

*Description*: *Leaf spots* amphigenous, subcircular to somewhat angular-irregular, 0.5–6 mm diam, occasionally confluent and larger, at first yellowish or yellowish brown, later with pale centre and narrow to moderately wide, brown margin, finally often large leaf segments discoloured, brown, necrotic, sometimes with shot-hole symptoms. *Caespituli* usually hypophyllous, punctiform, greyish to pale reddish. *Mycelium* internal and external; superficial hyphae sparingly to well-developed, emerging through stomata or arising from stomata, branched, septate, 1–4 µm wide, yellowish to olivaceous, thin-walled, almost smooth to distinctly verruculose. *Stromata* substomatal, small, subhyaline to faintly pigmented. *Conidiophores* in small to moderately large, loose to dense fascicles, arising from stomatic hyphal aggregations, emerging through stomata, or solitary, arising



**Fig. 69.** *Zasmidium subsanguineum* (HAL, Krieger, Fungi Saxon. Exs. 1293). **A.** Superficial hyphae. **B.** Conidiophore fascicles. **C.** Solitary conidiophores. **D.** Conidiophores. **E.** Conidia. Bar = 10  $\mu$ m.

from superficial hyphae, lateral, rarely terminal, erect, straight, flexuous, geniculate-sinuuous, simple or occasionally branched, 20–100  $\times$  2–5  $\mu$ m, continuous to pluriseptate, subhyaline, greenish, yellowish, olivaceous to reddish brown, thin-walled, almost smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, about 10–30  $\mu$ m long, conidiogenous loci conspicuous, thickened and darkened, 1–1.5  $\mu$ m diam. *Conidia* catenate, occasionally in branched chains, more or less cylindrical to fusiform, 10–55  $\times$  2–6  $\mu$ m, 0–3(–4)-septate, subhyaline, yellowish to pale olivaceous, thin-walled, verruculose, ends rounded to truncate, 1–2  $\mu$ m diam, hila thickened and darkened.

**Holotype:** **Canada:** *British Columbia:* on *Maianthemum canadense*, 6 Oct. 1887, B.C. Macoun 12 (NY 838629). **Isotypes:** CUP 41349, NY 41348.

**Host range and distribution:** On *Maianthemum* (*bifolium*, *canadense*, *dilatatum* [*kamtschaticum*], *racemosum* subsp. *amplexicaule*), *Asparagaceae*, Asia (Kazakhstan; Russia, Siberia), Europe (Austria, Belarus, Czech Republic, Estonia, France, Finland, Germany, Hungary, Italy, Latvia, Lithuania, Poland, Russia, Slovakia, Sweden, Ukraine), North America (Canada, Ontario, Quebec; USA, Alaska, California, Michigan, New York, Ohio, Oregon, Pennsylvania, Vermont, Washington, Wisconsin).

## Colchicaceae

### Cercospora

#### Key to *Cercospora* species on Colchicaceae

- |       |  |                      |
|-------|--|----------------------|
| 1     | Conidiophores relatively short and narrow, 25–55 $\times$ 2–4 $\mu$ m; conidia narrowly obclavate, 30–80 $\times$ 2–3.5 $\mu$ m, olivaceous; on <i>Iphigenia</i> ..... | <b>C. iphigeniae</b> |
|       | Conidiophores longer, to 170 $\mu$ m, and wider, 3–7 $\mu$ m; conidia acicular to obclavate-cylindrical, hyaline, 2.5–5.5 $\mu$ m wide; on other hosts .....           | 2                    |
| 2 (1) | On <i>Disporum</i> .....   | <b>C. dispori</b>    |
|       | On <i>Gloriosa</i> .....   | <b>C. gloriosae</b>  |

#### *Cercospora* species on Colchicaceae

***Cercospora dispori*** Togashi & Maki, *Trans. Sapporo Nat. Hist. Soc.* **17**: 98 (1942). (Fig. 70)

**Literature:** Chupp (1954: 345), Katsuki (1965: 42), Kim & Shin (1999a), Shin & Kim (2001: 62), Crous & Braun (2003: 164).

**Illustration:** Shin & Kim (2001: 63, fig. 22).

**Description:** *Leaf spots* amphigenous, scattered to confluent, usually vein-limited, subcircular, elliptical to angular, brown, ranging from yellowish brown, reddish brown to dark brown, 5–15 mm diam, confluent, later entire leaflets becoming necrotic, turning brown to blackish. *Caespituli* amphigenous, punctiform, scattered, dark brown to blackish. *Mycelium*

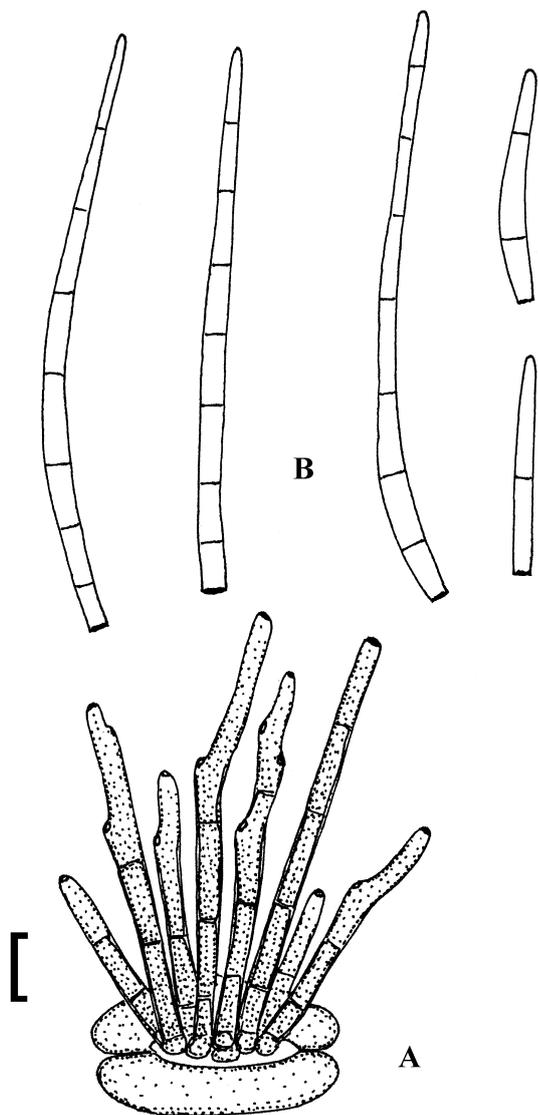


Fig. 70. *Cercospora dispori* (TNS-F-243895). A. Conidiophore fascicle. B. Conidia. Bar = 10  $\mu$ m.

internal; hyphae branched, septate, 1.5–3.5  $\mu$ m wide, hyaline to pale olivaceous or brown, thin-walled, smooth. *Stromata* lacking to well-developed, 10–70  $\mu$ m diam, substomatal or intraepidermal, subglobose, dark brown to blackish brown. *Conidiophores* in small to moderately large fascicles, 2–15, loose to moderately dense, occasionally solitary, arising from stromata, through stomata or erumpent, erect, straight, subcylindrical to geniculate in the upper half, unbranched, (10–)20–150(–200)  $\times$  3.5–7.5  $\mu$ m, (0–)1–7(–9)-septate, pale olivaceous to brown, often paler towards the tip, wall somewhat thickened, smooth; conidiogenous cells integrated, terminal and intercalary, about 10–30  $\mu$ m long, proliferation sympodial, rarely percurrent, conidiogenous loci terminal and lateral, thickened and darkened, 1.5–2.5  $\mu$ m diam. *Conidia* solitary, acicular or subacicular to cylindrical to almost filiform or somewhat obclavate-cylindrical, 25–130(–200)  $\times$  3.5–5.5  $\mu$ m, 1–12-septate, hyaline, thin-walled, smooth, apex obtuse to subacute, base truncate to slightly obconically truncate, about 2–2.5  $\mu$ m wide, hila somewhat thickened and darkened.

**Holotype: Japan:** Fukuoka Pref.: Mt Hiko, on *Disporum smilacinum* var. *ramosum*, 22 Sep. 1940, Y. Maki & T. Katsuki (TNS-F-243895).

**Host range and distribution:** On *Disporum* (*smilacinum*, *viridescens*), *Colchicaceae*, Asia (Japan, Korea).

**Notes:** Groenewald *et al.* (2013) included this species in molecular sequence analyses of the *Cercospora* s. str. complex and confirmed its position as species of its own. In a combined tree it clusters as sister to *C. chinensis*.

***Cercospora gloriosae* Syd., Ann. Cryptog. Exot. 2: 266 “1929” (1930).**

(Fig. 71)

**Synonym:** *Cercospora gloriosicola* J.M. Yen & Lim, *Bull. Trimestriel Soc. Mycol. France* 85: 467 “1969” (1970) [holotype: **Singapore:** on *Gloriosa superba*, 2 Aug. 1969, G. Lim (PC)].

**Literature:** Chupp (1954: 346), Vasudeva (1963: 114), Crous & Braun (2003: 199–200), Kamal (2010: 47).

**Illustration:** Yen & Lim (1980: 214, fig. 17).

**Description:** Leaf spots amphigenous, scattered, circular, subcircular to somewhat angular-irregular, 2–20 mm diam, at first greenish, yellowish, later dingy grey, with narrow darker border. *Caespituli* amphigenous, often more abundant on the lower leaf surface, punctiform, dark. *Mycelium* internal. *Stromata* substomatal, almost lacking or small, 10–40  $\mu$ m diam, rarely larger, to 70  $\mu$ m diam, medium to dark brown, composed of swollen hyphal cells, 3–7  $\mu$ m diam. *Conidiophores* in small to large fascicles, loose to moderately dense, arising from stromata, through stomata, erect, straight, subcylindrical to distinctly geniculate or geniculate-sinuuous towards the apex, unbranched or only rarely branched, 15–120(–170)  $\times$  3–7  $\mu$ m, 1–8-septate, pale to medium brown or olivaceous throughout or paler towards the tip, wall thin to somewhat thickened, smooth; conidiogenous cells integrated, terminal and intercalary, 10–30  $\mu$ m long, conidiogenous loci conspicuous, thickened and darkened, 2.5–4  $\mu$ m diam. *Conidia* solitary, shorter conidia obclavate-cylindrical, longer ones subacicular to distinctly acicular, 30–120  $\times$  2.5–5  $\mu$ m, 3–11-septate, hyaline, thin-walled, smooth, apex obtuse to acute, sometimes flagelliform, base truncate to short obconically truncate, 2.5–3.5  $\mu$ m wide, hila thickened and darkened.

**Lectotype (designated here, MycoBank MBT178179): India:** Bihar: Pusa, on *Gloriosa superba*, 15 Sep. 1908, P. C. Kar, no. 2259 (CUP 39896). *Isolectotype:* HCIO 2259.

**Host range and distribution:** On *Gloriosa* (*superba* [*virescens*], *Gloriosa* sp.), *Colchicaceae*, Africa (Ethiopia, Uganda), Asia (India, Indonesia, Singapore).

**Notes:** A true *Cercospora* s. str. distinguished from *C. apii* s. lat., which possibly attacks *Gloriosa* spp. as well, by having distinct lesions and obclavate-cylindrical to acicular conidia

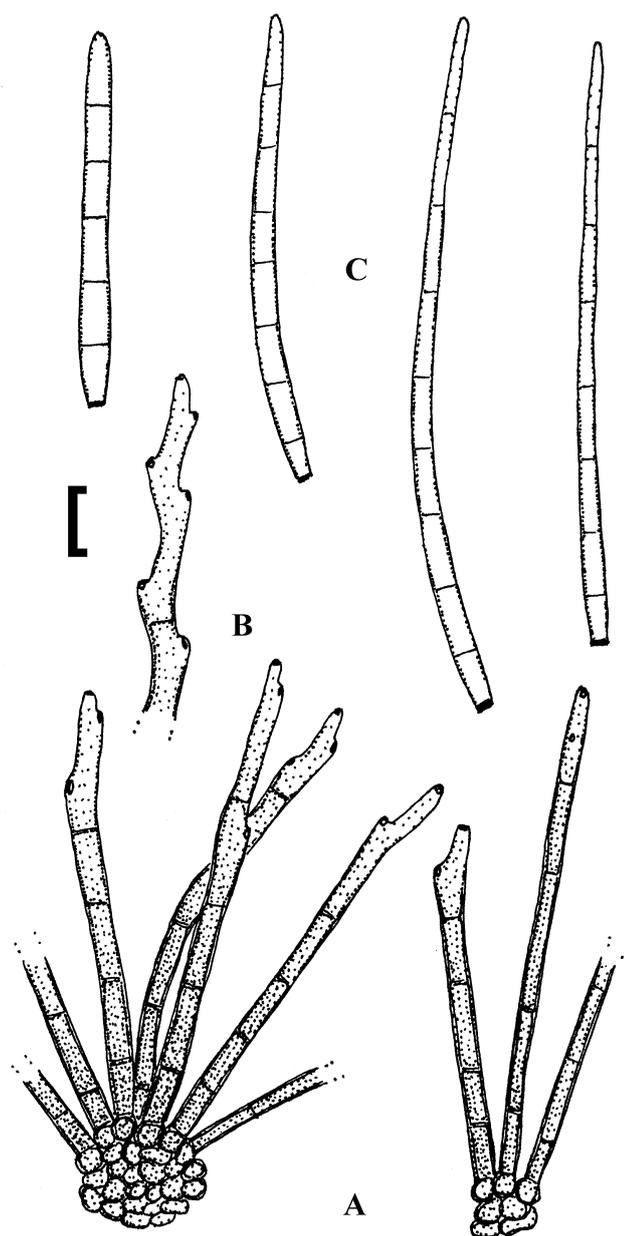


Fig. 71. *Cercospora gloriosae* (CUP 39896). A. Conidiophore fascicles. B. Conidiophore tip. C. Conidia. Bar = 10  $\mu$ m.

with truncate to obconically truncate base and obtuse, rounded apices. The conidiogenous loci and conidial hila are 2.5–4  $\mu$ m wide. Three well-developed Indian samples from Uttar Pradesh have been examined (K(M) 242532, 242946, 254732). The differentiation between *C. gloriosa* and *C. gloriosicola* is vague and could be proven by re-examinations of type material and other collections. Yen & Lim (1970) based the differentiation between the two species on Chupp's (1954) description of *C. gloriosae*, who mentioned acicular conidia 2–4  $\mu$ m wide. It is unclear on which specimens Chupp's (1954) description and data were based. Yen & Lim (1970) described obclavate to obclavate-cylindrical conidia, 4–5  $\mu$ m wide, and large stromata, 48–70  $\mu$ m diam. Type material of *C. gloriosicola*, deposited at PC, has been re-examined, and acicular conidia 2.5–3.5  $\mu$ m wide and stromata to 40  $\mu$ m diam have been found. Thus, the size of the stromata and the conidial shape and size, obclavate-cylindrical to

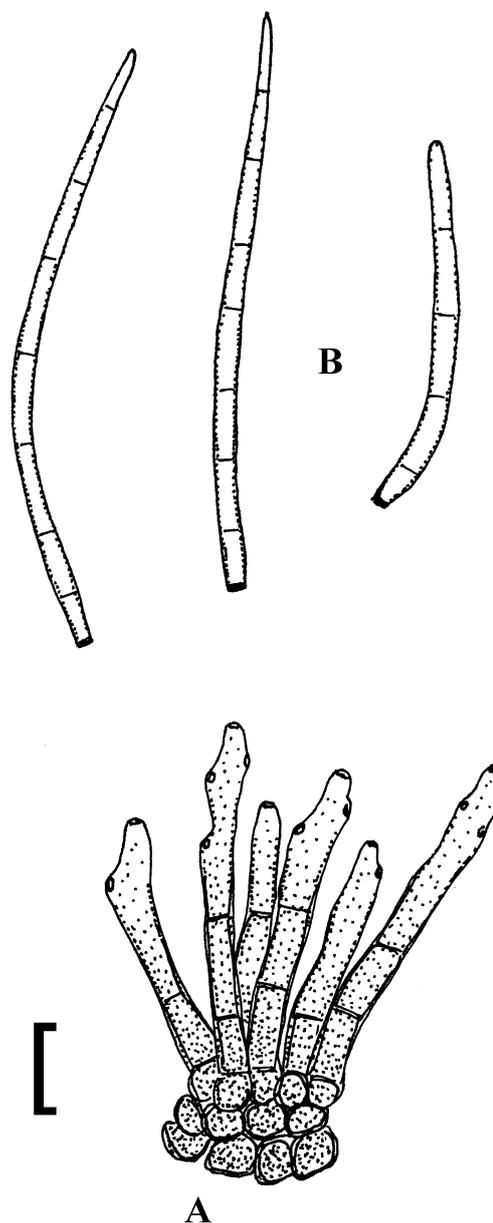


Fig. 72. *Cercospora iphigeniae* (based on Patwardhan & Sathe 1966: 152, fig. 2). A. Conidiophore fascicle. B. Conidia. Bar = 10  $\mu$ m.

acicular, 2.5–5  $\mu$ m wide, in *C. gloriosa* and *C. gloriosicola* are not genuinely different. In the type of *C. gloriosicola* the conidiophore fascicles are larger and denser, but such characters may be influenced by external conditions, and they are barely sufficient to warrant two separate species. The description of *C. gloriosa* in Chupp (1954) suggests that a second species with strictly acicular conidia, belonging to *C. apii* s. lat. may also occur on *Gloriosa* spp., but this question is still open and needs confirmation.

***Cercospora iphigeniae*** Patwardhan & Sathe, *Sydowia* 19: 151 "1965" (1966). (Fig. 72)

*Literature*: Crous & Braun (2003: 228), Kamal (2010: 53).

*Illustration*: Patwardhan & Sathe (1966: 152, fig. 2).

**Description:** Leaf spots broadly fusiform, pale grey with black margin. *Caespituli* mainly epiphyllous. *Stromata* depressed globose to flattened, 10–20 µm diam, dark brown. *Conidiophores* fasciculate, slightly divergent, arising from stromata, erect, straight to curved, subcylindrical to geniculate-sinuuous above, unbranched, 25–55 × 2–4 µm, 1–4-septate, brown, paler above, hyaline at the tip; conidiogenous cells integrated, terminal, with 1–3 thickened and darkened conidiogenous loci. *Conidia* solitary, narrowly obclavate, 30–80 × 2–3.5 µm, olivaceous, indistinctly 3–12-septate, thin-walled, apex pointed, base obconically truncate, hila thickened and darkened.

**Holotype:** India: Maharashtra: Pune, on *Iphigenia indica*, *Colchicaceae*, 23 Jul. 1964, P. G. Patwardhan & A. V. Sathe (AHMA 244).

**Host range and distribution:** Only known from the type collection.

**Notes:** Type material of this species was not available for re-examination. The generic affinity of this species is not quite clear as the conidia have been described to be olivaceous, so that it could also be a member of *Passalora*, but it seems rather to be a species of *Cercospora* s. str. A revision of type material is urgently necessary.

## Commelinaceae

### Cercospora

#### Key to *Cercospora* species on Commelinaceae

- 1 Conidiophores 25–190 × 4–6.5 µm; conidia acicular or slightly obclavate, i.e. slightly obconically truncate at the base, about 1.5–3 µm wide, width variable 2–5 µm; on *Pollia japonica* ..... **C. polliae-japonicae**  
Conidiophores shorter, usually 10–50 µm and/or conidia consistently acicular with truncate base or acicular to distinctly obclavate with smaller hila 1–2 µm wide; on other hosts ..... 2
- 2 (1) Conidia consistently acicular, 30–275 × 2–3 µm, base truncate; conidiophores 30–200 × 3–6 µm; conidiogenous loci 2.5–3 µm diam; on *Commelina benghalensis* ..... **C. benghalensis**  
Conidia obclavate-cylindrical to acicular, at least partly with obconically truncate base; conidiogenous loci 1–2 µm wide ..... 3
- 3 (2) Conidia 40–120 × (2–)3–5(–5.5) µm; conidiophores (20–)40–100 × 4–7 µm; on *Amischotolype*, *Aneilema*, *Commelina* and *Murdannia* spp., widespread ..... **C. commelinicola**  
Conidia narrower, 1.5–3.5 µm; conidiophores shorter, usually 10–50 µm ..... 4
- 4 (3) With definite leaf spots, subcircular to irregular, 1–4 mm diam; conidia occasionally in short chains; on *Commelina longifolia* ..... **C. commelinae-salicifoliae**  
Entire leaflets turning brown, finally withering; conidia consistently solitary; on *Murdannia nudiflora* ..... **C. nudiflorae**

#### *Cercospora* species on Commelinaceae

***Cercospora benghalensis*** Chidd., *Sydowia* 13: 153 (1959).  
(Similar to Fig. 1)

**Literature:** De (1991), Crous & Braun (2003: 78), Kamal (2010: 21–22).

**Illustration:** Chiddarwar (1959: plate V, figs 1–3).

**Description:** Leaf spots amphigenous, irregular-angular, 0.5–4 mm diam, scattered, dull to dark brown with paler brown centre. *Caespituli* amphigenous, scattered, punctiform, dark. *Mycelium* internal. *Stromata* substomatal, 10–25 µm diam, brown. *Conidiophores* in small to moderately large fascicles, 4–20, divergent, arising from stromata, through stomata, erect, straight to curved or geniculate-sinuuous,

unbranched, 25–235 × 3–4.5 µm, 0–11-septate, brown, thin-walled, smooth; conidiogenous cells integrated, terminal or intercalary, about 10–40 µm long, conidiogenous loci conspicuous, thickened and darkened, about 1.5–2 µm diam. *Conidia* solitary, acicular, sometimes almost filiform, straight to curved, 30–275 × 2–2.5 µm, 2–22-septate, hyaline, thin-walled, smooth, apex pointed, base truncate, about 1.5–2 µm wide, hila somewhat thickened and darkened.

**Holotype:** India: Maharashtra: Pune, Shivajinagar, Agricultural College, on *Commelina benghalensis*, 8 Sep. 1954, P. P. Chiddarwar 1 (K(M) IMI 83162). **Isotype:** BPI 433304.

**Host range and distribution:** On *Commelina benghalensis*, *Commelinaceae*, Asia (India, Maharashtra, West Bengal).

**Notes:** This species belongs to the *Cercospora apii* s. lat. complex.

***Cercospora commelinae-salicifoliae*** A.K. Kar & M. Mandal, *Indian Phytopathol.* **26**: 675 "1973"(1974). (Fig. 73)

*Literature*: Crous & Braun (2003: 133), Kamal (2010: 35).

*Illustration*: Kar & Mandal (1974: 676, fig. 2).

*Description*: Leaf spots amphigenous, scattered, subcircular to angular-irregular, 1–4 mm diam, pale brownish, later greyish brown to greyish white, margin darker, brown, reddish brown to purplish. *Caespituli* amphigenous, punctiform, dark. *Mycelium* internal. *Stromata* substomatal, subglobose to somewhat irregular, 10–40 µm diam, olivaceous-brown. *Conidiophores* in small to moderately large fascicles, loose to moderately dense, arising from stromata, through stomata, erect, straight, subcylindrical to geniculate-sinuous, unbranched, 10–45 × 2–5.5 µm, 0–4(–7)-septate, pale to medium olivaceous-brown or brown, thin-walled, smooth; conidiogenous cells integrated, terminal, occasionally intercalary or conidiophores reduced to conidiogenous cells, 10–25 µm long, conidiogenous loci thickened and darkened, 1–1.5 µm diam. *Conidia* solitary, narrowly obclavate-cylindrical, straight to slightly curved, 20–70 × 1.5–3.5 µm, 1–6-septate, hyaline, thin-walled, smooth, apex obtuse to acute, base subtruncate to short obconically truncate, 1–2 µm wide, hila thickened and darkened.

*Holotype*: India: West Bengal: Dasnapur, Midnapur, on *Commelina longifolia* [*salicifolia*], 13 Jan. 1969, M. Mandal (K(M) IMI 138302).

*Host range and distribution*: On *Commelina longifolia*, *Commelinaceae*, Asia (India, West Bengal).

*Note*: A true *Cercospora* s. str. distinct from *C. apii* s. lat. by its narrowly obclavate-cylindrical conidia with obconically truncate base and small conidiogenous loci.

***Cercospora commelinicola*** Chupp ex U. Braun, *Cryptog. Mycol.* **20**: 156 (1999). (Fig. 74)

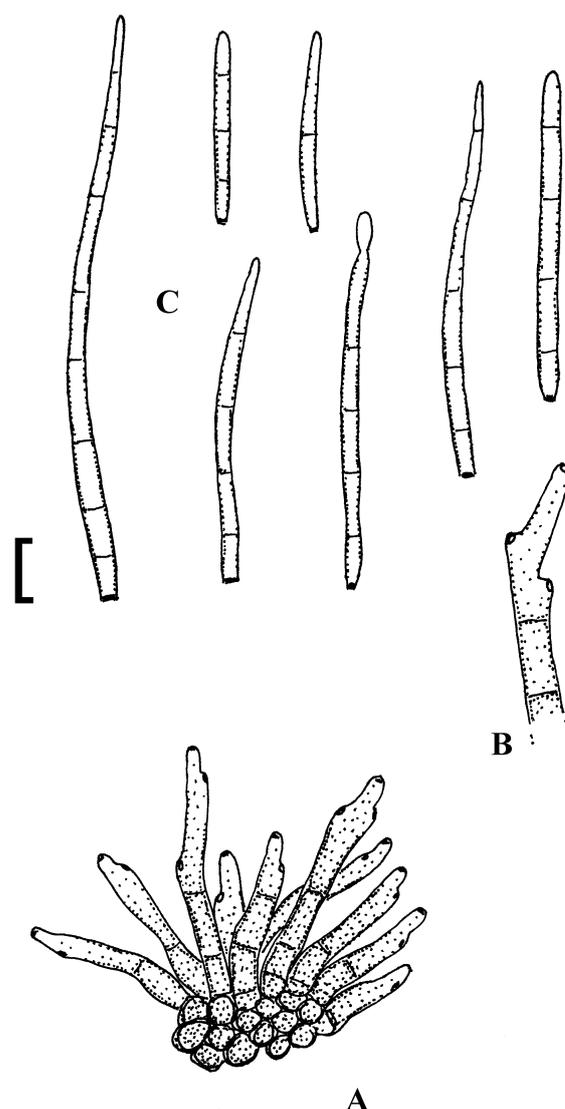
*Synonym*: *Cercospora commelinicola* Chupp, *Monograph of Cercospora*: 116 (1954), *nom. inval.* (ICN, Art. 39.1).

*Literature*: Chupp (1954: 116), Katsuki (1965: 19), Crous & Braun (2003: 133), Guo *et al.* (2005: 65), Braun & Urtiaga (2008).

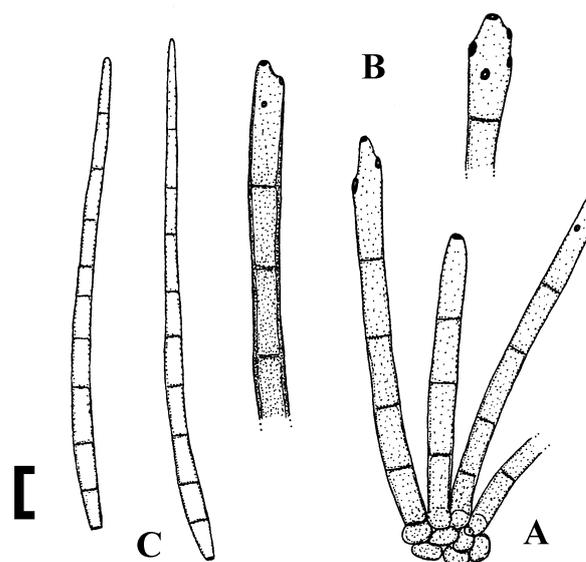
*Illustrations*: Braun (1999: 157, fig. 1), Guo *et al.* (2005: 65, fig. 40).

*Exsiccatae*: Sydow, *Fungi Exot. Exs.* 1238.

*Description*: Leaf spots amphigenous, subcircular to irregular, 1–15 mm diam or confluent and larger, forming large oblong blotches, to 30 mm diam, ochraceous to medium brown, later dull greyish brown to grey, margin narrow, dark brown to reddish brown. *Caespituli* usually epiphyllous, punctiform, dark brown. *Mycelium* internal. *Stromata* 10–45 µm diam,



**Fig. 73.** *Cercospora commelinae-salicifoliae* (K(M) IMI 138302). **A.** Conidiophore fascicle. **B.** Conidiophore tip. **C.** Conidia. Bar = 10 µm.



**Fig. 74.** *Cercospora commelinicola* (HBG, Syd., *Fungi Exot. Exs.* 1238). **A.** Conidiophore fascicle. **B.** Conidiophore tips. **C.** Conidia. Bar = 10 µm.

substomatal or intraepidermal, brown. *Conidiophores* in small to moderately large fascicles, 2–20, loose to moderately dense, arising from stromata, emerging through stomata or erumpent, erect, straight, subcylindrical and mostly barely or not geniculate to slightly geniculate-sinuuous, unbranched, apex rarely swollen,  $(10\text{--})30\text{--}100\text{--}(155) \times 4\text{--}7 \mu\text{m}$ , 1- to pluriseptate, pale to medium dark brown or olivaceous-brown, paler towards the tip, wall somewhat thickened, smooth; conidiogenous cells integrated, terminal,  $10\text{--}40 \mu\text{m}$  long, conidiogenous loci conspicuous, often aggregated, not or barely prominent,  $1.5\text{--}2 \mu\text{m}$  diam, thickened and darkened. *Conidia* solitary, narrowly obclavate-subcylindrical (-acicular),  $40\text{--}150\text{--}(200) \times (2\text{--})3\text{--}5.5\text{--}(6) \mu\text{m}$ , pluriseptate, distance between septa  $5\text{--}10 \mu\text{m}$ , rarely constricted at septa, hyaline, thin-walled, smooth, apex subacute, base short to long obconically truncate,  $1.5\text{--}2.5 \mu\text{m}$  diam, hila somewhat thickened and darkened.

**Holotype:** Ecuador: Prov. Pichincha: Mindo, on *Commelina virginica*, 9 Nov. 1937, H. Sydow [Fungi Exot. Exs. 1238] (HBG). **Isotypes:** Syd., Fungi Exot. Exs. 1238, e.g., B, CUP 39483.

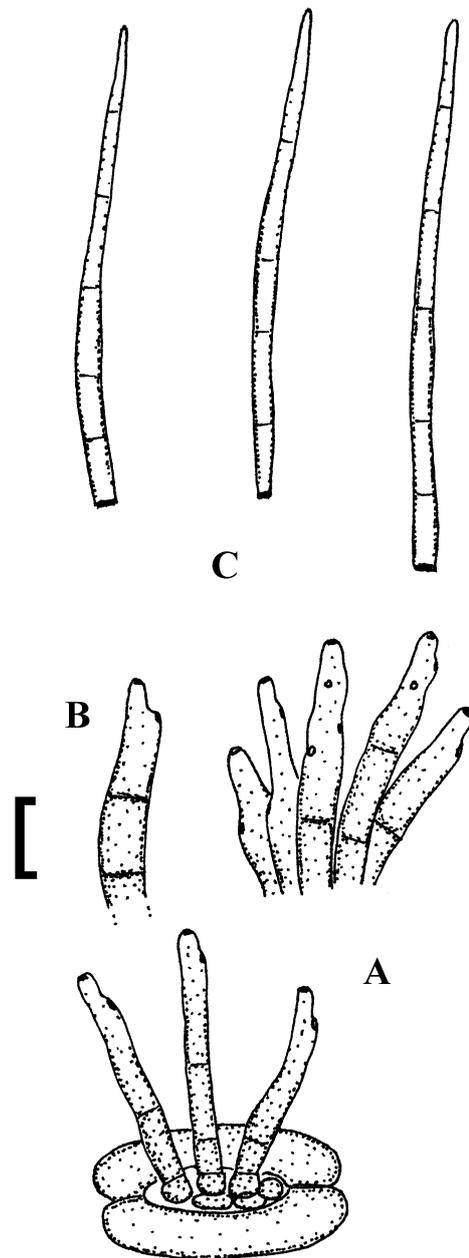
**Host range and distribution:** On *Amischotolype hookeri*, *Aneilema aequinoctiales*, *Commelina* (*benghalensis*, *communis*, *diffusa*, *erecta* [*elegans*], *imberbis* [*kotschy*], *paludosa*, *virginica*), *Commelinaceae*, Africa (Kenya, Malawi, Sudan, Tanzania), Asia (China, India, Japan), South America (Ecuador, Venezuela), West Indies (Barbados, Cuba).

**Notes:** Chupp proposed this name as “new combination” with reference to “*C. commelynae* Kalchbr. & Cooke” as described in Sydow (Ann. Mycol. 37: 425, 1939), but there was no valid basionym, as Sydow did not provide any Latin description or diagnosis. This species is a true *Cercospora* s. str. distinct from *C. apii* s. lat.

***Cercospora nudiflorae*** Chupp, *Monograph of Cercospora*: 117 (1954). (Fig. 75)

**Literature:** Crous & Braun (2003: 293).

**Description:** Leaf spots lacking, entire attacked leaves turning brown and withering. *Caespituli* amphigenous, punctiform, dark. *Mycelium* internal. *Stromata* substomatal, small,  $10\text{--}30 \mu\text{m}$  diam, brown. *Conidiophores* in small to moderately large fascicles, loose to dense, arising from stromata, through stomata, erect, straight, barely or only slightly geniculate-sinuuous, unbranched,  $(10\text{--})15\text{--}50\text{--}(80) \times 3\text{--}6 \mu\text{m}$ , usually 1–3-septate, pale to medium olivaceous-brown, paler towards the tip, thin-walled, smooth; conidiogenous cells integrated, terminal, occasionally conidiophores reduced to conidiogenous cells,  $10\text{--}25 \mu\text{m}$  long, with a single or several conidiogenous loci, sometimes aggregated, barely prominent,  $1\text{--}2 \mu\text{m}$  diam, thickened and darkened. *Conidia* solitary, narrowly obclavate to acicular,  $20\text{--}80 \times 1.5\text{--}3.5 \mu\text{m}$ , indistinctly pluriseptate, hyaline, thin-walled, smooth, apex acute or subobtuse, base truncate to obconically truncate,  $1\text{--}2 \mu\text{m}$  wide, hila thickened and darkened.



**Fig. 75.** *Cercospora nudiflorae* (CUP 35213). **A.** Conidiophore fascicles. **B.** Conidiophore tip. **C.** Conidia. Bar =  $10 \mu\text{m}$ .

**Lectotype (designated here, MycoBank MBT178143):** Bermuda: Devonshire Marsh, On *Murdannia nudiflora* [*Commelina nudiflora*], 12 Jan. 1926, H. H. Whetzel (CUP 35213). **Isolectotype:** CUP 40395.

**Host range and distribution:** On *Murdannia nudiflora*, *Commelinaceae*; South America (Venezuela), West Indies (Bermuda).

**Notes:** Records of *Cercospora commelinicola* from Venezuela and West Indies (Minter et al. 2001, Uriaga 1966) undoubtedly refer to *C. nudiflorae*. The two species have rather similar conidiophores and conidia. A record on *Commelina* sp. from Florida (Crous & Braun 2003) is doubtful and appears to belong to *C. commelinicola*.

***Cercospora polliae-japonicae*** Y.L. Guo & Y. Jiang,  
*Mycosystema* **19**: 302 (2000).  
(Fig. 76)

*Literature*: Crous & Braun (2003: 331), Guo *et al.* (2005: 66).

*Illustrations*: Guo & Jiang (2000b: 303, fig. 1), Guo *et al.* (2005: 657, fig. 41).

*Description*: *Leaf spots* amphigenous, subcircular, 2–12 mm diam, pale brown to brown. *Caespituli* amphigenous. *Mycelium* internal. *Stromata* lacking or small, 10–45 µm diam, brown. *Conidiophores* solitary or in small to moderately large, divergent fascicles, 2–28, erect, straight to curved, unbranched, somewhat geniculate, 25–190 × 4–6.5 µm, 0–7-septate, brown; conidiogenous cells integrated, terminal and intercalary, conidiogenous loci thickened and darkened, 2–3.5 µm diam. *Conidia* solitary, acicular to somewhat obclavate, straight to somewhat curved, 40–200 × 2–5 µm, pluriseptate, hyaline, thin-walled, smooth, apex pointed, base truncate to slightly obconically truncate, about 1.5–3 µm wide, hila thickened and darkened.

*Holotype*: **China**: Zhejiang Province: Hangzhou, on *Pollia japonica*, *Commelinaceae*, 26 May 1961, Q. M. Ma & X. J. Liu (HMAS 77628).

*Host range and distribution*: Only known from the type collection.

*Notes*: This species belongs to the *Cercospora apii* s. lat. complex.

### **Doubtful, excluded and insufficiently known species**

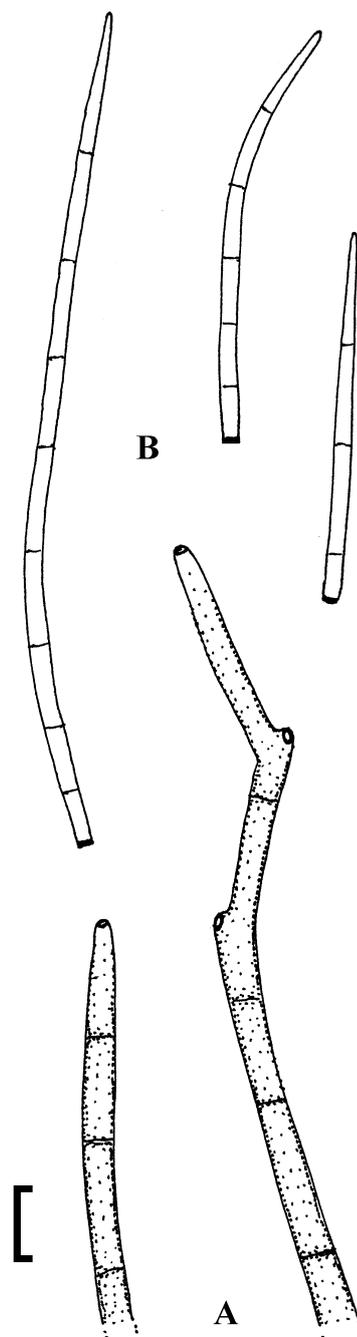
*Cercospora commelinae* Kalchbr. & Cooke, *Grevillea* **9**: 24 (1881); as “*commelynae*”.

*Literature*: Chupp (1954: 116), Crous & Braun (1996: 260; 2003: 133).

*Syntypes*: **South Africa**: Cape, on *Commelina benghalensis*, MacOwan 1346 (B 700016011, K(M) 193949, 193950).

*Host range and distribution*: On *Commelina benghalensis*, *Commelinaceae*, Africa (South Africa, Zimbabwe).

*Notes*: Chupp (1954) examined the type specimen lodged at Kew (MacOwen 1346), and concluded that *C. commelinae*



**Fig. 76.** *Cercospora polliae-japonicae* (HMAS 77628). **A.** Conidiophores. **B.** Conidia. Bar = 10 µm.

was in fact a species of *Septoria*. An examination of a South African collection (PREM 32777) identified by Chupp & Doidge (1948) to be *C. commelinae* and the type from B confirmed that the fungus would be better placed in *Septoria*.

### **Pseudocercospora**

#### **Key to *Pseudocercospora* species on *Commelinaceae***

- 1 *In vivo* with external mycelium; stromata lacking or almost so; with solitary conidiophores arising from superficial hyphae; on *Pollia japonica*, Taiwan ..... **P. polliae**
- Superficial mycelium *in vivo* lacking; conidiophores fasciculate, arising from small to well-developed stromata; on other hosts ..... 2

- 2 (1) Conidiophores only 0–3-septate; on *Amischotolype hispida*, Taiwan ..... **P. forrestiae**  
 Conidiophores pluriseptate; on *Commelina erecta*, Trinidad ..... **P. maracasensis**

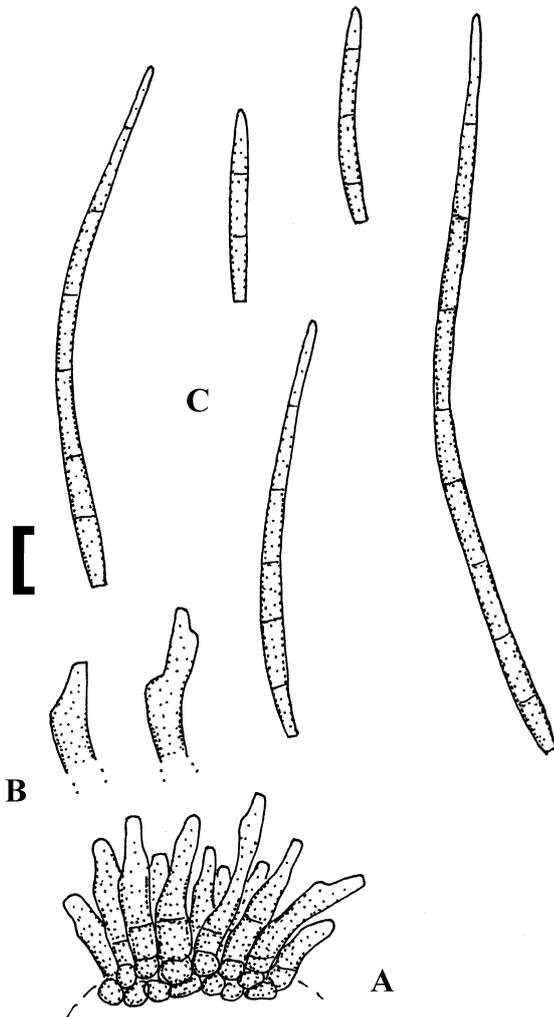


Fig. 77. *Pseudocercospora forrestiae* (NTU-PPE, holotype). A. Conidiophore fascicle. B. Conidiophores. C. Conidia. Bar = 10 µm.

### *Pseudocercospora* species on *Commelinaceae*

***Pseudocercospora forrestiae*** Goh & W.H. Hsieh,  
*Trans. Mycol. Soc. Republ. China* 2: 130 (1987).

(Fig. 77)

*Synonym: Cercospora forrestiae* Sawada, *Taiwan Agric. Res. Inst. Rept.* 85: 107 (1943), *nom. inval.* (ICN, Art. 39.1).

*Literature:* Chupp (1954: 117), Hsieh & Goh (1990: 59), Guo & Hsieh (1995: 58), Guo *et al.* (1998: 74), Crous & Braun (2003: 187).

*Illustrations:* Hsieh & Goh (1990: 59, fig. 41), Guo & Hsieh (1995: 61, fig. 56), Guo *et al.* (1998: 75, fig. 58).

*Description:* Leaf spots amphigenous, elliptical, 5–12 × 3–5.5 mm, greyish brown, with dark brown margin. *Caespituli* amphigenous. *Mycelium* internal. *Stromata* dark brown, to 50 µm diam. *Conidiophores* in well-developed, dense

fascicles, 10–25, arising from stromata, erect, straight to curved, cylindrical to geniculate-sinuuous, unbranched, 20–80 × 3.5–5 µm, 0–3-septate, pale olivaceous-brown, thin-walled, smooth; conidiogenous cells integrated, terminal or occasionally conidiophores reduced to conidiogenous cells, conidiogenous loci neither thickened nor darkened, inconspicuous or visible as truncate tips or shoulders. *Conidia* solitary, obclavate-cylindrical, straight to curved, 35–145 × 3–5 µm, 2–13-septate, pale olivaceous, thin-walled, smooth, apex obtuse to pointed, base obconically truncate, hila unthickened, not darkened.

*Holotype:* Taiwan: Taipei, Shihting, on *Amischotolype hispida* [*chinensis*], *Commelinaceae*, 6 Nov. 1927, K. Sawada (NTU-PPE [herb. Sawada]). *Isotype:* TNS-F-220428.

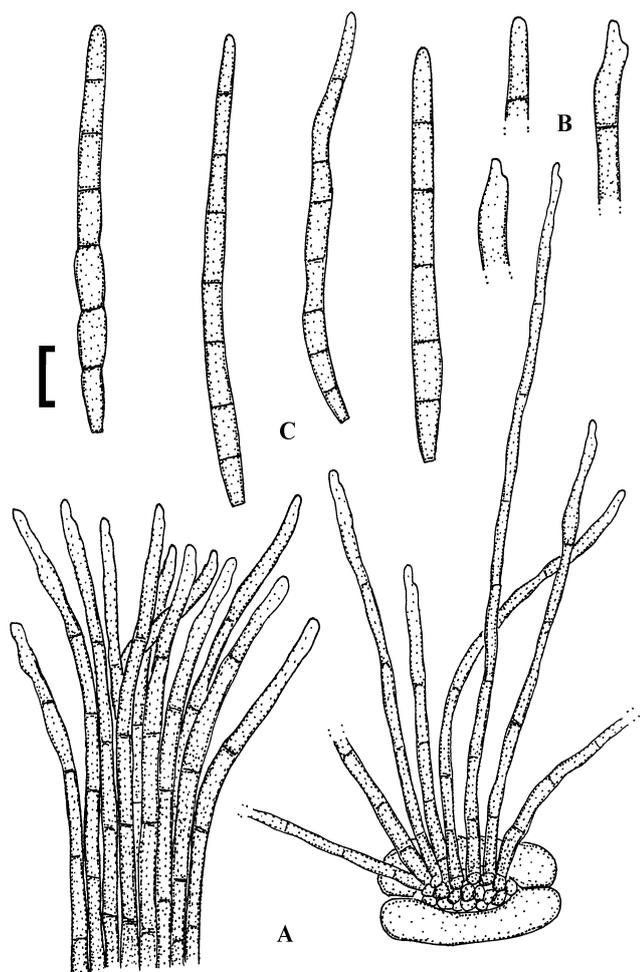
*Host range and distribution:* Only known from the type collection.

***Pseudocercospora maracasensis*** (R.E.D. Baker & W.T. Dale) Deighton, *Mycol. Pap.* 140: 147 (1976). (Fig. 78)

*Basionym: Cercospora maracasensis* R.E.D. Baker & W.T. Dale, *Mycol. Pap.* 33: 103 (1951).

*Literature:* Chupp (1954: 117), Crous & Braun (2003: 266–267).

*Description:* Leaf spots amphigenous, subcircular to irregular or somewhat angular-irregular, 4–30 mm diam, at first dull greenish, greyish green or greenish brown, later gradually changing to yellowish brown or brown, finally grey or greyish white, with distinct margin or marginal line, narrow, dark olivaceous-brown to dark reddish brown or blackish. *Caespituli* amphigenous, mainly hypophyllous, punctiform, scattered, blackish brown or dull greyish brown by abundant conidiation. *Mycelium* internal. *Stromata* small to well-developed, substomatal, subglobose to flattened above, 10–60 µm diam, medium to dark olivaceous-brown, cells 2–5 µm diam, rounded to angular in outline. *Conidiophores* in small to large fascicles, divergent to dense, sometimes almost coremioid, arising from stromata, through stomata, erect, subcylindrical-filiform, straight to curved, sinuous or somewhat geniculate, unbranched, 30–200 × 3–6 µm, pluriseptate, pale to medium olivaceous-brown, darker in mass, paler towards the tip, ultimate tip sometimes subhyaline, thin-walled, smooth; conidiogenous cells integrated, terminal, about 10–30 µm long, conidiogenous loci inconspicuous, unthickened and not darkened, occasionally somewhat refractive. *Conidia* solitary, obclavate-cylindrical, straight to curved, 35–110 × 3–6 µm, 3–9-septate, subhyaline to pale olivaceous, thin-walled, smooth, apex obtuse or subobtuse, base short to long obconically truncate, (1.5–)2(–2.5) µm wide, hila unthickened, not darkened.



**Fig. 78.** *Pseudocercospora maracasensis* (CUP 35326). **A.** Conidiophore fascicles. **B.** Conidiophore tips. **C.** Conidia. Bar = 10  $\mu$ m.

**Holotype:** Trinidad: Maracas Valley, on *Commelina erecta*, 4 Oct. 1944, R. E. D. Baker 226 (K(M) IMI 24457). **Isotypes:** CUP 35326, TRIN.

**Host range and distribution:** On *Commelina erecta* [*elegans*, *virginica*], *Commelinaceae*, West Indies (Trinidad and Tobago).

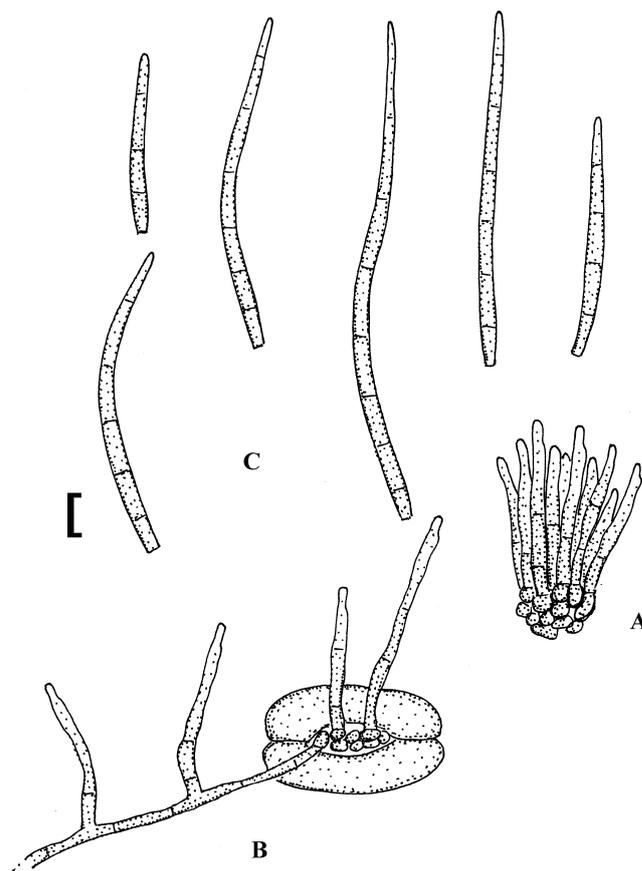
***Pseudocercospora polliae*** Goh & W.H. Hsieh, *Trans. Mycol. Soc. Republ. China* 2: 134 (1987). (Fig. 79)

**Synonym:** *Cercospora polliae* Sawada, *Rep. Gov. Agric. Res. Inst. Taiwan* 87: 86 (1944), *nom. inval.* (ICN, Art. 39.1).

**Literature:** Chupp (1954: 117, 118), Katsuki (1965: 19), Hsieh & Goh (1990: 60), Guo & Hsieh (1995: 59), Guo *et al.* (1998: 75), Crous & Braun (2003: 330).

**Illustrations:** Hsieh & Goh (1990: 60, fig. 42), Guo & Hsieh (1995: 63, fig. 57), Guo *et al.* (1998: 76, fig. 59).

**Description:** Leaf spots indistinct to circular or elliptical, 10–15 mm diam, centre greyish brown, margin dark brown.



**Fig. 79.** *Pseudocercospora polliae* (NTU-PPE, holotype). **A.** Conidiophore fascicle. **B.** Conidiophores and superficial hypha with solitary conidiophore emerging through a stoma. **C.** Conidia. Bar = 10  $\mu$ m.

**Caespituli** amphigenous, mainly hypophyllous. **Mycelium** internal and external; superficial hyphae emerging through stomata, sparingly branched, septate, 1.5–3.8  $\mu$ m wide, pale olivaceous, thin-walled, smooth. **Stromata** lacking or consisting of a few substomatal swollen hyphal cells to medium-sized, to 50  $\mu$ m diam. **Conidiophores** in small fascicles, 2–10, emerging through stomata, or solitary, arising from superficial hyphae, lateral, erect, straight to somewhat curved, subcylindrical to somewhat geniculate-sinuous, unbranched, (15–)20–60  $\times$  4–5  $\mu$ m, 0–3-septate, brown, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, conidiogenous loci inconspicuous. **Conidia** solitary, obclavate-filiform, subacicular, straight to somewhat curved, 30–130  $\times$  3–4.5  $\mu$ m, 3–13-septate, subhyaline to very pale olivaceous, thin-walled, smooth, apex pointed to subobtuse, base subtruncate to short obconically truncate, 2–2.5  $\mu$ m wide, hilum neither thickened nor darkened.

**Holotype:** Taiwan: Taipei, on *Pollia japonica*, 23 Mar. 1919, K. Sawada (NTU-PPE [hb. Sawada]). **Isotype:** TNS-F-220503.

**Host range and distribution:** On *Pollia japonica*, *Commelinaceae*, Asia (China, Japan, Taiwan).

## Costaceae

*Pseudocercospora*Key to *Pseudocercospora* species on Costaceae

- 1 Conidiophores short, in dense fascicles, 5–30 × 2–5 µm, usually aseptate; conidia straight to slightly curved, 25–110 × 2–4 µm; on *Costus spicatus* and *Costus* sp., Central and South America ..... **P. costi**
- Conidiophores very long, in loose to mostly dense, often even coremioid fascicles, 70–650 × 3–7 µm, pluriseptate; conidia straight to mostly distinctly curved, often strongly curved, sometimes apex even uncinately to circinate, much wider, 20–90 × (3.5–)5–7(–8) µm; on *Cheilocostus speciosus*, Asia and Oceania ..... **P. costina**

*Pseudocercospora* species on Costaceae

***Pseudocercospora costi*** (F.L. Stevens) U. Braun & Crous, in Crous & Braun, *Mycosphaerella and Anam.*: 140 (2003).

(Fig. 80)

Basionym: *Cercospora costi* F.L. Stevens, *Illinois Biol. Monogr.* 11: 57 (1927).

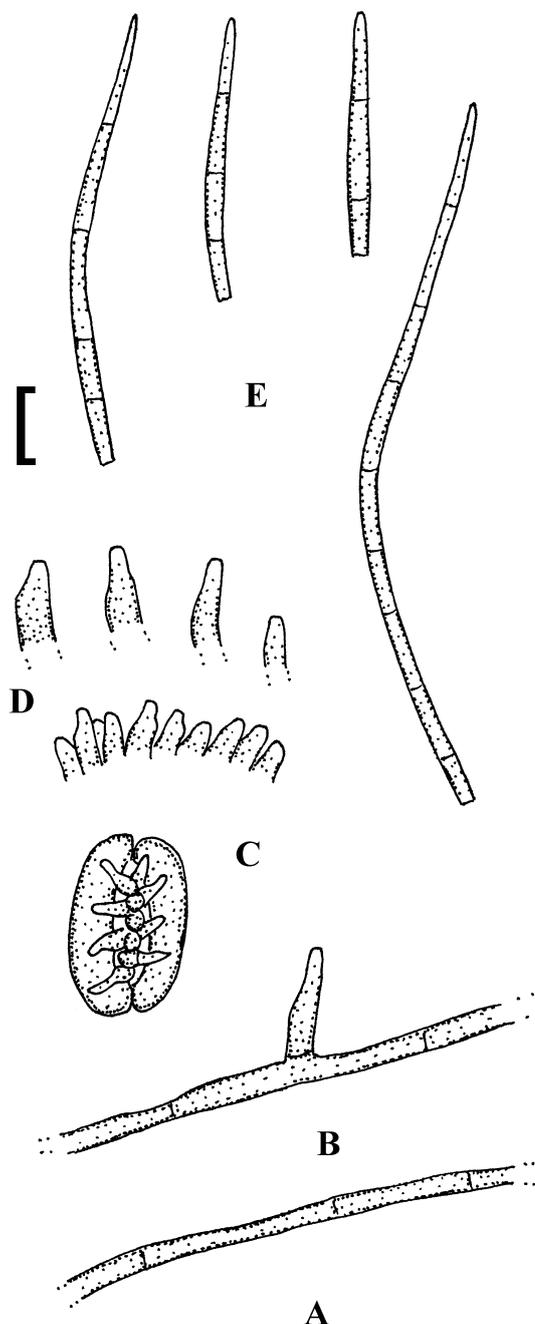
Literature: Chupp (1954: 607), Uruga (1986), Braun & Uruga (2012, 2013a).

**Description:** Lesions variable, irregular, small to large blotches, to 50 mm diam, pale brown, with narrow yellowish border. *Caespituli* amphigenous, scattered, punctiform, dark. *Mycelium* internal, occasionally also external with a few superficial hyphae, unbranched or sparingly branched, 1–3 µm wide, subhyaline to pale olivaceous, septate, thin-walled, smooth. *Stromata* 10–40 µm diam, substomatal, globose, yellowish brown to brown. *Conidiophores* in small to moderately large fascicles, arising from stromata, emerging through stomata, dense, occasionally solitary, arising from superficial hyphae, erect, straight, subcylindrical-conical to somewhat geniculate-sinuuous, unbranched, 5–30 × 2–5 µm, 0(–1)-septate, subhyaline to pale olivaceous or yellowish brown, thin-walled, smooth; conidiophores usually reduced to conidiogenous cells, conidiogenous loci inconspicuous, occasionally subdenticulate, but always unthickened and not darkened. *Conidia* solitary, narrowly obclavate-cylindrical to almost filiform, 25–110 × 2–4 µm, 2–10-septate, subhyaline to very pale olivaceous, thin-walled, smooth, apex subacute or subobtuse, base short to long obconically truncate, 1–2 µm wide, hila unthickened, not darkened.

**Holotype:** Panama: Gatun, on *Costus* sp., 24 Aug. 1923, F. L. Stevens (ILL 15148).

**Host range and distribution:** On *Costus* (*spicatus*, *Costus* sp.), *Costaceae*, Central and South America (Panama, Venezuela).

**Notes:** The conidiophores are very short, arranged in dense, often almost sporodochial conidiomata. The conidiogenous loci are inconspicuous. Some superficial hyphae with solitary conidiophores have been observed.



**Fig. 80.** *Pseudocercospora costi* (ILL 15148). **A.** Superficial hypha. **B.** Superficial hypha with solitary conidiophore. **C.** Conidiophore fascicles. **D.** Conidiophores. **E.** Conidia. Bar = 10 µm.

***Pseudocercospora costina*** (Syd. & P. Syd.) Deighton, *Mycol. Pap.* **140**: 135 (1976).

(Fig. 81)

*Basionym*: *Cercospora costina* Syd. & P. Syd., *Ann. Mycol.* **14**: 372 (1916).

*Synonyms*: *Ancylospora costi* Sawada, *Rep. Gov. Res. Inst. Formosa* **87**: 78 (1944), *nom. inval.* (ICN, Art. 39.1) [*syntypes*: **Taiwan**: Kaohsiung, on *Cheilocostus speciosus* [*Costus speciosus*], 6 Oct. 1908, R. Suzuki (BPI 4428256; K(M) IMI 31902, NTU-PPE, hb. Sawada)].

*Helicomina costi* M.A. Salam & P.N. Rao, *Indian Phytopathol.* **11**: 123 (1958) [*holotype*: **India**: Andhra Pradesh: Hyderabad, Pakhal forest, on *Cheilocostus speciosus*, 28 Sep. 1956, M. A. Salam (K(M) IMI 90212a)].

*Helicomina dracaenae* Hasija, *Indian Phytopathol.* **19**: 373 (1967) [*holotype*: **India**: Madhya Pradesh, Jabalpur, on *Costus* sp. (not *Dracaena* sp.), Sep. 1964, S. K. Hasija (K(M) IMI 109484)].

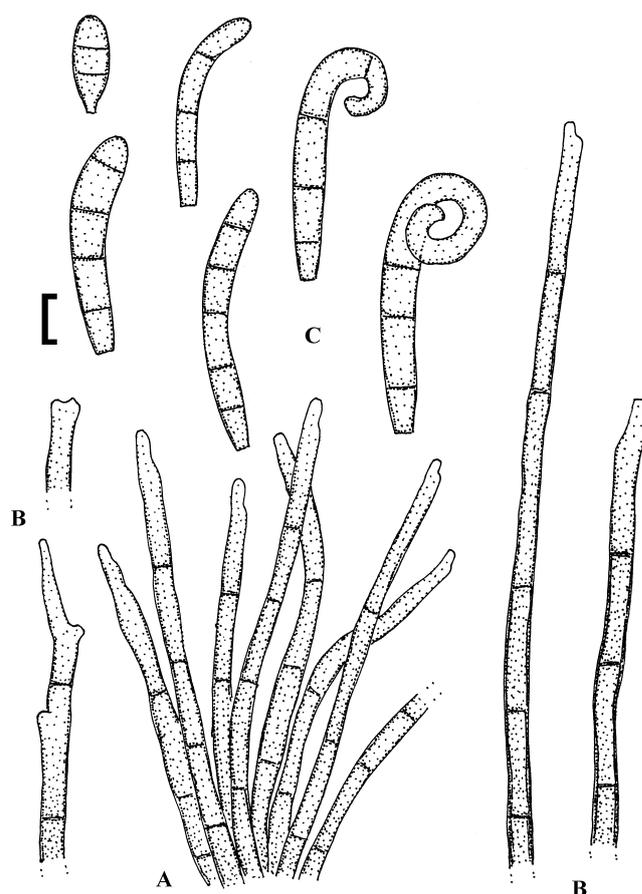
*Phaeosariopsis costi* A.K. Singh, S.K. Singh & Kamal ("costusae"), *Curr. Sci.* **53**: 876 (1984) [*holotype*: **India**: Uttar Pradesh, Gorakhpur, on *Cheilocostus speciosus*, Jan. 1980, A. K. Singh, KA-25 (K(M) IMI 244879)].

*Passalora costi* (A.K. Singh, S.K. Singh & Kamal) U. Braun & Crous, in Crous & Braun, *Mycosphaerella and Anam.*: 449 (2003).

*Literature*: Saccardo (1931: 895), Chupp (1954: 607), Deighton (1976: 135), Hsieh & Goh (1990: 356), Guo & Hsieh (1995: 355), Guo *et al.* (1998: 374), Braun (2001b: 62), Crous & Braun (2003: 141), Kamal (2010: 115, 167).

*Illustrations*: Deighton (1976: 136, fig. 81, 137, fig. 82), Singh *et al.* (1984: 876, fig. 1), Hsieh & Goh (1990: 356, fig. 273), Guo & Hsieh (1995: 356, fig. 300), Guo *et al.* (1998: 375, fig. 306).

*Description*: *Leaf spots* almost lacking, yellowish discolorations on the upper leaf surface, becoming dark when dry or with large subcircular to irregular patches, 5–50 mm diam, dingy grey to greyish white, margin indefinite. *Caespituli* hypophyllous, punctiform, scattered to dense, dark olivaceous, brown to blackish. *Mycelium* internal; hyphae sparingly branched, 2–5 µm diam, septate, pale olivaceous, thin-walled, smooth. *Stromata* substomatal, subglobose to somewhat irregular, 20–70 µm diam, brown or olivaceous-brown. *Conidiophores* in small to moderately large fascicles, to 20 conidiophores, loose to usually dense, often almost coremioid, arising from stromata, through stomata, erect, straight, subcylindrical-filiform, usually barely geniculate-sinuous, unbranched, 70–650 × 3–7 µm, pluriseptate throughout, pale to medium dark olivaceous or brown, paler towards the tip, wall somewhat thickened, smooth; conidiogenous cells integrated, terminal or intercalary, 10–40 µm long, sympodially and occasionally percurrently proliferating, conidiogenous loci inconspicuous to conspicuous by being subdenticulate, but always unthickened and not darkened. *Conidia* solitary, subcylindrical, cylindrical-obclavate to somewhat clavate, short conidia sometimes broadly ellipsoid-ovoid, straight to mostly distinctly curved, often strongly curved, sometimes



**Fig. 81.** *Pseudocercospora costina* (K(M) IMI 82089). **A.** Conidiophore fascicle. **B.** Conidiophores. **C.** Conidia. Bar = 10 µm.

apex even uncinately to circinate, 20–90 × (3.5–)5–7(–8) µm, (1–)2–8(–9)-septate, subhyaline to pale olivaceous or olivaceous-brown, thin-walled, smooth, apex obtuse, rounded, base short obconically truncate, gradually attenuated towards the base or sometimes abruptly attenuated at the very base, peg-like, 1.5–2.5(–3) µm wide, hila neither thickened nor darkened.

*Type*: **Philippines**: *Prov. Laguna*: Los Baños, on *Cheilocostus speciosus* [*Costus speciosus*], Jan. 1916, C. F. Baker 4149 p.p. (K(M) IMI 82089).

*Host range and distribution*: On *Cheilocostus speciosus* [*Costus speciosus*], *Costus* sp., *Costaceae*, Asia (China, India, Nepal, Philippines, Taiwan), Oceania (Fiji, Micronesia, Solomon Islands, Vanuatu).

*Notes*: Type material of this species is not preserved in Sydow's herbarium at S. K(M) IMI 82089 is the only fragment of type material that could be traced. It is unclear if additional duplicates exist. Therefore, we prefer to postpone a final typification. Records of this species on *Hedygium* sp. (*Zingiberaceae*) are doubtful (Braun 2001, Crous & Braun 2003). A collection from India on "*Hedygium*" sp. (Jabalpur, 19 Oct. 1977, R. C. Rayak, K(M) IMI 217586) has been examined and undoubtedly represents *P. costina*, but the identity of the host plant is unclear. It cannot be excluded that the leaves belong to *Costus* s. lat.

## Cyperaceae

## Cercospora

Key to *Cercospora* species on Cyperaceae

- 1 Conidia strictly acicular, base of the conidia truncate ..... 2  
 Conidia not strictly acicular, conidia at least partly obclavate-cylindrical or filiform  
 and base of the conidia at least partly obconically truncate ..... 4
- 2 (1) With distinct leaf spots; conidiophores short, 20–45 µm; on *Cyperus fuscus*, Europe  
 ..... **C. cyperi-fusci** (see “doubtful, excluded and insufficiently known species”)  
 Leaf spots lacking; conidiophores much longer, 30–120 µm; on *Kyllinga erecta*, Africa ..... 3
- 3 (2) Conidiophores often branched; conidia 20–120 × 1.5–3 µm, 1–12-septate ..... **C. kyllingae**  
 Conidiophores unbranched; conidia longer and wider, 60–250 × 3–4 µm, 8–21-septate ..... **C. kyllingicola**
- 4 (1) Conidiophores very long, 30–200 µm, pluriseptate; conidia short, cylindrical-fusiform,  
 (12–)15–35 × 2–4 µm, 1–3-septate; on *Bulbostylis*, *Rhynchospora* and *Scleria* spp. .... **C. glauciana**  
 Conidiophores shorter, to 90 µm; conidia longer, 20–120 µm, often more than 3 septa ..... 5
- 5 (4) Conidiophores (10–)20–90 µm long; conidia (30–)40–120(–150) × (2–)2.5–5(–5.5) µm;  
 on *Cyperus* spp., Africa and Asia ..... **C. cyperi**  
 Conidiophores shorter, usually 5–35 µm; conidia narrower, 1.5–3 µm ..... 6
- 6 (5) Conidiophores very short, 5–20 µm, 0–1-septate ..... 7  
 Conidiophores longer, 10–35(–60) µm, 0–4-septate ..... 8
- 7 (6) Conidiophores 2–5 µm wide, hila 1–2 µm wide; conidia narrowly cylindrical-filiform  
 to acicular; on *Cyperus* spp. .... **C. cyperigena**  
 Conidiophores narrower, 1.5–3 µm, hila 1 µm diam; conidia narrowly obclavate-filiform;  
 on *Eleocharis* spp. .... **C. eleocharidis**
- 8 (6) Conidiophores very pale, subhyaline to pale olivaceous; conidiogenous loci very small,  
 1–1.5(–2) µm diam; on *Carex*, *Cyperus*, *Eleocharis*, *Fuirena* and *Kobresia* spp. .... **C. caricis**  
 Conidiophores distinctly pigmented, olivaceous-brown; conidiogenous loci somewhat broader,  
 1.5–2 µm; on species of *Scirpus* s. lat. .... **C. uredinophila**

*Cercospora* species on Cyperaceae

***Cercospora caricis*** Oudem., *Nederl. Kruidk. Arch.* II,  
 6: 59 (1892).

(Fig. 82)

*Synonyms:* *Cercospora caricina* Ellis & Dearn., *Proc. Canad. Inst.*, N.S., Part 3, 1: 91 (1897) [*lectotype* (designated here, MycoBank MBT178144): **Canada:** Ontario: London, on *Carex rosea*, Aug. 1896, *J. Dearness* 2390 (DAOM); *isotypes:* NY and Ellis & Everh., *Fungi Columb.* 1170, e.g., BPI 434250–434253, HBG, LEP].

*Cercospora microstigma* Sacc., *Ann. Mycol.* 10: 315 (1912) [*holotype:* **Canada:** Ontario: London, on *Carex laxiflora*, 6 Aug. 1910, *J. Dearness* (PAD); *isotypes:* Barthol., *Fungi Columb.* 4904, e.g. BPI 438409].

*Cercospora caricis* Dearn. & House, *New York State Mus. Bull.* 188: 29 (1916), *nom. illeg.* (ICN, Art. 53.1) [*type:* **USA:** New York: Old Forge, on *Carex folliculata*, Aug., *C. H. Peck* (NYS)].

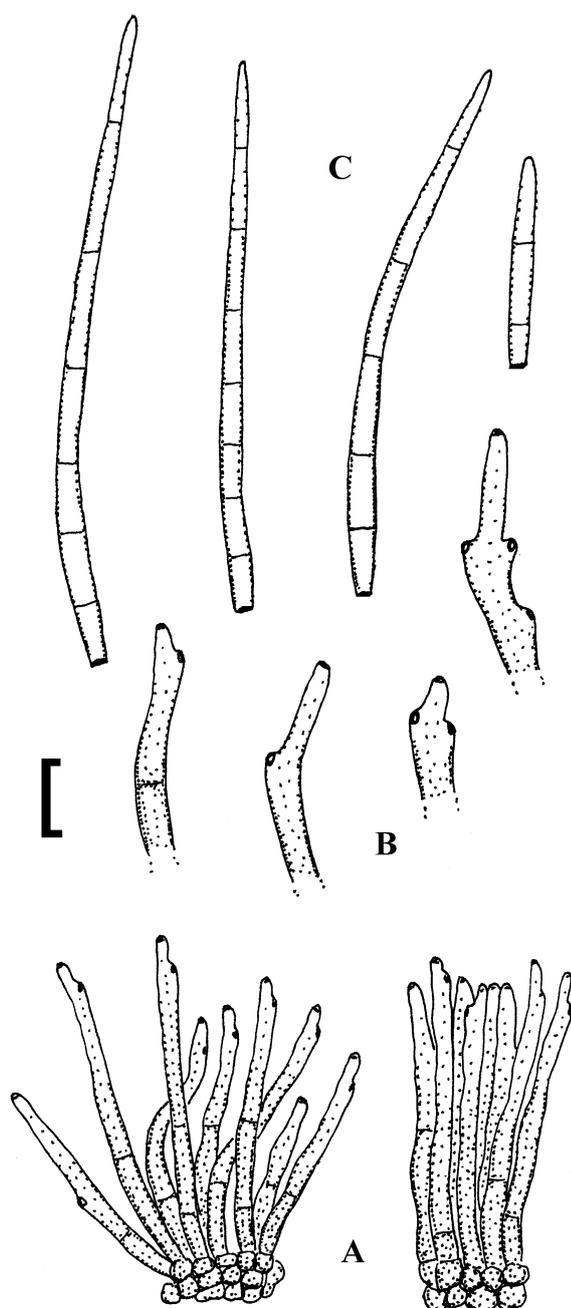
*Cercosporina caricis* Sacc., *Syll. Fung.* 25: 900 (1931), *nom. nov.*, as “(Dearn. & House) Sacc., *comb. nov.*”.

*Literature:* Saccardo (1899: 1105; 1913: 1431), Lindau (1910: 88), Chupp (1954: 191), Vasudeva (1963: 70), Blaney et al. (1988), Crous & Braun (1996: 254; 2003: 105), Braun et al. (1999: 298), Inglis et al. (2001), Kamal (2010: 29), Pirnia et al. (2012).

*Illustration:* Vasudeva (1963: 71, fig. 36).

*Exsiccatae:* Barthol., *Fungi Columb.* 4904. Ellis & Everh., *Fungi Columb.* 1170. Ellis & Everh., *N. Amer. Fungi* 3489.

*Description:* Leaf spots amphigenous, elliptical to oblong or somewhat irregular, about 2–10 × 1–3 mm, pale brown to brown, sometimes paler with age, margin indefinite or narrow and darker brown or lesions expanded, or the whole leaf or larger leaf segments becoming necrotic. *Caespituli* hypophyllous, punctiform, dark, often linear between veins. *Mycelium* internal. *Stromata* substomatal, 10–60 µm diam, brown to dark brown. *Conidiophores* in small to moderately large fascicles, divergent to dense, sometimes very dense, almost coremioid, arising from stromata, through stomata,



**Fig. 82.** *Cercospora caricis* (LEP, Ellis & Everh., Fungi Columb. 1170). **A.** Conidiophore fascicles. **B.** Conidiophore tips. **C.** Conidia. Bar = 10  $\mu\text{m}$ .

erect, straight, subcylindrical to moderately geniculate-sinuuous, unbranched, 10–45  $\times$  3–6  $\mu\text{m}$ , 0–3(–4)-septate, olivaceous-brown throughout or with paler tips, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, about 10–30  $\mu\text{m}$  long, conidiogenous loci conspicuous, thickened and darkened, 1–1.5(–2)  $\mu\text{m}$  diam. *Conidia* solitary, narrowly obclavate-cylindrical to acicular, (20–)25–80(–120)  $\times$  1.5–3  $\mu\text{m}$ , usually 2–8-septate, hyaline, thin-walled, smooth, apex pointed to subobtuse, base truncate to short obconically truncate, 1–2  $\mu\text{m}$  wide, hila somewhat thickened and darkened.

**Holotype: The Netherlands:** The Hague, on *Carex* sp., Sep. 1891, C. E. Destrée (not traced).

**Host range and distribution:** On *Carex* (*albursina*, *alopecoidea*, *arctata*, *bebbii*, *bicknellii*, *bromoides*, *castanea*, *cephalophora*, *crawfordii*, *cristatella*, *davisii*, *deflexa*, *folliculata*, *granularis*, *gravida*, *interior*, *intumescens*, *laxiflora*, *lupulina*, *microptera*, *normalis*, *orbicularis*, *pensylvanica*, *pilulifera* [oeder], *plantaginea*, *projecta*, *pubescens*, *retrorsa*, *rosea* [convoluta], *sartwelliana*, *stipata*, *stricta*, *subcapitatus*, *tenera*, *vulpinoidea* [muhlenbergii], *Carex* sp.), *Cyperus* (*articulatus* [fistulosus], *esculentus*, *filiculmis*, *mitis* [subcapitatus], *rotundus*, *Cyperus* sp.), *Eleocharis acutangula* [fistulosa], *Fuirena pubescens* [*Carex pubescens*], *Kobresia simpliciuscula* [*Carex mirabilis*], *Cyperaceae*, Africa (South Africa), Asia (India, Iran), Australia, Caucasus (Georgia), Europe (Great Britain, Ireland, The Netherlands), South America (Brazil), Oceania (New Caledonia), North America (Canada; USA, Arizona, Iowa, Illinois, Kansas, Maine, North Carolina, New York, Washington, Wisconsin).

**Notes:** A true *Cercospora* s. str. distinct from *C. apii* s. lat. by having much smaller conidiogenous loci, 1–1.5(–2)  $\mu\text{m}$  wide, and obclavate-subcylindrical conidia with obconically truncate bases. Further studies including pathogenicity tests on *Carex* and *Cyperus* are required to prove the conspecificity of species occurring on these two host genera. Material from the Netherlands appropriate for a neotypification was not found. Therefore, we prefer to postpone a neotypification.

***Cercospora cyperi* Sawada, Trans. Nat. Hist. Soc. Taiwan 17: 179 (1914).**

(Fig. 83)

**Synonyms:** *Cercospora cypericola* Chupp & H.C. Greene, *Amer. Midl. Naturalist* 50: 508 (1953) [*lectotype* (designated here, MycoBank MBT178145): **USA: Wisconsin:** Dane County, Madison, University of Wisconsin Arboretum, on *Cyperus strigosus*, 12 Aug. 1952, H. C. Greene (CUP 40865); *isotypes*: BPI 435441, CUP 40873, WIS].

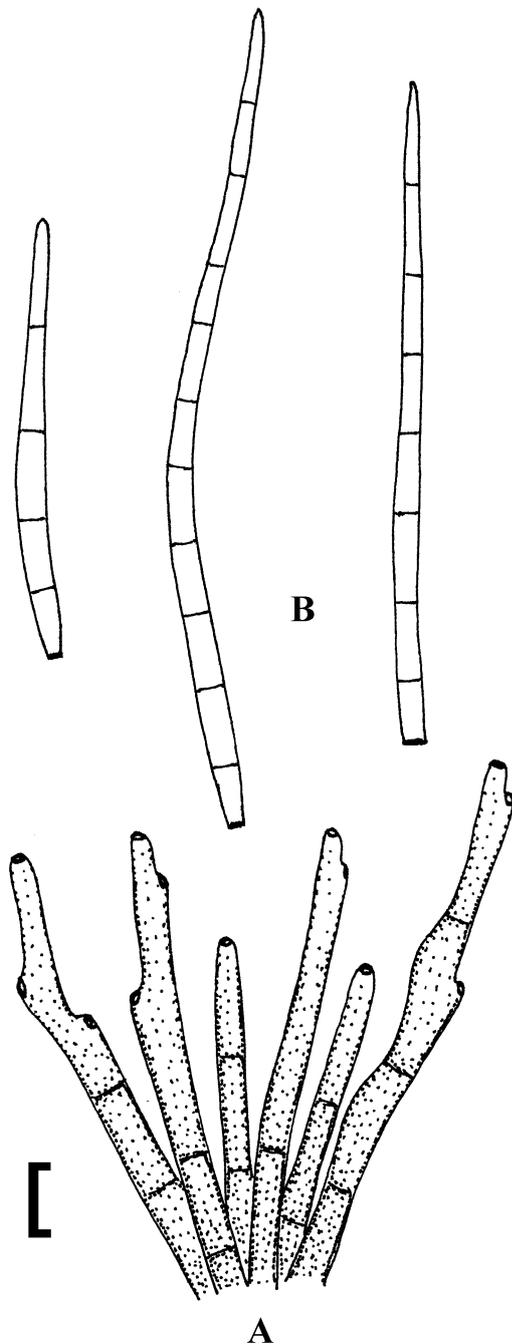
*Cercospora ugandensis* Hansf., *Proc. Linn. Soc. London* 1942–1943: 59 (1943) [*type: Uganda:* Kampala Swamp, on *Cyperus* sp. (*Mariscus* sp.), Jul. 1930, Hansford 1311 (not traced)].

*Cercospora cyperi-rotundi* Thirum. & Govindu, *Sydowia* 7: 312 (1953) [*type: India: Bihar:* Patna, on *Cyperus rotundus*, 3 Dec. 1952, M. J. Thirumalachar (probably not preserved)].

**Literature:** Chupp (1954: 191), Vasudeva (1963: 95), Hsieh & Goh (1990: 103), Crous & Braun (2003: 150), Guo *et al.* (2005: 105), Kamal (2010: 38).

**Illustrations:** Thirumalachar & Govindu (1953: plate 7, figs 19–20), Hsieh & Goh (1990: 104, fig. 78), Guo *et al.* (2005: 106, fig. 71).

**Description:** *Leaf spots* amphigenous, irregular to oblong, 1–25  $\times$  0.5–5 mm, brown, margin indefinite. *Caespituli* hypophyllous, punctiform, fine, brown to dark brown. *Mycelium* internal. *Stromata* lacking or small, substomatal, 10–25  $\mu\text{m}$  diam, brown, composed of thick-walled cell, 2–6  $\mu\text{m}$  diam. *Conidiophores* in small to moderately large fascicles, loose



**Fig. 83.** *Cercospora cyperi* (NTU-PPE, holotype). **A.** Conidiophore fascicle. **B.** Conidia. Bar = 10  $\mu$ m.

to rather dense, rarely solitary, arising from internal hyphae or stromata, through stomata, erect, straight, subcylindrical to somewhat geniculate-sinuous, unbranched, (10–)20–90  $\times$  3–6(–7)  $\mu$ m, 0–5-septate, pale to medium olivaceous-brown or brown throughout or paler towards the tip, thin-walled, smooth; conidiogenous cells integrated, terminal, 10–30  $\mu$ m long, conidiogenous loci small, (1–)1.5–2(–2.5)  $\mu$ m wide, thickened and darkened. *Conidia* solitary, narrowly obclavate-cylindrical, subbacillar, (30–)40–120(–150)  $\times$  (2–)2.5–5(–5.5)  $\mu$ m, 3–10-septate, hyaline, thin-walled, smooth, apex pointed or subobtusate, base short to long obconically truncate to subtruncate, 1.5–2  $\mu$ m wide, hila thickened and darkened.

[*Holotype*: **Taiwan**: Taipei, on *Cyperus pilosus*, 8 Nov. 1913, K. Sawada (not preserved)]. *Neotype* (**designated here**, MycoBank MBT178174): **Taiwan**: Taipei, on *Cyperus* sp., 25 Oct. 1924, K. Sawada (NTU-PPE [hb. Sawada]).

*Host range and distribution*: On *Cyperus* (*esculentus*, *filiculmis*, *houghtonii*, *pilosus*, *rotundus*, *schweinitzii*, *strigosus*, *Cyperus* spp.), *Cyperaceae*, Africa (Libya, Morocco, Nigeria, Uganda), Asia (China, India, Indonesia, Taiwan), ?North America (USA, Wisconsin), ?South America (Brazil).

*Notes*: Numerous collections on *Cyperus* spp., determined as *C. cyperi*, *C. cypericola*, *C. cyperi-rotundi* as well as *C. ugandensis*, have been examined and proved to represent a single species, characterised by having similar leaf spots, small conidiogenous loci, 1.5–2  $\mu$ m diam, and obclavate-cylindrical conidia, (2–)2.5–5(–6)  $\mu$ m wide, with small hila, 1–2  $\mu$ m diam. The status of *C. ugandensis*, described from *Cyperus* sp. [*Mariscus* sp.], is uncertain. Type material could not be traced, but the original description of this species agrees well with *C. cyperi*. Therefore, *C. ugandensis* is tentatively reduced to synonym with the latter species. Description and illustration of “*C. ugandensis*” from India (see Vasudeva, 1963: 205, fig. 151) do not agree with *C. cyperi*. The Indian collection is characterised by having large stromata, 30–70  $\mu$ m diam, very numerous densely fasciculate conidiophores, and narrow conidia, 14–71  $\times$  2–3  $\mu$ m. African records of *C. ugandensis* on *Kyllinga elatior* and *Kyllinga* sp. (Crous & Braun 2003) are unclear. A specimen from Zimbabwe has been examined (on *Kyllinga* sp., Uruma, 29 Mar. 1957, J. O. Whiteside, K(M) IMI 69047a). In any case, this collection does neither belong to *C. kyllingae* nor to *C. kyllingicola*. It is closer to *C. cyperi*, but the conidiophores are uniformly short, about 10–30  $\mu$ m, and the conidia are very narrow, about 1.5–2.5  $\mu$ m.

*Cercospora cyperi* is morphologically very close to *C. caricis*, but differs in having somewhat wider conidia. Inoculation experiments and molecular examinations are necessary to find out if these differences are sufficient to maintain two distinct species. *Cercospora cyperi* seems to be confined to Africa and Asia. Records from North America are doubtful and seem to refer to *C. caricis*. Another record on *Cyperus* sp. from Brazil (Mendes *et al.* 1998) is also uncertain. Type material of *C. cyperi*, collected up to 1919, is not preserved in Sawada’s herbarium at the National Taiwan University. Therefore, authentic material from 1924 is designated as neotype.

***Cercospora cyperigena*** U. Braun & Crous, in Crous & Braun *Mycosphaerella and Anam.*: 151 (2003). (Fig. 84)

*Literature*: Braun & Urtiaga (2012: 302–303).

*Illustration*: Crous & Braun (2003: 151, fig. 8).

*Description*: *Leaf spots* amphigenous, subcircular to elliptical-fusiform, 1–8 mm diam, occasionally confluent, centre yellowish olivaceous to light brown, with a narrow brown margin. *Caespituli* hypophyllous, finely punctiform, often

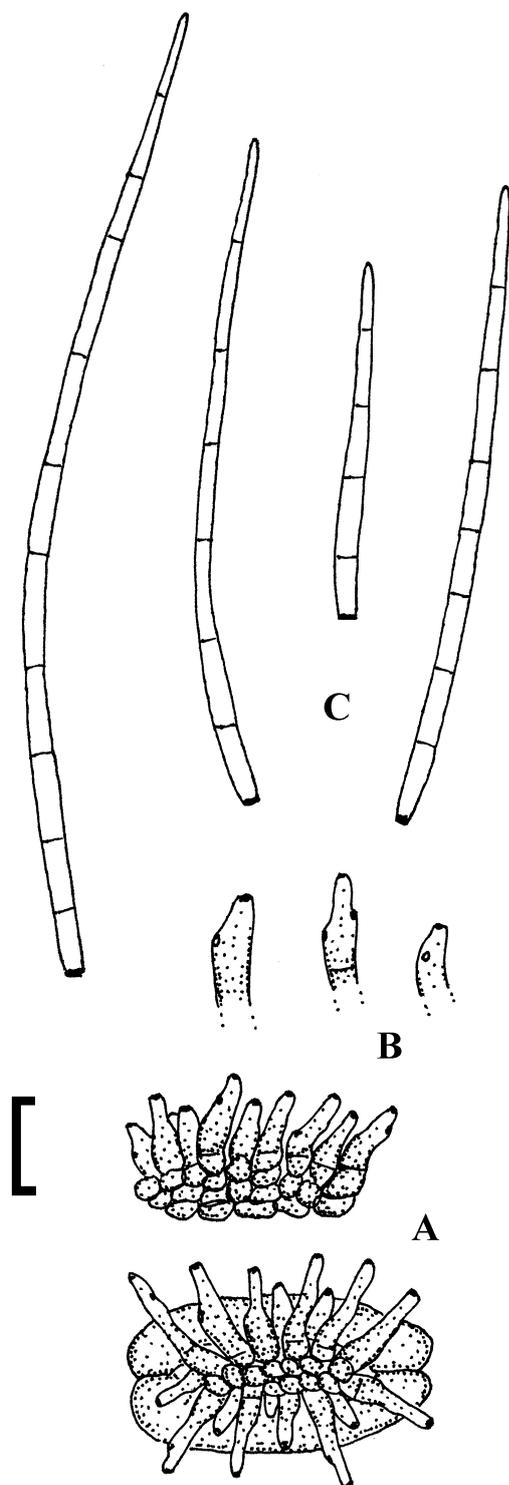


Fig. 84. *Cercospora cyperigena* (K(M) IMI 259773). A. Conidiophore fascicles. B. Conidiophores. C. Conidia. Bars = 10  $\mu$ m.

in lines, blackish brown, later greyish white by rich conidial formation. *Mycelium* internal. *Stromata* substomatal, 10–40  $\mu$ m diam, olivaceous-brown. *Conidiophores* numerous, in dense fascicles, arising from stromata, emerging through stomata, erect, straight, subcylindrical-conical, slightly geniculate-sinuous, unbranched, 5–20  $\times$  2–5  $\mu$ m, 0–1-septate, pale olivaceous or olivaceous-brown, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 5–15  $\mu$ m long,

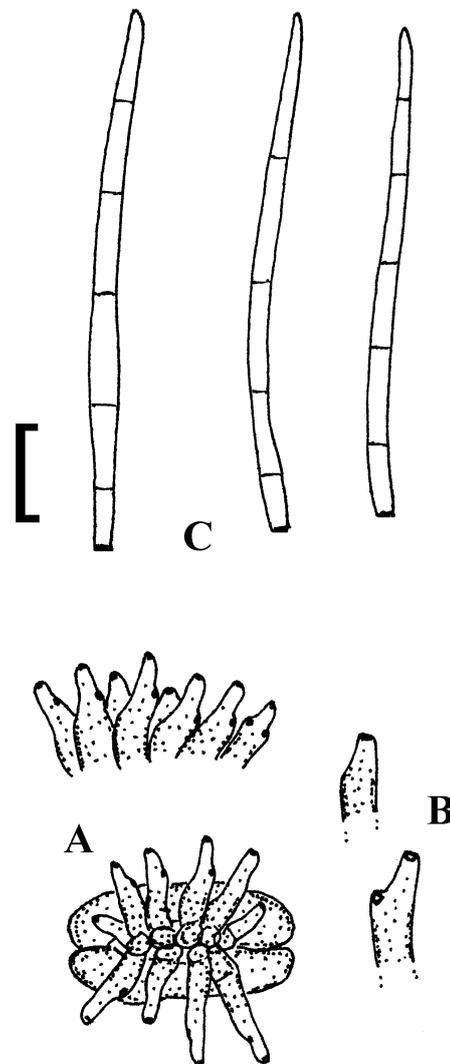


Fig. 85. *Cercospora eleocharidis* (BPI 436100). A. Conidiophore fascicles. B. Conidiophores. C. Conidia. Bar = 10  $\mu$ m.

conidiogenous loci conspicuous, 1–2  $\mu$ m wide, thickened and darkened. *Conidia* solitary, narrowly cylindrical-filiform to subacicular, 40–160  $\times$  1–2.5  $\mu$ m, pluriseptate, mostly 6–14-septate, hyaline, thin-walled, smooth, apex subacute, base truncate, hila 1–2  $\mu$ m wide, slightly thickened and darkened.

*Holotype*: Tanzania: on *Cyperus* sp., 28 May 1981, C. L. Keswani (K(M) IMI 259573).

*Host range and distribution*: On *Cyperus* (*rotundifolius*, *Cyperus* sp.), *Cyperaceae*, Africa (Tanzania), South America (Venezuela).

*Note*: This species is quite distinct from *Cercospora cyperi* (incl. *C. cypericola* and *C. cyperi-rotundi*) by very short, 0–1-septate conidiophores and very long and narrowly cylindrical-filiform to subacicular conidia.

***Cercospora eleocharidis*** Davis, *Trans. Wisconsin Acad. Sci.* 24: 300 (1929). (Fig. 85)

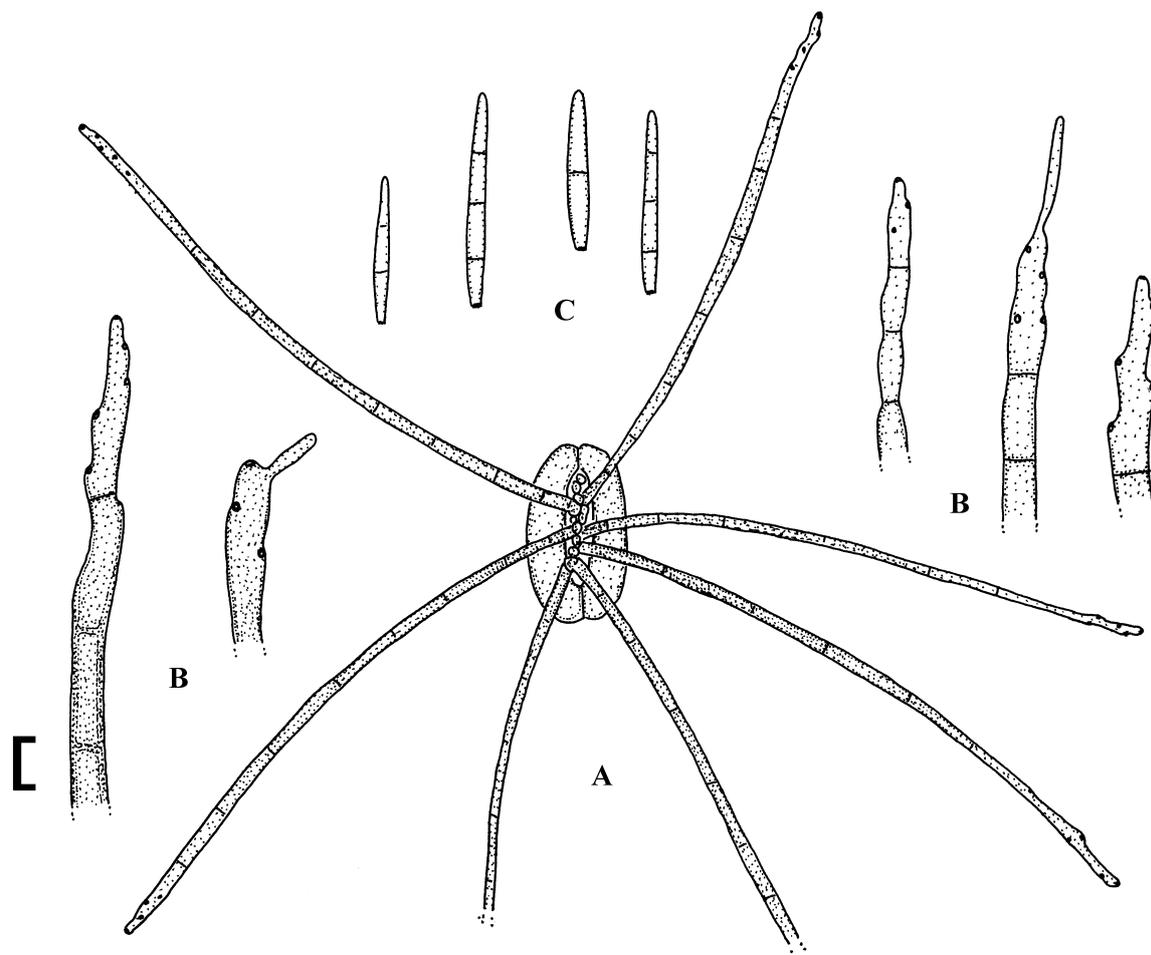


Fig. 86. *Cercospora glauciana* (PDD 46385). A. Conidiophore fascicle. B. Conidiophores. C. Conidia. Bar = 10  $\mu$ m.

*Literature:* Chupp (1954: 192), Crous & Braun (2003: 172), Braun & Crous (2005: 409).

*Description:* Leaf spots formed as small, oblong, brown discolorations, finally the whole leaf blade sometimes turning brown. *Caespituli* amphigenous, finely punctiform, dark. *Mycelium* internal. *Stromata* lacking or formed as small aggregations of swollen hyphal cells in the substomatal cavity, 10–20  $\mu$ m diam, brown. *Conidiophores* in small to moderately large fascicles, mostly dense, arising from stromata, emerging through stomata, erect, straight, subcylindrical-conical, not or only slightly geniculate, unbranched, 5–15  $\times$  1.5–3  $\mu$ m, aseptate, pale olivaceous or brownish, thin-walled, smooth; conidiophores reduced to conidiogenous cells, conidiogenous loci minute but conspicuous, 1  $\mu$ m diam, somewhat thickened and darkened. *Conidia* solitary, narrowly obclavate to almost linear, straight to somewhat curved, (20–)30–70  $\times$  1.5–2.5(–3)  $\mu$ m, indistinctly 2–6-septate, hyaline, thin-walled, smooth, apex pointed, gradually narrowed towards the obconically truncate base, 1  $\mu$ m wide, hila slightly thickened and darkened.

*Lectotype* (designated here, MycoBank MBT178146): **USA:** *Wisconsin:* Barron County, Brill, on *Eleocharis palustris*, 23 Jul. 1928, J. J. Davis (BPI 436100). *Isolectotypes:* CUP 39751, WIS.

*Host range and distribution:* On *Eleocharis* (*acicularis*, *compressa*, *elliptica*, *kuroguwai*, *obtusata*, *palustris*, *Eleocharis* sp.), *Cyperaceae*, Asia (Japan), North America (USA, Idaho, Louisiana, Wisconsin).

*Notes:* A true *Cercospora* s. str. quite distinct from *C. apii* s. lat. by having very short and narrow conidiophores, 5–15  $\times$  2–3  $\mu$ m, minute but distinct conidiogenous loci, 1  $\mu$ m diam. Conidia are narrowly obclavate-fusiform to filiform, 20–70  $\times$  1.5–2.5  $\mu$ m.

***Cercospora glauciana* Viégas, *Bol. Soc. Bras. Agron.* 8: 27 (1945). (Fig. 86)**

*Literature:* Chupp (1954: 192), Braun & Sivapalan (1999: 5), Crous & Braun (2003: 198), Kirschner & Piepenbring (2006: 214).

*Illustrations:* Braun & Sivapalan (1999: 4, fig. 2), Kirschner & Piepenbring (2006: 214, fig. 7).

*Description:* Leaf spots amphigenous, almost indistinct, diffuse discolorations to subcircular, elliptical or fusiform, oblong, 1–10  $\times$  0.5–5 mm, sometimes larger, to 20 mm diam, dull brown, greyish brown to blackish brown, later

with pale centre, greyish white, surrounded by a darker margin. *Caespituli* hypophyllous, fine, not very conspicuous. *Mycelium* internal; hyphae sparingly branched, septate, pale brown, 1–3  $\mu\text{m}$  wide, thin-walled, smooth. *Stromata* almost lacking or small, substomatal aggregations of swollen hyphal cells in the substomatal cavity, 10–35  $\mu\text{m}$  diam, brown, cells 2–5  $\mu\text{m}$  diam. *Conidiophores* in small fascicles, 1–12, divergent to moderately dense, arising from internal hyphae or stromata, through stomata, erect, cylindrical-filiform, straight to somewhat curved, not or only slightly geniculate-sinuuous near the apex, unbranched, occasionally torulose, with swellings, 30–200  $\times$  3–5  $\mu\text{m}$ , swellings occasionally to 8  $\mu\text{m}$  wide, 1–10-septate, medium to dark olivaceous-brown or medium brown, paler towards the tip, wall somewhat thickened below and thin towards the tip, smooth or almost so; conidiogenous cells integrated, terminal and intercalary, 10–35  $\mu\text{m}$  long, sympodially and sometimes also percurrently proliferating, conidiogenous loci solitary or several, sometimes aggregated, thickened and darkened, minute, about 1  $\mu\text{m}$  diam. *Conidia* solitary, cylindrical-fusiform, (12–)15–35  $\times$  2–4  $\mu\text{m}$ , 1–3-septate, hyaline or subhyaline, thin-walled, smooth, apex obtuse to attenuated, base short obconically truncate, 1–1.5  $\mu\text{m}$  wide, hila somewhat thickened and darkened.

**Holotype:** Brazil: São Paulo: Campinas, Faz. Staz. Elisa, on *Bulbostylis major*, 18 Feb. 1943, A. P. Viégas (IACM 4141).

**Host range and distribution:** On *Bulbostylis major*, *Rhynchospora* sp., *Scleria (ciliaris, lithosperma, Scleria* sp.), unidentified *Cyperaceae*, *Cyperaceae*, Asia (Brunei), Oceania (Fiji, Micronesia, Palau, Solomon Islands, Vanuatu), Central and South America (Brazil, Panama).

**Note:** A true *Cercospora* s. str. quite distinct from *C. apii* s. lat. by its short and narrowly subcylindrical-fusiform conidia.

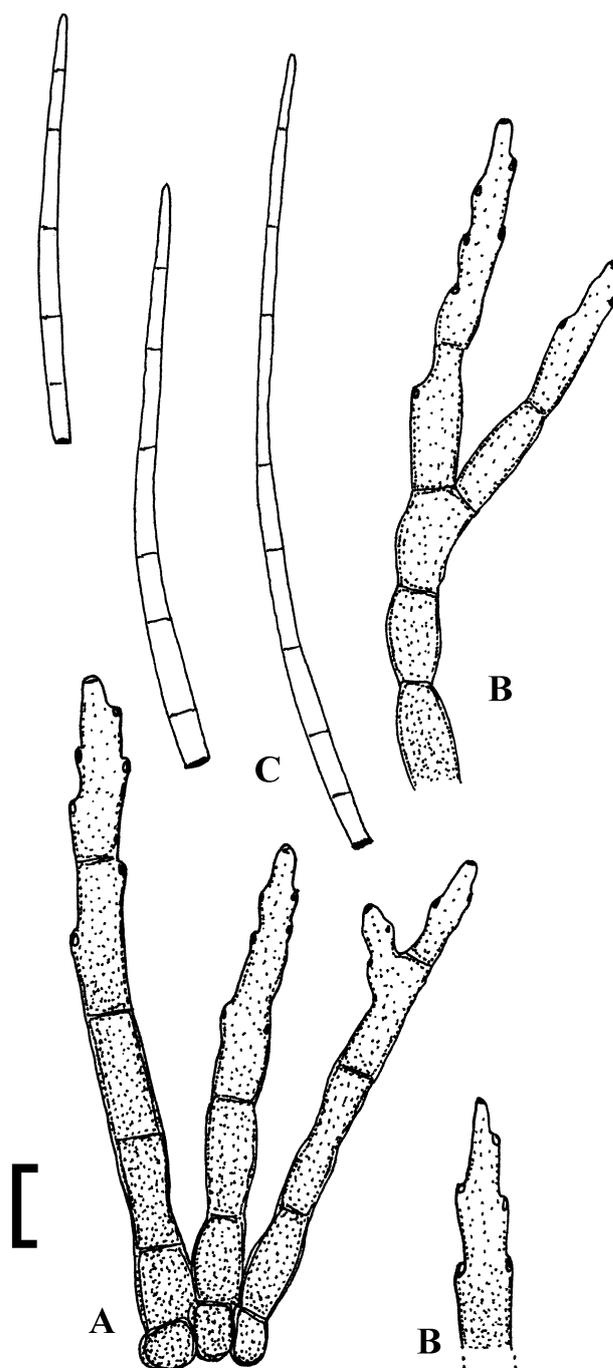
***Cercospora kyllingae*** J.M. Yen & Gilles, *Cah. Maboké* 8: 81 (1970).  
(Fig. 87)

**Literature:** Crous & Braun (2003: 240).

**Illustration:** Yen & Gilles (1970: 80, fig. 4).

**Description:** Leaf spots lacking. *Caespituli* hypophyllous, indistinct. *Mycelium* internal. *Stromata* lacking. *Conidiophores* solitary or in small divergent or somewhat denser fascicles, 2–5, arising from internal hyphae, emerging through stomata, erect, straight to flexuous, subcylindrical or narrowed towards the apex, fertile part distinctly geniculate-sinuuous, simple or often branched, 30–105  $\times$  4–5  $\mu\text{m}$ , 3–7-septate, pale brown to brown, smooth; conidiogenous cells integrated, terminal and intercalary, conidiogenous loci conspicuous, thickened and darkened. *Conidia* solitary, acicular, 20–120  $\times$  1.5–3  $\mu\text{m}$ , 1–12-septate, hyaline, thin-walled, smooth, apex acute, base truncate or subtruncate, hila thickened and darkened.

**Holotype:** Gabon: Libreville, on *Kyllinga erecta*, *Cyperaceae*, 22 Jan. 1970, G. Gilles ("Par.Gab. no. 41") (not traced).



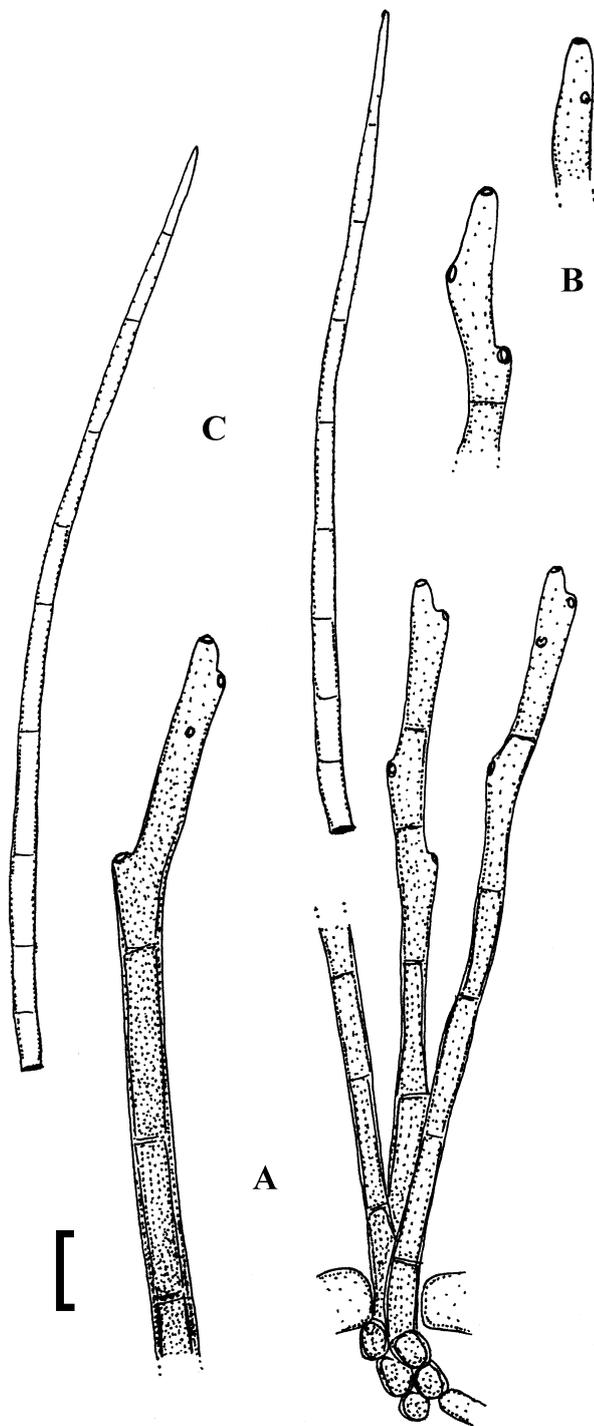
**Fig. 87.** *Cercospora kyllingae* (based on Yen & Gilles 1970: 80, fig. 4). **A.** Conidiophore fascicle. **B.** Conidiophores. **C.** Conidia. Bar = 10  $\mu\text{m}$ .

**Host range and distribution:** Only known from the type collection, which we have not traced.

**Notes:** This species with its acicular conidia undoubtedly belongs to the *C. apii* s. lat. complex.

***Cercospora kyllingicola*** J.M. Yen & Gilles, *Cah. Maboké* 8: 83. 1970.  
(Fig. 88)

**Literature:** Crous & Braun (2003: 240).



**Fig. 88.** *Cercospora kyllingicola* (based on Yen & Gilles 1970: 82, fig. 5). **A.** Conidiophore fascicle and conidiophore. **B.** Conidiophore tips. **C.** Conidia. Bar = 10  $\mu$ m.

*Illustration:* Yen & Gilles (1970: 82, fig. 5).

*Description:* *Leaf spots* lacking. *Caespituli* hypophyllous, indistinct. *Mycelium* internal. *Stromata* lacking. *Conidiophores* solitary or in small divergent fascicles, arising from internal hyphae, emerging through stomata, erect, straight to slightly flexuous, 0–2 times geniculate, unbranched, 35–120  $\times$  4–5  $\mu$ m, 1–6-septate, pale brown to brown, paler towards the tip, smooth; conidiogenous cells integrated, terminal and intercalary, conidiogenous loci conspicuous, thickened and darkened.

*Conidia* solitary, acicular, straight to somewhat curved, 60–250  $\times$  3–4  $\mu$ m, 8–21-septate, hyaline, thin-walled, smooth, apex pointed, base truncate, hila thickened and darkened.

*Holotype:* **Gabon:** Libreville, on *Kyllinga erecta*, *Cyperaceae*, 22 Jan. 1970, G. Gilles ("Par.Gab. no. 41") (not traced).

*Host range and distribution:* Only known from the type collection which we have not traced.

*Notes:* This species with its acicular conidia does undoubtedly belong to the *C. apii* s. lat. complex. It differs from *C. kyllingae* by its unbranched conidiophores and longer, broader conidia. However, *C. kyllingae* and *C. kyllingicola* occur both on *Kyllinga erecta*, are from the same locality and belong to the *C. apii* complex. If the described morphological differences between the two species are sufficient to keep two separate species is uncertain, somewhat doubtful and requires further collections and examinations.

***Cercospora uredinophila* (Sacc.) Deighton, *Mycol. Pap.* 118: 40 (1969).**

(Fig. 89)

*Basionym:* *Cercosporella uredinophila* Sacc., *Ann. Mycol.* 12: 312 (1914).

*Synonym:* *Cercosporella scirpina* Davis, *Trans. Wisconsin Acad. Sci.* 18: 266 (1915) [*lectotype (designated here, MycoBank MBT178147: USA: Wisconsin: St. Croix Falls, on Scirpus pedicellatus, 25 Aug. 1914, J. J. Davis (BPI 420940); isolectotype: WIS*].

*Literature:* Saccardo (1931: 744), Braun (1993a: 236; 1995: 122), Crous & Braun (2003: 416).

*Illustrations:* Deighton (1969: 40, fig. 23), Braun (1993a: 237, fig. 3; 1995: 123, fig. 107).

*Exsiccatae:* Syd., *Fungi Exot. Exs.* 444.

*Description:* *Leaf spots* amphigenous, subcircular, elliptical, oblong, irregular, 1–4 mm diam, scattered to confluent, pale brown, margin indefinite or darker. *Caespituli* amphigenous, punctiform, whitish, pale pink to brownish, not very conspicuous. *Mycelium* internal; hyphae branched, septate, 1–3  $\mu$ m wide, hyaline or subhyaline. *Stromata* small, substomatal, 10–30  $\mu$ m diam, subhyaline, yellowish to pale olivaceous, composed of subhyaline to yellowish swollen hyphal cells, 2–5  $\mu$ m diam. *Conidiophores* in small to usually moderately large fascicles, about 8–20, divergent to dense, arising from stromata, through stomata, erect, straight, subcylindrical, unbranched, somewhat attenuated towards the tip to moderately geniculate-sinuuous, unbranched, 20–35(–60)  $\times$  2–6(–7)  $\mu$ m, aseptate, almost hyaline to pale yellowish olivaceous, thin-walled, smooth; conidiophores reduced to conidiogenous cells, conidiogenous loci conspicuously thickened and darkened, planate to subdentate, about 1.5–2  $\mu$ m diam. *Conidia* formed singly, acicular, filiform, narrowly obclavate, straight to somewhat curved or sinuous, (35–)40–80(–140)  $\times$  2–3  $\mu$ m, mostly (2–)3–7(–12)-septate, hyaline, thin-walled, smooth, apex acute to subobtuse, base

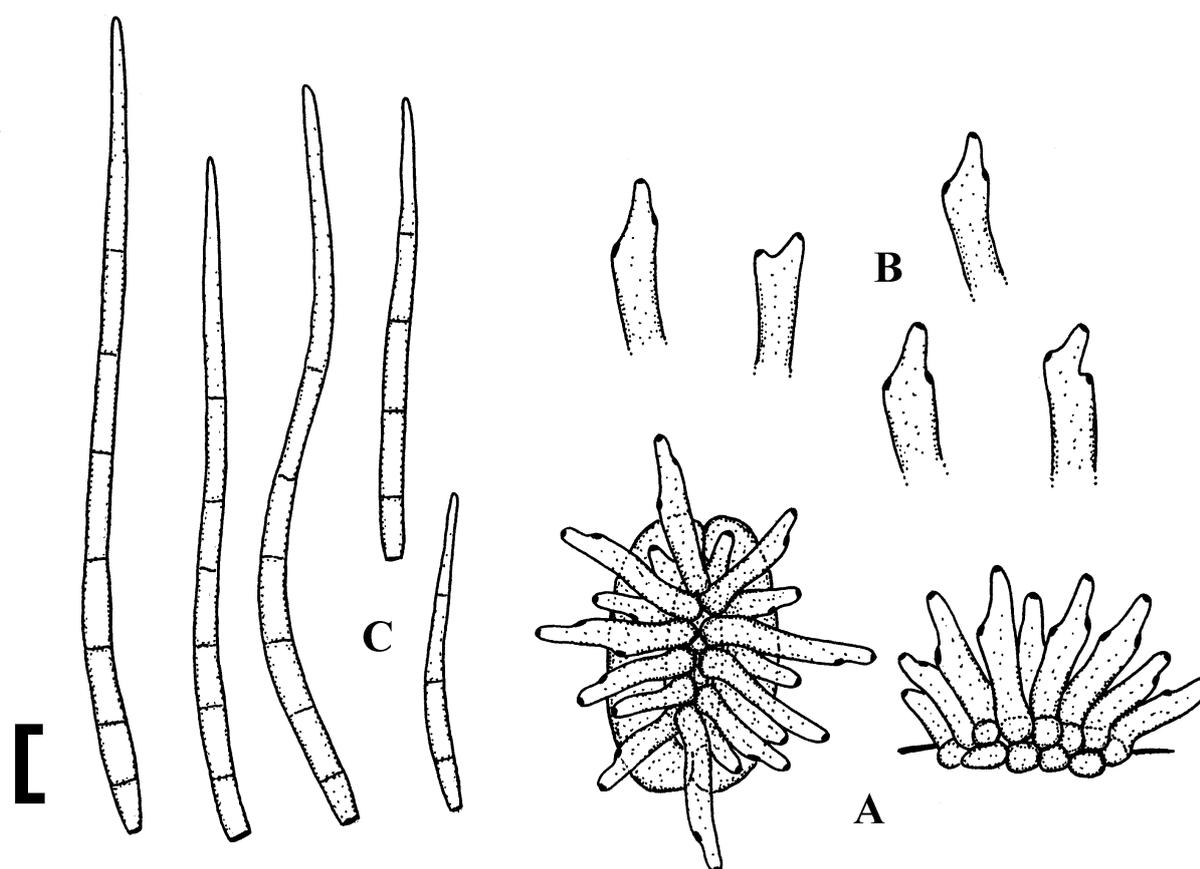


Fig. 89. *Cercospora uredinophila* (PAD, holotype). A. Conidiophore fascicles. B. Conidiophores. C. Conidia. Bar = 10  $\mu$ m.

truncate or short obconically truncate, 1.5–2.5  $\mu$ m wide, hilum thickened and darkened.

**Holotype:** Philippines: Manila, on *Scirpus grossus*, 29 Mar. 1913, P. W. Graff 170 (PAD). **Isotypes:** Syd., Fungi Exot. Exs. 444, e.g. BPI 420980, CUP, K(M) IMI 16432a, MICH 15397.

**Host range and distribution:** On *Actinoscirpus grossus* [*Scirpus grossus*], *Scirpus* (*cyperinus*, *pedicellatus*, *Scirpus* sp.), *Cyperaceae*, Asia (Malaysia, Philippines), North America (USA, Wisconsin).

### Doubtful, excluded and insufficiently known species

*Cercospora crinospora* G.F. Atk., *J. Elisha Mitchell Sci. Soc.* 8: 58 (1892).

**Synonym:** *Dactylaria crinospora* (G.F. Atk.) U. Braun & Crous, in Crous & Braun, *Mycosphaerella and Anam.*: 143 (2003).

**Literature:** Saccardo (1892: 655), Chupp (1954: 191).

**Holotype:** USA: Alabama: Auburn, on *Rhynchospora glomerata*, *Cyperaceae*, 27 Aug. 1891, B. M. Duggar (CUP-A 2034).

**Host range and distribution:** Only known from the type collection.

**Notes:** This species was placed in *Dactylaria* sect. *Mirandina* (*sensu de Hoog* 1985). The conidiophores are formed in small fascicles, 15–60  $\times$  2–3.5  $\mu$ m, pale to medium olivaceous-brown, septate, wall somewhat thickened; conidiogenous cells integrated, terminal, denticulate. The conidia are solitary, cylindrical-filiform to subfusiform, 15–60  $\times$  1–2.5  $\mu$ m, obscurely 1–4-septate, hyaline, smooth. This species is morphologically close to *D. congesta* (conidiophores subhyaline) and *D. irregularis* (isolated from bark, conidiophores shorter and wider).

*Cercospora cyperi-fusci* Sandu, *Lucr. Ști. Inst. Agron. 'Prof. Ion Ionescu de la Brad'* 1960: 384 (1960).

**Literature:** Crous & Braun (2003: 151).

**Description:** Lesions necrotic, brown, indeterminate, covering almost entire leaves. *Conidiophores* fasciculate, 4–12, rarely solitary, emerging through stomata, erect, geniculate-sinuous ("nodulose"), unbranched, 20–45  $\times$  3.5–4  $\mu$ m, aseptate or with a single septum, brown, paler towards the tip. *Conidia* solitary, acicular, 90–110  $\times$  4  $\mu$ m, pluriseptate, hyaline, apex acute, base truncate.

**Holotype:** Romania: Cîrjoaia, Zbereni forest near Cotnari, on *Cyperus fuscus*, 30 Jul. 1957, C. Sandu-Ville (not traced).

**Host range and distribution:** On *Cyperus fuscus*, *Cyperaceae*, Europe (Romania).

*Notes:* It was not possible to get type material or any other collections of this species. It is unclear and unknown to us if and where type material has been deposited. According to the original description and illustration (Sandu-Ville et al. 1960), the conidia of *C. cyperi-fusci* are strictly acicular placing this species in the *C. apii* s. lat. complex, i.e. it does not belong to *C. cyperi* which is common and widespread on *Cyperus* spp.

*Cercospora scirpi* Zaprom., *Bolezni Rast.* **12**: 92 (1923).

*Synonyms:* *Cercospora scirpi* (Zaprom.) Karak., in Vassiljevsky & Karakulin, *Fungi Imperfecti Parasitici (Hyphomycetes)* **1**: 173 (1937).

*Cercospora scirpi* Moesz, *Magyar Biol. Kutatóint. Munkái* **1**: 114 (1930) [*holotype:* Hungary: Hévízfürdő, on *Schoenoplectus litoralis*, 10 Sep. 1927, Moesz (BP); *isotype:* B].

*Pseudocercospora scirpi* (Moesz) Deighton, *Mycol. Pap.* **133**: 55 (1973).

*Literature:* Chupp (1954: 192), Braun (1995: 160; 1998a: 404), Braun & Mel'nik (1997: 91).

*Holotype:* Uzbekistan: Tashkent Gub., on *Schoenoplectus lacustris*, 18 Jul. 1918, Zaprometov (LE 159401).

*Host range and distribution:* On *Eleocharis palustris*, *Schoenoplectus (lacustris, litoralis)*, *Scirpus acutus*, *Cyperaceae*, Asia (Uzbekistan), Europe (Germany, Great Britain, Hungary), North America (USA, Wisconsin).

*Notes:* Based on the original description, Braun (1995: 122) interpreted the name *Cercospora scirpi* as synonym of *C. uredinicola*, but later Braun (1998: 404) traced and examined type material of *C. scirpi* and reduced it to synonymy with *Pseudocercospora scirpi*.

*Cercospora scirpicola* (Fuckel) Zind.-Bakker, *Rev. Mycol.* **5**: 64 (1940).

*Basionym:* *Sporidesmium scirpicola* Fuckel, *Fungi Rhen. Exs.*, no. 78 (1863).

*Synonyms:* *Clasterosporium scirpicola* (Fuckel) Sacc., *Syll. Fung.* **4**: 393 (1886).

*Alternaria scirpicola* (Fuckel) Sivan., *Bitunicate Ascomycetes and their Anamorphs*: 526 (1984).

*Nimbya scirpicola* (Fuckel) E. Simmons, *Sydowia* **41**: 318 (1989).

*Sphaeria scirpicola* DC., *Fl. franç.*, edn. 3, **2**: 300 (1805): Fr., *Syst. Mycol.* **2**: 510 (1823).

*Macrospora scirpicola* (DC.: Fr.) Fuckel, *Jahrb. Nassauischen Vereins Naturk.* **23–24**: 140 "1869" (1870).

*Pleospora scirpicola* (DC.: Fr.) P. Karst., *Bidrag Kännedom Finlands Natur Folk* **19**: 72 (1871).

*Clathrospora scirpicola* (DC.: Fr.) Höhn., *Ann. Mycol.* **18**: 77 (1920).

*Pyrenophora scirpicola* (DC.: Fr.) E. Müll., *Sydowia* **5**: 256 (1951).

*Sphaeria scirpi* Rabenh., *Deutschl. Krypt.-Fl.* **1** (*Pilze*): 170 (1844), *nom. superfl.*

*Pleospora scirpi* (Rabenh.) Ces. & De Not., *Comment. Soc.*

*Crittog. Ital.* **1**: 217 (1863).

*Pyrenophora scirpi* (Rabenh.) Wehmeyer, *World Monograph of the Genus Pleospora and its Segregates*: 287 (1961).

*Pleospora eleocharidis* Plowr., *Fungi of Norfolk*: 18 (1884).

*Pleospora palustris* Berl., *Nuovo Giorn. Bot. Ital.* **20**: 67 (1888).

*Literature:* Chupp (1954: 193), Ellis (1976: 421), Crous & Braun (2003: 369), Woudenberg et al. (2013: 198, current taxonomy and phylogeny).

*Syntypes:* Germany: Hattenheim, *Fuckel, Fungi Rhen. Exs.* 78 (e.g., FH, G, HAL).

*Host range and distribution:* On *Eleocharis*, *Eriophorum*, *Festuca*, *Juncus*, *Scirpus* (s. lat.) spp., *Cyperaceae*, *Juncaceae*, *Poaceae*, Europe and North America.

*Notes:* *Sphaeria scirpi* is a superfluous name since Rabenhorst (*l. c.*) cited in his original description the valid name *Sphaeria scirpicola* DC. as synonym. Rabenhorst also referred to 'Fries, Elench. II: 108' and 'Syst. II: 510', but in these works Fries only cited *S. scirpicola* DC.

## Passalora

A single species.

*Passalora cyperi* (Durgas Gupta, Padhi & Chowdhry) U. Braun & Crous, in Crous & Braun, *Mycosphaerella and Anam.*: 450 (2003).

*Basionym:* *Phaeoramularia cyperi* Durgas Gupta, Padhy & Chowdhry, *Curr. Sci.* **50**: 140 (1981).

*Literature:* Singh (2003: 527), Kamal (2010: 116).

*Illustration:* Gupta et al. (1981: 140, fig. 1).

*Description:* Leaf spots amphigenous, circular to elongated, 0.5–2 mm diam, deep brown. *Caespituli* hypophyllous, effuse, brown. *Mycelium* internal. *Stromata* pseudoparenchymatous, globose, small, 15–18 µm diam, medium brown. *Conidiophores* fasciculate, arising from stromata, about 7–9 per fascicle, erect, straight, subcylindrical or occasionally geniculate, rarely branched, 45–90 × 3.5–6(–7) µm, 3–10-septate, olivaceous-brown, smooth; conidiogenous cells integrated, terminal, conidiogenous loci conspicuous, thickened and darkened. *Conidia* solitary to catenate, in branched chains, cylindrical to ellipsoid-fusiform, 4–22 × 2–5 µm, 0–1-septate, pale olivaceous-brown, ends rounded, with thickened and darkened hila.

*Holotype:* India: Odisha: Bhubaneswar, on *Cyperus alternifolius*, *Cyperaceae*, 22 Nov. 1977, D. Gupta (HCIO 32895).

*Host range and distribution:* Only known from the type collection.

*Notes:* This species is only tentatively maintained in *Passalora* (including *Phaeoramularia*). The conidia are rather cladosporioid, but details of the structure of the conidiogenous

loci and conidial hila are unknown. Type material was not available for re-examination.

## Zasmidium

### Key to *Zasmidium* species on Cyperaceae

- 1      Stromata present, 10–30 µm diam; conidiogenous loci and conidial hila 2–3 µm wide;  
           conidia 20–300 × 3–5 µm, pluriseptate (with to 30 septa); on *Gahnia* ..... **Z. gahniae**  
       Stromata lacking; conidiogenous loci and conidial hila narrower, 1–1.5 µm diam;  
           conidia shorter and above all narrower, 20–50(–70) × 2.5–3.5(–4) µm,  
           only (0–)1–3-septate; on *Scleria* ..... **Z. scleriae**

### *Zasmidium* species on Cyperaceae

#### *Zasmidium gahniae* (McKenzie) U. Braun & McKenzie, comb. nov.

MycoBank MB809039

(Fig. 90)

*Basionym:* *Stenella gahniae* McKenzie, *New Zealand J. Bot.*  
 20: 248 (1982).

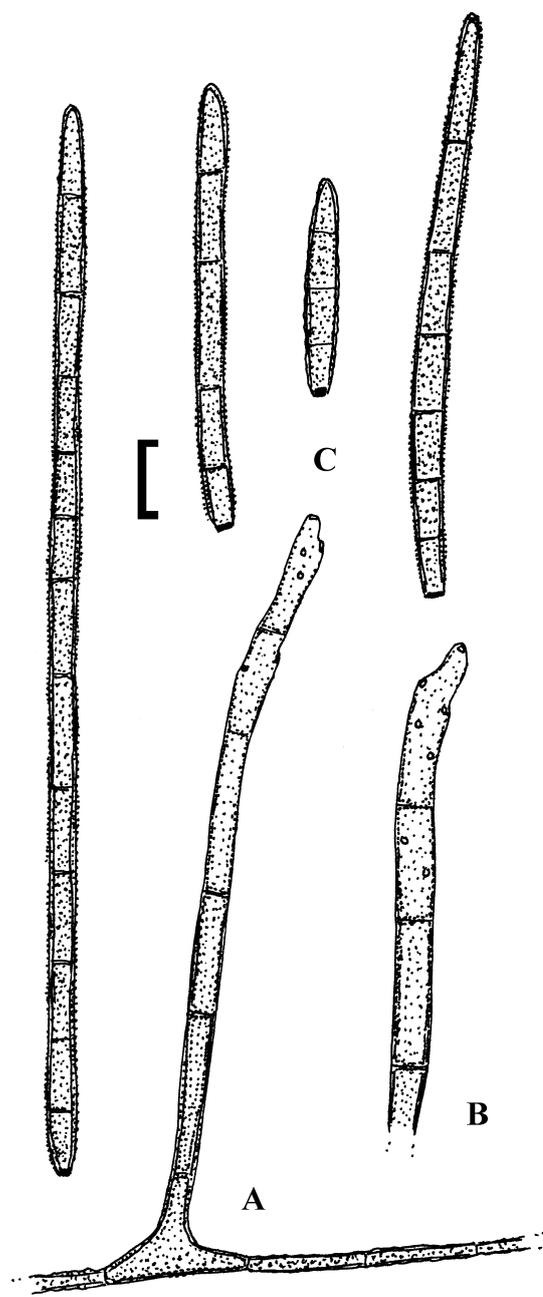
*Illustration:* McKenzie (1982: 249–250, figs 4–5).

*Description:* Colonies epiphyllous. *Mycelium* internal and external; superficial hyphae branched, septate, 1.5–2.5 µm wide, pale straw-coloured, thin-walled, minutely verruculose. *Stromata* absent. *Conidiophores* solitary, arising from superficial hyphae, lateral, originating from brown, smooth, sometimes swollen hyphal cells, 10–30 µm wide, erect, straight or flexuous, occasionally 1–2 times geniculate, unbranched, to 150 µm long and 3–4.5 µm wide, pluriseptate, brown, paler towards the tip, thin-walled, smooth; conidiogenous cells integrated, terminal and intercalary, sympodial, conidiogenous loci conspicuous, numerous, slightly prominent, thickened and darkened, 2–3 µm wide. *Conidia* solitary, straight or almost so, cylindrical to narrowly obclavate, 20–300 × 3–5 µm, pluriseptate (to 30 septa), straw-coloured, thin-walled, minutely verruculose, apex obtuse, rounded, base truncate to short obconically truncate, 2–3 µm wide, hila thickened and darkened.

*Holotype:* **New Zealand:** Auckland Domain, on *Gahnia setifolia*, *Cyperaceae*, 28 Sep. 1978, W. S. M. Versluys & E. H. C. McKenzie (PDD 38658).

*Host range and distribution:* On *Gahnia* (*lacera*, *setifolia*), *Cyperaceae*, New Zealand.

*Notes:* This species is characterised by having scolecosporous (cercosporoid), pluriseptate conidia formed singly, with planate conidiogenous loci and hila. Such cercosporoid former *Stenella* species belong to the *Mycosphaerellaceae* and have to be reallocated to *Zasmidium*.



**Fig. 90.** *Zasmidium gahniae* (PDD 38658). **A.** Solitary conidiophore arising from superficial hypha. **B.** Conidiophore. **C.** Conidia. Bar = 10 µm.

**Zasmidium scleriae** (McKenzie) U. Braun & McKenzie, **comb. nov.**

Mycobank MB809040

(Fig. 91)

*Basionym:* *Stenella scleriae* McKenzie, *New Zealand J. Bot.* **20**: 250 (1982).*Illustration:* McKenzie (1982: 251, fig. 6).

*Description:* Colonies amphigenous, mainly epiphyllous. *Mycelium* internal and external; superficial hyphae, branched, septate, 1.5–5 µm wide, pale straw-coloured, thin-walled, minutely verruculose. *Stromata* absent. *Conidiophores* solitary, arising from superficial hyphae, lateral, erect, originating from brown, smooth, sometimes swollen cells, 5–10 µm diam, straight to flexuous or somewhat geniculate, unbranched, to 210 µm long and 2.5–4(–4.5) µm wide, pluriseptate, brown, paler towards the tip; conidiogenous cells integrated, terminal or intercalary, sympodial, conidiogenous loci thickened and darkened, slightly prominent, 1–1.5 µm wide. *Conidia* solitary, straight or curved to sinuous, cylindrical to narrowly obclavate, 20–50(–70) × 2.5–3.5(–4) µm, indistinctly (0–)1–3-septate, straw-coloured, thin-walled, minutely verruculose, apex obtuse, rounded, base truncate to short obconically truncate, 1–1.5 µm wide, hila somewhat thickened and darkened.

*Holotype:* **Solomon Islands:** Kolombangara, on *Scleria polycarpa*, *Cyperaceae*, 12 Jul. 1980, E. H. C. McKenzie (PDD 40911).

*Host range and distribution:* Only known from the type collection.

*Notes:* See *Z. gahniae*.

**Dioscoreaceae****Cercospora****Key to Cercospora species on Dioscoreaceae**

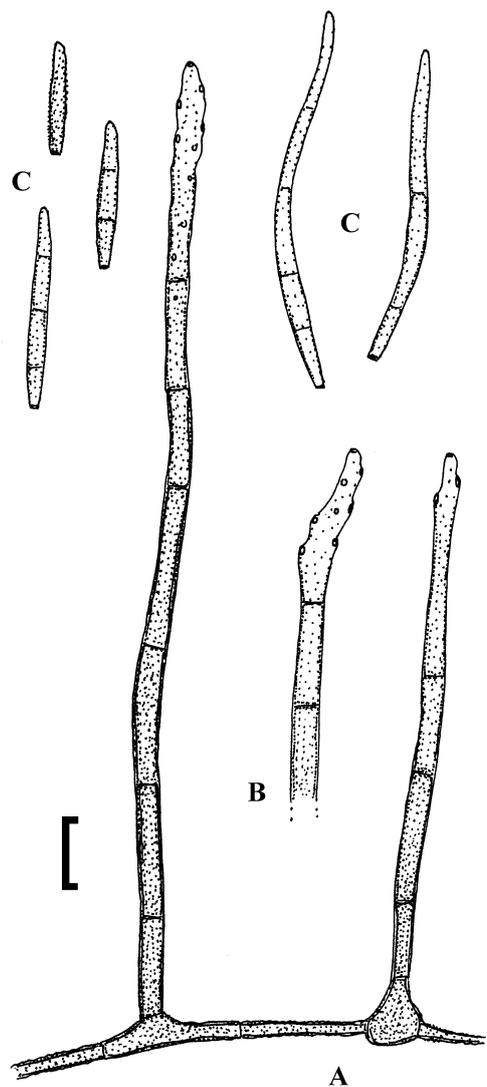
- 1 Conidiophores very short, 7–45 × 3–7 µm, 0–1-septate; on *Dioscorea pyrenaica*, Europe ..... **C. aragonensis**  
Conidiophores much larger, (10–)40–320 µm, pluriseptate; on *Dioscorea* spp., Africa, Asia ..... 2
- 2 (1) Stromata well-developed, large, about 30–65 µm diam; conidia strictly acicular;  
on *Dioscorea oppositifolia*, China ..... **C. cantoniensis**  
Stromata lacking or small, 10–40 µm diam; conidia acicular, shorter ones obclavate-cylindrical;  
on *Dioscorea* spp. .... **C. dioscoreae-pyrifoliae**

**Cercospora species on Dioscoreaceae**

**Cercospora aragonensis** Durrieu, *Bull. Trimestriel Soc. Mycol. France* **80**: 169 (1964).

(Fig. 92)

*Literature:* Pons & Sutton (1988: 15), Crous & Braun (2003: 63).



**Fig. 91.** *Zasmidium scleriae* (PDD 40911). **A.** Solitary conidiophores arising from superficial hypha. **B.** Conidiophore. **C.** Conidia. Bar = 10 µm.

*Illustration:* Pons & Sutton (1988: 14, fig. 5).

*Description:* Leaf spots yellowish to brownish, necrotic, at the leaf edge, extending to the petioles, to 10 mm diam. *Caespituli* amphigenous. *Mycelium* internal. *Stromata* substomatal, 20–60 µm diam, pseudoparenchymatic, brown. *Conidiophores* fasciculate, to 20, arising from stromata, through stomata,

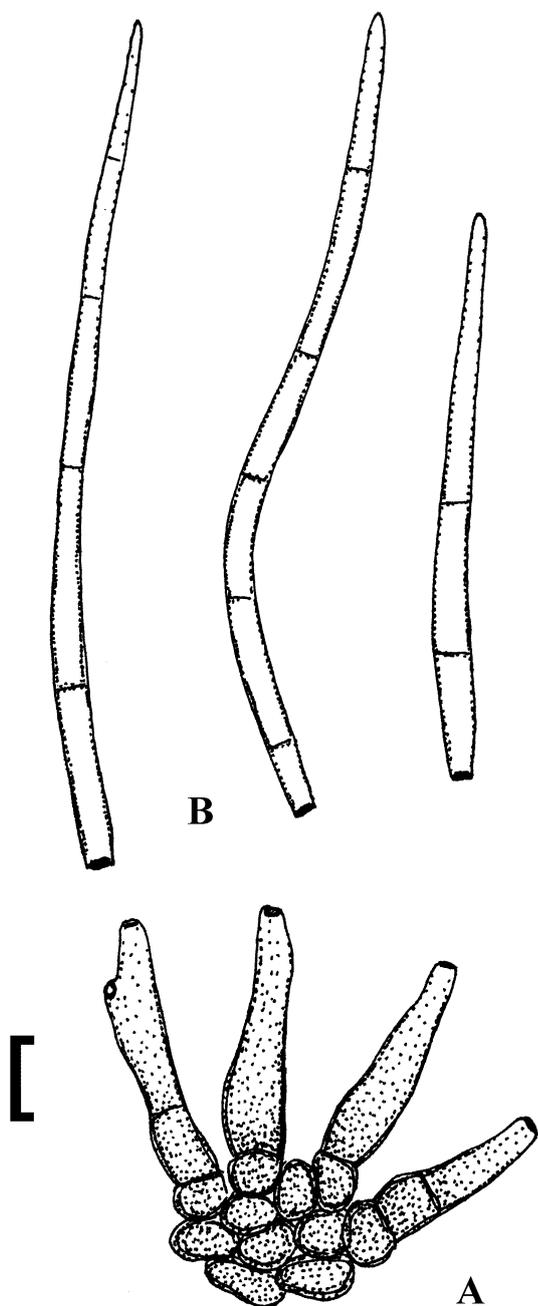


Fig. 92. *Cercospora aragonensis* (K(M) IMI 255661). A. Conidiophore fascicle. B. Conidia. Bar = 10  $\mu$ m.

short, subcylindrical-conical or only slightly geniculate-sinuuous, unbranched, 7–45  $\times$  3–7  $\mu$ m, 0–1-septate, pale olivaceous, thin-walled, smooth; conidiophores reduced to conidiogenous cell or occasionally integrated, terminal, sympodial and occasionally percurrent, conidiogenous loci conspicuous, somewhat thickened and darkened, about 2.5–3  $\mu$ m diam. *Conidia* solitary, acicular to narrowly obclavate, straight to curved, 65–155  $\times$  3–4  $\mu$ m, 2–12-septate, hyaline, thin-walled, smooth, apex pointed, base truncate to somewhat obconically truncate (gradually attenuated towards the base), about 2–3  $\mu$ m wide, hila somewhat thickened and darkened.

**Holotype:** Spain: Prov. Hueasca: Pyrenees, Mt Tourbón, on *Dioscorea pyrenaica*, 25 Jul. 1963, G. Durrieu (TLA 1828). **Isotype:** K(M) IMI 255661 (slide).

**Host range and distribution:** On *Dioscorea pyrenaica* *Dioscoreaceae*, Europe (Spain).

**Notes:** A true *Cercospora* s. str. distinct from *C. apii* s. lat. by its very short conidiophores and narrowly obclavate to acicular conidia. However, this species is only known from the type collection. New collections are necessary to establish the morphological variability of conidiophores and conidia. As already mentioned by Sutton & Pons (1988), it cannot be excluded that *C. aragonensis* was based on immature material.

***Cercospora cantonensis*** P.K. Chi, *Fungal Diseases of Cultivated Medical Plants in Guangdong Province*: 84 (1994); also in *J. S. China Agric. Univ.* 15: 14 (1994) (Similar to Fig. 1)

**Literature:** Guo *et al.* (2005: 107).

**Illustrations:** Chi (1994: 84, fig. 72), Guo *et al.* (2005: 107, fig. 72).

**Description:** Leaf spots amphigenous, circular, elliptical to irregular, greyish white with brown border. *Caespituli* amphigenous. *Mycelium* internal. *Stromata* well-developed, large, about 30–65  $\mu$ m diam, globose, olivaceous-brown. *Conidiophores* fasciculate, 5–18, divergent to dense, arising from stromata, erect, straight, subcylindrical to distinctly geniculate, to six times, unbranched, about 40–325  $\times$  3–6.5  $\mu$ m, usually 3–13-septate, olivaceous-brown; conidiogenous cells integrated, terminal and intercalary, conidiogenous loci distinct, thickened and darkened. *Conidia* solitary, acicular, about 30–255  $\times$  2–4  $\mu$ m, 5–30-septate, hyaline, thin-walled, smooth, apex pointed, base truncate, with thickened and darkened hilum.

**Holotype:** China: Prov. Guangdong: Luoding, on *Dioscorea oppositifolia* [*opposita*], Jul. 1986, S. Q. Chen 341 (Hb. South China Agric. Univ., Guangzhou).

**Host range and distribution:** On *Dioscorea (gracillima, oppositifolia)*, *Dioscoreaceae*, Asia (China).

**Notes:** Crous & Braun (2003) reduced *C. cantoniensis* to synonymy with *C. dioscoreae-pyrifoliae*, but we prefer to maintain it tentatively as a separate species based on differences in the formation of stromata. *Cercospora cantoniensis* was described to have well-developed stromata, about 30–65  $\mu$ m diam, whereas *Cercospora* collections on other *Dioscorea* spp., referred to as *C. dioscoreae-pyrifoliae*, are characterised by having small or no stromata. Guo *et al.* (2005) maintained *C. cantoniensis* as a separate species based on a comparison with the original description of *C. dioscoreae-pyrifoliae* which is, however, misleading with regard to the given conidial size (see notes under the latter species).

***Cercospora dioscoreae-pyrifoliae*** J.M. Yen, *Bull. Trimestriel Soc. Mycol. France* 84: 5 (1968); as "*dioscoreae-pyrifoliae*". (Fig. 93)

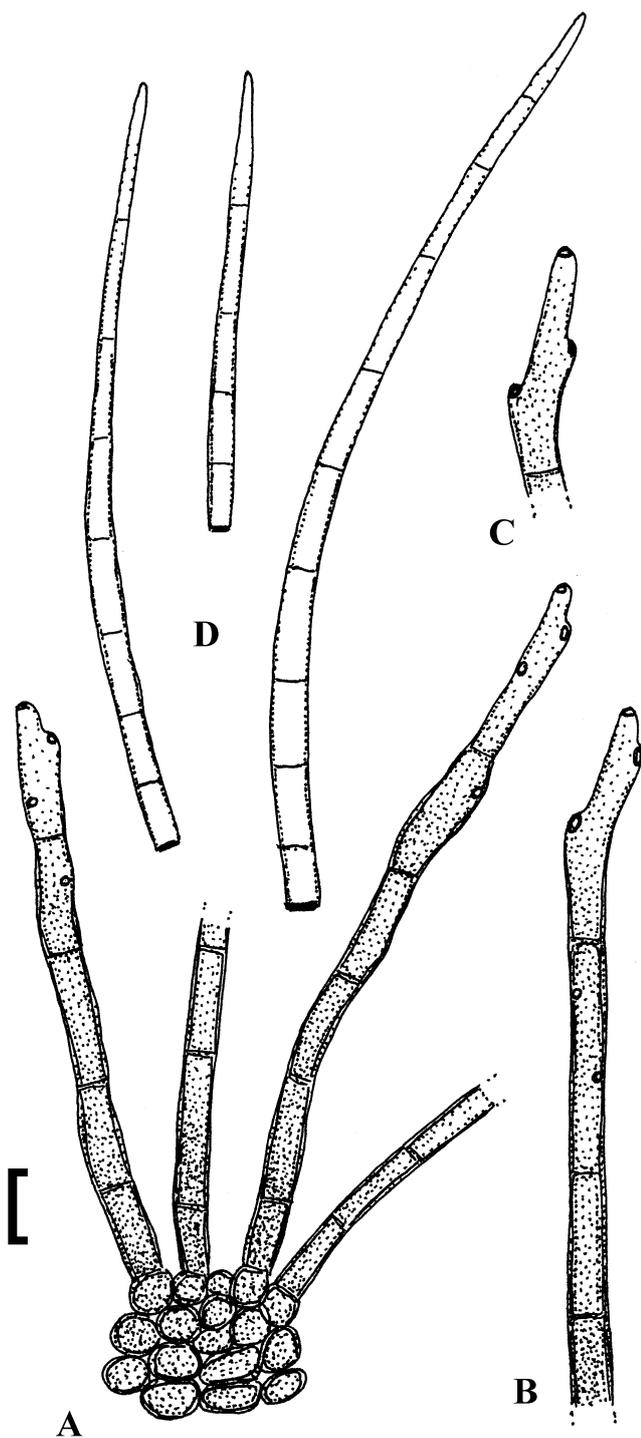


Fig. 93. *Cercospora dioscoreae-pyrifoliae* (PC, holotype). A. Conidiophore fascicle. B. Conidiophore. C. Conidiophore tip. D. Conidia. Bar = 10  $\mu$ m.

**Synonyms:** *Cercospora pachyderma* var. *indica* Munjal, Lall & Chona, *Indian Phytopathol.* **14**: 187 (1961) [holotype: **India:** Uttarakhand: Jeolikote, Kumaon, on *Dioscorea* sp., 22 Oct. 1959, J. N. Kapoor (HCIO 26873); isotype: K(M) IMI 256769].

?*Mycosphaerella papuana* Sivan., *Trans. Brit. Mycol. Soc.* **85**: 743 (1985) [holotype: **Papua New Guinea:** Nembi Valley, on *Dioscorea* sp., 17 Sep. 1984, J. M. Waller 2144 (K(M) IMI 293049)].

**Literature:** Yen & Lim (1980: 159), Pons & Sutton (1988: 7–15, as *C. apii*), Crous & Braun (2003: 162), Aptroot (2006: 149), Kamal (2010: 41), Nakashima et al. (2011).

**Illustrations:** Yen (1968: 7, fig. 1), Yen & Lim (1980: 212, fig. 15), Sivanesan (1985: 744–746, figs 1–3), Pons & Sutton (1988: 8–11, figs 1–3), Nakashima et al. (2011: 256, fig. 1c,d).

**Description:** Leaf spots amphigenous, subcircular, elliptical to angular-irregular, 0.5–10 mm diam, at first brown, later with pale centre, finally greyish white with dark border, brown, and sometimes yellowish halo. *Caespituli* amphigenous, punctiform, dark, scattered. *Mycelium* internal. *Stromata* lacking or almost so to small, 10–40  $\mu$ m diam, substomatal to intraepidermal, brown. *Conidiophores* in small to moderately large fascicles (usually 2–30), divergent to moderately dense, arising from internal hyphae or stromata, emerging through stomata or erumpent, straight to distinctly geniculate-sinuous, unbranched, (10–)40–200  $\times$  3–7  $\mu$ m, usually 0–8-septate, pale to dark olivaceous-brown or brown, wall thin to slightly thickened, smooth; conidiogenous cells integrated, terminal and intercalary, rarely conidiophores reduced to conidiogenous cells, 10–40  $\mu$ m long, sympodial, rarely percurrent, conidiogenous loci 2–4  $\mu$ m diam. *Conidia* solitary, acicular, shorter conidia sometimes obclavate-subcylindrical, 30–185  $\times$  2–4  $\mu$ m, rarely longer, 3–18-septate, hyaline, thin-walled, smooth, apex pointed, base truncate or only slightly attenuated at the very base, 1.5–3.5  $\mu$ m wide, hila thickened and darkened.

**Holotype:** **Singapore:** Jurong, on *Dioscorea pyrifolia*, 17 Dec. 1965, J. M. Yen 738 (PC). **Isotype:** K(M) IMI 255659.

**Host range and distribution:** On *Dioscorea* (*bulbifera*, *cayennensis* subsp. *rotundata* [rotundata], *deltoidea*, *esculenta*, *pyrifolia*, *sylvatica*, *tokoro*, *villosa* [glauca], *Dioscorea* sp.), *Dioscoreaceae*, Africa (Ghana, Nigeria, Tanzania), Asia (Borneo, India, Japan, Malaysia, Papua New Guinea, Singapore).

**Notes:** *Cercospora dioscoreae-pyrifoliae* can currently only be circumscribed and used as a heterogeneous morphotaxon. This species is morphologically part of the *C. apii* s. lat. complex, but phylogenetically all examined isolates derived from *Dioscorea* spp. are distinct from *C. apii* s. str. However, in comprehensive phylogenetic studies on *Cercospora* s. str., sequences retrieved from *Dioscorea* isolates clustered in four clades, which represent different plurivorous *Cercospora* species. Currently it is quite unclear to which group the name *C. dioscoreae-pyrifoliae* pertains. Yen (1968) described relatively broad conidia, 3.5–6  $\mu$ m wide, which is, however, not in agreement with the conidial size found in type material, which is narrower, about 2–4  $\mu$ m (see also Pons & Sutton 1988).

The cited asexual/sexual connection has not been experimentally proven, i.e. it is unclear if *Mycosphaerella papuana* represents the genuine sexual morph of *C. dioscoreae-pyrifoliae*. *Mycosphaerella papuana* was described as follows (Sivanesan 1985): “*Ascomata* often mixed with the anamorph, amphigenous, mainly epiphyllous,

solitary, rarely aggregated, immersed to somewhat erumpent, globose, sometimes immersed in stromata giving rise to conidiophores, 85–110 µm diam, peridium to 20 µm thick, composed of 4–6 layers of brown, polygonal, pseudoparenchymatous cells. *Asci* saccate-cylindrical, apex rounded, 34–46 × 7–10 µm, colourless, paraphysate, 8-spored; ascospores narrowly obovate, 10–16 × 2–4.5 µm, to 18 µm long and subhyaline when discharged, with a single median septum, hyaline, ends acute, guttulate when young”.

### **Doubtful, excluded and insufficiently known species**

*Cercospora golaghati* Saikia & A. Sarbhoy, *Curr. Sci.* **49**: 830 (1980).

*Literature*: Pons & Sutton (1988: 70), Crous & Braun (2003: 201), Kamal (2010: 47).

*Illustration*: Saikia & Sarbhoy (1980: 830, fig. 1).

*Description*: *Leaf spots* apical and marginal, yellowish to brown. *Caespituli* hypophyllous, effuse. *Mycelium* internal.

*Stromata* small, to 25 µm diam, composed of pale to dark brown cells. *Conidiophores* fasciculate, 2–7, arising from stromata, divergent, erect, straight or flexuous, geniculate, unbranched, (60–)80–100(–147) × 4–5.5 µm, 2–6-septate, mid golden brown, olivaceous or greyish brown; conidiogenous cells integrated, terminal, with thickened and darkened conidiogenous loci. *Conidia* solitary, obclavate-cylindrical, straight to slightly curved, about (35–)50–60(–80) × 4–6 µm, 3–7-septate, pale orange brown, thin-walled, smooth, apex conical, base obconically truncate with thickened and darkened hilum.

*Holotype*: **India**: Assam: Golaghat, on *Dioscorea alata*, *Dioscoreaceae*, 21 Nov. 1977, U. N. Saikia (HCIO 32660).

*Host range and distribution*: On *Dioscorea alata*, *Dioscoreaceae*, Asia (India).

*Notes*: An attempt to obtain type material of this species on loan from HCIO was not successful. The generic affinity of this species is unclear. Conidia were described as “pale orange brown” which would be in favour of *Passalora*, above all in combination with obclavate conidia.

## **Distocercospora**

### **Key to *Distocercospora* species on *Dioscoreaceae***

- 1 Conidiophores very long and usually multibranching and pluriseptate, 50–490(–625) × 3–6.5 µm; conidia with thickened inner wall layer, usually finely verruculose; on numerous *Dioscorea* spp. .... **D. pachyderma**
- Conidiophores much shorter, 15–80 × 3–10 µm, shorter ones aseptate, longer ones only 1–2(–3)-septate; conidia thin-walled; on *Dioscorea* sp., South Africa ..... **D. africana**

### ***Distocercospora* species on *Dioscoreaceae***

***Distocercospora africana*** Crous & U. Braun, *Sydowia* **46**: 208 (1994).  
(Fig. 94)

*Literature*: Crous & Braun (1996: 247).

*Illustration*: Crous & Braun (1994: 209, fig. 3).

*Description*: *Leaf spots* amphigenous, scattered, subcircular to angular, vein-limited, 8–20 mm diam. *Caespituli* hypophyllous, medium brown, punctiform, 40–80 × 30–40 µm. *Mycelium* internal; hyphae branched, septate, 1–2.5 µm diam. *Stromata* well-developed, substomatal, erumpent, large stromata rupturing the stomata, 15–50 µm wide and 10–40 µm high, medium brown. *Conidiophores* in small to moderately large fascicles, loose to dense, arising from stromata, through stomata, straight and subcylindrical to moderately geniculate-sinuuous, unbranched or occasionally branched, 15–80 × 3–10 µm, shorter ones aseptate, longer ones 1–2(–3)-septate, olivaceous to brown, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, about

15–30 µm long, sympodial, conidiogenous loci conspicuous, somewhat thickened and darkened. *Conidia* solitary, subacicular to obclavate (-subcylindrical), straight to curved, 30–110 × 3–5 µm, 1–5(–6)-distoseptate, subhyaline to olivaceous, thin-walled, smooth, apex obtuse to subacute, base short obconically truncate, hila slightly thickened and darkened.

*Holotype*: **South Africa**: Cape Province: Kentani, on living leaves of *Dioscorea* sp., *Dioscoreaceae*, 26 Apr. 1917, A. Pegleu (PREM 10125).

*Host range and distribution*: On *Dioscorea (sylvatica, Dioscorea* sp.), *Dioscoreaceae*, South Africa.

***Distocercospora pachyderma*** (Syd. & P. Syd.) Pons & B. Sutton, *Mycol. Pap.* **160**: 60 (1988).  
(Fig. 95)

*Basionym*: *Cercospora pachyderma* Syd. & P. Syd., *Ann. Mycol.* **12**: 203 (1914).

*Synonyms*: *Cercosporina pachyderma* (Syd. & P. Syd.) Sacc., *Syll. Fung.* **25**: 900 (1931).

*Cercospora dioscoreae-bulbiferae* J.M. Yen & Gilles, *Cah. Maboké* **9**: 105 “1971” (1973) [*holotype*: **Gabon**: Libreville,

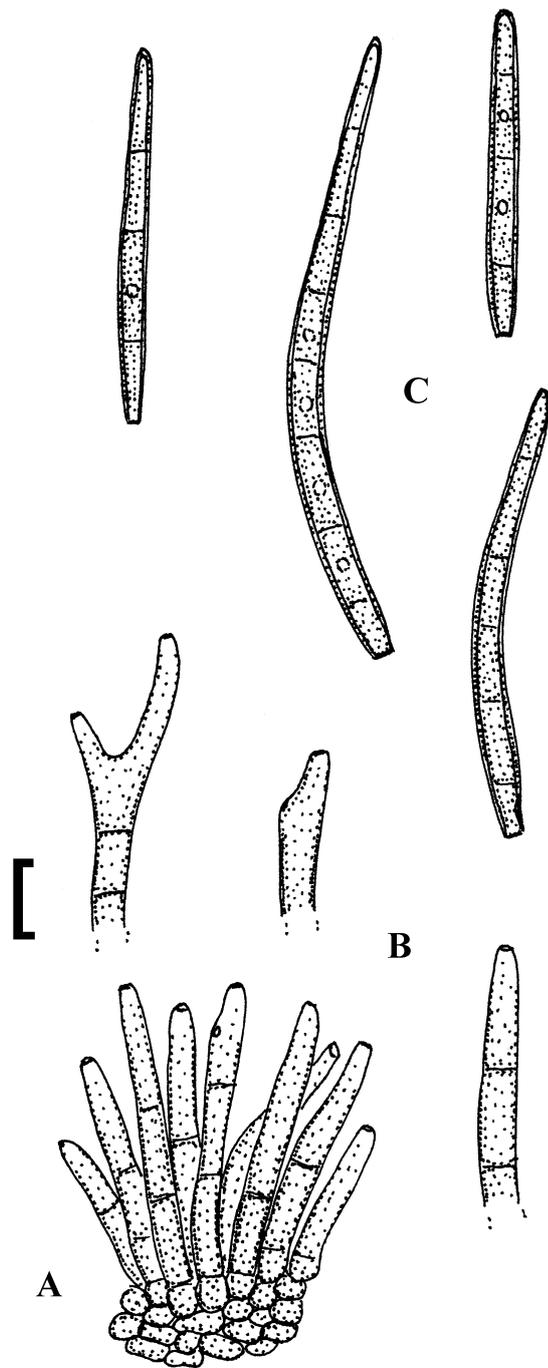


Fig. 94. *Distocercospora africana* (PREM 10125). A. Conidiophore fascicle. B. Conidiophores. C. Conidia. Bar = 10  $\mu$ m.

28 km on Kango Rd, on *Dioscorea bulbifera*, 21 Feb. 1971, G. Gilles PC 86 (K(M) IMI 216331)].

**Literature:** Saccardo (1931: 900), Chupp (1954: 197), Katsuki (1965: 28), Pons & Sutton (1988: 60), Guo (1999), Shin & Kim (2001: 119–121), Kirschner et al. (2004: 61–63), Kamal (2010: 277).

**Illustrations:** Yen & Gilles (1973: 104, fig. 2), Pons & Sutton (1988: 61–64, figs 28–31), Shin & Kim (2001: 120, fig. 51), Kirschner et al. (2004: 62, figs 10–13), Kamal (2010: 276, fig. 47).

**Description:** Leaf spots lacking or almost so or formed as indistinct to distinct yellowish to brown discolorations or spots, 2–10 mm diam, with diffuse to distinct margin, sometimes much darker, blackish grey to blackish. *Caespituli* amphigenous, effuse to discrete, velutinous, greyish, grey-olivaceous to darker olivaceous, brown or blackish brown. *Mycelium* internal; hyphae branched, straight to strongly sinuous, tortuose, 1.5–5  $\mu$ m wide, subhyaline to medium brown, thin-walled, smooth. *Stromata* lacking or almost so to small, 10–30  $\mu$ m diam, substomatal, subglobose to irregularly shaped, brown, composed of swollen hyphal cells, 3–6  $\mu$ m diam, more or less rounded to mostly angular-irregular in outline. *Conidiophores* in mostly lax to moderately dense fascicles, about 5–30, arising from internal hyphae or small stromata, through stomata, erect, subcylindrical-filiform, flexuous to strongly geniculate-sinuous, sometimes subdentate in the upper fertile part, simple or branched, ranging from slightly branched to multibranched, 50–490(–625)  $\times$  3–6.5  $\mu$ m, pluriseptate, individual cells about 15–45  $\mu$ m long, pale brown, brown or olivaceous-brown, somewhat paler towards the apex, wall thin to somewhat thickened, to 0.75  $\mu$ m, smooth to somewhat rough; conidiogenous cells integrated, terminal and intercalary, 15–55  $\mu$ m long, conidiogenous loci conspicuous, 1–2  $\mu$ m diam, unthickened or almost so to slightly thickened, not to somewhat darkened-refractive, not to somewhat prominent or even subdentate. *Conidia* solitary, rarely in short chains, obclavate-cylindrical, short conidia sometimes ellipsoid-ovoid to cylindrical-fusiform, straight to strongly curved or sigmoid, (15–)25–95(–140)  $\times$  (1.5–)3–6.5(–7)  $\mu$ m, (0–)1–5-distoseptate, subhyaline to pale olivaceous or brownish, inner wall layer somewhat thickened, smooth or almost so to finely verruculose, apex obtuse, base subtruncate to short obconically truncate, 1–2  $\mu$ m wide, hila unthickened to slightly thickened and not to slightly darkened-refractive.

[**Holotype: Philippines:** Prov. Laguna: Luzon, Los Baños, on *Dioscorea alata*, 10 Nov. 1913, M. B. Raimundo, C. F. Baker 2053 (not preserved)]. **Neotype (designated here, MycoBank MBT178148): Philippines:** Prov. Laguna: Luzon, Morong Valley, on *Dioscorea alata*, 9 Nov. 1913, M. B. Raimundo, C. F. Baker 2051 (S-F37683). **Topotype material: Philippines:** Prov. Laguna: Luzon, Los Baños, on *Dioscorea alata*, Nov. 1913, C. F. Baker 522 (B; BPI 439183–439184; K(M) IMI 256649, S-F37682). **Epitype (designated here, MycoBank MBT178149): Japan:** Iwate Pref.: Morioka, Koma, on *Dioscorea* sp., 10 Sep. 2013, C. Nakashima (MUMH11476). Duplicate: CBS H-21733; ex-epitype cultures: MUCC1716, CBS 138247.

**Host range and distribution:** On *Dioscorea* (*alata*, *bulbifera*, *esculenta*, *glabra*, *japonica*, *oppositifolia*, *pentaphylla*, *polystachya* [*batatas*], *quartiniana* [*beccariana*], *sagittata*, *subcalva*, *tokoro*, *yunnanensis*, *Dioscoreaceae*, Africa (Gabon, Sierra Leone, Uganda), Asia (China, India, Japan, Korea, Malaysia, Myanmar, Philippines), Oceania (American Samoa, Micronesia, Solomon Islands), West Indies (Barbados, Trinidad and Tobago).

**Notes:** The structure of the conidiogenous loci and conidial hila is intermediate between corresponding structures

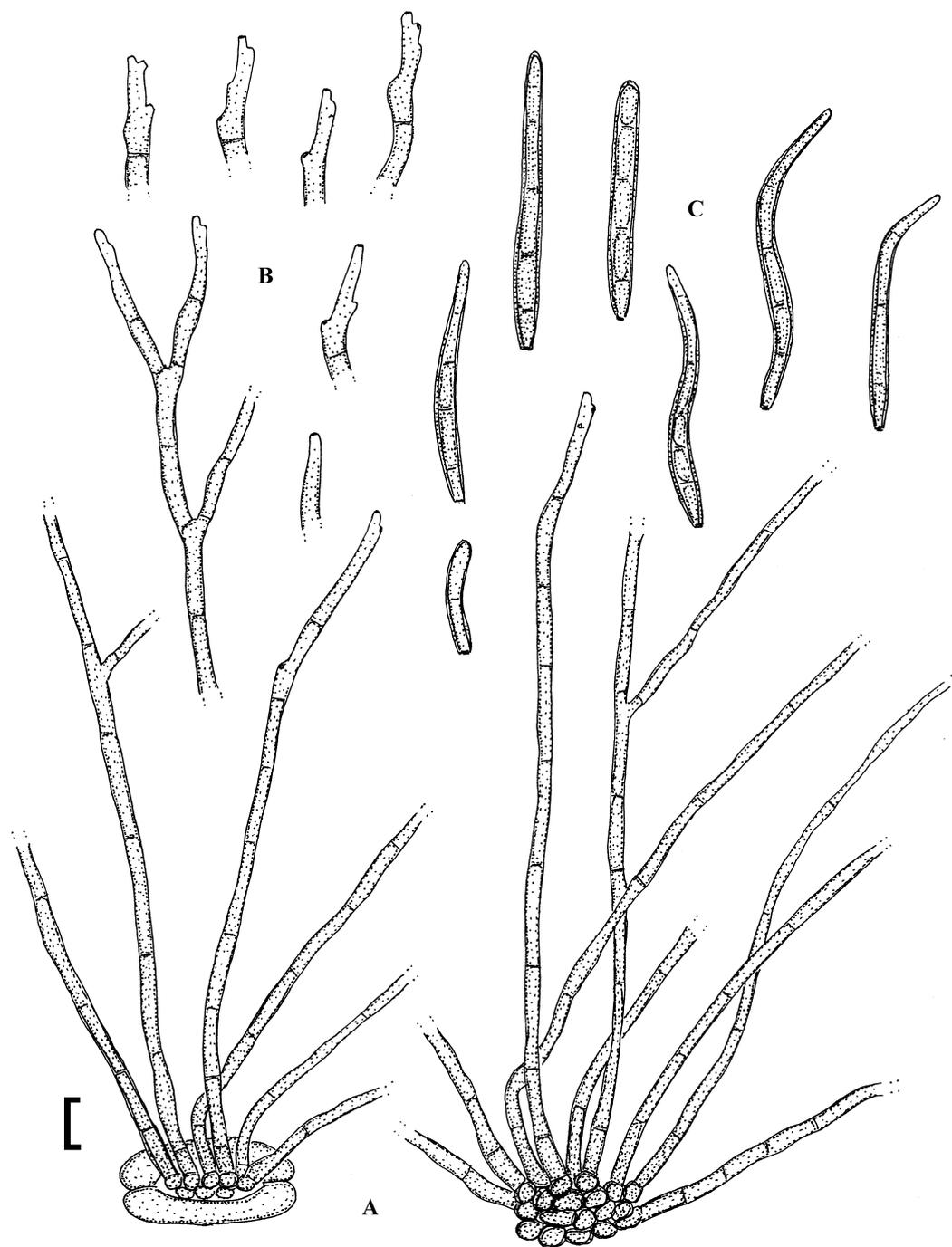


Fig. 95. *Distocercospora pachyderma* (S-F37683). A. Conidiophore fascicles. B. Conidiophore tips. C. Conidia. Bar = 10 µm.

in *Passalora* and *Pseudocercospora* and above all confusable with some *Pseudocercospora* species with more conspicuous, subdenticulate, refractive scars and hila. The abundant hypophyllous sporulation, and long, flexuous

conidiophores with dispersed sympodial conidiogenous loci, and the distoseptate conidia (also prominent in culture), are definitive characters for this species.

## *Passalora*

### Key to *Passalora* species on *Dioscoreaceae*

- 1 Superficial hyphae with solitary conidiophores *in vivo* present (mycovellosiella-like) ..... 2
- Superficial hyphae and solitary conidiophores *in vivo* lacking, conidiophores only fasciculate ..... 4
- 2 (1) Conidiophores long, 40–120 µm; on *Dioscorea alata*, China ..... **P. dioscoreigena**
- Conidiophores shorter, 5–50 µm; on *Dioscorea nipponica* ..... 3

- 3 (2) Conidiogenous loci 1–2 µm diam; conidia narrow, 15–90 × 2–5 µm, 0–3-septate;  
Far East of Russia and Japan ..... **P. tranzschelii var. tranzschelii**  
Conidiogenous loci 1.5–3 µm diam; conidia broader, 30–125 × 4–7 µm,  
3–10-septate; China ..... **P. tranzschelii var. chinensis**
- 4 (1) Conidia catenate; on *Dioscorea* spp., widespread ..... **P. dioscoreae**  
Conidia formed singly; on *Dioscorea* spp., China ..... 5
- 5 (4) Conidiophores long, 35–175 µm, often branched; conidia very broad,  
10–55 × 7.5–10 µm, 1–2-septate ..... **P. dioscoreicola**  
Conidiophores shorter, 25–65(–115) µm, usually unbranched; conidia much narrower,  
30–85(–105) × 4.5–6.5 µm ..... **P. dioscoreae-subcalvae**

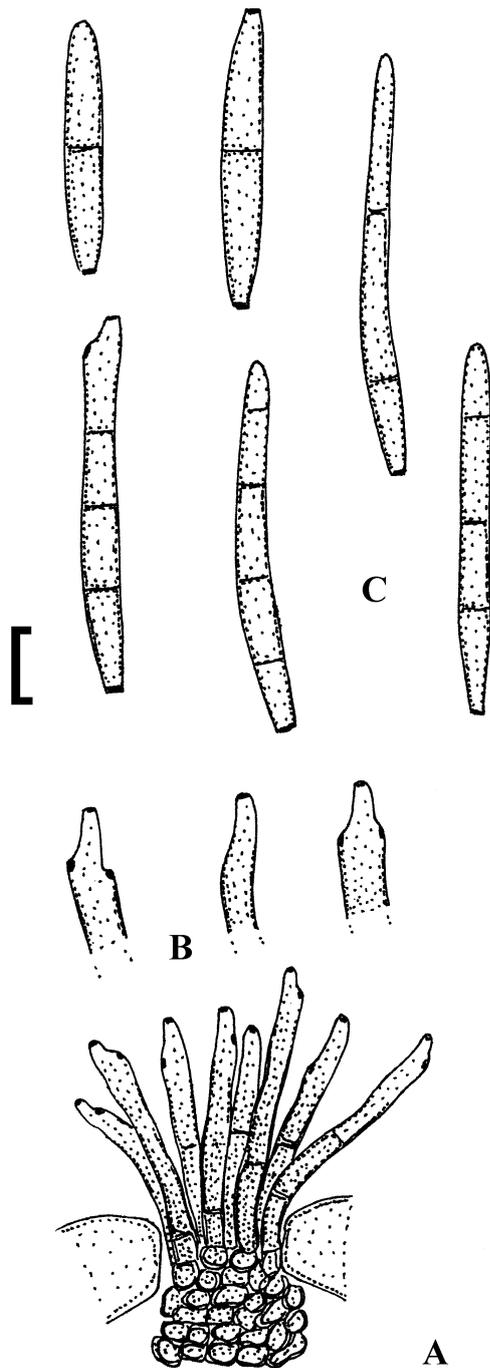


Fig. 96. *Passalora dioscoreae* (NY 838293). **A.** Conidiophore fascicle. **B.** Conidiophore tips. **C.** Conidia. Bar = 10 µm.

### *Passalora* species on *Dioscoreaceae*

***Passalora dioscoreae*** (Ellis & G. Martin) U. Braun & Crous, in Crous & Braun, *Mycosphaerella and Anam.*: 162 (2003).

(Fig. 96)

*Basionym*: *Cercospora dioscoreae* Ellis & G. Martin, *Amer. Naturalist* **16**: 1003 (1882).

*Synonyms*: *Phaeoramularia dioscoreae* (Ellis & G. Martin) Deighton, in Ellis, *More Dematiaceous Hyphomycetes*: 319 (1976).

*Cercospora nubilosa* Ellis & Everh., *J. Mycol.* **4**: 115 (1888) [*holotype*: **USA**: Ohio: Cleveland, on *Dioscorea* sp., as “*Smilax* sp.”, 20 Aug. 1888, S. M. Tracy (NY 838195); *isotypes*: K(M) 255658, NY 838194].

*Cercospora tokoro* Togashi, *Bull. Imp. Coll. Agric. Forest. (Morioka)* **22**: 46 (1936) [*lectotype (designated here, MycoBank MBT178150)*: **Japan**: Iwate Pref.: Mt Iwate, on *Dioscorea tokoro*, 15 Sep. 1934, K. Togashi (TNS-F-243948); *isolectotype*: K(M) IMI 166671].

*Literature*: Saccardo (1886: 479; 1892: 654), Vasudeva (1963: 98), Chupp (1954: 197), Katsuki (1965: 28), Ellis (1976: 319), Pons & Sutton (1988: 33), Guo et al. (2003: 140–141), Kamal (2010: 117).

*Illustrations*: Ellis (1976: 320, fig. 241 C), Pons & Sutton (1988: 34–36, figs 14–16), Guo et al. (2003: 141, fig. 88).

*Exsiccatae*: Ellis & Everh., *North Amer. Fungi* 2471.

*Description*: *Leaf spots* amphigenous, variable, subcircular, angular-irregular to diffuse, sometimes vein-limited, 2–45 mm diam, pale to dark brown or olivaceous to olivaceous-brown, purplish brown, border diffuse, yellowish to cream, sometimes with distinct darker margin. *Caespituli* amphigenous, mainly hypophyllous, punctiform, dark. *Mycelium* internal. *Stromata* substomatal, 15–40 µm diam, brown, composed of subhyaline to brown swollen hyphal cells. *Conidiophores* in small to moderately large fascicles, about 5–30, arising from stromata, through stomata, erect, straight, subcylindrical to somewhat geniculate-sinuous, unbranched, 8–60 × 3–6 µm, rarely longer, 0–4-septate, pale olivaceous to olivaceous-brown, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores sometimes reduced to conidiogenous cells, 10–35 µm long, conidiogenous loci conspicuous, thickened

and darkened, 1.5–2.5 µm diam. *Conidia* solitary or catenate, in simple or occasionally branched chains, subcylindrical to obclavate-cylindrical, rarely subclavate, straight to curved, 15–120 × (2–)3–5(–5.5) µm, 1–8-septate, pale olivaceous, thin-walled, smooth to somewhat rough, apex obtuse, subobtuse to truncate, base short obconically truncate, about 2–2.5 µm wide, hila somewhat thickened and darkened.

**Holotype:** USA: Pennsylvania: Delaware Co., on *Dioscorea villosa*, 1 Aug. 1882, W. Trimble (NY 838293). **Isotype:** K(M) IMI 256891.

**Host range and distribution:** On *Dioscorea* (*alata*, *bulbifera*, *cayennensis*, *composita*, *deltoidea*, *esculenta*, *floribunda*, *hispida*, *japonica*, *nipponica*, *polystachya* [*batatas*], *quinquelobata*, *sativa*, *subcalva*, *tokoro*, *ubi*, *villosa*), *Dioscoreaceae*, Africa (Togo, Uganda), Asia (China, India, Indonesia, Japan, Korea, Philippines, Sri Lanka, Taiwan), Europe (Italy), North America (Canada; USA, Delaware, Iowa, Illinois, Indiana, Maryland, Michigan, North Carolina, Ohio, Pennsylvania, Washington, Wisconsin), Central and South America (Brazil, Guatemala, Panama, Venezuela), West Indies (Cuba, Trinidad and Tobago).

**Passalora dioscoreae-subcalvae** Y.L. Guo, *Mycosystema* 20: 301 (2001). (Fig. 97)

**Literature:** Guo *et al.* (2003: 81), Crous & Braun (2003: 451).

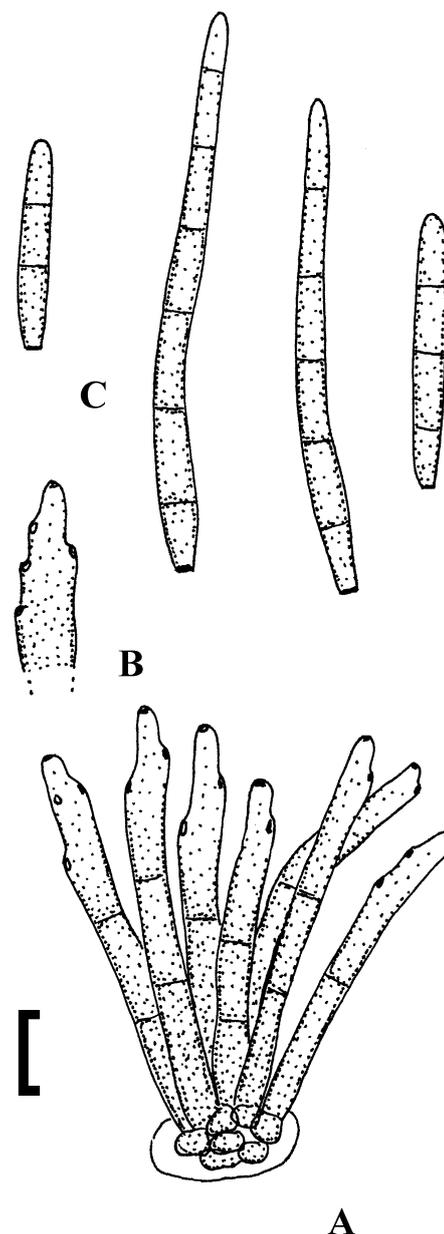
**Illustrations:** Guo (2001b: 301, fig. 1), Guo *et al.* (2003: 82, fig. 50).

**Description:** Leaf spots amphigenous, subcircular to irregular, 3–12 mm diam, reddish brown or centre grey to yellowish brown, with dark brown border line, halo yellowish brown above and pale yellowish to greyish brown below. *Caespituli* hypophyllous. *Mycelium* internal. *Stromata* lacking or small, substomatal. *Conidiophores* in loose fascicles, 3–14, through stomata, erect, straight, subcylindrical to geniculate above, usually unbranched, 25–65(–115) × 4.5–6.5(–8.5) µm, 0–4-septate, pale olivaceous-brown, paler towards the tip, thin-walled, smooth; conidiogenous cells integrated, terminal, sympodial, conidiogenous loci conspicuous, thickened and darkened, about 2–3 µm diam. *Conidia* solitary, obclavate to obclavate-cylindrical, straight to curved, 30–85(–105) × 4.5–6.5 µm, 2–6-septate, subhyaline to pale olivaceous, thin-walled, smooth, apex obtuse, base short obconically truncate, 2–3 µm wide, hila thickened and darkened.

**Holotype:** China: Guangxi: Shangsi, on *Dioscorea subcalva*, 27 Oct. 1957, L. W. Xu, no. 532 (HMAS 78803).

**Host range and distribution:** On *Dioscorea* (*alata*, *subcalva*), *Dioscoreaceae*, Asia (China, Guangxi).

**Passalora dioscoreicola** Y.L. Guo, *Mycosystema* 20: 302 (2001); as "*dioscoreiicola*". (Fig. 98)



**Fig. 97.** *Passalora dioscoreae-subcalvae* (HMAS 78803). **A.** Conidiophore fascicle. **B.** Conidiophore tip. **C.** Conidia. Bar = 10 µm.

**Literature:** Crous & Braun (2003: 451).

**Illustrations:** Guo (2001b: 302, fig. 2), Guo *et al.* (2003: 83, fig. 51).

**Description:** Leaf spots amphigenous, subcircular to irregular, 4–10 mm diam, greyish brown to brown, halo pale yellowish brown to greyish brown. *Caespituli* mainly hypophyllous. *Mycelium* internal. *Stromata* lacking or small, substomatal. *Conidiophores* in loose to dense fascicles, through stomata, erect, straight, subcylindrical to usually distinctly or strongly geniculate above, unbranched or branched, 35–175 × 4–6 µm, width often irregular, 1–6-septate, olivaceous to medium olivaceous-brown, paler towards the tip, thin-walled, smooth; conidiogenous cells integrated, terminal and intercalary, sympodial, conidiogenous loci conspicuous, thickened and darkened, about 2–3 µm diam. *Conidia* solitary, obclavate, clavate, fusiform-ellipsoid, straight to slightly, curved, 10–55

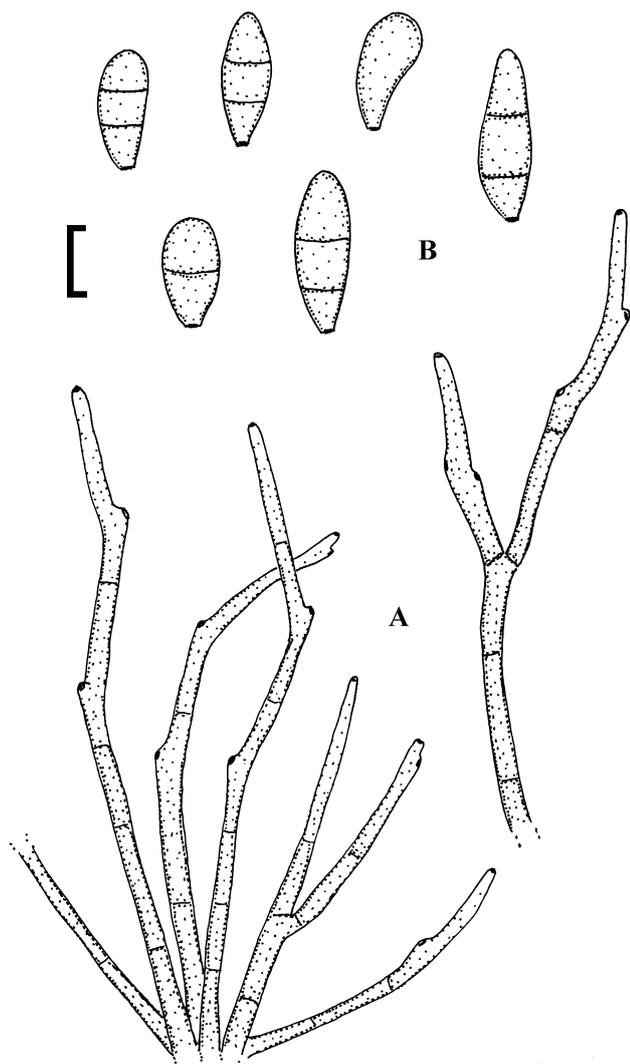


Fig. 98. *Passalora dioscoreicola* (HMAS 79141). A. Conidiophores. B. Conidia. Bar = 10  $\mu$ m.

$\times$  7.5–10  $\mu$ m, 1–2-septate, olivaceous, thin-walled, smooth, apex obtuse, broadly rounded, base rounded to short obconically truncate, about 2–3  $\mu$ m wide, hila thickened and darkened.

**Holotype:** China: Yunnan: Menglun, on *Dioscorea* sp., 22 Oct. 1973, Y. C. Zong & X. J. Liu 133 (HMAS 79141).

**Host range and distribution:** On *Dioscorea* sp., *Dioscoreaceae*, Asia (China, Yunnan).

***Passalora dioscoreigena*** U. Braun & Crous, in Crous & Braun, *Mycosphaerella and Anam.*: 451 (2003). (Fig. 99)

**Basionym:** *Mycovellosiella dioscoreicola* Y.L. Guo, *Mycosystema* 21: 21 (2002), non *Passalora dioscoreicola* Y.L. Guo, 2001.

**Literature:** Guo et al. (2003: 27–28).

**Illustrations:** Guo (2002: 18, fig. 2), Guo et al. (2003: 27, fig. 13).

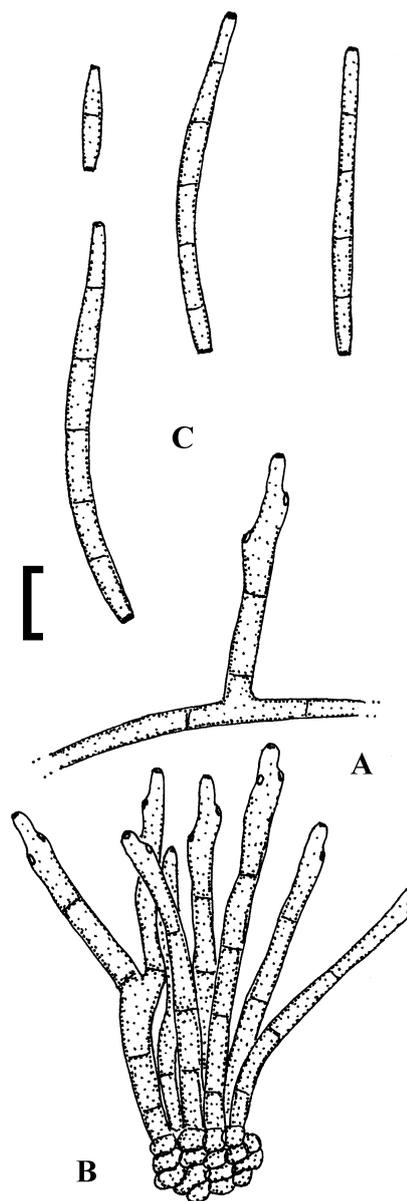


Fig. 99. *Passalora dioscoreigena* (HMAS 79139). A. Superficial hypha with solitary conidiophore. B. Conidiophore fascicle. C. Conidia. Bar = 10  $\mu$ m.

**Description:** Leaf spots amphigenous, circular to irregular, 1–5 mm diam, often confluent, yellowish brown to reddish brown, margin indefinite, with pale olivaceous-brown halo on the upper leaf surface, effuse, grey, greyish brown to dark brown below. *Caespituli* hypophyllous. *Mycelium* internal and external; superficial hyphae emerging through stomata, branched, septate, 2.5–4  $\mu$ m wide, thin-walled, pale olivaceous. *Stromata* lacking or small, substomatal, brown. *Conidiophores* loosely fasciculate, emerging through stomata, or solitary, arising from superficial hyphae, lateral, erect, straight to curved, subcylindrical to somewhat geniculate, simple, rarely branched, 40–120  $\times$  5–8.5  $\mu$ m, 1–5-septate, often with constrictions at septa, pale olivaceous-brown or olivaceous-brown, thin-walled, smooth; conidiogenous cells integrated, terminal and intercalary, sympodial, conidiogenous loci conspicuous, 2–3  $\mu$ m diam, thickened and darkened. *Conidia* catenate, in simple

or branched chains, obclavate-cylindrical, 25–110 × 4.5–6.5 µm, 1–6-septate, pale olivaceous to olivaceous-brown, thin-walled, smooth, apex obtuse to truncate, base short obconically truncate, hila thickened and darkened.

**Holotype:** China: Sichuan: Emeishan, on *Dioscorea alata*, 6 Oct. 1956, X. J. Liu (HMAS 79139).

**Host range and distribution:** On *Dioscorea* (*alata*, *Dioscorea* sp.), *Dioscoreaceae*, Asia (China, Sichuan).

**Passalora tranzschelii** (Vassiljevsky) U. Braun & Crous, in Crous & Braun, *Mycosphaerella and Anam.*: 473 (2003).

var. **tranzschelii**

(Fig. 100)

**Basionym:** *Ragnhildiana tranzschelii* Vassiljevsky, in Vassiljevsky & Karakulin, *Fungi Imperfecti Parasitici (Hyphomycetes)* 1: 379 (1937).

**Synonyms:** *Ragnhildiana dioscoreae* Vassiljevsky, in Vassiljevsky & Karakulin, *Fungi Imperfecti Parasitici (Hyphomycetes)* 1: 379 (1937), non *Passalora dioscoreae* (Ellis & G. Martin) U. Braun & Crous, 2003 [*probable type:* Russia: Far East, near Vladivostok, on *Dioscorea nipponica* [giralidii], 15 Aug. 1929, W. Tranzschel (LE 347)].

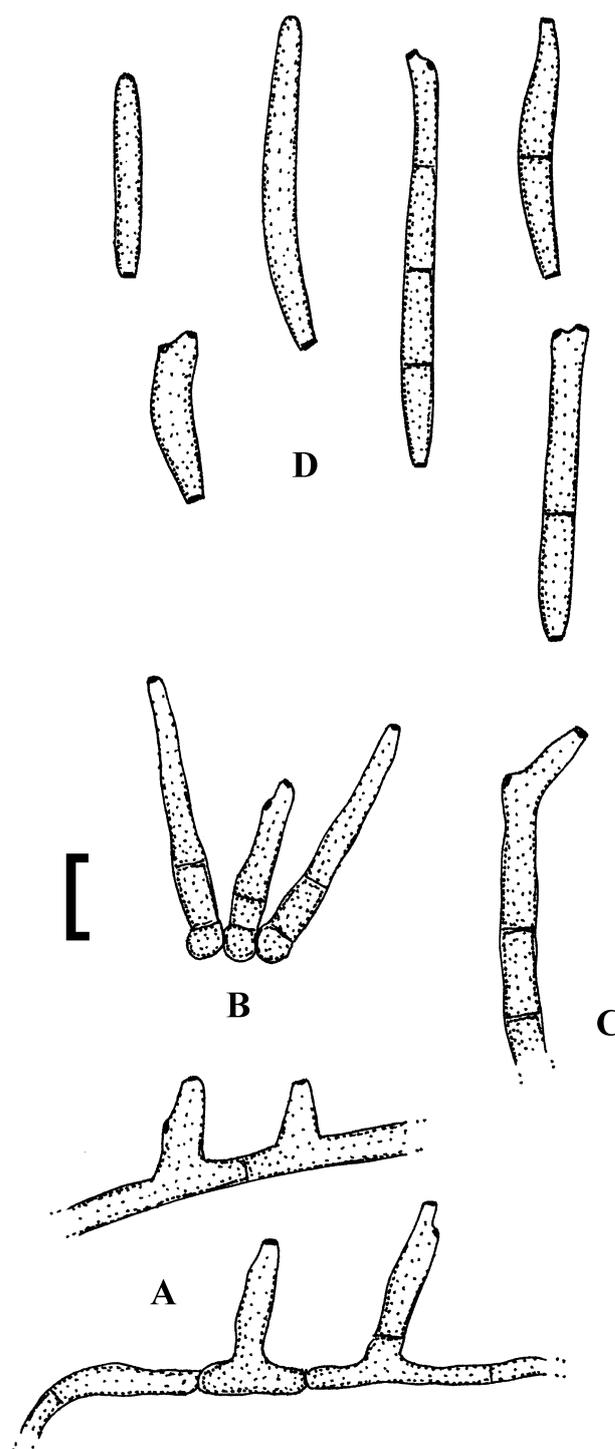
*Mycovellosiella dioscoreae* (Vassiljevsky) N. Pons & B. Sutton, *Mycol. Pap.* 160: 49 (1988).

*Mycovellosiella deightonii* Katsuki & Y. Harada, *Rep. Tottori Mycol. Inst.* 10: 566 (1973) [*holotype:* Japan: Aomori Pref.: Hirosaki, on *Dioscorea nipponica*, 15 Aug. 1971, Y. Harada (HHUF4130); *isotype:* K(M) 165059].

*Passalora dioscoreae-nipponicae* Y.L. Guo, *Mycosystema* 30: 868 (2011).

**Illustration:** Pons & Sutton (1988: 46–48, figs 20–22).

**Description:** Leaf spots amphigenous, circular to angular-irregular, scattered to confluent, 3–35 mm diam, at first yellowish, later pale to darker brown, margin narrow, darker. *Caespituli* hypophyllous, effuse, greyish to grey-brown. *Mycelium* internal and external; superficial hyphae emerging through stomata, branched, 2–4 µm wide, hyaline to pale brown, thin-walled, smooth. *Stromata* absent or almost so, only with a few substomatal swollen hyphal cells. *Conidiophores* occasionally in small, loose groups or fascicles, to six, through stomata, but usually solitary, arising from superficial hyphae, lateral, erect to occasionally decumbent, straight, subcylindrical-conical to somewhat geniculate-sinuous, unbranched or rarely branched, 5–50 × 3–7 µm, 0–2-septate, pale olivaceous to olivaceous-brown, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores often reduced to conidiogenous cells, 5–40 µm long, sympodial, conidiogenous loci conspicuous, 1–2 µm diam, somewhat thickened and darkened. *Conidia* solitary as well as catenate in simple or sometimes branched chains, obclavate-cylindrical, short conidia sometimes short cylindrical to ellipsoid-ovoid, 15–90 × 2–5 µm, 0–3-septate, subhyaline to pale olivaceous, apex obtuse to truncate, base subtruncate to short obconically truncate, 1–2 µm wide, hila slightly thickened and darkened.



**Fig. 100.** *Passalora tranzschelii* var. *tranzschelii* (LE 505). A. Superficial hypha with solitary conidiophore. B. Conidiophore fascicle. C. Conidiophore. D. Conidia. Bar = 10 µm.

**Holotype:** Russia: Ussuria: Voroshilov, on *Dioscorea nipponica* [giralidii], 30 Jul. 1927, W. Tranzschel (LE 505).

**Host range and distribution:** On *Dioscorea nipponica*, *Dioscoreaceae*, Asia (Japan; Russia, Far East).

var. **chinensis** Y.L. Guo, var. nov.

Mycobank MB809022

(Fig. 101)

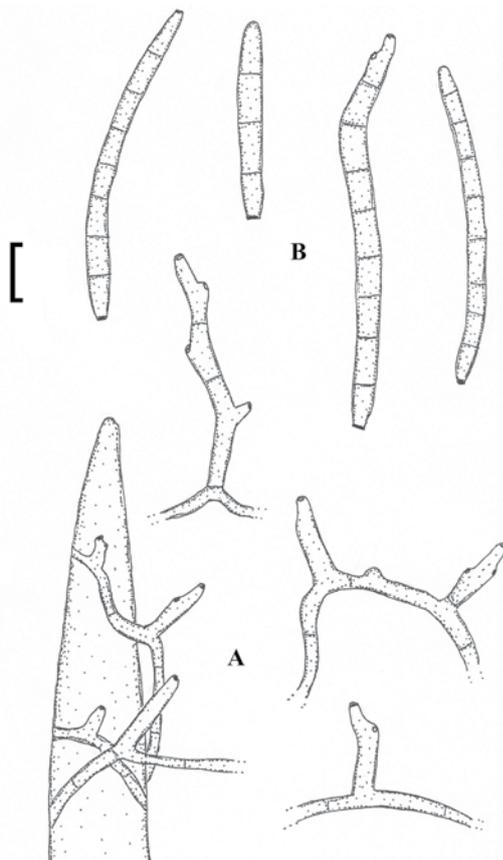


Fig. 101. *Passalora tranzschelii* var. *chinensis* (HMAS 65914). **A.** Superficial hyphae with solitary conidiophores. **B.** Conidia. Bar = 10  $\mu\text{m}$ .

Illustration: Guo (2011: 869, fig. 4).

**Diagnosis:** Distinguished from var. *tranzschelii* by its larger conidiogenous loci, 1.5–3  $\mu\text{m}$  diam, as well as longer and above all broader conidia, 30–125  $\times$  4–7  $\mu\text{m}$ , with 3–10 septa.

**Holotype:** China: Hebei Province: Yu County, Xiaowutai Mountains, on *Dioscorea nipponica*, 29 Aug. 1990, Y. L. Guo 1293-a (HMAS 65914). **Paratype:** China: Hebei Province: Zhuolu County, Yangjiaping, 31 Aug. 1990, Y. L. Guo 1332 (HMAS 65915).

**Note:** Guo (2011) assigned the material of the fungus now described as var. *chinensis* to *Passalora dioscoreae-nipponicae*, a new name introduced for *Ragnhildiana dioscoreae*. However, type material of the latter species agrees with *Passalora tranzschelii* s. str. (now var. *tranzschelii*).

### **Doubtful, excluded and insufficiently known species**

*Cercosporidium dioscoreae* S. Singh, *Plant Parasitic Fungi of Gorakhpur* [University of Gorakhpur, PhD thesis (1994)], not effectively published (ICN, Art. 30.8).

**Synonym:** *Passalora dioscoreae* Poonam Srivast., *J. Living World* 1: 115 (1994); as "(S. Singh) Poonam Srivast."; *nom. inval.* (ICN, Art. 39.1 and 40.1).

## ***Pseudocercospora***

### **Key to *Pseudocercospora* species on *Dioscoreaceae***

- 1 Conidiophores very long, 50–490(–625)  $\times$  3–6.5  $\mu\text{m}$ , pluriseptate, often branched; conidia (15–)25–95(–140)  $\times$  (1.5–)3–6.5(–7)  $\mu\text{m}$ , (0–)1–5-distoseptate, subhyaline to pale olivaceous or brownish ..... see ***Distocercospora pachyderma***  
Conidiophores much shorter, mostly unbranched; conidia euseptate ..... 2
- 2 (1) Conidia solitary or in short chains, small, above all short, (10–)15–30(–35)  $\times$  2.5–6  $\mu\text{m}$ , 0–3-septate, very pale, subhyaline to pale olivaceous; on *Dioscorea* spp., North America ..... ***P. subrufa***  
Conidia much longer, about 25–130  $\mu\text{m}$ , pluriseptate ..... 3
- 3 (2) Stromata lacking; conidiophores very long, 40–270  $\mu\text{m}$ , pluriseptate; conidia mostly distinctly to strongly curved or sigmoid ..... ***P. cylindrata***  
Stromata developed, if lacking conidiophores much shorter and only 0–3-septate; conidia straight to somewhat curved, but not strongly so ..... 4
- 4 (3) Conidia narrow, 1–3  $\mu\text{m}$  ..... 5  
Conidia much broader, 2.5–8  $\mu\text{m}$  ..... 6
- 5 (4) Stromata lacking; mycelium internal and external; superficial hyphae with solitary conidiophores abundant; conidiophores short, 4–30  $\mu\text{m}$ ; conidia subhyaline and very narrow, 1–2.5  $\mu\text{m}$  ..... ***P. ubicola***  
Stromata well-developed, 20–65  $\mu\text{m}$  diam; mycelium consistently internal; superficial hyphae with solitary conidiophores lacking ..... ***P. hiratsukana***
- 6 (4) Stromata lacking; conidiophores long, 20–150  $\mu\text{m}$ ; conidia smooth ..... ***P. ubi***

- Stromata developed, 10–90  $\mu\text{m}$  diam; conidiophores much shorter, 5–65  $\mu\text{m}$ ,  
if longer conidia verruculose ..... 7
- 7 (6) Conidiophores long, 15–180  $\mu\text{m}$ ; conidia cylindrical to subcylindrical, faintly verruculose ..... **P. carbonacea**  
Conidiophores shorter, 5–65  $\mu\text{m}$ ; conidia not consistently cylindrical-subcylindrical,  
either consistently obclavate and smooth to somewhat rough or variable in shape,  
cylindrical, obclavate to clavate and smooth ..... 8
- 8 (7) Conidia cylindrical to obclavate-cylindrical, base often peg-like (abruptly attenuated),  
pale to moderately deep olivaceous-brown, smooth ..... **P. contraria**  
Conidia consistently obclavate, base obconically truncate, subhyaline to pale olivaceous,  
smooth to somewhat rough-walled ..... **P. dioscoreae**

### *Pseudocercospora* species on *Dioscoreaceae*

***Pseudocercospora carbonacea*** (L.E. Miles) N. Pons  
& B. Sutton, *Mycol. Pap.* **160**: 26 (1988).

(Fig. 102)

*Basionym*: *Cercospora carbonacea* L.E. Miles, *Trans. Illinois Acad. Sci.* **10**: 255 (1917).

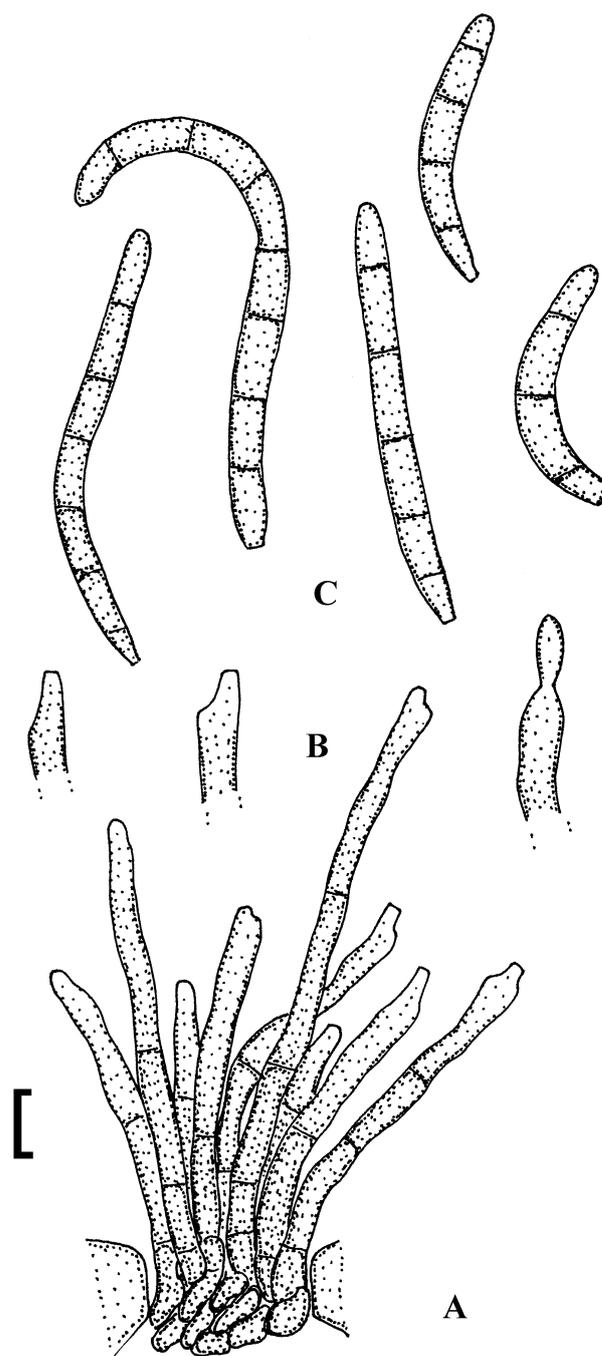
*Synonym*: *Stenella dioscoreicola* J.M. Yen, A.K. Kar & B.K. Das, *Mycotaxon* **16**: 53 (1982) [*holotype*: **India**: West Bengal: Cooch Behar, Forest of Chelapata, on *Dioscorea* sp., 17 Oct. 1980, B. K. Das Pcc4452 (LAM, Yen #10578)].

*Literature*: Saccardo (1931: 874), Chupp (1954: 196), Vasudeva (1963: 68), Ellis (1976: 257), Little (1987a), Pons & Sutton (1988: 26), Crous & Braun (2003: 104), Phengsintham *et al.* (2003a: 107), Kamal (2010: 159).

*Illustrations*: Ellis (1976: 257, fig. 194 A), Yen *et al.* (1982: 52, fig. 8), Little (1987a: fig., unnumbered), Pons & Sutton (1988: 29, fig. 12), Phengsintham *et al.* (2003a: 108, figs 58–59).

*Description*: *Leaf spots* amphigenous, subcircular to angular-irregular, 3–20 mm diam, brown, margin indistinct, sometimes with brownish halo. *Caespituli* hypophyllous. *Mycelium* internal; rarely with a few superficial hyphae, branched, 2–3  $\mu\text{m}$  wide, septate, pale olivaceous, thin-walled, faintly verruculose. *Stromata* substomatal, 10–90  $\mu\text{m}$  diam. *Conidiophores* in small to large fascicles, about 5–40, loose to dense, arising from stromata, through stomata (rarely with solitary conidiophores arising from superficial hyphae when present), erect, straight, subcylindrical to somewhat geniculate-sinuous, unbranched, 10–180  $\times$  3–5  $\mu\text{m}$ , (0–)1–3-septate, pale to medium olivaceous-brown, wall smooth or almost so to somewhat rough; conidiogenous cells integrated, terminal, 10–60  $\mu\text{m}$  long, sympodial, rarely percurrent, conidiogenous loci inconspicuous to subdenticulate, but always unthickened and not darkened. *Conidia* solitary, cylindrical or subcylindrical, straight to strongly curved or sigmoid, 40–130  $\times$  3.5–6  $\mu\text{m}$ , 3–9-septate, subhyaline to pale olivaceous, thin-walled, smooth to somewhat verruculose, apex obtuse, rounded, base short obconically truncate, occasionally somewhat peg-like, about 2–2.5  $\mu\text{m}$  wide, hila unthickened, not darkened.

*Lectotype* (designated here, MycoBank MBT178152):  
**Puerto Rico**: Vega Alta, on *Dioscorea alata*, 1913, F. L.



**Fig. 102.** *Pseudocercospora carbonacea* (NY 936951). **A.** Conidiophore fascicle. **B.** Conidiophore tips. **C.** Conidia. Bar = 10  $\mu\text{m}$ .

Stevens, 4178 (NY 936951). *Isolectotypes*: BPI 434203, 424305, 845236; MICH 15267.

*Host range and distribution*: On *Dioscorea* (*alata*, *bulbifera*, *caucasica*, *cayennensis*, *deltoides*, *dumetorum*, *glabra*, *microbotrya* [*gilbertii*], *nipponica*, *oppositifolia*, *pentaphylla* [*spinosa*], *trifida*, *Dioscorea* spp.), *Dioscoreaceae*, Africa (Ethiopia, Ghana, Guinea, Nigeria, Sierra Leone, Tanzania, Togo), Asia (India, Indonesia, Myanmar, Thailand), Australia, North America (Canada), Central and South America (Brazil, Panama, Venezuela), West Indies (Barbados, Cuba, Dominican Republ., French Antilles, Grenada, Haiti, Jamaica, Puerto Rico, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago, Virgin Islands).

*Notes*: Due to inconspicuous conidiogenous loci, *Stenella dioscoreicola* has to be excluded from *Stenella* (*Zasmidium*). It agrees well with *Pseudocercosora carbonacea*, which is known from India, and is undoubtedly a synonym. *P. carbonacea* is one of few *Pseudocercospora* species with rough-walled conidiophores and conidia. The type collection of *St. dioscoreicola* differs from other collections of *P. carbonacea* by the formation of a few superficial hyphae with solitary conidiophores, which is, however, not unusual in *Pseudocercospora* species.

***Pseudocercospora contraria*** (Syd. & P. Syd.)  
Deighton, *Mycol. Pap.* 140: 30 (1976).

(Fig. 103)

*Basionym*: *Cercospora contraria* Syd. & P. Syd., *Ann. Mus. Congo, Bot.*, ser. V, 3: 21 (1909).

*Synonyms*: *Cercospora wildemanii* Syd. & P. Syd., *Ann. Mus. Congo, Bot.*, ser. V, 3: 21 (1909) [*lectotype* (designated here, MycoBank MBT178154: Republic of Congo: Kiduma, on *Dioscorea* sp. (as *Dolichos* sp.), 28 Feb. 1907, H. Vanderyst (BR-MYC 039969,05); *isolectotypes*: B 700016014, K(M) IMI 90862].

*Mycosphaerella contraria* Hansf., *Proc. Linn. Soc. London* 153: 22 (1941) [*type*: Uganda: Kampala plantation, on *Dioscorea* sp., June 1937, Chandler (K(M) IMI 7956)].

*Literature*: Saccardo (1913: 1419, 1430), Chupp (1954: 196, 340), Katsuki (1965: 28), Deighton (1976: 30), Ellis (1976: 257), Sivanesan (1984: 207), Little (1987b), Pons & Sutton (1988: 17), Guo & Hsieh (1995: 84), Guo *et al.* (1998: 101), Shin & Kim (2001: 178), Aptroot (2006: 68), Meeboon *et al.* (2008).

*Illustrations*: Deighton (1976: 31–32, figs 16–17), Sivanesan (1984: 208, fig. 109), Little (1987b: fig., unnumbered), Pons & Sutton (1988: 19–21, figs 6–8), Guo & Hsieh (1995: 86, fig. 78), Guo *et al.* (1998: 102, fig. 82), Shin & Kim (2001: 179, fig. 78).

*Exsiccatae*: Poelt & Scheuer, *Reliqu. Petrak.* 2797.

*Description*: *Leaf spots* subcircular, elliptical to irregular, 2–10 mm diam or confluent and larger, dingy grey or whitish, greyish brown, reddish to blackish brown, sometimes surrounded by a light brown border of 1–5 mm, less distinct

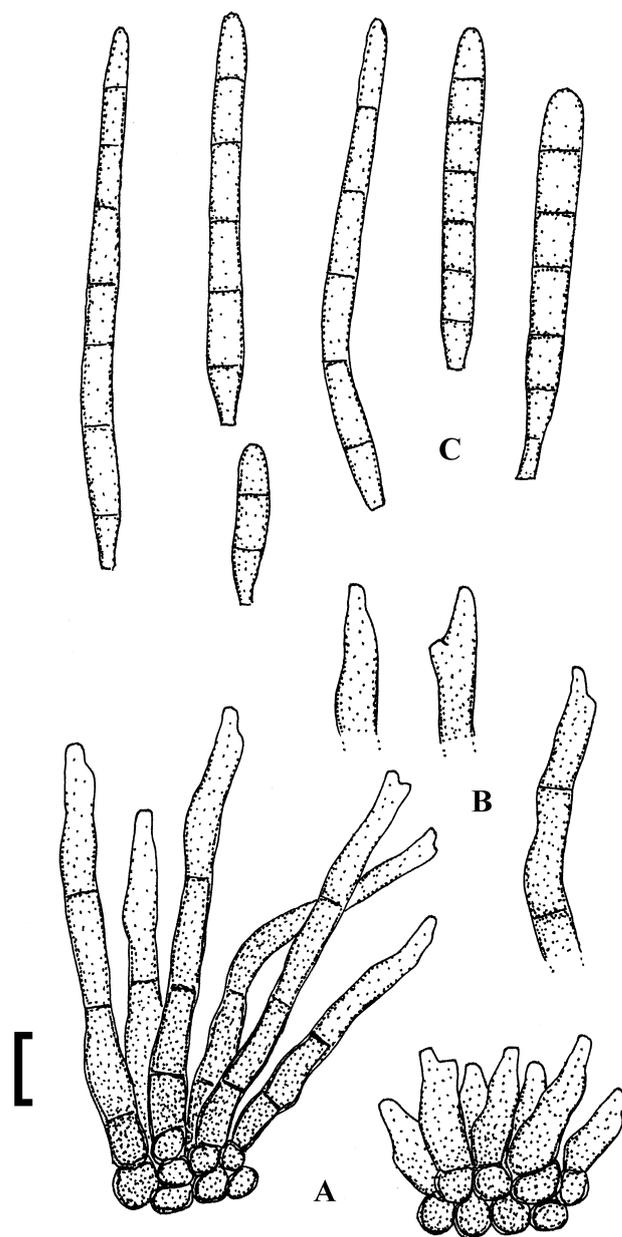


Fig. 103. *Pseudocercospora contraria* (B, holotype). A. Conidiophore fascicles. B. Conidiophore tips. C. Conidia. Bar = 10  $\mu$ m.

on the lower side, sometimes with brownish or reddish halo. *Caespituli* amphigenous, punctiform, at first greenish, later deeper brown. *Mycelium* internal; hyphae branched, septate, hyaline, 1–3.5  $\mu$ m wide. *Stromata* substomatal or occasionally immersed, about 15–60  $\mu$ m diam, subglobose, brown to dark brown. *Conidiophores* in small and loose to usually large and dense fascicles, to 30 or even more, arising from stromata, through stomata or occasionally erumpent, erect, straight, subcylindrical to somewhat geniculate-sinuous, unbranched, 10–65  $\times$  2–6.5  $\mu$ m, 0–3-septate, pale to medium olivaceous or olivaceous-brown, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 10–25  $\mu$ m long, sympodial or occasionally percurrent, conidiogenous loci inconspicuous to subdentate, 1–2  $\mu$ m diam, but always unthickened, not darkened. *Conidia* solitary, cylindrical to obclavate-cylindrical, straight to curved, (15–) 30–115  $\times$  2.5–8  $\mu$ m, 2–22-septate, pale to moderately deep

olivaceous-brown, wall thin to somewhat thickened, smooth, apex obtuse, rounded, base obconically truncate, sometimes peg-like, 1.5–2 µm wide, hila unthickened, not darkened. *Sexual morph*: *Ascomata* immersed, to 120 µm diam; asci 28–40 × 8–10 µm, 8-spored; ascospores fusiform to ellipsoid-ovoid, 8–12 × 2–4 µm, with a single median septum, not or barely constricted, colourless, ends rounded.

*Lectotype* (designated here, MycoBank MBT178153): **Republic of Congo**: Lazard, Kisantu, on *Dioscorea* sp., 9 Feb. 1908, *H. Vanderyst* (BR-MYC 039968,04). *Isolectotypes*: B 700016012, K(M) IMI 91059.

*Host range and distribution*: On *Dioscorea* (*alata*, *asteriscus*, *bulbifera*, *cochleari-apiculata*, *dumetorum*, *hirtiflora*, *oppositifolia*, *pentaphylla* [*triphylla*], *quartiniana*, *quinquelobata*, *schimperiana*, *trifida*, *villosa* [*sativa*], *Dioscorea* spp.), *Dioscoreaceae*, Africa (Cameroon, Congo, Ghana, Guinea, Nigeria, Sierra Leone, Sudan, Tanzania, Togo, Uganda), Asia (China, India, Indonesia, Japan, Java, Korea, Thailand), South America (Brazil), Oceania (Solomon Islands).

***Pseudocercospora cylindrata*** (Chupp & Linder) N. Pons & B. Sutton, *Mycol. Pap.* **160**: 27 (1988). (Fig. 104)

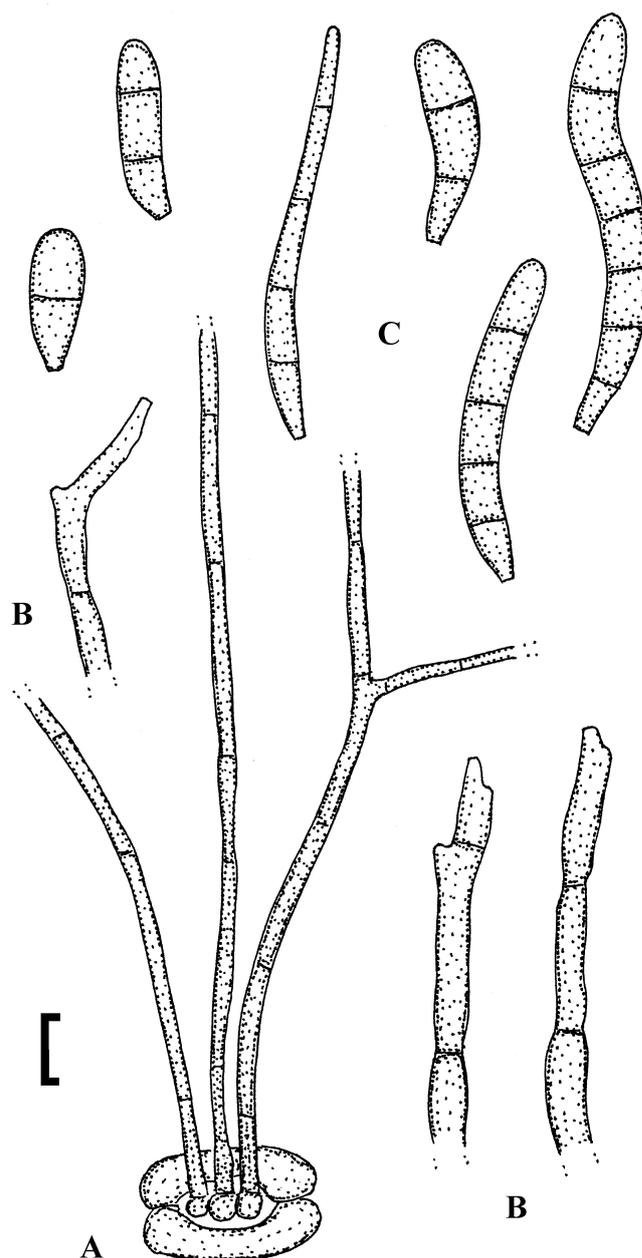
*Basionym*: *Cercospora cylindrata* Chupp & Linder, *Mycologia* **29**: 29 (1937).

*Synonym*: *Helicomina cylindrata* (Chupp & Linder) Chupp, *Monograph of Cercospora*: 197 (1954).

*Literature*: Chupp (1954: 196), Pons & Sutton (1988: 27), Goh & Hsieh (1995: 357), Guo *et al.* (1998: 379), Crous & Braun (2003: 149–150), Kamal (2010: 169).

*Illustrations*: Pons & Sutton (1988: 32, fig. 13), Guo *et al.* (1998: 380, fig. 311).

*Description*: *Leaf spots* indistinct or above all evident on the lower leaf surface, angular, vein-limited, 1–5 mm diam or confluent and larger, to 20 mm, mid dark brown, less evident on the upper leaf surface, only visible as diffuse pale brown angular discolorations. *Caespituli* hypophyllous, dark olivaceous to almost blackish. *Mycelium* internal and external, with some superficial threads. *Stromata* lacking. *Conidiophores* in small fascicles, 2–10, arising from internal hyphae, through stomata or solitary, arising from procumbent hyphae, lateral, erect, straight to flexuous, sinuous, but mostly not distinctly geniculate, unbranched or occasionally branched near the apex, 40–270 × 4–5 µm, width often irregular, plainly pluriseptate, olivaceous-brown, thin-walled, smooth; conidiogenous cells integrated, terminal and intercalary, conidiogenous loci inconspicuous to subdentate, but always unthickened and not darkened. *Conidia* solitary, cylindrical to somewhat obclavate-cylindrical, mostly distinctly to strongly curved to sigmoid, 15–80 × 3–6.5 µm, 1–8-septate, pale to medium brown or olivaceous-brown, thin-walled, smooth, apex obtuse, base short obconically truncate, sometimes almost peg-like, about 1.5–2.5 µm wide, hila unthickened, not darkened.



**Fig. 104.** *Pseudocercospora cylindrata* (FH 2515). **A.** Conidiophore fascicle. **B.** Conidiophore tips. **C.** Conidia. Bar = 10 µm.

*Holotype*: **China**: Kwangsi: Yung Hsien, Ta Tseh Tsuen, on *Dioscorea* sp., 18 Aug. 1933, S. Y. Cheo, no. 2515 (FH 2515). *Isotypes*: CUP 39586, K(M) IMI 255655 (slide), VIA 4733.

*Host range and distribution*: On *Dioscorea* (*japonica*, *Dioscorea* sp.), *Dioscoreaceae*, Asia (China, Japan; India, West Bengal).

*Notes*: Chupp (1954) recorded this species from Japan on *Dioscorea septemloba*, which is, however, unconfirmed. This species is not listed in Katsuki (1965). However, a Japanese collection on *Dioscorea japonica*, deposited by R. Kurata as *Cercospora ubi* at IUM-FY682, has been re-examined and proved to be *Pseudocercospora cylindrata*.

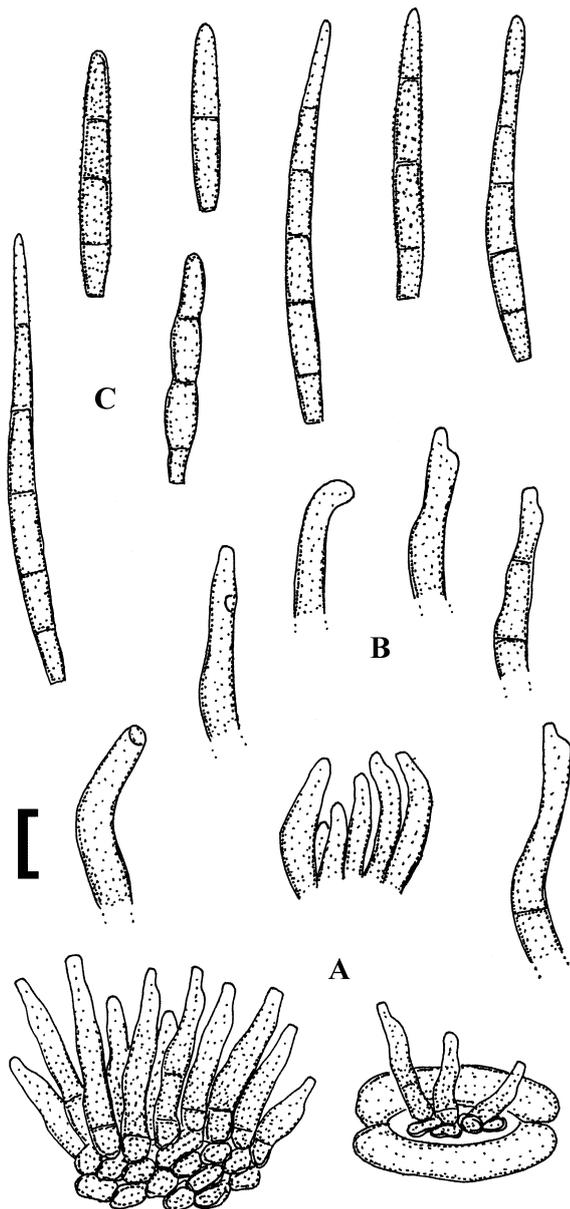


Fig. 105. *Pseudocercospora dioscoreae* (PC, holotype). A. Conidiophore fascicles. B. Conidiophores. C. Conidia. Bar = 10 µm.

***Pseudocercospora dioscoreae*** U. Braun, Mouch. & McKenzie, *New Zealand J. Bot.* **37**: 313 (1999). (Fig. 105)

*Illustration*: Braun et al. (1999: 311, fig. 16).

*Description*: *Leaf spots* amphigenous, angular-irregular, 2–25 mm diam, dingy greyish brown to greyish white, margin narrow, dark brown to blackish. *Caespituli* amphigenous, mostly epiphyllous, punctiform, scattered, dark brown. *Mycelium* internal; hyphae septate, branched, brown, smooth. *Stromata* substomatal, 10–60 µm diam, brown. *Conidiophores* numerous, in dense fascicles, arising from stromata, through stomata, erect, straight or often curved throughout or only at the tip, subcylindrical, barely or only slightly geniculate, unbranched, 5–50 × 3–8 µm, 0–1-septate, pale to medium brown, thin-walled, smooth; conidiogenous cells integrated,

terminal or conidiophores reduced to conidiogenous cells, 5–30 µm long, conidiogenous loci inconspicuous, occasionally subconspicuous (in front view visible as minute slightly darkened circle). *Conidia* solitary, almost consistently obclavate, rarely fusiform or subcylindrical, 30–85 × (3–)4–6(–7) µm, 3–7-septate, subhyaline to pale olivaceous, thin-walled, smooth to somewhat rough, apex subacute, base obconically truncate, 2–3 µm wide, hila unthickened, not darkened.

*Holotype*: **New Caledonia**: Monts Koghis (Lavoix), on *Dioscorea bulbifera*, 6 May 1964, Huguenin, NC 64.256 (PC).

*Host range and distribution*: On *Dioscorea* (*alata*, *bulbifera*), *Dioscoreaceae*, Oceania (New Caledonia, Vanuatu).

*Notes*: Braun et al. (1999) cited two collections from Vanuatu on *Dioscorea alata* and *D. bulbifera*, respectively, as paratypes (PDD 46864 and 57186).

***Pseudocercospora hiratsukana*** (Togashi & Katsuki) Deighton, *Mycol. Pap.* **140**: 34 (1976).

(Fig. 106)

*Basionym*: *Cercospora hiratsukana* Togashi & Katsuki, *J. Jap. Bot.* **28**: 286 (1953).

*Literature*: Katsuki (1965: 28), Deighton (1976: 34–36), Yen & Lim (1980: 177), Pons & Sutton (1988: 26), Crous & Braun (2003: 218).

*Illustrations*: Deighton (1976: 35, fig. 18), Pons & Sutton (1988: 28, fig. 11).

*Description*: *Leaf spots* amphigenous, subcircular, elliptical to irregular-angular, somewhat vein-limited, 2–8 mm diam, brown, later greyish brown or grey, margin indefinite or darker, brown. *Caespituli* amphigenous, mainly hypophyllous, punctiform, dark. *Mycelium* internal, rarely with repent hyphae, 1.5–3 µm wide, very pale olivaceous. *Stromata* substomatal, subglobose, 20–65 µm diam, olivaceous-brown. *Conidiophores* in dense, mostly large fascicles, to 30 or even more, arising from stromata, through stomata, sometimes rupturing the stomata, erect, straight to slightly flexuous-sinuuous, barely geniculate, subcylindrical or somewhat attenuated towards the tip, unbranched, 5–40 × 2–4 µm, 0–2(–4)-septate, pale olivaceous to olivaceous-brown, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores often reduced to conidiogenous cells, 5–25 µm long, conidiogenous loci inconspicuous or visible as truncate tips, unthickened, not darkened. *Conidia* solitary, obclavate, obclavate-subcylindrical, subcylindrical, fusiform, straight to somewhat curved, 25–60 × 1.5–3 µm, 2–7-septate, subhyaline to pale olivaceous or olivaceous-brown, thin-walled, smooth, apex obtuse to subacute, base obconically truncate, 1–2 µm wide, hila unthickened, not darkened.

*Spermatogonia* sometimes developed, amphigenous, mainly epiphyllous, scattered, immersed, globose, 50–55 µm diam, sometimes apparently developed in old conidiophore stromata; spermatia rod-shaped, 3–4 × 1 µm, hyaline.

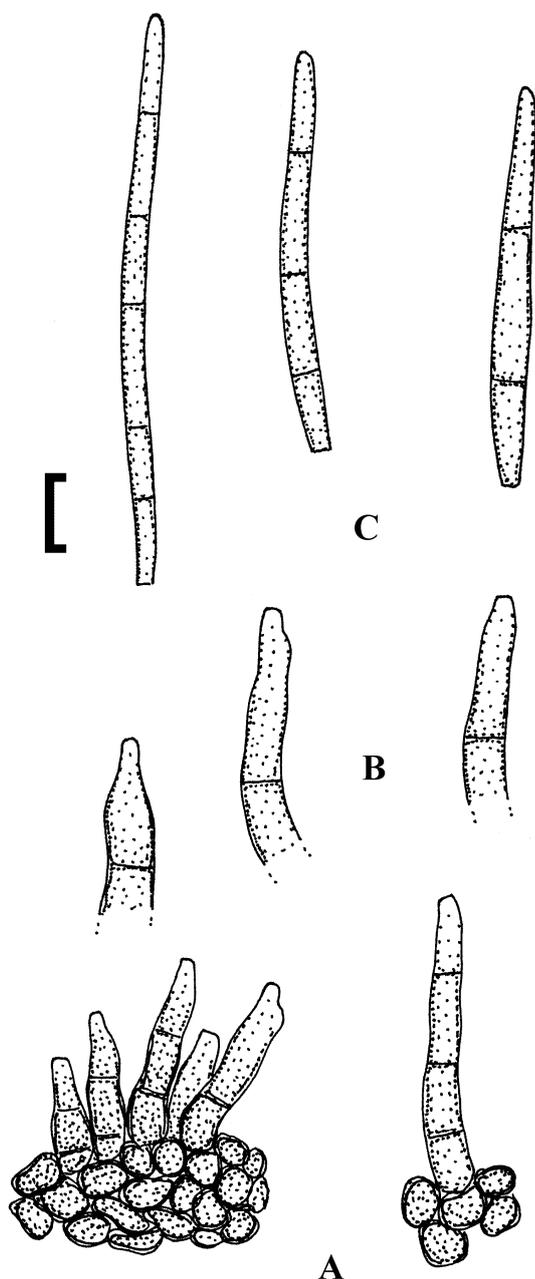


Fig. 106. *Pseudocercospora hiratsukana* (CUP 40760). A. Conidiophore fascicle and solitary conidiophore. B. Conidiophores. C. Conidia. Bar = 10  $\mu$ m.

[Type: **Japan**: Kagoshima Pref.: Kusukawa, Yaku Island, on *Dioscorea quinqueloba*, 14 Oct. 1949, S. Katsuki (not preserved)]. **Neotype (designated here, MycoBank MBT178155)**: **Japan**: Kagoshima, Yaku Island, on *Dioscorea quinqueloba*, 5 Aug. 1951, S. Katsuki (CUP 40760). **Epitype (designated here, MycoBank MBT178156)**: **Japan**: Tokyo, Inagi, Kurihira, on *Dioscorea tokoro*, 23 Oct. 1999, E. Imaizumi (TNS-F-61275). Ex-epitype culture: MAFF238300.

**Host range and distribution**: On *Dioscorea* (*quinqueloba*, *tokoro*, *Dioscorea* sp.), *Dioscoreaceae*, Asia (Japan, Singapore).

**Notes**: Type material of this species could not be traced but other authentic collections were examined. The collection

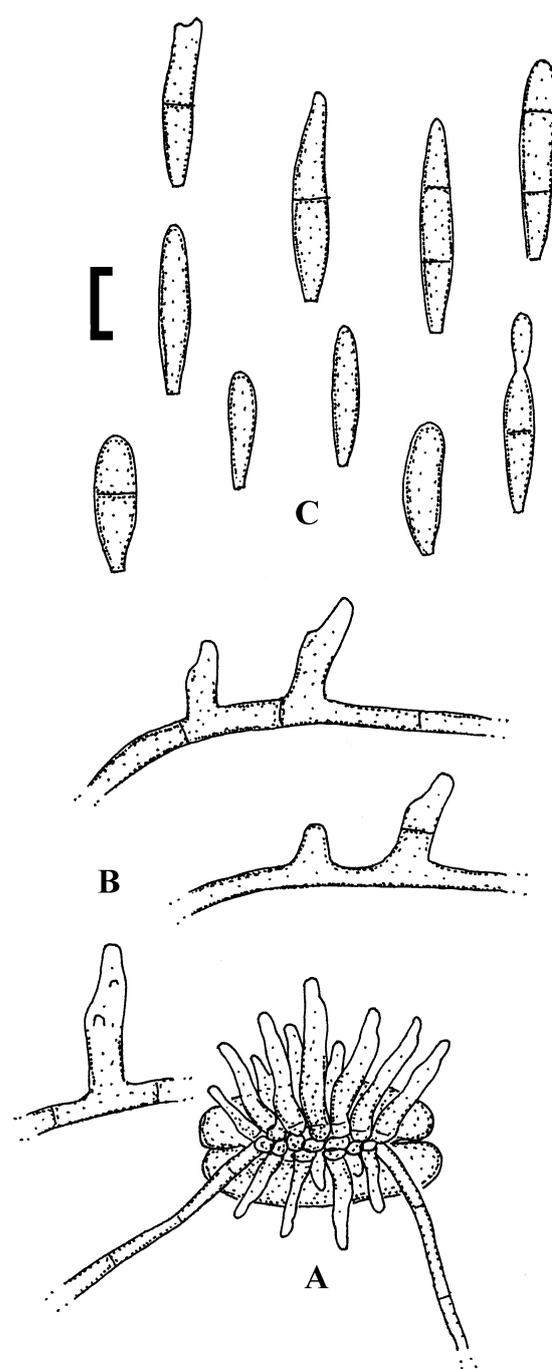


Fig. 107. *Pseudocercospora subrufa* (NY 830555). A. Conidiophore fascicle. B. Solitary conidiophores arising from superficial hyphae. C. Conidia. Bar = 10  $\mu$ m.

designated as neotype represents topotype material, and there is an additional specimen collected by Katsuki elsewhere [Fukuoka, Shikano-shima, 27 Nov. 1949, S. Katsuki (CUP 39641 and YNU 24495; slide at K(M) IMI 92182a)].

***Pseudocercospora subrufa* (Ellis & Holw.) U. Braun, *Cryptog. Bot.* 3: 241 (1993). (Fig. 107)**

**Basionym**: *Ramularia subrufa* Ellis & Holw., *J. Mycol.* 4: 2 (1888).

**Synonyms**: *Mycovellosiella subrufa* (Ellis & Holw.) U. Braun, *Mycotaxon* 48: 288 (1993).

*Ramularia dioscoreae* Ellis & Everh., *Proc. Acad. Nat. Sci. Philadelphia* **43**: 85 (1891) [lectotype (designated by Braun 1993): **USA**: Wisconsin: Racine, on *Dioscorea villosa*, 17 Aug. 1889, J. J. Davis (NY 1042940); isolectotype: NY 1042938].

*Didymaria fulva* Ellis & Everh., *in herb.* [authentic material: **USA**: Indiana: Crowfordsville, on *Dioscorea villosa*, 7 June 1894, Olive (BPI 415505, NY 928029, 928030, 928031)].

*Literature*: Saccardo (1892: 562), Sutton & Pons (1988: 37), Braun (1998: 373).

*Illustrations*: Sutton & Pons (1988: 38, fig. 17), Braun (1993a: 242, fig. 18; 1998: 372, fig. 633).

*Description*: Leaf spots amphigenous, small, 1–4 mm diam, angular-irregular, vein-limited, yellowish, ochraceous to pale brown, finally sometimes greyish white, margin indefinite or sometimes with darker marginal line. *Caespituli* hypophyllous, greyish white to faintly pigmented, yellowish ochraceous. *Mycelium* internal and external; superficial hyphae climbing leaf hairs, branched, 1–4 µm wide, septate, subhyaline to pale olivaceous, thin-walled, smooth. *Stromata* small to well-developed, substomatal to erumpent, pigmented. *Conidiophores* solitary, arising from superficial hyphae, lateral, as well as in small to moderately large, loose to dense fascicles, arising from stromata, through stomata or erumpent, erect, straight and subcylindrical to geniculate-sinuous, unbranched or rarely branched, 5–60 × 2–5.5 µm, aseptate or sparingly septate, subhyaline, yellowish, greenish to olivaceous, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 5–30 µm long, conidiogenous loci often somewhat protuberant, subdenticulate, but unthickened, sometimes conspicuous by being slightly darkened or refractive. *Conidia* solitary, occasionally catenate, rarely in branched chains, ellipsoid-ovoid, fusiform, straight to curved, (10–)15–30(–35) × 2.5–6 µm, (0–)1–2(–3)-septate, subhyaline to faintly yellowish green or pale olivaceous, thin-walled, smooth, apex rounded to subacute, base obconically truncate, 1–1.5 µm wide, hila unthickened, not or barely darkened.

*Holotype*: **USA**: Iowa: Decorah, on *Dioscorea villosa* (as “*Smilax* sp.”), 28 June 1885, Holway (NY 830555). *Isotype*: B 700016015.

*Host range and distribution*: On *Dioscorea villosa*, *Dioscoreaceae*, North America (USA, Iowa, Indiana, Wisconsin).

*Notes*: The conidiogenous loci of this unusual species are subconspicuous, i.e., unthickened, but occasionally somewhat darkened, protuberant, subdenticulate. Taxa with subconspicuous (above all unthickened) scars have to be placed in *Pseudocercospora*, which has recently been confirmed by molecular examinations (Crous et al. 2000, 2013).

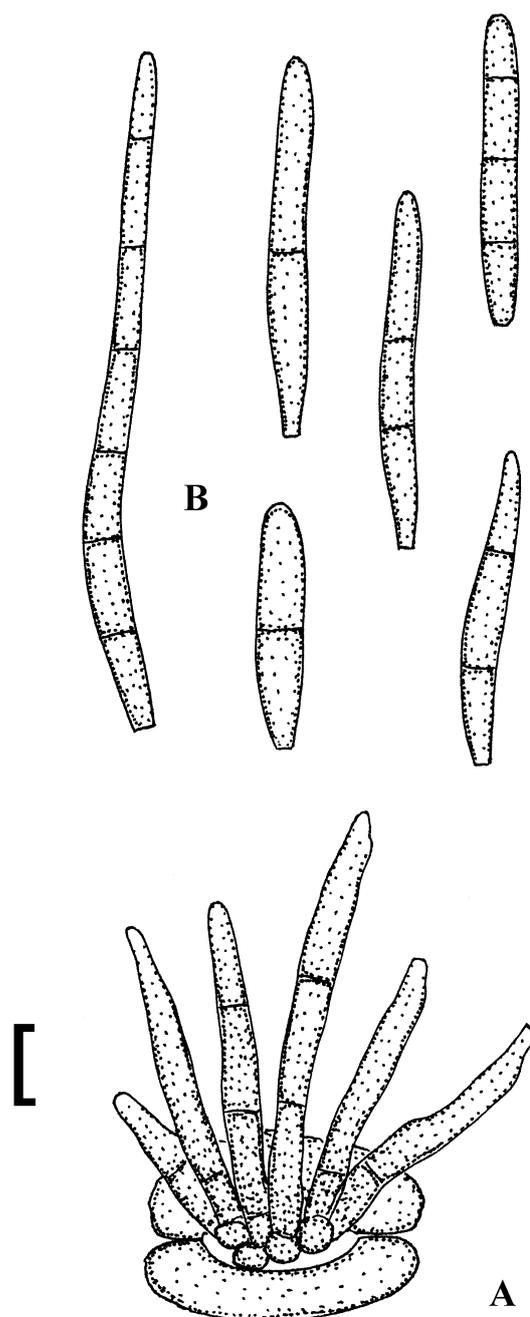


Fig. 108. *Pseudocercospora ubi* (K(M) IMI 166111). A. Conidiophore fascicle. B. Conidia. Bar = 10 µm.

***Pseudocercospora ubi*** (Racib.) Deighton, *Mycol. Pap.* **140**: 36 (1976). (Fig. 108)

*Basionym*: *Cercospora ubi* Racib., *Paras. Algen Pilze Javas* **3**: 39 (1900).

*Synonym*: *Cercospora brasiliensis* Av.-Saccá, *Bol. Agric. São Paulo* **18**: 580 (1917) [type: **Brazil**: São Paulo, on *Dioscorea* sp. (not traced)].

*Literature*: Saccardo (1906: 1073), Chupp (1954: 198), Batista et al. (1965: 12), Katsuki (1965: 28), Deighton (1976: 36), Pons & Sutton (1988: 24), Hsieh & Goh (1990: 104), Guo & Hsieh (1995: 86), Guo et al. (1998: 102), Crous & Braun (2003: 414), Kamal (2010: 229).

*Illustrations:* Batista *et al.* (1965: 22, fig. 8), Deighton (1976: 37, fig. 19), Pons & Sutton (1988: 25, fig. 10), Hsieh & Goh (1990: 105, fig. 79), Guo & Hsieh (1995: 87, fig. 79), Guo *et al.* (1998: 103, fig. 83).

*Description:* *Leaf spots* subcircular to angular-irregular, 4–15 mm diam, yellowish to brown, margin indefinite. *Caespituli* amphigenous, mainly hypophyllous, effuse, greyish brown. *Mycelium* internal. *Stromata* lacking or only small substomatal aggregations of swollen, pigmented hyphal cells. *Conidiophores* in small, loose fascicles, 2–12, occasionally solitary, arising from internal hyphae or stromatic hyphal aggregations, emerging through stomata, erect or occasionally decumbent, straight, subcylindrical or somewhat attenuated towards the tip, flexuous, slightly geniculate-sinuuous, unbranched, 20–120(–150) × 3.5–6 µm, 0–4-septate, pale to medium olivaceous-brown or brown, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, mostly 15–30 µm long, conidiogenous loci inconspicuous or only visible as truncate tips, unthickened, not darkened. *Conidia* solitary, obclavate-cylindrical, subclavate, straight to somewhat curved, (20–)25–70(–120) × 3–6(–7.5) µm, (0–)1–6(–9)-septate, subhyaline to pale olivaceous or olivaceous-brown, thin-walled, smooth, apex obtuse, base short obconically truncate, about 1.5–3 µm wide, hila unthickened, not darkened.

*Holotype:* Indonesia: Java: Buitenzorg, on *Dioscorea alata* (KRA). *Isotype:* K(M) IMI 166111 (slide).

*Host range and distribution:* On *Dioscorea* (*alata*, *bulbifera*, *caucasica*, *esculenta*, *microbotrya* [*gibertii*], *nipponica*, *pentaphylla* [*spinosa*], *polystachya* [*batatas*], *villosa* [*sativa*]), *Dioscoreaceae*, Africa (Togo), Asia (China, India, Indonesia, Japan, Malaysia, Papua New Guinea, Philippines, Russia, Taiwan), Oceania (Samoa, Solomon Islands, Tonga, Vanuatu), Central and South America (Brazil, Panama, Venezuela), West Indies (Dominican Republ.).

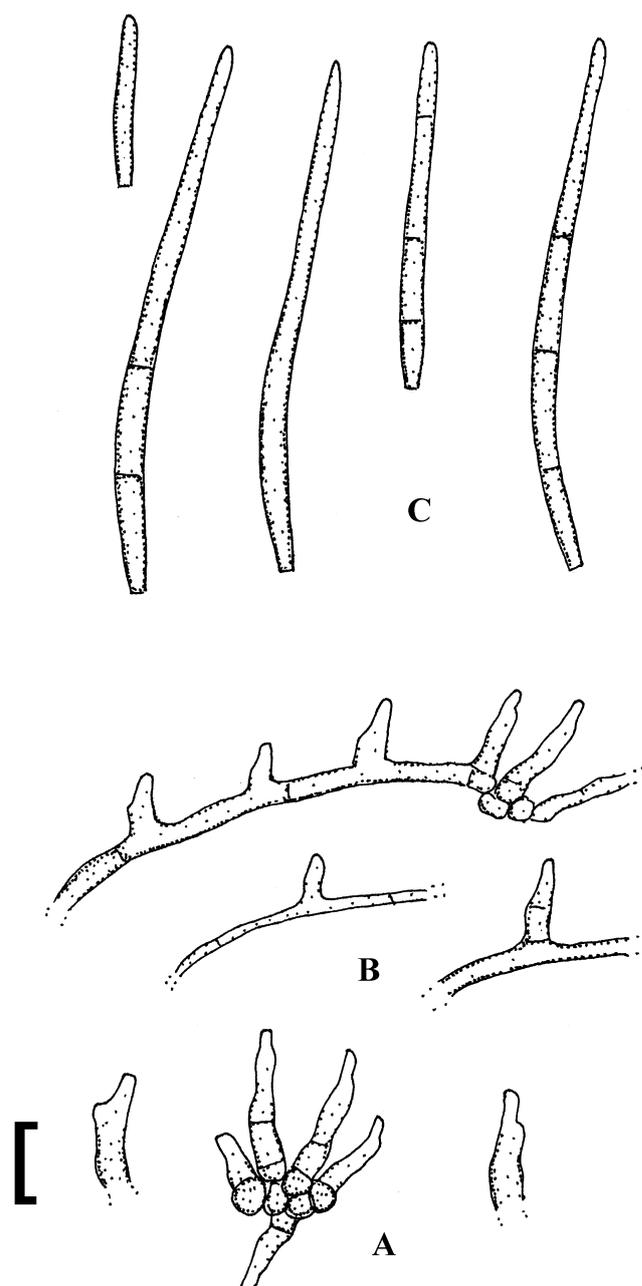
***Pseudocercospora ubicola*** (J.M. Yen) Deighton, *Mycol. Pap.* **140**: 155 (1976). (Fig. 109)

*Basionym:* *Cercospora ubicola* J.M. Yen, *Rev. Mycol.* **30**: 200 (1965).

*Literature:* Yen & Lim (1980: 189), Shaw (1984), Sutton & Pons (1988: 22), Guo & Jiang (2000a), Crous & Braun (2003: 414).

*Illustrations:* Yen (1965: 201, fig. 14), Yen & Lim (1980: 262, fig. 64), Sutton & Pons (1988: 23, fig. 9).

*Description:* *Leaf spots* amphigenous, irregular-angular, yellowish to brown, vein-limited, margin indefinite, confluent. *Caespituli* hypophyllous, indistinct. *Mycelium* internal and external; superficial hyphae emerging through stomata, branched, 1–2.5 µm wide, septate, pale olivaceous to olivaceous-brown, thin-walled, smooth. *Stromata* lacking or small stromatic hyphal aggregations, 8–15 µm diam,



**Fig. 109.** *Pseudocercospora ubicola* (PC, holotype). **A.** Conidiophore fascicle and conidiophores. **B.** Solitary conidiophores arising from superficial hyphae. **C.** Conidia. Bar = 10 µm.

substomatal, somewhat pigmented. *Conidiophores* in small, loose fascicles, 2–5, emerging through stomata or solitary, arising from superficial hyphae, erect, straight to curved, subcylindrical-conical, somewhat geniculate-sinuuous, unbranched, 4–30 × 2–5 µm, 0–3-septate, subhyaline to pale olivaceous or olivaceous-brown, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 5–20 µm long, conidiogenous loci inconspicuous to subdenticulate, but unthickened and not darkened. *Conidia* solitary, acicular-filiform to narrowly obclavate-cylindrical, straight to curved, (12–)25–100 × 1–2.5 µm, (0–)2–8-septate, subhyaline, thin-walled, smooth, apex subacute to subobtuse, base truncate to short obconically truncate, 1–2 µm wide, hila unthickened, not darkened.

**Holotype:** Singapore: Botanic Garden, on *Dioscorea pyrifolia*, 7 June 1964, S. H. Sun (PC). **Isotype:** K(M) IMI 120988 (slide).

**Host range and distribution:** On *Dioscorea* (*pyrifolia*, *subcalva*), *Dioscoreaceae*, Asia (China, Papua New Guinea, Singapore).

### Zasmidium

A single species.

**Zasmidium dioscorinum** Archana Singh, R. Singh, Sham. Kumar, Upadhyaya & R.F. Castañeda, *Nova Hedwigia* **98**: 258 (2014).

(Fig. 110)

**Illustration:** Singh et al. (2014: 259, fig. 1).

**Description:** Leaf spots amphigenous, small to large, 1.5–15 mm diam, subcircular to angular, vein-limited, scattered, blackish brown. Colonies hypophyllous, effuse, blackish brown. Mycelium internal and external; superficial hyphae branched, septate, 1.5–2.5 µm wide, thin-walled, verruculose. Stromata superficial, prosenchymatous, 20–30 × 20–25 µm, dark brown. Conidiophores in loose fascicles, 8–19, arising from stromata, or solitary, arising from superficial hyphae, lateral, erect, straight to curved-sinuuous, flexuous to 0–3 times geniculate, unbranched, 6–130 × 3–4 µm, 2–7-septate, brown, paler towards the apex, wall thickened, smooth; conidiogenous cells integrated, terminal, 8.5–28.5 µm long, sympodial, conidiogenous loci conspicuous, thickened and darkened, 0.5–1.5 µm diam. Conidia solitary, short obclavate-subcylindrical, ellipsoid-fusiform, straight to slightly curved, 12–40 × 4–6 µm, 1–3-septate, light brown, wall slightly thickened, verruculose, obtuse, rounded to somewhat attenuated, base rounded to short obconically truncate, 0.5–1.5 µm wide, hila somewhat thickened and darkened.

**Holotype:** India: Uttar Pradesh: Siddharthnagar, Bansi, on *Dioscorea oppositifolia*, *Dioscoreaceae*, Mar. 2008, A. Singh (HCIO 42396). **Isotype:** GPU–KSR 398.

**Host range and distribution.** Only known from the type collection.

### Flagellariaceae

#### Pseudocercospora

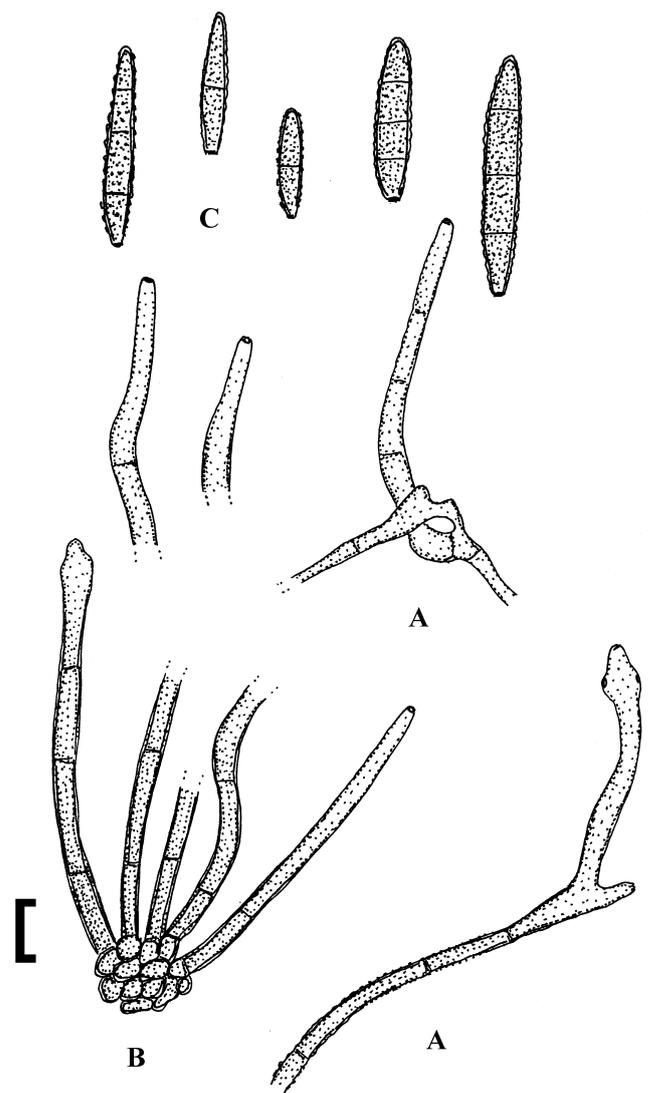
A single species.

**Pseudocercospora flagellariae** Goh & W.H. Hsieh, *Trans. Mycol. Soc. Republ. China* **2**: 130 (1987).

(Fig. 111)

**Synonym:** *Cercospora flagellariae* Sawada, *Taiwan Agric. Rev.* **38**: 696 (1942), *nom. inval.* (ICN, Art. 39.1).

**Literature:** Chupp (1954: 237), Goh & Hsieh (1990: 132), Guo



**Fig. 110.** *Zasmidium dioscorinum* (based on Singh et al. 2014: 259, fig. 1). **A.** Solitary conidiophore arising from superficial hypha. **B.** Conidiophore fascicle. **C.** Conidia. Bars = 10 µm.

& Hsieh (1995: 121), Guo et al. (1998: 137), Crous & Braun (2003: 186).

**Illustrations:** Goh & Hsieh (1990: 133, fig. 101), Guo & Hsieh (1995: 124, fig. 109), Guo et al. (1998: 138, fig. 113).

**Description:** Leaf spots elliptical, 3–5 mm diam, pale to dark brown. Caespituli amphigenous. Mycelium internal. Stromata hemispherical, 50–70 µm wide and to 40 µm high, dark brown. Conidiophores in dense almost sporodochial fascicles, arising from stromata, erect, straight, subcylindrical, not or barely geniculate, apex mostly truncate, unbranched, short, 5–20 × 4–6 µm, 0–2-septate, brown, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores often reduced to conidiogenous cells, conidiogenous loci inconspicuous or visible as truncate tip, but always unthickened and not darkened. Conidia solitary, cylindrical, obclavate-cylindrical or slightly clavate, almost straight to curved, 55–70 × 4–5 µm, 3–5-septate, colourless, thin-walled, smooth, apex

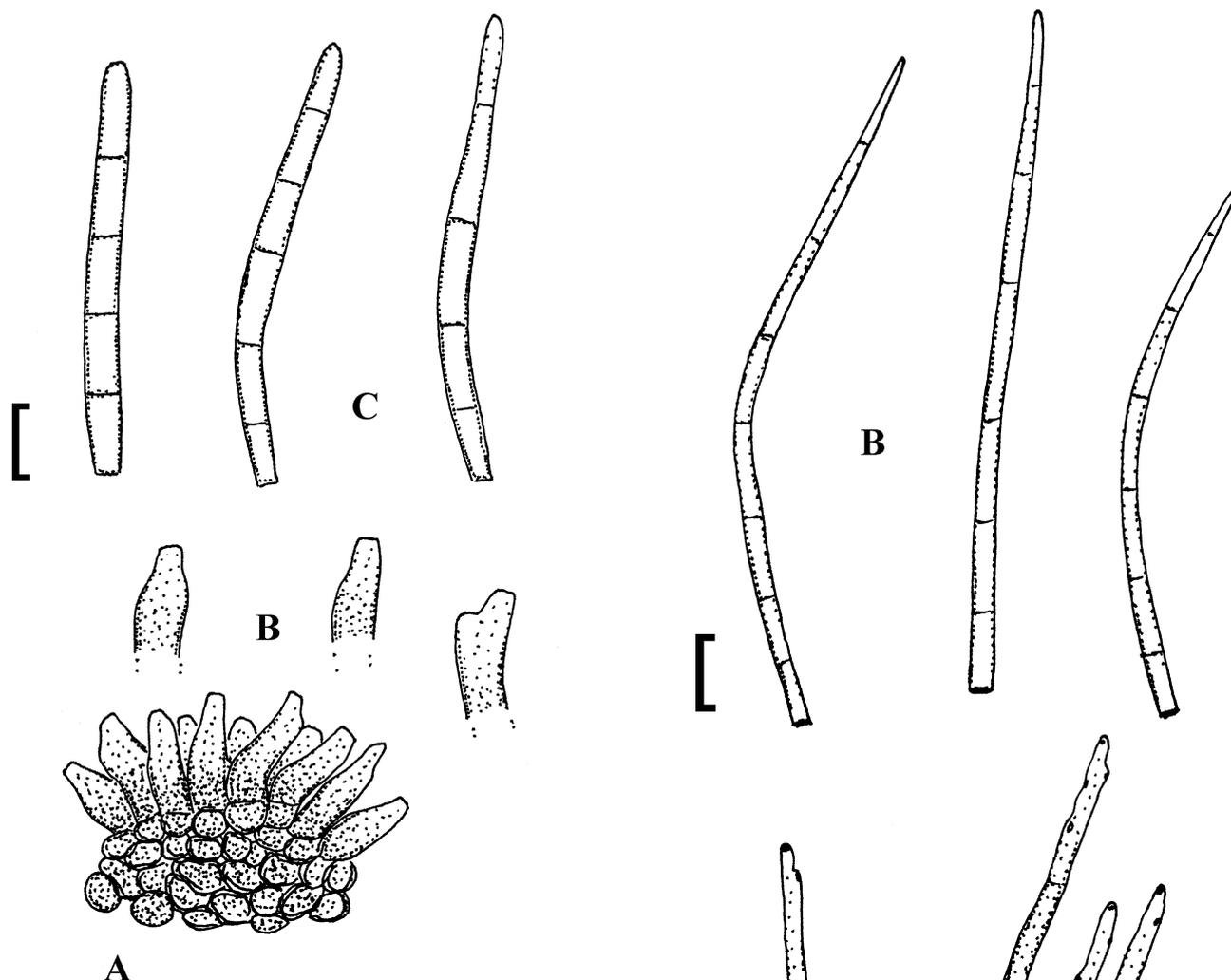


Fig. 111. *Pseudocercospora flagellariae* (NTU-PPE, holotype). A. Conidiophore fascicle. B. Conidiophores. C. Conidia. Bar = 10 µm.

obtuse, rounded, base truncate to obconically truncate, hila neither thickened nor darkened.

*Holotype: Taiwan:* Hengchun, Pingtung Hsieh, on *Flagellaria indica*, 26 Apr. 1931, K. Sawada (NTU-PPE, herb. Sawada).

*Host range and distribution:* On *Flagellaria indica*, *Flagellariaceae*, Asia (Taiwan).

## Heliconiaceae

### *Cercospora*

A single species.

***Cercospora heliconiae*** Chowdhry, D. Gupta & Padhi, *Indian Phytopathol.* **36**: 625 (1983). (Fig. 112)

*Literature:* Crous & Braun (2003: 214), Kamal (2010: 50).

*Illustration:* Chowdry *et al.* (1983: 625, fig. 2).

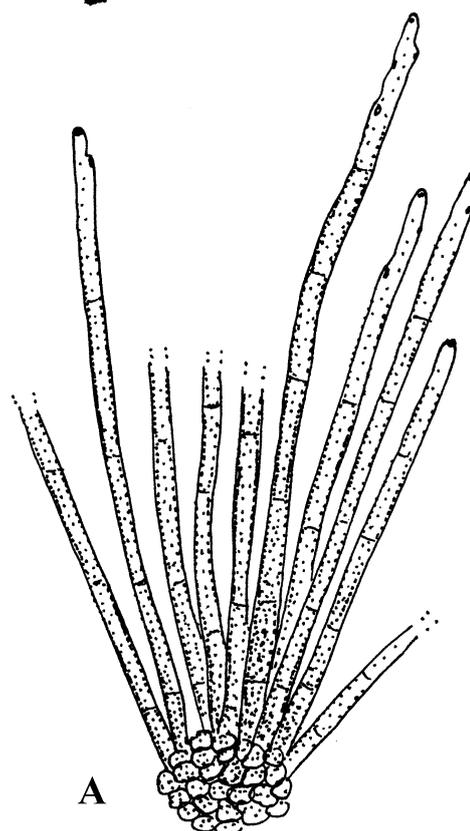


Fig. 112. *Cercospora heliconiae* (based on Chowdhry *et al.* 1983: 625, fig. 2). A. Conidiophore fascicle. B. Conidia. Bar = 10 µm.

*Description:* Leaf spots amphigenous, brown, at first marginal, then extending to the midrib, 16–80 mm diam. Caespituli amphigenous. Stromata globose, 30–50 µm diam, dark brown. Conidiophores in well-developed, dense fascicles, 11–40, arising from stromata, erect, subcylindrical,

straight to sinuous, 2–7 times geniculate, unbranched, 95–180 × 3–4.5 µm, 2–8-septate, deep olivaceous-brown; conidiogenous cells integrated, terminal and intercalary, conidiogenous loci conspicuous, thickened and darkened. *Conidia* solitary, acicular, straight to curved, 35–180 × 1.5–3 µm, 8–23-septate, hyaline, thin-walled, smooth, apex acute, base truncate, hila thickened and darkened.

*Holotype: India: Odisha: Bhubaneswar, on Heliconia caribaea, Heliconiaceae, 28 Nov. 1977, D. Gupta (HCIO 32855).*

*Host range and distribution:* Only known from the type collection.

*Note:* A true *Cercospora* s. str. belonging to the *C. apii* s. lat. complex.

## *Pseudocercospora*

### Key to *Pseudocercospora* species on *Heliconiaceae*

- Conidiophores (20–)30–90 × 4.5–9 µm; conidiogenous loci unthickened, not darkened; conidia cylindrical, subcylindrical to somewhat fusiform, 50–120 × 4.5–6 µm, 0–5-septate, pale brown; on *Heliconia psittacorum* ..... ***P. heliconiae***  
Conidiophores shorter and narrower, 10–65 × 3–6(–7) µm; conidiogenous loci subconspicuous, paracercospora-like, i.e. only ultimate rim slightly thickened and darkened, in front view visible as minute circle; conidia obclavate-cylindrical, somewhat narrower, 30–130 × 2.5–5 µm, 1–10-septate; on *Heliconia psittacorum* ..... ***P. fijiensis*** (see under *Musaceae*)

### *Pseudocercospora heliconiae* Meiriele Silva & O.L.

Pereira, *Mycotaxon* **113**: 366 (2010).

(Fig. 113)

*Illustration:* Silva & Pereira (2010: 367–369, figs 1–6).

*Description:* Leaf spots amphigenous, variable, subcircular to subangular-irregular, brownish to dingy grey or greyish white, border darker, at first small, 2–10 mm diam, later spreading or confluent, covering large leaf areas. *Caespituli* amphigenous, mainly hypophyllous, punctiform, dark olivaceous-brown to blackish brown. *Mycelium* internal. *Stromata* absent or small, 10–40 µm diam, brown to dark brown, substomatal. *Conidiophores* in small to moderately large, loose to dense fascicles, arising from internal hyphal cells or small stromata, erect, almost straight to curved, subcylindrical to geniculate-sinuous, unbranched, (20–) 30–90 × 4.5–9 µm, 0–4(–5)-septate, medium brown, paler towards the tip, wall thin to somewhat thickened, to 1 µm, at the very base sometimes to 2 µm, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 15–50 µm long, conidiogenous loci inconspicuous or visible as truncate tips, 2–3 µm wide, but always unthickened and not darkened. *Conidia* solitary, cylindrical, subcylindrical to somewhat fusiform, i.e. gradually attenuated to base and apex, 50–120 × 4.5–6 µm, 0–5-septate, pale brown, thin-walled, smooth, apex obtuse, base obconically truncate, 2–3.5 µm wide, hila unthickened, not darkened.

*Holotype: Brazil: Minas Gerais: Viçosa, on Heliconia psittacorum, Heliconiaceae, 12 May 2008, O. L. Pereira (VIC 31221. Isotype: HAL 2356 F.*

*Host range and distribution:* Only known from the type collection.

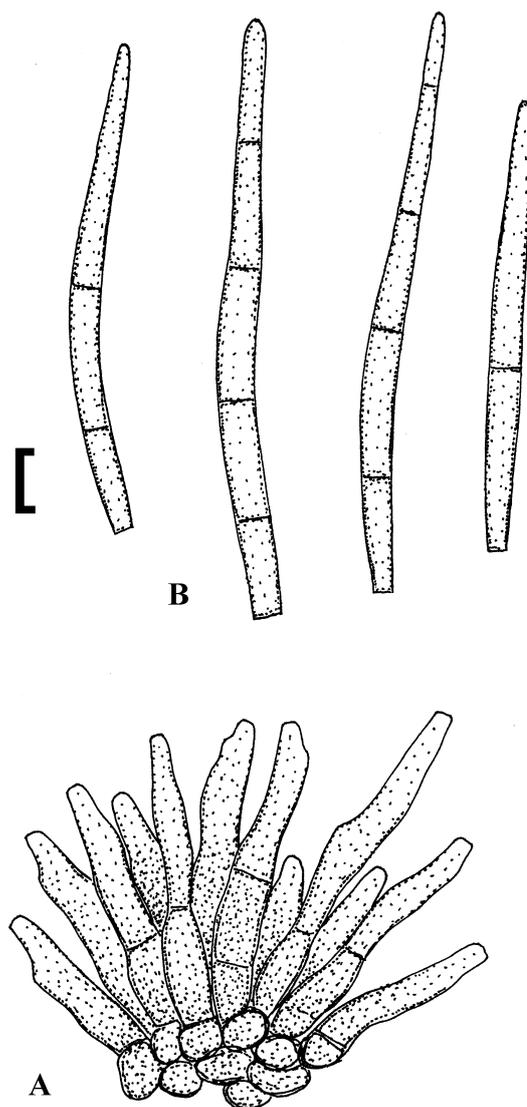


Fig. 113. *Pseudocercospora heliconiae* (HAL 2356 F). A. Conidiophore fascicle. B. Conidia. Bar = 10 µm.

Note: A record of *Pseudocercospora fijiensis* on *Heliconia psittacorum* was published from Brazil (Gasparotto *et al.* 2005).

## Hydrocharitaceae

### *Cercospora*

A single species.

***Cercospora limnobii*** Conway, *Trans. Brit. Mycol. Soc.* **71**: 523 "1978" (1979).  
(Similar to Fig. 1)

*Literature*: Crous & Braun (2003: 252).

*Illustration*: Conway (1979b: 522, figs 1–4).

*Description*: Leaf spots irregularly shaped, 10–15 mm diam, later coalescing along the margin and tip, medium to dark brown. *Stromata* lacking or small, 10–30 µm diam, substomatal, mostly only a few swollen hyphal cells, brown, wall thickened. *Mycelium* internal; hyphae branched, straight to sinuous-torulose, pale olivaceous to medium brown, 2–6 µm wide. *Conidiophores* solitary or in small fascicles, 2–6, arising from internal hyphae or stromata, through stomata, erect, straight, subcylindrical to geniculate-sinuous in the upper fertile part, 75–130(–260) × 4–8 µm, septate, brown throughout or with paler tips; conidiogenous cells integrated, terminal and intercalary, about 10–35 µm long, conidiogenous loci conspicuous, thickened and darkened, 2–4 µm diam. *Conidia* solitary, acicular, straight or almost so, 75–150(–250) × 3–4.5 µm, pluriseptate, hyaline, thin-walled, smooth, apex acute, base truncate, 2–3 µm wide, hila thickened and darkened.

*Holotype*: USA: Florida: Deep Creek, Rodman Reservoir, Orange Springs, on *Limnobium spongia*, Hydrocharitaceae, 12 Sep. 1975, K. E. Conway & D. Bowman (BPI 71882).

*Host range and distribution*: Only known from the type collection.

Note: This species belongs to the *C. apii* complex.

## Hypoxidaceae

### *Pseudocercospora*

A single species.

***Pseudocercospora curculiginis*** Y.L. Guo & X.J. Liu, *Mycosystema* **5**: 101 (1992).  
(Fig. 114)

*Literature*: Guo & Hsieh (1995: 10–11), Guo *et al.* (1998: 22).

*Illustrations*: Guo & Liu (1992: 102, fig. 2), Guo & Hsieh (1995: 12, fig. Fig.11), Guo *et al.* (1998: 22, fig. 11).

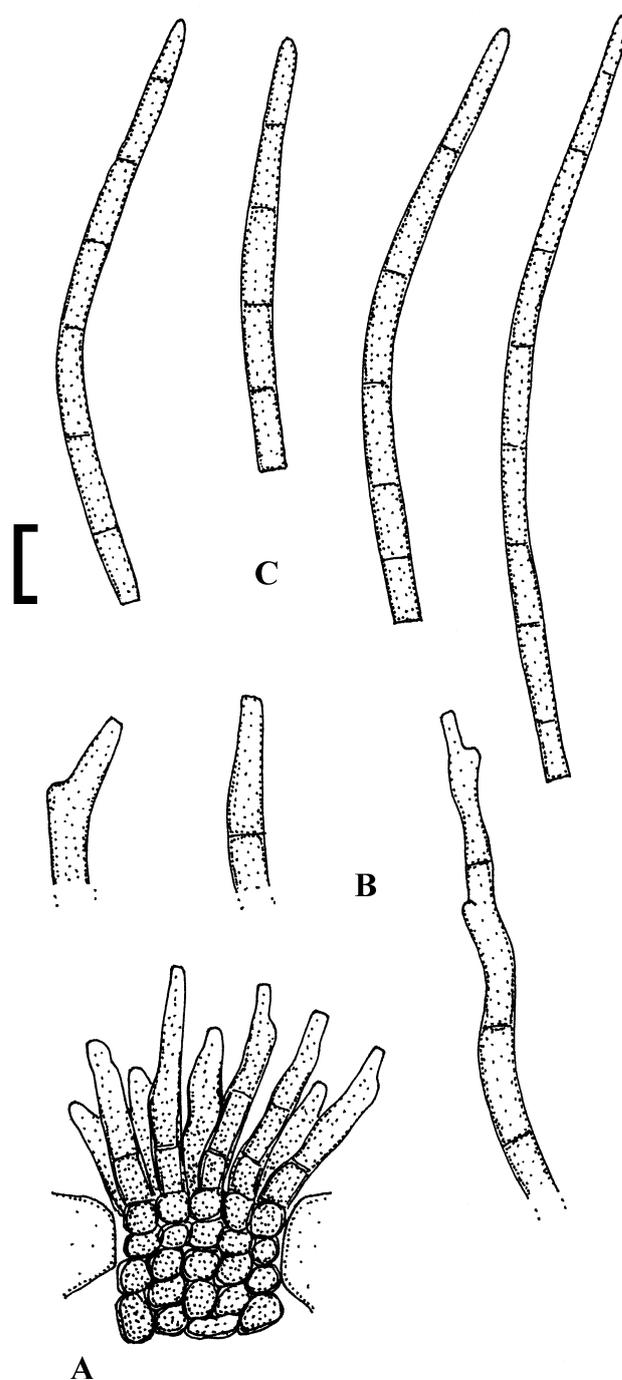


Fig. 114. *Pseudocercospora curculiginis* (HMAS 62713). A. Conidiophore fascicle. B. Conidiophores. C. Conidia. Bar = 10 µm.

*Description*: Leaf spots amphigenous, elliptical to oblong-elliptical, 0.5–10 × 0.3–10 mm, often confluent, pale grey to pale brown, surrounded by a dark greyish marginal line and yellowish brown to pale greyish brown halo on the upper side and grey to pale greyish brown below. *Caespituli* amphigenous. *Mycelium* internal. *Stromata* none or small, 10–30 µm diam, globose, greyish brown. *Conidiophores* fasciculate, 2–15, arising from internal hyphal cells or stromata, through stomata, erect, straight to curved, subcylindrical to somewhat geniculate-sinuous, mostly unbranched, 6.5–96.5 × 3–4.5 µm, 1–7-septate, uniformly pale to medium olivaceous-brown, thin-walled, smooth; conidiogenous cells

integrated, terminal and intercalary, conidiogenous loci inconspicuous, unthickened, not darkened. *Conidia* solitary, acicular to somewhat obclavate-subcylindrical,  $40\text{--}120 \times 3\text{--}4 \mu\text{m}$ , 4–12-septate, olivaceous, thin-walled, smooth, apex obtuse to pointed, base truncate or occasionally somewhat obconically truncate, hila unthickened, not darkened.

**Holotype: China:** Guangdong: Dinghushan, on *Molinearia capitulata* [*Curculigo capitulata*], Hypoxidaceae, 21 Oct. 1981, Y. L. Guo & X. J. Liu 17 (HMAS 62713)

**Host range and distribution:** Only known from the type collection.

## Iridaceae

### *Cercospora*

#### Key to *Cercospora* species on Iridaceae

- 1 Conidiophores short,  $15\text{--}50 \times 3\text{--}5.5 \mu\text{m}$ ; conidia acicular,  $25\text{--}70 \times 2\text{--}4 \mu\text{m}$ ; on *Iris* spp. .... ***C. iridis***  
 Conidiophores very long, about  $60\text{--}340 \times 3\text{--}5 \mu\text{m}$ ; conidia obclavate-cylindrical,  $57\text{--}133 \times 4\text{--}7 \mu\text{m}$ ; on *Neomarica caerulea* ..... ***C. neomaricae***

#### *Cercospora* species on Iridaceae

***Cercospora iridis*** Chupp, *Monograph of Cercospora*: 260 (1954).

**Literature:** Crous & Braun (2003: 229).

**Description:** Leaf spots amphigenous, elliptical to oblong, 5–20 mm in length, straw-coloured to brownish, darkened when fruiting is abundant. *Caespituli* amphigenous, dark. *Mycelium* internal. *Stromata* globose to flattened, 20–40  $\mu\text{m}$  diam, dark brown. *Conidiophores* fasciculate, 2–20, divergent, straight to slightly curved, 0–2 times geniculate, unbranched,  $15\text{--}50 \times 3\text{--}5.5 \mu\text{m}$ , sparingly septate, pale to medium brown, paler towards the tip; conidiogenous loci conspicuous, thickened and darkened. *Conidia* solitary, acicular, straight to somewhat curved,  $25\text{--}70 \times 2\text{--}4 \mu\text{m}$ , indistinctly pluriseptate, thin-walled, smooth, tip subacute or subobtuse, base truncate, hila thickened and darkened.

**Holotype: Mexico:** Matamoros, on *Iris* sp., 12 May 1944, C. J. Hansen 57462 (not traced).

**Host range and distribution:** On *Iris* spp., Iridaceae, Asia (Nepal), North America (Mexico), South America (Brazil).

**Notes:** A true *Cercospora* s. str. close to *C. apii* s. lat. but with short conidiophores and obclavate-acicular conidia. According to Chupp (1954), type material was said to be deposited at "U.S.D.A. Herbarium" (now BPI), but this collection is not preserved in this herbarium.

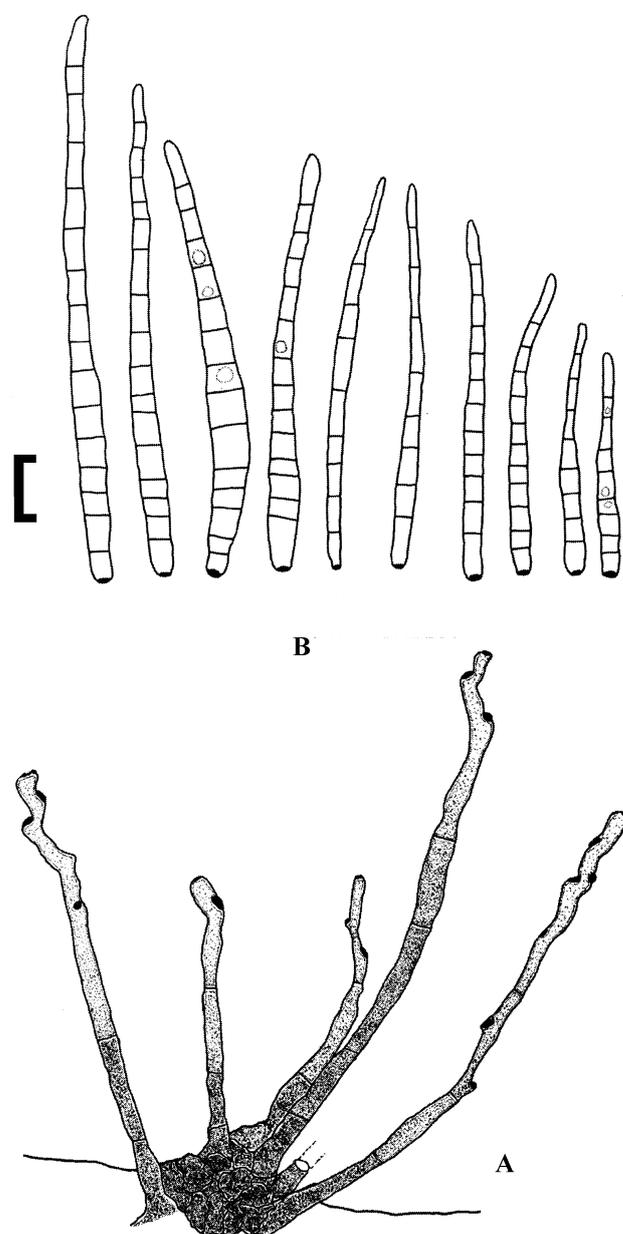
***Cercospora neomaricae*** Macedo & R.W. Barreto, sp. nov.

Mycobank MB809023

(Fig. 115)

**Synonym:** *Cercospora neomaricae* Macedo & R.W. Barreto, *Australas. Pl. Pathol.* **37**: 581 (2008); nom. *ival.* (ICN, Art. 40.6).

**Illustration:** Macedo & Barreto (2008: 582, Fig. 2).



**Fig. 115.** *Cercospora neomaricae* (VIC 305338). **A.** Conidiophore fascicle. **B.** Conidia. Bar = 10  $\mu\text{m}$ .

**Description:** *Leaf spots* amphigenous, subcircular, about 3–10 mm diam, brown with yellow halo, later centre greyish with dark brown margin (eye-spots) and yellow halo. *Caespituli* amphigenous. *Mycelium* internal. *Stromata* lacking to well-developed. *Conidiophores* in loose fascicles, arising from internal hyphae or stromata, erect, straight to slightly curved, geniculate, unbranched, about  $60\text{--}340 \times 3\text{--}5 \mu\text{m}$ , 2–6-septate, dark brown, thin-walled, smooth; conidiogenous cells integrated, terminal or intercalary, sympodial, with conspicuous conidiogenous loci, thickened and darkened. *Conidia* solitary, obclavate-subcylindrical, straight to somewhat curved,  $57\text{--}133 \times 4\text{--}7 \mu\text{m}$ , 6–16-septate, hyaline, thin-walled, smooth, apex obtuse to somewhat pointed, base truncate to usually

obconically truncate, hila thickened and darkened. *In vitro:* Colonies slow-growing (3–6 cm in 15 d), white to pale pinkish cottony aerial mycelium which may raise centrally with irregular greyish sectioning (in MEA), rays of mycelial threads immersed in the medium formed at the periphery (in MEA), colony in reverse white to pink, greenish brown, dark grey or almost black, not sporulating.

**Holotype:** **Brazil:** Rio de Janeiro, municipality Petrópolis, Haipava, on *Neomarica caerulea*, Aug. 2007, D. M. Macedo & R. W. Barreto (VIC 305338).

**Host range and distribution:** On *Neomarica caerulea*, *Iridaceae*, South America (Brazil).

### *Pseudocercospora* (including *Stigmina*)

#### Key to *Pseudocercospora* species on *Iridaceae*

- 1 Conidiogenous cells sympodially proliferating, without annellations; conidia acicular-filiform,  $70\text{--}135 \times 2\text{--}3 \mu\text{m}$ , 5–14-euseptate, smooth; on *Libertia*, New Zealand ..... ***P. libertiae***  
 Conidiophores percurrently proliferating, with annellations; conidia subcylindrical,  $18\text{--}25 \times 7\text{--}8 \mu\text{m}$ , 1–3-distoseptate, verruculose; on *Dierama*, South Africa ..... ***Stigmina dieramae***

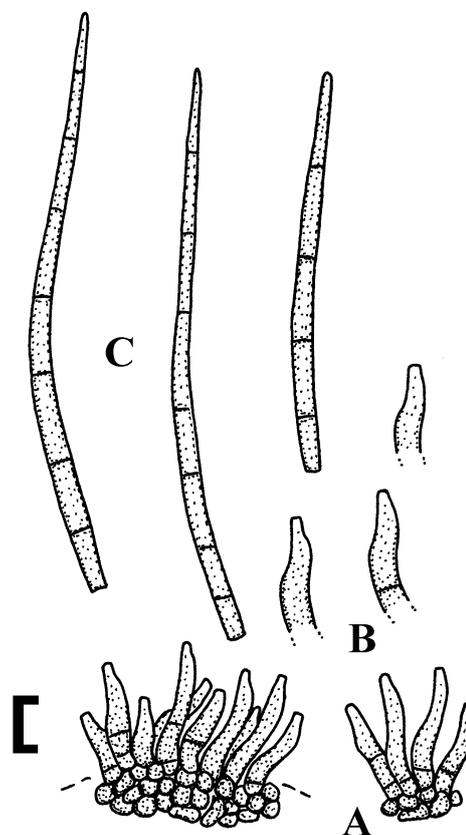
#### *Pseudocercospora* species on *Iridaceae*

***Pseudocercospora libertiae*** U. Braun & C.F. Hill, in Braun *et al.*, *Australas. Pl. Pathol.* **32**: 89 (2003). (Fig. 116)

**Illustration:** Braun *et al.* (2003b: 90, fig. 4).

**Description:** *Leaf spots* amphigenous, oblong, spread along the leaf margin, finally very long, expanded, covering large parts of the leaves, pale to dark brown, reddish brown, later pale straw-coloured to dull greyish white, with brown to reddish brown border. *Caespituli* amphigenous, punctiform, dark brown, loose to dense, pale dingy olivaceous to greyish white by abundant conidial formation. *Mycelium* internal. *Stromata* lacking or small, substomatal, 10–30  $\mu\text{m}$  diam, olivaceous-brown. *Conidiophores* in small to moderately large fascicles, loose to dense, arising from internal hyphae or stromata, through stomata, erect, straight, subcylindrical-conical to geniculate-sinuous, unbranched,  $5\text{--}25 \times 2\text{--}4 \mu\text{m}$ , occasionally to 6  $\mu\text{m}$  wide at the very base, conidiophores often appearing to be longer by persistent conidia, 0–1-septate, subhyaline to pale olivaceous or olivaceous-brown, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 5–20  $\mu\text{m}$  long, sympodial, conidiogenous loci inconspicuous. *Conidia* solitary, acicular-filiform,  $70\text{--}135 \times 2\text{--}3 \mu\text{m}$ , obscurely 5–14-septate, often with minute oil droplets when fresh, subhyaline to pale olivaceous, thin-walled, smooth, apex subacute, base truncate or gradually attenuated towards the base (i.e. only slightly obconically truncate),  $(1.5\text{--})2\text{--}(2.5) \mu\text{m}$  wide, hila unthickened, not darkened.

**Holotype:** **New Zealand:** Auckland, Auckland University Campus, on *Libertia ixioides*, *Iridaceae*, 8 Apr. 2001, C. F. Hill 398 (HAL 1728 F).



**Fig. 116.** *Pseudocercospora libertiae* (HAL 1728 F). **A.** Conidiophore fascicles. **B.** Conidiophores. **C.** Conidia. Bar = 10  $\mu\text{m}$ .

*Host range and distribution:* Only known from the type collection.

***Stigmia dieramae*** Crous & B. Sutton, *S. Afr. J. Bot.* **63**: 284 (1997).  
(Fig. 117)

*Illustration:* Crous & Sutton (1997: 284, fig. 7).

*Description:* *Leaf spots* amphigenous, black, diffuse, 1–12 × 1 mm. *Caespituli* amphigenous, scattered, punctiform, blackish. *Mycelium* internal and external, superficial; hyphae light brown, branched, septate, 4–6 µm wide, smooth to verruculose, forming small substomatal stromatic aggregations. *Conidiophores* fasciculate, 2–8, arising from stromatic hyphal aggregations, forming small conidiomata, 13–30 µm diam, emerging through stomata, erect, subcylindrical, straight or once geniculate, unbranched or only branched at the base, 8–16 × 6–8 µm, aseptate or 1-septate, brown, thin-walled, verruculose; conidiogenous cells integrated, terminal or conidiophores aseptate, i.e. reduced to conidiogenous cells, tapering to a rounded end, brown, verruculose, percurrently proliferating, with 1–3 irregular annellations, conidiogenous locus neither thickened nor darkened. *Conidia* solitary, holoblastic, subcylindrical, straight to somewhat curved, 18–25 × 7–8 µm, 1–3-distoseptate, brown, verruculose, with longitudinal striations, apex obtuse, broadly rounded, base truncate to subtruncate, with marginal frill, but neither thickened nor darkened.

*Holotype:* **Lesotho:** Thaba Putsoa, Maseru district, on *Dierama* sp., *Iridaceae*, 23 Feb. 1967, A. J. Guillarmod (PREM 44333).

*Host range and distribution:* Only known from the type collection.

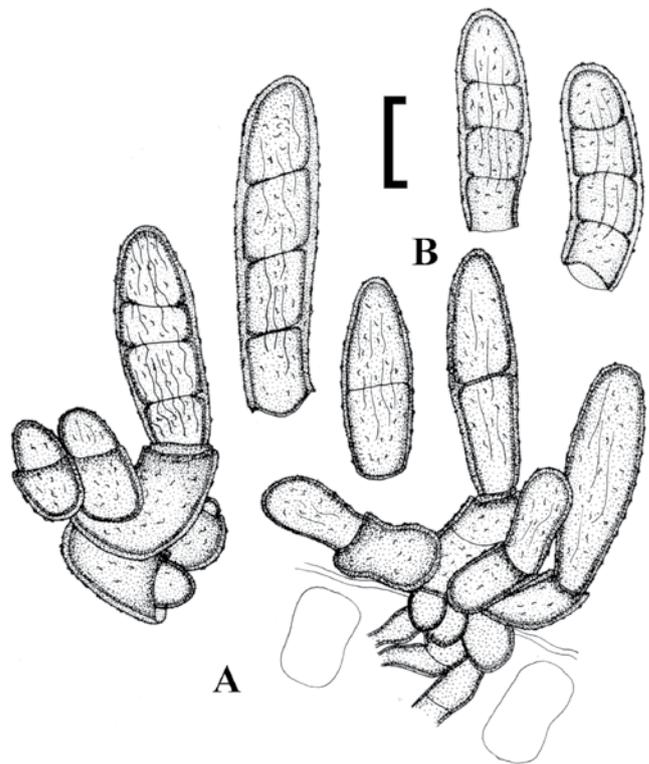
*Notes:* Due to didymo- to phragmosporous, distoseptate conidia, this species is morphologically close to the type species of *Stigmia*, which proved to be a species of *Pseudocercospora* based on its phylogenetic position. Therefore, *Stigmia* was reduced to synonymy with *Pseudocercospora*. On the other hand, *S. dieramae* is characterised by having verruculose conidiophores and conidia which is reminiscent of *Pseudoasperisporium*. However, the latter genus differs by its euseptate conidia.

## Juncaceae

### *Cercospora*

#### Key to *Cercospora* species on Juncaceae

- |   |   |                           |
|---|---|---------------------------|
| 1 | Conidiophores (5–)10–60(–80) µm long, pale to dark brown or olivaceous-brown; conidia obclavate-cylindrical, 2.5–5(–6) µm wide, hyaline, subhyaline to pale olivaceous; on numerous <i>Juncus</i> spp. .... | <b>C. juncina</b>         |
|   | Conidiophores 5–30 µm long, paler, subhyaline to pale olivaceous to medium brown; conidia acicular, rarely obclavate, narrower, 1.5–3 µm, hyaline; on <i>Juncus marginatus</i> , USA .....                  | <b>C. junci-marginati</b> |



**Fig. 117.** *Stigmia dieramae* (PREM 44333). **A.** Conidiophore fascicles. **B.** Conidia. Bar = 10 µm. P.W. Crous del.

*Stigmia dieramae* has not yet been cultured and its phylogenetic position is still unknown. Therefore, we hesitate to reallocate this species to *Pseudocercospora* and retain it tentatively in *Stigmia* awaiting confirmation by cultures and phylogenetic data.

#### **Doubtful, excluded and insufficiently known species**

*Cercospora iridicola* Tracy & Earle, *nom. nud.*

**USA:** *Mississippi:* Starkville, on *Iris pabularia*, *Iridaceae*, Jan 1894, S. M. Tracy (not traced).

*Notes:* A heterosporium-like fungus (*Cladosporium*), according to Chupp (1954: 261), probably *Cladosporium iridis*.

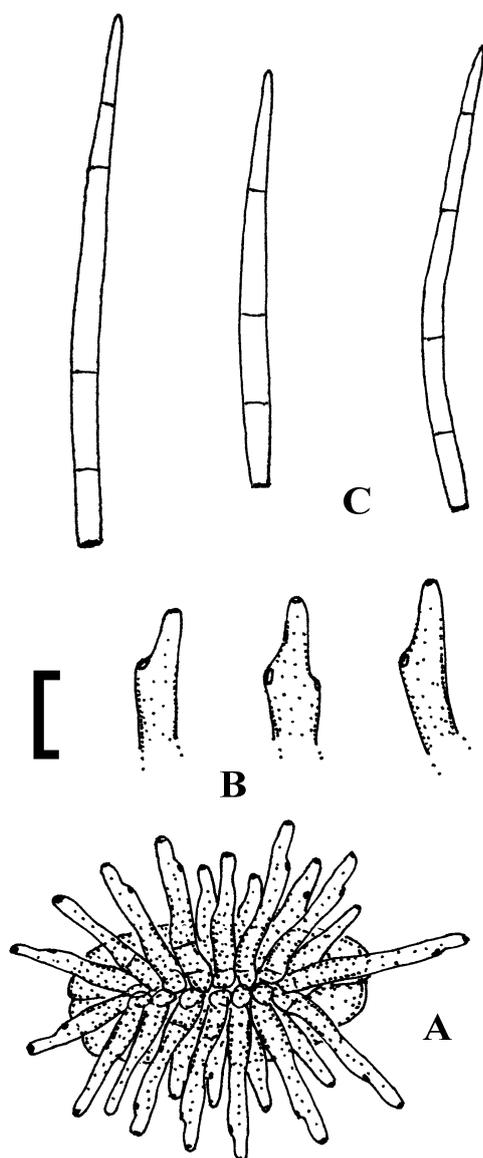


Fig. 118. *Cercospora junci-marginati* (NYS, holotype). A. Conidiophore fascicle. B. Conidiophores. C. Conidia. Bar = 10  $\mu$ m.

### *Cercospora* species on Juncaceae

*Cercospora junci-marginati* U. Braun, *Mycotaxon* **48**: 277 (1993).

(Fig. 118)

*Basionym*: *Ramularia junci* Peck, *Rep. (Annual) New York State Mus. Nat. Hist.* **44**: 26 (1891), non *Cercospora junci* Davis, 1929.

*Literature*: Saccardo (1892: 563), Braun (1998: 300), Crous & Braun (2003: 233).

*Illustration*: Braun (1993b: 280, fig. 3).

*Description*: Leaf spots amphigenous, oblong, 2–10  $\times$  1–2 mm, brown, margin indefinite. *Caespituli* amphigenous. *Mycelium* internal, forming substomatal stromata, 10–35  $\mu$ m diam, yellowish brown. *Conidiophores* in dense fascicles, arising from stromata, emerging through stomata, straight,

subcylindrical to geniculate-sinuous, unbranched, 5–30  $\times$  2–5  $\mu$ m, aseptate, subhyaline, pale olivaceous to medium brown, thin-walled, smooth; conidiophores reduced to conidiogenous cells, conidiogenous loci minute, 1–2  $\mu$ m diam, somewhat thickened and darkened. *Conidia* solitary, acicular, rarely narrowly obclavate, 25–65  $\times$  1.5–3  $\mu$ m, 1–5-septate, hyaline, thin-walled, smooth, apex pointed, base truncate, 1–2.5  $\mu$ m wide, hila somewhat thickened and darkened.

*Holotype*: USA: New York: Selkirk, on *Juncus marginatus*, Peck (NYS).

*Host range and distribution*: On *Juncus marginatus*, *Juncaceae*, North America (USA, NY).

*Cercospora juncina* Sacc., *Ann. Mycol.* **11**: 552 (1913).

(Fig. 119)

*Synonyms*: *Cercosporina juncicola* Hori & Kasai, *Jap. J. Bot.* **2**: 105 (1923) [*type*: Japan: Okayama Pref.: Kanaeura, on *Juncus effusus*, 28 June 1921, M. Kasai (not preserved)].

*Cercospora junci* Davis, *Trans. Wisconsin Acad. Sci.* **24**: 300 (1929) [*holotype*: USA: Wisconsin: Brill, on *Juncus brevicaudatus*, 23 Jul. 1928, J. J. Davis (WIS)].

*Cercospora juncicola* (Hori & Kasai) Vassiljevsky, in Vassiljevsky & Karakulin, *Fungi Imperfectii Parasitici (Hyphomycetes)* **1**: 275 (1937).

*Cercospora juncicola* (Hori & Kasai) Chupp, *Monograph of Cercospora*: 263 (1954), *comb. superfl.*

*Cercospora junci-filiformis* Mel'nik, *Novosti Sist. Nizsh. Rast.* 1966: 214 (1966) [*holotype*: Russia: St. Petersburg area, Tosnensky Rayon, Lisino-Korpus, 15 Jul. 1963, V. A. Mel'nik (LE 40408)].

*Literature*: Saccardo (1931: 877), Chupp (1954: 263), Braun & Mel'nik (1997: 65), Crous & Braun (2003: 233).

*Illustration*: Braun & Mel'nik (1997: fig. 33).

*Exsiccatae*: Barthol., *Fungi Columb.* 4902.

*Description*: Lesions at first small, subcircular, elliptical-oval, oblong, 1–10  $\times$  1–3 mm, sometimes diffuse, brown with diffuse yellowish halo, later larger segments of the leaf sheath or stem turning dark brown. *Caespituli* punctiform, minute, dark brown to blackish. *Mycelium* internal. *Stromata* substomatal, 10–40  $\mu$ m diam, rarely larger, to 75  $\mu$ m, brown to dark brown, composed of swollen hyphal cells, 2–7  $\mu$ m diam, rounded to angular in outline. *Conidiophores* in small to moderately large fascicles, about 3–20, loose to usually dense or very dense, arising from stromata, through stomata, erect, straight, subcylindrical to distinctly geniculate-sinuous, unbranched, (5–)10–60(–80)  $\times$  2–6  $\mu$ m, rarely swollen at the base, to 8  $\mu$ m wide, 0–2-septate, pale to dark brown or olivaceous-brown, wall thin or slightly thickened; conidiogenous cells integrated, terminal or conidiophores often reduced to conidiogenous cells, sympodial, 5–30  $\mu$ m long, conidiogenous loci conspicuous, about 1.5–2  $\mu$ m diam, thickened and darkened. *Conidia* solitary, obclavate-cylindrical, straight to curved, 25–

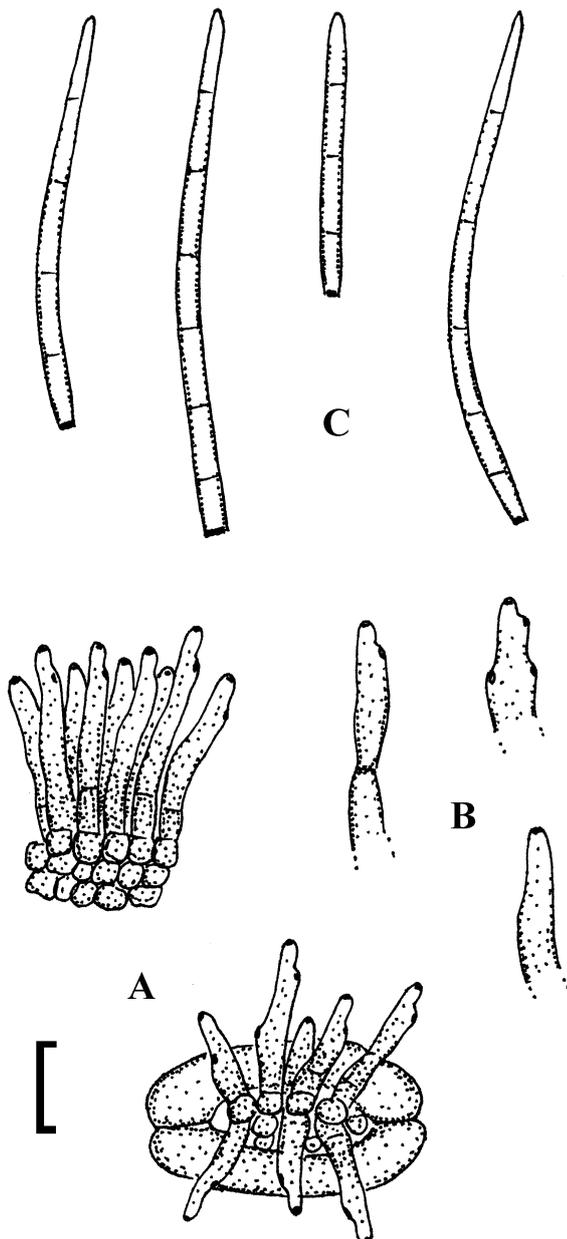


Fig. 119. *Cercospora juncina* (BPI 437515). A. Conidiophore fascicles. B. Conidiophores. C. Conidia. Bar = 10  $\mu$ m.

75  $\times$  2.5–5(–6)  $\mu$ m, 2–6-septate, hyaline, subhyaline to pale olivaceous, thin-walled, smooth, apex obtuse to pointed, base short obconically truncate, 1.5–2.5  $\mu$ m wide, hila thickened and darkened.

**Holotype:** Canada: Ontario, London, on *Juncus canadensis*, 12 Aug. 1910, J. Dearness, 3502 [Barthol., Fungi Columb. 4902] (PAD). **Isotypes:** Barthol., Fungi Columb. 4902, e.g. BPI 437515, 437516, DAOM, K(M) IMI 8038.

**Host range and distribution:** On *Juncus* (*balticus*, *brachycephalus*, *brevicaudatus*, *canadensis*, *confusus*, *dudleyi*, *effusus*, *ensifolius*, *filiformis*, *greenei*, *pygmaeus*, *Juncaceae*, Africa (Morocco), Asia (Japan), Europe (Romania, Russia), North America (Canada; USA, Utah, Washington, Wisconsin).

**Notes:** Type material of *Cercosporina juncicola* is not preserved, and even Katsuki (1965) failed to trace type material or any other collections of this species. However, based on the data given in the original description, this species seems to be a synonym of *C. juncina*, above all due to short conidiophores and obclavate-cylindrical, hyaline to olivaceous conidia. The fungus described and illustrated by Ellis (1976: 262–263, fig. 199C) does not agree with the original description of *C. juncicola* (conidiophores 50–90  $\times$  4–6  $\mu$ m, pale to medium brown; conidia solitary, obclavate-subcylindrical to subacicular, straight to curved, 40–140  $\times$  3–5  $\mu$ m, 2–7-septate, pale straw-coloured, often minutely verruculose). The identity of the described material, probably from UK, is unclear. The source of Chupp's (1954) description is also unclear and not in accordance with the original data of *C. juncicola*.

### *Liliaceae* (s. str.)

#### *Passalora*

A single species.

#### *Passalora streptopi* (Dearn. & Barthol.) U. Braun, comb. nov.

Mycobank MB809041

(Fig. 120)

**Basionym:** *Cercospora streptopi* Dearn. & Barthol., *Mycologia* 9: 363 (1917).

**Literature:** Saccardo (1931: 883), Chupp (1954: 354).

**Exsiccatae:** Barthol., Fungi Columb. 5004.

**Description:** *Leaf spots* amphigenous, subcircular to angular-irregular, 1–6 mm diam or confluent and larger, yellowish, olivaceous to brownish, finally sometimes greyish white, margin indefinite or darker, brown, sometimes with diffuse yellowish, straw-coloured to pale brownish halo. *Caespituli* amphigenous, punctiform to effuse, brown, scattered to aggregated, loose to dense. *Mycelium* internal. *Stromata* almost lacking, only with small substomatal aggregations of swollen hyphal cells, globose to subglobose, brown, substomatal, 10–50  $\mu$ m diam. *Conidiophores* in small to moderately large, loose to dense fascicles, arising from internal hyphae or stromata, emerging through stomata, erect, straight and subcylindrical to subclavate, i.e. width somewhat increasing from base to top, barely or only slightly geniculate-sinuous, unbranched, 10–70  $\times$  2.5–5  $\mu$ m, 0–4-septate, pale olivaceous to brown below, paler towards the apex, tips often subhyaline, darker brown in mass, thin-walled, smooth; conidiogenous cells integrated, terminal, occasionally conidiophores reduced to conidiogenous cells, 10–35  $\mu$ m long, often with a single, sometimes with several conspicuous conidiogenous loci, 1–1.5  $\mu$ m diam, somewhat thickened and darkened-refractive. *Conidia* solitary as well as catenate, usually in simple chains, broadly ellipsoid-ovoid, cylindrical, subclavate to somewhat obclavate, straight to slightly curved, 18–70  $\times$  (3–)4–7(–9)  $\mu$ m, (0–)1–7-septate, sometimes constricted at septa, subhyaline to yellowish, pale olivaceous or olivaceous-brownish to medium brown, thin-walled, smooth, older conidia occasionally rough-walled, apex

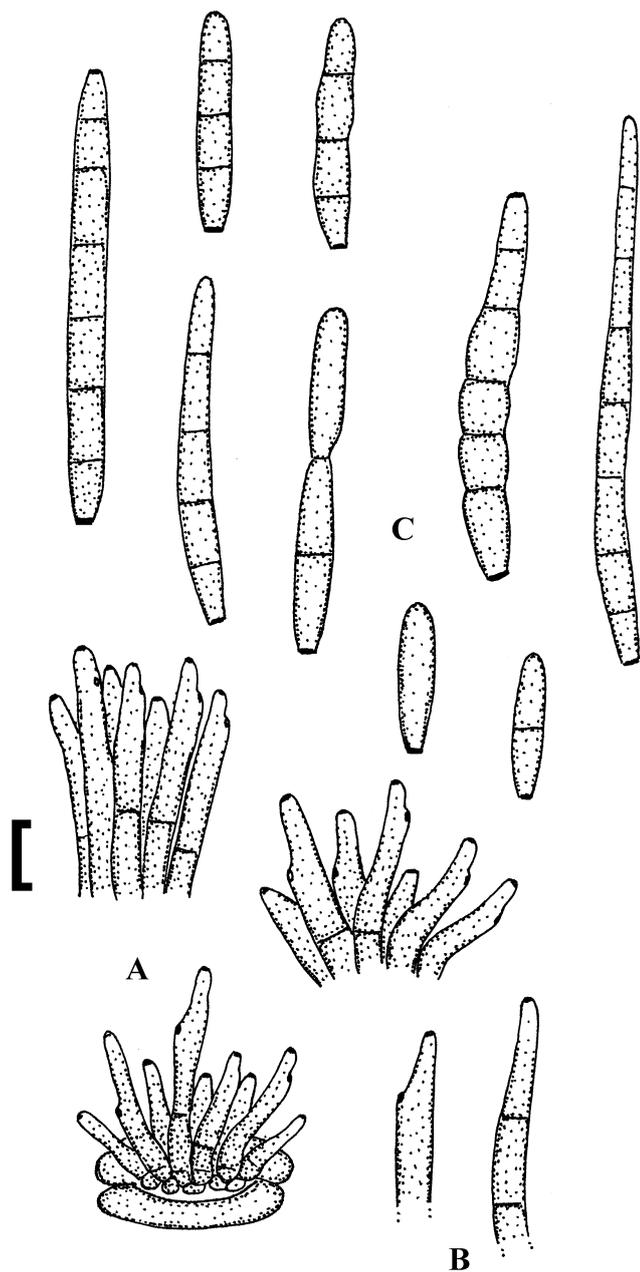


Fig. 120. *Passalora streptopi* (BPI 441721). A. Conidiophore fascicles. B. Conidiophores. C. Conidia. Bar = 10  $\mu$ m.

obtuse, rounded to obconically truncate in catenate conidia, base subtruncate to obconically truncate, 1–2  $\mu$ m wide, hila slightly thickened and darkened-refractive.

**Lectotype (designated here, MycoBank MBT178157): USA:** Washington: Jefferson, Duckabush River, Olympic National Park, on *Streptopus amplexifolius*, Aug. 1912, E. Bartholomew [Fungi Columb. 5004] (BPI 441721). **Isolectotypes:** Barthol., Fungi Columb. 5004, BPI 441722, 845248, DAOM, MICH 5601.

**Host range and distribution:** On *Prosartes (hookeri, trachycarpum)*, *Streptopus amplexifolius*, *Liliaceae s. str.*, North America (Canada; USA, Montana, Oregon, Tennessee, Washington).

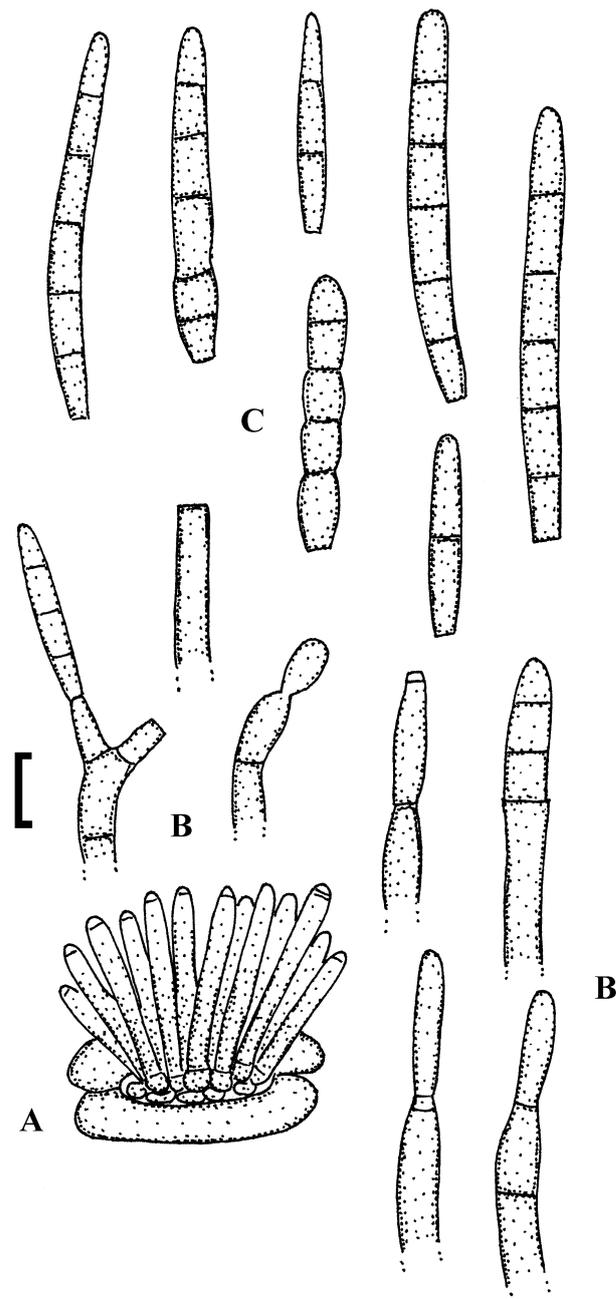


Fig. 121. *Pseudocercospora dispori* (WSP 35442). A. Conidiophore fascicle. B. Conidiophores. C. Conidia. Bar = 10  $\mu$ m.

**Notes:** This species is a typical phaeoramularioid *Passalora* species characterised by having pigmented conidiophores and conidia, conspicuous (thickened and darkened) conidiogenous loci and conidial hila and catenate conidia.

### *Pseudocercospora*

A single species.

#### *Pseudocercospora dispori* (U. Braun) U. Braun, **comb. nov.**

MycoBank MB809012

(Fig. 121)

**Basionym:** *Stigmina dispori* U. Braun, *Mycotaxon* 51: 66 (1994).

Illustration: Braun (1994: 64, fig. 33).

**Description:** *Leaf spots* amphigenous, angular-irregular, 1–15 mm diam or confluent and larger, often large leaf segments or entire leaves discoloured, yellowish ochraceous, later brownish, margin indefinite. *Caespituli* amphigenous, mostly hypophyllous, punctiform, yellowish, brownish, finally almost black. *Mycelium* internal, pigmented, forming well-developed, substomatal stromata. *Conidiophores* fasciculate, sporodochial, arising from stromata, emerging through stomata, fascicles rich and dense, erect, straight to somewhat flexuous, unbranched or occasionally branched near the apex, subcylindrical to subclavate,  $10\text{--}40 \times 2\text{--}6 \mu\text{m}$ , aseptate or septate, at first subhyaline, later yellowish to brown, smooth, thin-walled; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, monoblastic, determinate or percurrently proliferating, with delicate annellations, conidiogenous loci broad and truncate, unthickened, not darkened. *Conidia* solitary, subcylindrical, subclavate or obclavate,  $25\text{--}60 \times 4\text{--}9 \mu\text{m}$ , (0–)2–5-septate, occasionally constricted at the septa, subhyaline to faintly yellowish green or olivaceous, thin-walled, smooth, apex obtuse, base truncate, hila neither thickened nor darkened.

**Holotype:** USA: Washington: Mason County, Lilliwaup, on *Prosartes hookeri* [*Disporum hookeri*], Liliaceae, 27 Jul. 1937, L. K. Jones (WSP 35442).

**Host range and distribution:** Only known from the type collection.

**Notes:** This species is a cercostigmina-like hyphomycete. However, *Cercostigmina* has been reduced to synonym with *Pseudocercospora*.

### Zasmidium

A single species.

**Zasmidium liriopes** (F.L. Tai) U. Braun, Y.L. Guo & H.D. Shin, **comb. nov.**

Mycobank MB809013

(Fig. 122)

**Basionym:** *Cercospora liriopes* F.L. Tai, *Bull. Chinese Bot. Soc.* **2**: 55 (1936).

**Synonyms:** *Stenellopsis liriopes* (F.L. Tai) H.D. Shin & U. Braun, *Mycotaxon* **74**: 116 (2000).

*Passalora liriopes* (F.L. Tai) Y.L. Guo, *Mycosystema* **20**: 303 (2001).

**Literature:** Chupp (1954: 348), Shin & Kim (2001: 276–277), Guo *et al.* (2003: 103).

**Illustration:** Shin & Braun (2000: 117, fig. 5), Shin & Kim (2001: 277, fig. 127), Guo *et al.* (2003: 103, fig. 65).

**Exsiccatae:** Triebel, *Microfungi Exs.* 637.

**Description:** *Leaf spots* amphigenous, scattered, circular, 1–5 mm diam, centre tan to dingy grey with reddish brown,

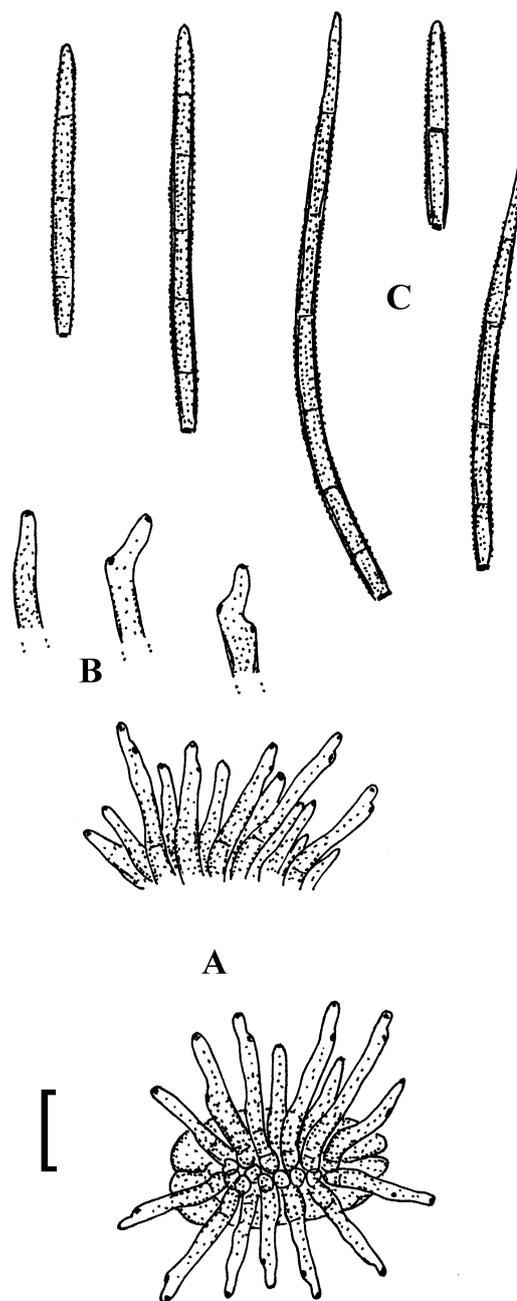


Fig. 122. *Zasmidium liriopes* (HAL, Triebel, *Microfungi Exs.* 637). A. Conidiophore fascicles. B. Conidiophores. C. Conidia. Bar = 10  $\mu\text{m}$ .

slightly raised margin and occasionally yellowish brown halo on the upper leaf surface, sometimes with dots in the centre of spots on the upper side when viewed with a hand lens. *Caespituli* amphigenous, punctiform, blackish. *Mycelium* internal; hyphae branched, septate, 2–4  $\mu\text{m}$  wide, hyaline. *Stromata* well-developed, globular, substomatal, 25–70  $\mu\text{m}$  diam, brown to blackish brown. *Conidiophores* in loose to dense fascicles, (5–)10–40, arising from stromata, through stomata, erect, almost straight to curved, sometimes sinuous, 0–2 times geniculate, but mostly not distinctly geniculate, unbranched, 5–55  $\times$  2–5.5  $\mu\text{m}$ , 0–3-septate, olivaceous-brown or pale brown throughout, thin-walled, smooth or almost so; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 5–25  $\mu\text{m}$  long, conidiogenous

loci conspicuous, 1–2.5 µm diam, truncate, almost unthickened to somewhat thickened and somewhat darkened-refractive. *Conidia* solitary, subcylindrical-obclavate, straight to somewhat curved, (10–)20–105 × 2.5–4.5 µm, mostly (0–)2–7-septate, subhyaline to pale olivaceous or olivaceous-brown, thin-walled, finely but distinctly verruculose, apex obtuse, base obconically truncate or subtruncate, 1–2 µm wide, hila unthickened or only slightly so, not or only slightly darkened-refractive.

**Holotype:** **China:** Jiangsu: Wuxi, on *Liriope spicata*, 4 Oct. 1930, C. T. Wei 1061 (HMAS 06991). **Paratype:** **China:** Jiangsu: Wuxi, on “*Ophiopogon*” sp. [*Liriope* sp.?], 19 Sep. 1934, C. T. Wei 1030 (HMAS 06990).

**Host range and distribution:** On *Liriope* (*muscaria* [*platyphylla*], *spicata*, *Liriope* sp.), *Liliaceae*, Asia (China, Japan, Korea), North America (USA, Florida).

**Notes:** *Cercospora liriopes* is an unusual species. Due to distinct conidiogenous loci and verruculose conidia, Shin & Braun (2000) assigned this species to *Stenellopsis*. This reallocation was based on material collected from Korea, and type material had not been examined. Guo (2001b) introduced the combination *Passalora liriopes*, and Guo *et al.* (2003) added a Chinese description and illustration. Details of the structure of the conidial surface were not provided. Korean material agrees very well with the Chinese type material of *C. liriopes*. Y.L. Guo recently re-examined this material and found that the conidia are slightly verruculose. Thus, there is no doubt that the Korean collections pertain to *C. liriopes*. However, the generic affinity of this species is not quite clear and confused. Narrow long, pluriseptate, verruculose conidia are not in favour of *Passalora*. They are rather reminiscent of former *Stenellopsis* species, which are stenella- and zasmidium-like, but without formation of verruculose superficial hyphae. However, it has been proven, also based on molecular methods, that such species rather belong to *Zasmidium* (see Braun *et al.* 2013). Furthermore, *C. liriopes* was included in molecular sequence analyses and proved to cluster together with *Zasmidium citri-grisea* and *Z. musicola* (Arzanlou *et al.* 2008) in a groups with 100 % bootstrap support, which fully substantiates the need to reallocate *C. liriopes* to *Zasmidium*.

### **Doubtful, excluded and insufficiently known species**

*Cercospora liliicola* Richon, *Cat. Champ. Marne*: No. 2032 (1889) [**type:** **France:** Marne, St. Amand, on *Lilium candidum* (not preserved)].

**Synonyms:** *Cylindrosporium inconspicuum* G. Winter, in Rabenh., *Fungi Eur. Exs.*, Cent. 12 (*resp.* Cent. 32), no. 3178, Dresden 1884 and *Jahresber. Naturf. Ges. Graubündens, N.S.*, **34**: 69 (1890) [**lectotype** (designated by Braun 1995a): **Switzerland:** Zürich, on *Lilium martagon*, Jul. 1883, G. Winter, Rabenh., *Fungi Eur. Exs.* 3178 (HAL)].

*Cercospora hungarica* Bäumler, *Verh. Zool.-Bot. Ges. Wien* **38**: 707 (1888) [**lectotype** (designated by Braun 1995a): **Slovakia:** Banská Štiavnica, Prenčov, on *Lilium martagon*, Kmet (HBG)].

*Cylindrosporium inconspicuum* var. *candidum* Sacc. & Fautrey, in Saccardo, *Syll. Fung.* **16**: 1010 (1902).

*Cercospora inconspicua* (G. Winter) Höhn., *Ann. Mycol.* **1**: 413 (1903) and *Hedwigia* **42**: (178) (1903).

*Cercospora lillii* Dearn., *Mycologia* **21**: 327 (1929) [**holotype:** **USA:** N.Y.: Washington Co., north of Devines woods, Vaughns, north of Hudson Falls, on *Lilium canadense*, 1 Jul. 1919, Burnham (DAOM 5975)].

*Pseudocercospora hungarica* (Bäumler) Sivan., *Bitunicate Ascomycetes and their Anamorphs* (Vaduz): 202 (1984).

*Pseudocercospora inconspicua* (G. Winter) U. Braun, *Nova Hedwigia* **47**: 343 (1988).

## **Marantaceae**

### **Cercospora**

A single species.

**Cercospora calatheae** Viégas & Chupp, *Bol. Soc. Brasil. Agron.* **8**: 13 (1945).  
(Fig. 123)

**Literature:** Chupp (1954: 378), Crous & Braun (2003: 94).

**Description:** *Leaf spots* amphigenous, circular or subcircular, 0.5–3 mm diam, pale brown to dingy grey, margin dark brown. *Caespituli* amphigenous, mainly hypophyllous, fine, not very conspicuous. *Mycelium* internal. *Stromata* lacking or only with a few substomatal swollen, brown hyphal cells. *Conidiophores* solitary or in small to moderately large fascicles, 2–15, arising from internal hyphae or hyphal aggregations, through stomata, erect, straight, subcylindrical to slightly geniculate-sinuuous near the apex, unbranched, 40–250 × 4–8 µm, pluriseptate throughout, pale to medium olivaceous-brown, wall thin to slightly thickened, smooth; conidiogenous cells integrated, terminal, about 10–25 µm long, with a single or several conspicuous conidiogenous loci, 2–3 µm diam, thickened and darkened. *Conidia* solitary, broadly acicular to subcylindrical, 30–200 × 4–6.5 µm, 3- to pluriseptate, hyaline thin-walled, smooth, apex obtuse or subobtuse, base truncate or subtruncate, hila 2.5–3 µm wide, thickened and darkened.

**Lectotype** (designated here, MycoBank MBT178158): **Brazil:** São Paulo: Cunha, on *Calathea* sp., 13 Apr. 1939, A. P. Viégas & J. Kiehl 3029 (CUP 39264). **Isolectotype:** IACM.

**Host range and distribution:** On *Goeppertia* (*allouia* [*Calathea allouia*], *macrosepala* [*Calathea macrosepala*], *Goeppertia* [*Calathea*] sp.), *Marantaceae*, North America (USA, Florida), Central and South America (Brazil, Dominican Republ., Panama).

**Notes:** A true *Cercospora* s. str. distinct from *C. apii* s. lat. by wider conidia.

### **Pseudocercospora**

A single species.

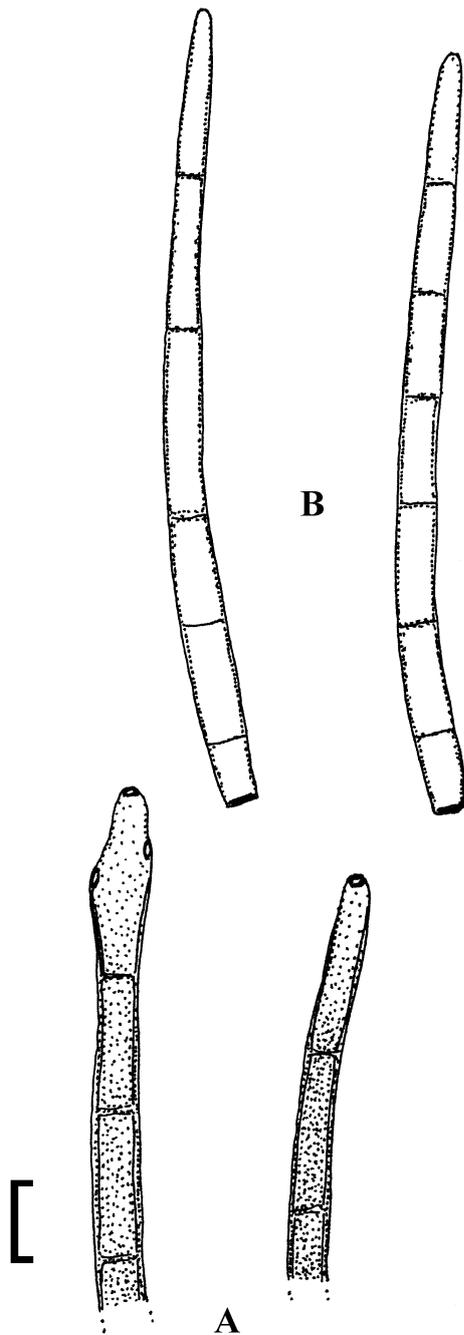


Fig. 123. *Cercospora calathea* (CUP 39264). A. Conidiophores. B. Conidia. Bar = 10  $\mu$ m.

***Pseudocercospora pruinosa*** (V.G. Rao & B.R.D. Yadav) Kamal, *Cercosporoid Fungi of India*: 211 (2010); as "*pruinosa*".  
(Fig. 124)

*Basionym*: *Cercospora pruinosa* V.G. Rao & B.R.D. Yadav, *Cryptog. Bot.* 2: 188 (1991); as "*pruinosa*".

*Literature*: Braun & Crous (2003: 337).

*Illustration*: Rao & Yadav (1991: 188, fig. 1).

*Description*: *Leaf spots* amphigenous, marginal, irregularly shaped, pale buff with cinnamon-coloured margin. *Caespituli* amphigenous, mainly hypophyllous. *Mycelium* internal.

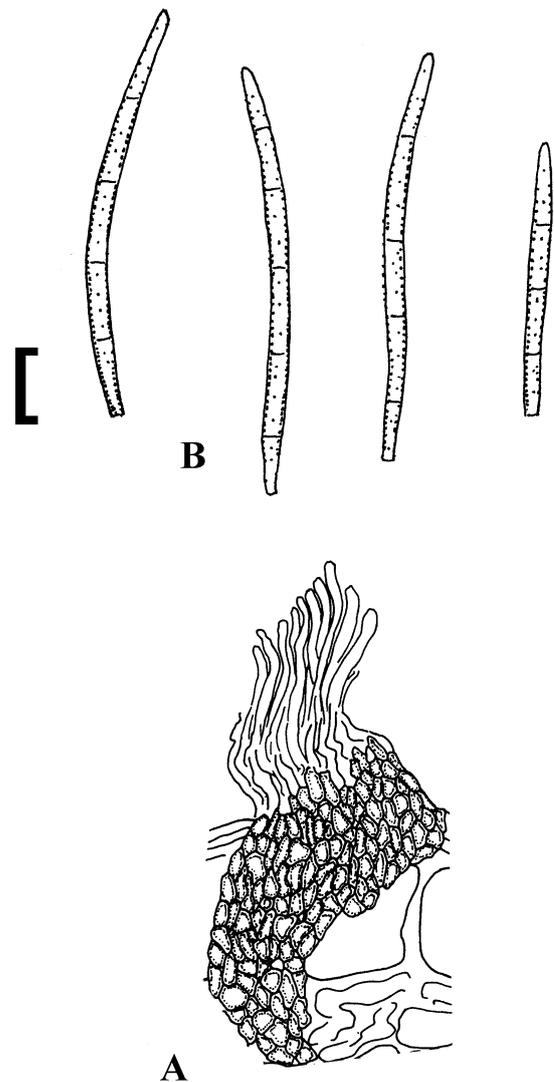


Fig. 124. *Pseudocercospora pruinosa* (based on Rao & Yadav 1991: 188, fig. 1). A. Conidiophore fascicle. B. Conidia. Bar = 10  $\mu$ m.

*Stromata* well-developed, immersed to erumpent, olivaceous to dark brown. *Conidiophores* numerous in dense fascicles, arising from stromata, erect, straight to curved-sinuous, short, to about 30  $\mu$ m, apically geniculate, septate, brown; conidiogenous loci inconspicuous. *Conidia* solitary, obclavate-subacicular, 56–142  $\times$  5–6.5  $\mu$ m, 3–6-septate, hyaline or subhyaline, thin-walled, smooth, apex acute to subobtuse, base short obconically truncate, hila unthickened, not darkened.

*Holotype*: **India**: Maharashtra: Poona, on *Plelostachya pruinosa*, Marantaceae, Dec. 1977, B. R. D. Yadav (AMH 4129).

*Host range and distribution*: Only known from the type collection.

*Notes*: This species is insufficiently known, details of stromata and conidiophores were not described, and the type material was not available. Kamal's (2010) reallocation of this species suggests that the conidiogenous loci and conidial hila are neither thickened nor darkened, which is supported by the original illustration.

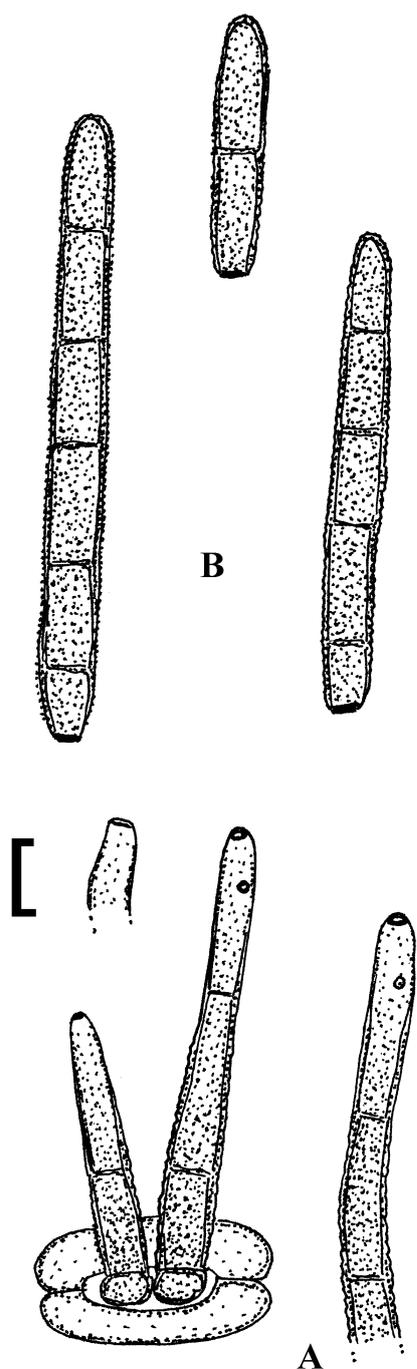


Fig. 125. *Zasmidium thaliae* (BPI 441902). A. Conidiophore fascicle and conidiophore. B. Conidia. Bar = 10  $\mu$ m.

### *Zasmidium*

A single species.

#### *Zasmidium thaliae* (Ellis & Langl.) U. Braun, **comb. nov.**

MycoBank MB809014

(Fig. 125)

*Basionym:* *Cercospora thaliae* Ellis & Langl., *J. Mycol.* **6**: 36 (1890).

*Literature:* Saccardo (1892: 654), Chupp (1954: 378), Crous & Braun (2003: 401).

*Description:* Leaf spots amphigenous, oblong, 1–5  $\times$  1–2 mm or confluent and larger, vein-limited, medium to medium dark brown, margin indefinite. *Caespituli* mainly hypophyllous, punctiform, scattered to aggregated, dark brown. *Mycelium* internal. *Stromata* lacking or almost so. *Conidiophores* solitary or in small fascicles, 2–15, arising from internal hyphae, emerging through stomata, erect, straight to somewhat curved, subcylindrical or somewhat attenuated towards the tip, neither geniculate nor sinuous, unbranched, about 30–60  $\times$  6–12  $\mu$ m, sparingly septate, brown, paler towards the apex, wall somewhat thickened, but thin near the apex, verruculose; conidiogenous cells integrated, terminal, about 10–30  $\mu$ m long, conidiogenous loci conspicuous, cercosporoid, i.e. planate, somewhat thickened and darkened, 3–4  $\mu$ m diam. *Conidia* solitary, cylindrical or subcylindrical, 35–100  $\times$  6–9  $\mu$ m, 1–5-septate, brown, wall slightly thickened, verruculose, apex obtuse, broadly rounded, base subtruncate, truncate to short obconically truncate, 3–4.5  $\mu$ m wide, hila somewhat thickened and darkened.

*Lectotype* (designated here, MycoBank MBT178159): **USA: Louisiana:** St. Martinsville, on *Thalia dealbata*, 6 Oct. 1889, A. B. Langlois 2130 (NY 945725). *Isolectotype:* BPI 441902. *Syntype:* NY 945726 (from 1 Oct. 1889). *Topotypes* (from Nov. 1889): CUP 41402, NY 838631–838635; Ellis & Everh., *N. Amer. Fungi* 2476, e.g. BPI 441901, 441903, CUP, OSC 53168.

*Host range and distribution:* On *Thalia dealbata*, *Marantaceae*, North America (USA, Louisiana).

*Notes:* Chupp (1954) excluded this species from *Cercospora* and suggested an affinity to *Coryneum* and *Heterosporium*. This species resembles, indeed, heterosporium-like *Cladosporium* species, but the conidiogenous loci are cercosporoid, i.e. planate, thickened and darkened and is morphologically closer to *Stenellopsis* and *Verrucisporota*, two genera which are now tentatively considered to be synonyms of *Zasmidium*.

### Melanthiaceae

#### *Cercospora*

A single species.

#### *Cercospora paridis* Erikss., *Hedwigia* **22**: 158 (1883). (Fig. 126)

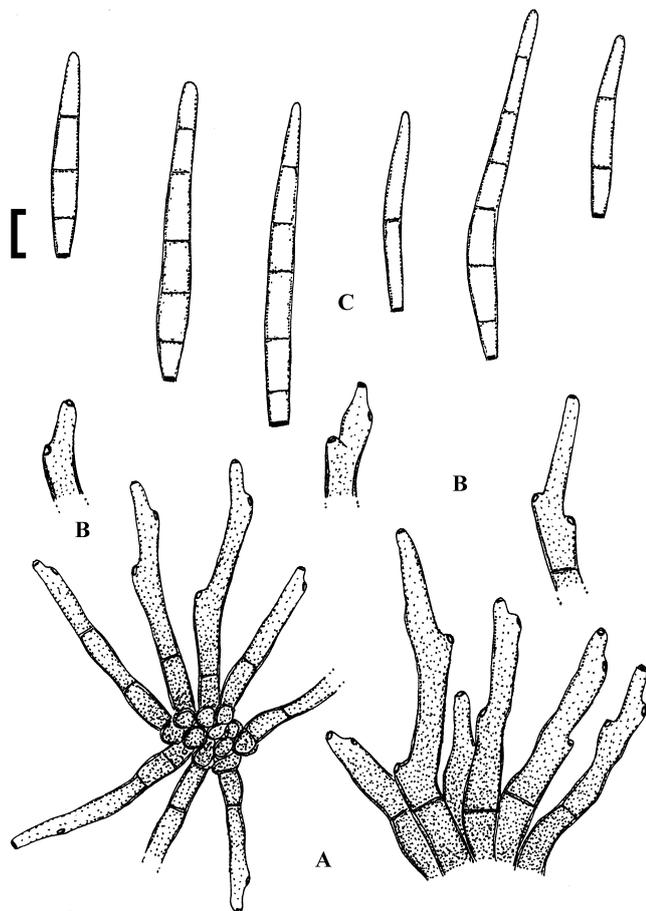
*Synonyms:* *Cercosporidium paridis* (Erikss.) X.J. Liu & Y.L. Guo, *Acta Mycol. Sin.* **1**: 99 (1982).

*Passalora paridis* (Erikss.) Poonam Srivast., *J. Living World* **1**: 117 (1994), *comb. inval.* (ICN, Art. 41.5).

*Passalora paridis* (Erikss.) Y.L. Guo, *Mycosystema* **20**: 157 (2001).

*Cercospora majanthemi* var. *paridis* Bäumler, *Verh. Zool.-Bot. Ges. Wien.* **38**: 717 (1888) [*type: Slovakia:* Banská Štiavnica (Schemnitz), on *Paris quadrifolia* (not preserved)].

*Literature:* Saccardo (1886: 476; 1892: 654), Lindau (1910: 90, 799), Chupp (1954: 351), Braun & Mel'nik (1997: 78),



**Fig. 126.** *Cercospora paridis* (HAL, Erikss., Fungi Paras. Scand. Exs. 85). **A.** Conidiophore fascicles. **B.** Conidiophore tips. **C.** Conidia. Bar = 10  $\mu$ m.

Guo (2001a: 157), Crous & Braun (2003: 308), Guo et al. (2003: 103–104).

*Illustration:* Guo et al. (2003: 104, fig. 66).

*Exsiccatae:* Bucholtz & Bondatsev, Fungi Ross. Exs. 699. Erikss., Fungi Paras. Scand. Exs. 85. Jaczewski, Komarov & Tranzschel, Fungi Ross. Exs. 149. Petr., Fl. Bohem. Morav. Exs., Pilze 1910. Smarords, Fungi Lat. Exs. 199. Syd., Mycoth. Germ. 291, 1779. Tranzschel & Sereb., Mycoth. Ross. 147, 199. Vestergr., Micromyc. Rar. Sel. Praec. Scand. 1444.

*Description:* Leaf spots amphigenous, at first not very conspicuous, only diffuse pale greenish discolorations, later subcircular, oval to irregular, 2–15 mm diam, greyish greenish, greenish brown, yellowish, pale straw-coloured, margin indefinite or somewhat darker, sometimes limited by darker veins, without or with diffuse halo, yellowish or greenish grey, occasionally subzonate. *Caespituli* mainly hypophyllous, punctiform to pustulate, dark olivaceous-brown to blackish brown, scattered to confluent. *Stromata* globose or subglobose, well-developed, substomatal to immersed, 20–110  $\mu$ m diam, dark brown, composed of swollen hyphal cells, 2–8  $\mu$ m wide, brown, thick-walled. *Conidiophores* in small, loose to mostly large and dense fascicles, arising from stromata, through stomata or erumpent, erect, subcylindrical, usually distinctly

geniculate, unbranched, 30–160  $\times$  4–6  $\mu$ m, (0–)1–4-septate, pale to medium olivaceous-brown or brownish, thin-walled, smooth; conidiogenous cells integrated, terminal, occasionally intercalary, 15–50  $\mu$ m long, conidiogenous loci conspicuous, thickened and darkened, 2–3  $\mu$ m diam. *Conidia* solitary, cylindrical-obclavate, rarely subacicular, short conidia occasionally broadly fusiform, 25–80  $\times$  4–7  $\mu$ m, 1–7-septate, hyaline or subhyaline, apex obtuse or subobtuse, base short to long obconically truncate, occasionally subtruncate, 2–3  $\mu$ m wide, hila thickened and darkened.

*Lectotype (designated here, MycoBank MBT178160):* Sweden: Stockholm, experimental field, on *Paris quadrifolia*, 12 Jul. 1882, Erikss., Fungi Paras. Scand. Exs. 85 (S-F37688). *Isolectotypes:* Erikss., Fungi Paras. Scand. Exs. 85, e.g., B, BPI 439237, FH, HAL.

*Host range and distribution:* On *Paris (quadrifolia, verticillata)*, *Trillium apetalon*, *Melanthiaceae*, Asia (China, Japan, Kazakhstan, Russia), Europe (Czech Republic, Denmark, Estonia, Finland, Germany, Hungary, Italy, Latvia, Norway, Poland, Romania, Russia, Slovakia, Slovenia, Sweden, Ukraine).

*Notes:* The conidial shape of this species is rather passalora-like, but on account of colourless conidia and cercospora-like conidiogenous loci, it is maintained in *Cercospora* s. str. Molecular sequence analyses of morphologically similar species proved that such species belong in *Cercospora* as far as the conidia are colourless. A collection from Japan on *Trillium apetalon* (unpublished record) is morphologically indistinguishable from specimens on *Paris* spp. and at least tentatively assigned to *C. paridis*. Inoculation tests and/or molecular sequence analyses are necessary to prove the conspecificity of the fungi concerned.

## Musaceae

### Cercospora

A single species.

*Cercospora apii* Fresen. s. lat. (Crous & Braun 2003: 35)

*Synonym:* *Cercospora hayi* Calp., *Studies on the Sigatoka Disease of Bananas and its Fungus Pathogens, Atkins Garden and Research Laboratory:* 63 (1955) [type: Cuba: on *Musa  $\times$ paradisiaca*, 1955, Calpouzoz (FH); ex type culture: ATCC 12234].

*Literature:* Kaiser & Lukezic (1965), Crous & Braun (2003: 212).

*Illustration:* Calpouzoz (1955: 61, figs 17–18).

*Host range and distribution:* On *Musa (acuminata [?nana], balbisiana,  $\times$ paradisiaca [ $\times$ sapientum], Musa sp.)*, *Musaceae*, Asia (Bangladesh, Philippines, Thailand, Yemen), Australia, Central and South America (Brazil, Panama), West Indies (Cuba), Oceania (Fiji).

*Notes:* *Cercospora hayi* was described as follows (Calpозos 1955): “Probably not forming its own spots but found on necrotic leaf areas or on spots of other fungi. Conidiophores loosely to dense fasciculate, arising through the stomata, unbranched, sparsely 2–4-septate, slightly flexuous to tortuous, pale olivaceous to olivaceous-brown, 30–80 × 3.5–7 µm, apex truncate, marked with one or two scars, lateral conidial scars present. Conidia hyaline, slenderly obclavate, straight to curved, 6–14-septate, 54–154 µm long, maximum with 3–4.5 µm, truncate base 2.2–3.5 µm wide, tip acute, 0.7–0.9 µm wide”. The conidia were described to be “slenderly obclavate, but they are obviously acicular. Calpозos (1955) recorded this species from Cuba on *Musa ×paradisiaca*, *M. nana* and *M. balbisiana*. Due to similar conidiophores and colourless acicular conidia, Crous & Braun (2003) reduced the name *C. hayi* to synonymy with *C. apii* s. lat. (see description in Crous & Braun 2003: 35), and Arzanlou *et al.* (2003: 24) confirmed that this treatment appears to be correct based on a comparison of rDNA sequence data. However, *C. apii* s. lat. (*C. hayi*) collections on banana are genetically not uniform and seem to belong to several species. Based on ITS rDNA data, isolates of *C. hayi* from banana clustered with *C. apii* and *C. nicotiana* as well as separately together with *C. kikuchii* (Goodwin *et al.* 2011). Groenewald *et al.* (2013) found sequence data of *Cercospora* isolates from banana in three different clades, viz. in the *Cercospora* cf. *citruillina* clade (material from Bangladesh), in clade N (from Bangladesh) and clade O (from Thailand). *Cercospora hayi* has to be epitypified with material from Cuba, and this collection should be cultured and sequenced to reveal the genuine identity of this species. Based purely on morphology, *Cercospora* collections on banana, which morphologically agree with the concept of *C. apii* s. lat. as outlined in Crous & Braun (2003), can only be referred to as the latter species in this sense.

### **Doubtful, excluded and insufficiently known species**

*Cercospora musae* var. *paradisiaca* Bat. & Garnier, *Revista Agric.* (Recife) **3**: 54 (1963).

### **Pseudocercospora**

#### **Key to *Pseudocercospora* species on *Musaceae***

- |       |  |                           |
|-------|--|---------------------------|
| 1     | Conidia broadly obclavate-cylindrical (-fusiform), (20–)40–75 × (4–)5–8 µm .....   | <b>P. musicola</b>        |
|       | Conidia narrower, 2–5(–6) µm .....   | 2                         |
| 2 (1) | Superficial hyphae with solitary conidiophores present <i>in vivo</i> ; fasciculate conidiophores very long, 30–120 µm and pluriseptate .....  | <b>P. musae-sapientum</b> |
|       | Superficial hyphae and solitary conidiophores lacking <i>in vivo</i> or conidiophores much shorter, to 30 µm .....   | 3                         |
| 3 (2) | Caespituli predominantly epiphyllous, <i>in vivo</i> sporodochial, to 100 µm wide, composed of large stromata, to 70 µm diam, and numerous densely arranged short conidiophores, 10–25 µm long, sympodially or to 4 times percurrently proliferating; conidia subcylindrical, mostly 30–50 × 2.5–3 µm; ascospores often germinating with 3 or 4 germ tubes, polar and lateral, 5–6 µm wide, often distorted during germination ..... | <b>P. eumusae</b>         |

*Notes:* Type material of this variety has been found at PC (**Brazil:** *Pernambuco*: on *Musa paradisiaca*, 28 Apr. 1962, L. de Geos Vieira [Fongos do Brasil 30658], ex herb. URM), but no sporophore of a cercosporoid fungus could be traced. Thus, its taxonomic status and value remain unclear.

*Cercospora musarum* S.F. Ashby, *Bull. Dept. Agric.* (Kingston) **2**: 109 (1913).

*Synonyms:* *Brachysporium torulosum* Syd., *Hedwigia* **49**: 83 (1909) [*holotype:* **Brazil:** *Pará*: on *Musa acuminata* [*cavendishii*], 24 Jan. 1908, C. F. Baker (S-F21932); *isotype:* K(M) 9810].

*Helminthosporium torulosum* (Syd.) S.F. Ashby, *Trop. Agric.* (Trinidad) **10**: 6 (1932).

*Deightoniella torulosa* (Syd.) M.B. Ellis, *Mycol. Pap.* **66**: 7 (1957).

*Corynespora torulosa* (Syd.) Crous, *Persoonia* **31**: 211 (2013).

*Literature:* Chupp (1954: 403), Crous & Braun (2003: 406), Crous *et al.* (2013b).

*Neotype (designated here,* MycoBank MBT178161): **Jamaica:** on *Musa ×paradisiaca*, 11 Oct. 1926, Maxwell [annotated by S. F. Ashby as *Helminthosporium torulosum*] (BPI 438705).

*Notes:* Crous *et al.* (2013b) elucidated the phylogenetic position of this species, which clusters very close to other *Corynespora* species. Details of the type material were not given in the original description, but collections made before 1913 could not be traced so that a neotypification is needed.

“*Cercospora stachytarphetae* Ellis & Everh.”

*Notes:* Records of this species as a “hyperparasite” on *Macrophoma musae* on *Musa ×paradisiaca* in India (see Kamal 2010) are doubtful.

- Conidiophores *in vivo* fasciculate, large sporodochia not formed, stromata smaller, percurrent proliferations lacking; conidia longer if cylindrical; ascospores (if sexual morph formed) with two polar germ tubes, parallel to the long axis of the spore, 4–5 µm wide, not distorted ..... 4
- 4 (3) Conidia obclavate-cylindrical, 2–5(–6) µm wide ..... 5  
Conidia consistently cylindrical or subcylindrical, narrow, 2–4 µm ..... 8
- 5 (4) Conidiogenous loci visible as minute circles, rim very slightly thickened and darkened, hila with similar structure; conidia subhyaline to pale olivaceous-brown; ascospores without mucoid sheath ..... **P. fijiensis [Paracercospora fijiensis]**  
Conidiogenous loci and hila neither thickened nor darkened; conidia pale olivaceous to brown; ascospores [in the sexual morph of *P. musae*] with or without mucoid sheath ..... 6
- 6 (5) Conidiophores 10–55 µm long, 1–5-septate, usually pluriseptate throughout and geniculate-sinuous ..... **P. fengshanensis**  
Conidiophores 5–30 µm long, 0–2-septate, mostly 0–1-septate, barely geniculate ..... 7
- 7 (6) Conidia (10–)20–80(–110) × (2–)2.5–5(–6) µm; ascospores 14–18 × 3–4 µm, with mucoid sheath ..... **P. musae**  
Conidia shorter and above all narrower, (25–)30–45(–60) × 2–2.5(–3) µm; ascospores shorter and narrower, (9–)10–11(–12) × (2–)2.5–3 µm, without mucoid sheath; mainly on *Acacia mangium*, but also reported from *Musa* sp. .... **P. thailandica**
- 8 (4) Conidia very long, 80–120 × 2.5–4 µm, mostly gradually tapering toward the tip and sometimes also base, widest in the middle ..... **P. longispora**  
Conidia shorter, usually < 100 µm, and narrower, 2–3 µm, cylindrical-subcylindrical, not tapering ..... 8
- 9 (8) Conidia long, (40–)78–95(–120) µm ..... **P. indonesia**  
Conidia shorter, (25–)30–70(–83) µm ..... 10
- 10 (9) Conidia (30–)60–70(–83) µm long, cylindrical ..... **P. assamensis**  
Conidia shorter, (25–)30–45(–60) µm long, cylindrical to obclavate-cylindrical, mainly on *Acacia mangium*, but also reported from *Musa* sp. .... **P. thailandica**

### ***Pseudocercospora* species on Musaceae**

***Pseudocercospora assamensis*** Arzanlou & Crous, *Persoonia* 20: 28 (2008).  
(Fig. 127)

*Illustration:* Arzanlou et al. (2008: 28–29, figs 7–8).

*Description:* *In vitro* (on MEA): *Mycelium* submerged and superficial; submerged hyphae 2.5–4 µm wide, branched, septate, medium brown, thin-walled, smooth; aerial hyphae medium brown, thin-walled, smooth. *Conidiophores* solitary, arising from superficial hyphae, lateral, subcylindrical, unbranched or branched, to 20 µm long and 2–3 µm wide, 0–1-septate, medium brown, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, sympodial, conidiogenous loci inconspicuous. *Conidia* solitary, subcylindrical, straight to curved, older conidia sometimes with irregular swellings, (30–)60–70(–83) × 2–3 µm, pluriseptate, pale brown, thin-walled, smooth, apex rounded, base truncate to slightly obconically truncate, about 1 µm wide, hila unthickened, not darkened.

*Culture characteristics:* Colonies on MEA reaching 47 mm diam after 30 d at 24 °C, elevated in the centre, with abundant

aerial mycelium and entire, smooth margin, surface pale mouse-grey to mouse-grey, olivaceous in reverse. Colonies on OA reaching 35 mm diam after 30 d at 24 °C, effuse, with moderate velvety aerial mycelium and entire, smooth margin, surface pale mouse-grey and iron-grey in reverse.

*Holotype:* India: Assam: Naojan, on *Musa* cv. Nanderan (Plantain), *Musaceae*, 2005, I. Buddenhagen (CBS H-20044).  
*Ex-type culture:* CBS 122467.

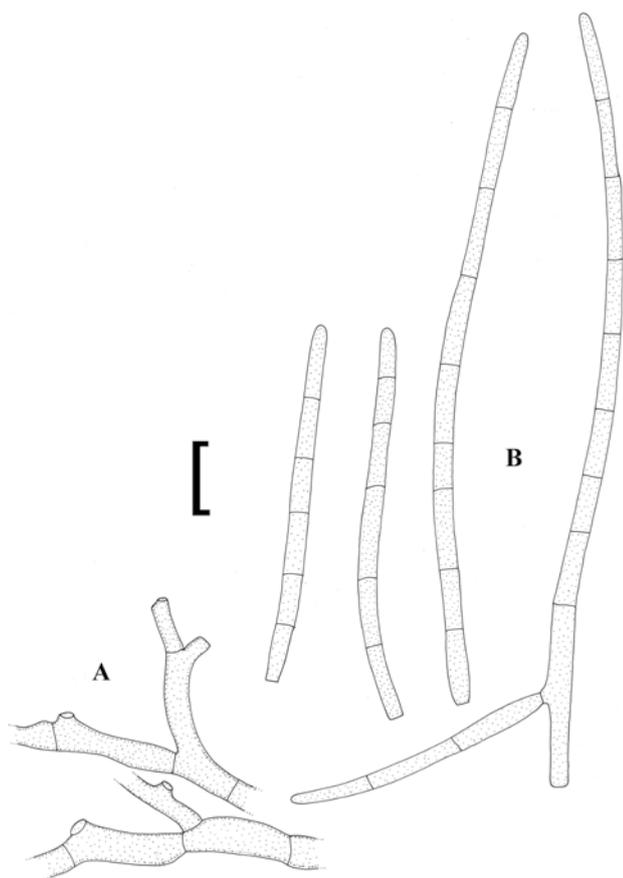
*Host range and distribution:* Only known from the type collection.

***Pseudocercospora eumusae*** Crous & Mour., *Sydowia* 54: 36 (2002).  
(Fig. 128)

*Synonym:* *Mycosphaerella eumusae* Crous & Mour., *Sydowia* 54: 36 (2002) [*holotype:* Réunion: on *Musa* sp., 2001, J. Carlier (PREM 57314)].

*Literature:* Arzanlou et al. (2008: 26).

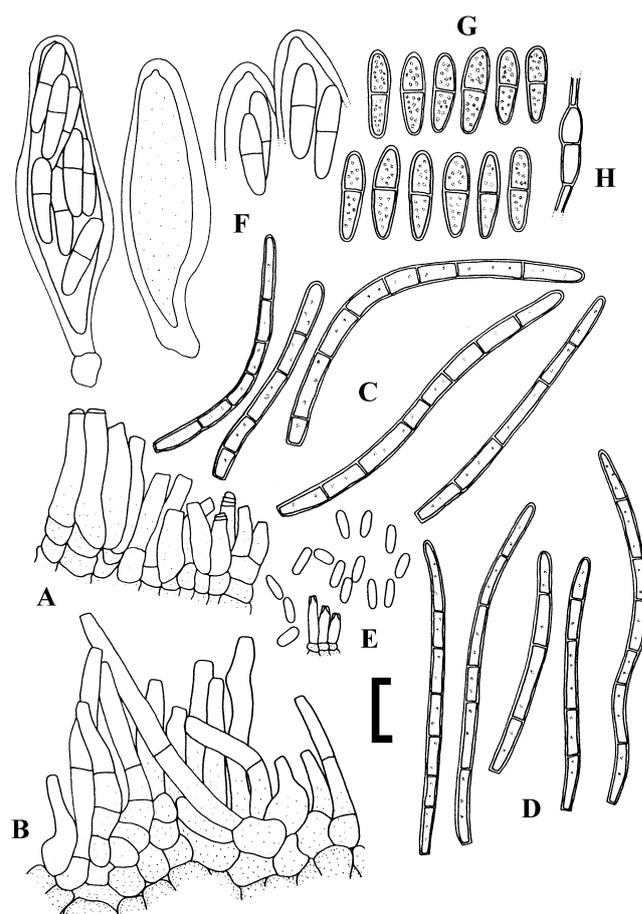
*Illustration:* Crous & Mourichon (2002: 37–38, figs 1–12).



**Fig. 127.** *Pseudocercospora assamensis* (CBS H-20044). **A.** Hyphae with conidiophores. **B.** Conidia. Bar = 10 µm. P.W. Crous del.

**Description:** Leaf spots amphigenous, initially visible as faint brown streaks, later oval to elliptical light brown lesions with grey centre and dark brown border, finally confluent, forming larger, brown, necrotic areas under favourable conditions, grey spots and patches visible in necrotic areas, lesion surrounded by a diffuse chlorotic yellowish halo. *Caespituli* mainly epiphyllous, punctiform, grey. *Mycelium* internal; hyphae branched, septate, 1.5–2.5 µm wide, pale brown, thin-walled, smooth. *Stromata* well-developed, to 70 µm diam, subepidermal or substomatal, brown. *Conidiophores* numerous, in dense fascicles, arising from stromata, forming sporodochial conidiomata, through stomata or erumpent, erect, straight, subcylindrical or somewhat attenuated towards the tip to geniculate-sinuous, unbranched or branched, 10–25 × 3–5 µm, 0–3-septate, hyaline to pale brown, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 10–20 µm long, sympodial to percurrent, with 1–4 fine annellations, conidiogenous loci inconspicuous or visible as truncate tip, but always unthickened and not darkened. *Conidia* solitary, subcylindrical, straight to curved, (18–)30–50(–65) × (2–)2.5–3 µm, 3–8-septate, subhyaline to pale olivaceous, thin-walled, smooth, apex obtuse, base subtruncate to short obconically truncate, hila unthickened, not darkened.

*Spermogonia* mainly hypophyllous, subepidermal, substomatal, to 75 µm diam, dark brown; spermatia rod-shaped, 3–6 × 1 µm, hyaline. *Mycosphaerella-like sexual morph:* *Ascomata* amphigenous, mainly hypophyllous, subepidermal, somewhat erumpent, black, to 80 µm diam,



**Fig. 128.** *Pseudocercospora eumusae* (PREM 57315). **A–B.** Conidiophore fascicles. **C–D.** Conidia. **E.** Spermatia. **F.** Asci. **G.** Ascospores. **H.** Germination ascospore. Bar = 10 µm. P.W. Crous del.

apical ostiole 10–15 µm diam, wall composed of 2–3 layers of medium brown *textura angularis*, asci paraphysate, fasciculate, bitunicate, sessile, obovoid, straight to slightly curved, 30–50 × 9–15 µm, 8-spored, ascospores multiseriate, overlapping, obovoid, tapering towards both ends, but with more pronounced taper towards the base, widest in the middle of the upper cell, (11–)12–13(–16.5) × (3–)3.5–4(–4.5) µm, medianly 1-septate, hyaline, guttulate, ends rounded.

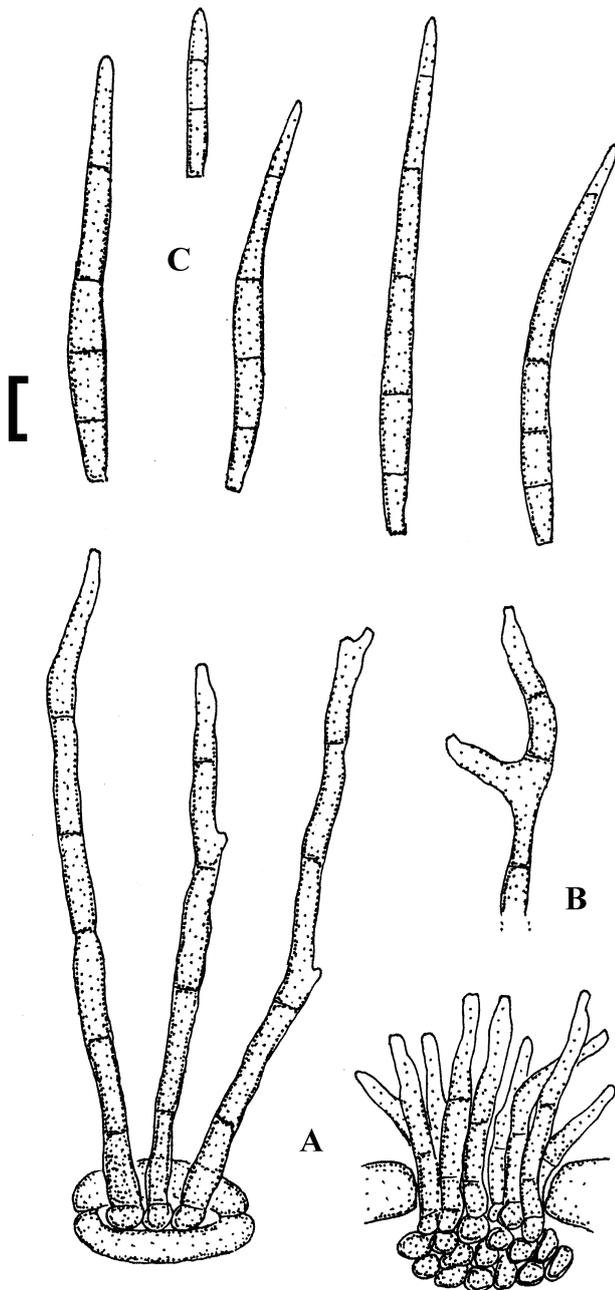
**Holotype:** Réunion: on *Musa* sp., 2001, J. Carlier (PREM 57315).

**Host range and distribution:** On *Musa* spp., *Musaceae*, Africa (Mauritius, Nigeria, Réunion), Asia (India, Sri Lanka, Thailand, Malaysia, Vietnam).

***Pseudocercospora fengshanensis*** (T.Y. Lin & J.M. Yen) J.M. Yen & S.K. Sun, *Cryptog. Mycol.* **4**: 197 (1983). (Fig. 129)

**Basionym:** *Cercospora fengshanensis* T.Y. Lin & J.M. Yen, *Rev. Mycol.* **35**: 320 “1970” (1971).

**Literature:** Hsieh & Goh (1990: 243), Guo & Hsieh (1995: 217), Guo *et al.* (1998: 229–230), Crous & Braun (2003: 183).



**Fig. 129.** *Pseudocercospora fengshanensis* (based on Guo & Hsieh 1995: 219, fig. 185). **A.** Conidiophore fascicles. **B.** Conidiophore. **C.** Conidia. Bar = 10  $\mu$ m.

*Illustrations:* Lin & Yen (1971b: 319, fig. 1), Guo & Hsieh (1995: 219, fig. 185), Guo *et al.* (1998: 230, fig. 190).

*Description:* *Leaf spots* amphigenous, distinct, oblong-elliptical, scattered to confluent, 6–45  $\times$  4–12 mm, centre greyish brown to greyish white, with narrow, dark brown to blackish margin and pale grey to yellowish brown halo on the upper leaf surface. *Caespituli* amphigenous. *Mycelium* internal. *Stromata* lacking or small, 15–40  $\mu$ m diam, substomatal, globose, dark brown. *Conidiophores* in small, loose to dense fascicles, 2–7, rarely solitary, arising from internal hyphae or stromata, through stomata, erect, straight to flexuous, somewhat geniculate-sinuous, unbranched, 10–55  $\times$  4–6  $\mu$ m, 1–5-septate, brown or olivaceous-brown,

paler towards the tip, thin-walled, smooth; conidiogenous cells integrated, terminal, conidiogenous loci inconspicuous or subdenticulate, but always unthickened and not darkened. *Conidia* solitary, obclavate-cylindrical, straight to somewhat curved, 15–95  $\times$  3–5  $\mu$ m, 2–9-septate, occasionally constricted at septa, pale olivaceous or brown, thin-walled, smooth, apex obtuse, base short obconically truncate, hila neither thickened nor darkened.

*Holotype:* **Taiwan:** Feng-Shan, on *Musa* sp., Apr. 1970, T. Whang F.S. 4 (not traced; probably not preserved).

*Host range and distribution:* On *Musa* (*acuminata* [*nana*], *Musa* sp.), *Musaceae*, Asia (China, Taiwan).

*Note:* This species is morphologically close to *P. musae*, but differs in having to 5-septate, mostly geniculate-sinuous conidiophores.

***Pseudocercospora fijiensis*** (M. Morelet) Deighton, *Mycol. Pap.* **140**: 144 (1976).

(Fig. 130)

*Basionym:* *Cercospora fijiensis* M. Morelet, *Ann. Soc. Sci. Nat. Archéol. Toulon Var.* **21**: 105 (1969).

*Synonyms:* *Mycosphaerella fijiensis* M. Morelet, *Ann. Soc. Sci. Nat. Archéol. Toulon Var.* **21**: 105 (1969) [holotype: see *P. fijiensis*].

*Cercospora pingtungensis* T.Y. Lin & J.M. Yen, *Bull. Trimestriell. Soc. Mycol. France* **87**: 427 (1971) [*type:* **Taiwan:** Pingtung, on *Musa acuminata* [*canvendishii*], 5 and 27 Oct. 1970, B. Shiu, P.T. no. 52 (probably not preserved)].

*Cercospora fijiensis* var. *difformis* J.L. Mulder & Stover, *Trans. Brit. Mycol. Soc.* **67**: 82 (1976) [holotype: **Honduras:** La Lima, on *Musa* sp., Mar. 1974, R. H. Stover (K(M) IMI 183747)].

*Mycosphaerella fijiensis* var. *difformis* J.L. Mulder & Stover, *Trans. Brit. Mycol. Soc.* **67**: 82 (1976).

*Paracercospora fijiensis* (M. Morelet) Deighton, *Mycol. Pap.* **144**: 51 (1979).

*Paracercospora fijiensis* var. *difformis* (J.L. Mulder & Stover) Deighton, *Mycol. Pap.* **144**: 52 (1979).

*Literature:* Meredith & Lawrence (1970b), Mulder & Stover (1976), Deighton (1979: 51–52), Sivanesan (1984: 216–218), Mulder & Holliday (1974a), Johanson & Jeger (1993), Johanson *et al.* (1994), Crous *et al.* (2002: 51), Crous & Braun (2003: 185), Gasparotto *et al.* (2005), Aptroot (2006: 91), Arzanlou *et al.* (2008: 26).

*Illustrations:* Meredith & Lawrence (1970b: 465–471, figs 1–8), Lin & Yen (1971a: 426, fig. 1), Mulder & Stover (1976: 79–82, figs 2–11), Mulder & Holliday (1974a: fig., unnumbered), Deighton (1979: 51, fig. 27 A–C), Sivanesan (1984: 217, fig. 116), Guo *et al.* (2005: 293, fig. 215), Aptroot (2006: 13, fig. 320), Arzanlou *et al.* (2008: 35, figs 18 b, e, 19).

*Description:* *Leaf spots* amphigenous, symptoms variable, at first formed as minute, faint, reddish brown specks, later elongated and wider, visible as narrow reddish brown streaks, to 20  $\times$  2 mm, parallel to leaf veins, confluent, later turning

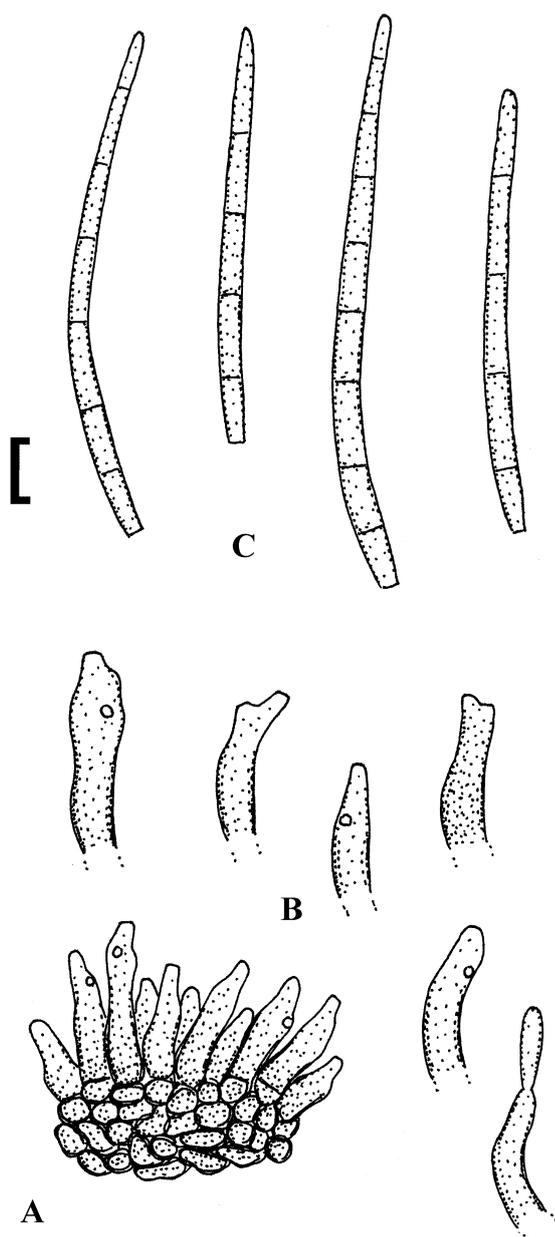


Fig. 130. *Pseudocercospora fijiensis* (K(M) IMI 136696). A. Conidiophore fascicle. B. Conidiophores. C. Conidia. Bar = 10  $\mu$ m.

dark brown to blackish, occasionally with a dark purplish tinge, older leaf spots elliptical-fusiform, with light brown water-soaked border, finally with dark brown to blackish centre, slightly depressed, at the end drying, turning to pale grey or buff-coloured, with distinct dark brown to blackish margin. *Caespituli* amphigenous, distinct on the upper leaf surface, punctiform, dark brown, less conspicuous on the lower leaf surface. *Mycelium* internal. *Stromata* lacking or almost so on the lower leaf surface, developed on the upper side, subglobose, substomatal to immersed, erumpent, about 10–50  $\mu$ m diam, composed of pigmented cells, circular to polygonal in outline. *Conidiophores* solitary or in small (2–8) to moderately large fascicles, loose to moderately dense, arising from internal hyphae or stromata, through stomata or erumpent, more numerous and denser when arising from stromata on the upper leaf surface, fascicles occasionally arising from immature spermogonia or ascoma initials, erect,

straight to curved or somewhat flexuous, subcylindrical or somewhat attenuated towards the tip, barely to moderately geniculate-sinuuous, unbranched, 10–65  $\times$  3–6(–7)  $\mu$ m, 0–3(–5)-septate, pale to medium olivaceous-brown or brown, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, about 10–30  $\mu$ m long, conidiogenous loci inconspicuous to subconspicuous by being ring-like, i.e. with slightly thickened and darkened rim (paracercospora-like), about 1.5–2.5  $\mu$ m wide. *Conidia* solitary, obclavate to cylindrical or subcylindrical, size rather variable, 30–130  $\times$  2.5–5  $\mu$ m, 1–10-septate, subhyaline to pale olivaceous-brown, thin-walled, smooth, apex obtuse to subacute, base subtruncate to short obconically truncate, 1.5–3  $\mu$ m wide, hila unthickened, not darkened or only ultimate rim slightly so.

*Spermogonia* often associated with conidiophores, amphigenous, immersed, hour-glass-shaped, oval, obpyriform to subglobose, about 30–90  $\mu$ m diam, pale to medium brown; *spermatia* short cylindrical-bacilliform, 2.5–5  $\times$  1–2.5  $\mu$ m.

*Mycosphaerella-like sexual morph*: *Ascomata* amphigenous, scattered, immersed, globose, 40–85  $\mu$ m diam, with narrow to moderately thick papillate ostiole, somewhat erumpent, aparaphysate, wall of three or more layers of polygonal, brown cells; *asci* numerous, cylindrical-obclavate, about 28–35  $\times$  6.5–8  $\mu$ m, 8-spored; *ascospores* biserial, fusiform-clavate, 11.5–20  $\times$  2.5–6  $\mu$ m, with a single septum, median or somewhat suprmedian, not or slightly constricted at the septum, colourless, without mucoid sheath, germinating with two germ tubes both from the polar ends, not distorted, growth parallel to the long axis of the spore, 4–5  $\mu$ m wide.

*Holotype*: **Hawaii**: on *Musa* sp., 12 Dec. 1968, D. S. Meredith & J. S. Lawrence (K(M) IMI 136696). *Epitype* (designated by Arzanlou *et al.* 2008: 26): **Cameroon**: on *Musa* sp., date and collector unknown (CBS H-20037), ex epitype culture CIRAD 86 = CBS 120258.

*Host range and distribution*: On *Musa* (*acuminata*, *xparadisiaca*, *Musa* spp.), *Musaceae*, ?*Heliconia pittacorum*, *Heliconiaceae*; Africa (Benin, Burundi, Cameroon, Central African Republic, Congo, Comoros, Gabon, Ghana, Guinea-Bissau, Ivory Coast, Kenya, Malawi, Mayotte, Niger, Nigeria, Rwanda, São Tomé e Príncipe, Somalia, Tanzania, Togo, Tonga, Uganda, Zambia), Asia (Bhutan, Brunei, China, Indonesia, Japan, Malaysia, Papua New Guinea, Peru, Philippines, Singapore, Taiwan, Thailand, Vietnam), Australia, Oceania (American Samoa, Cook Islands, Fiji, French Polynesia, Hawaii, Micronesia, New Caledonia, Niue, Norfolk Islands, Northern Mariana Islands, Samoa, Solomon Islands, Tahiti, Tonga, Vanuatu, Wallis and Futuna Islands), Central and South America (Belize, Bolivia, Brazil, Colombia, Costa Rica, Dominican Republ., Ecuador, El Salvador, Guatemala, Guyana, Honduras, Nicaragua, Panama, Venezuela), North America (Mexico; USA, Florida), West Indies (Cuba, Jamaica, Martinique, Netherlands Antilles, Haiti).

*Notes*: As the conidiogenous loci and conidial hila are similar to those of *Paracercospora egenula*, the type species of

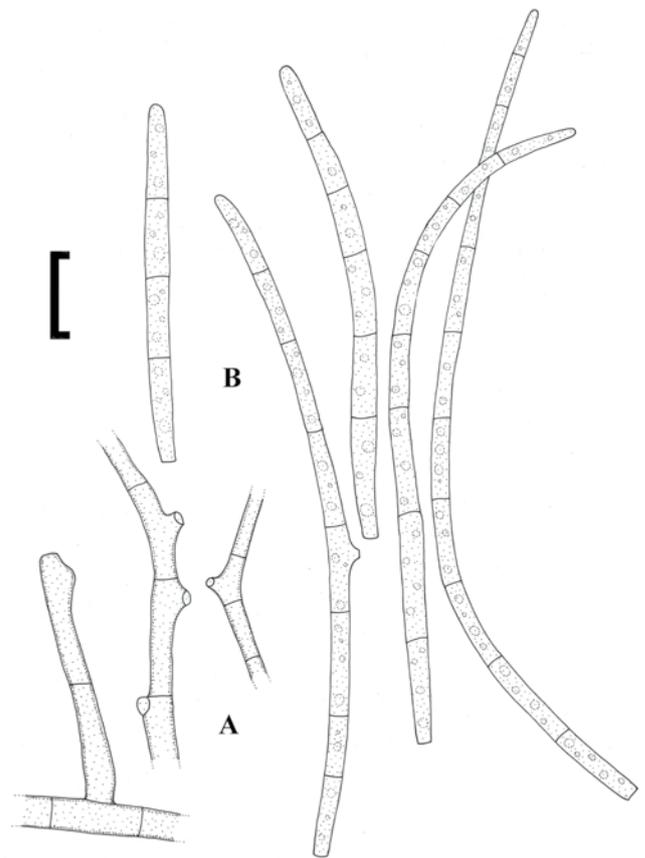
*Paracercospora*, *Pseudocercospora fijiensis*, was previously considered to be a species of the latter genus. However, *P. fijiensis* clusters within the large *Pseudocercospora* clade (Arzanlou et al. 2008, Crous et al. 2013a), and must thus be retained in this genus, although in molecular analyses *Paracercospora egenula* and thus also the genus *Paracercospora* proved to represent a separate genus of its own (Crous et al. 2013a), i.e. the special paracercospora-like scar type is not sufficient to distinguish *Paracercospora* and *Pseudocercospora* (see Braun et al. 2013a). The status of *Cercospora pingtungensis* (Lin & Yen 1971a; Hsieh & Goh 1990: 242–243; Guo et al. 2005: 292–293, fig. 215) is unclear, as type material could not be traced. According to the original description and illustration, this species cannot be maintained in *Cercospora* s. str. The more or less cylindrical conidia are pigmented and the conidiogenous loci range from being inconspicuous, truncate, unthickened, not darkened to conspicuous, prominent. These characters and the dimensions of conidiophores and conidia agree well with those of *Pseudocercospora* (*Paracercospora*) *fijiensis*. The described stromata in *C. pingtungensis* are larger than in common collections of *P. fijiensis*, but the description of Lin & Yen (1971a) was mainly based on epiphyllous colonies which differ from hypophyllous ones in having larger stromata, corresponding to the description of *Cercospora fijiensis* var. *difformis* (Mulder & Stover 1976). Furthermore, very large stromata seem to refer to immature spermogonia, as suggested by Lin & Yen (1971a: 426, fig. 1A), who classified these structures as “pyncidiostromata”. It is not unusual in cercosporoid fungi that conidiophore fascicles may arise from ascomata and that epiphyllous and hypophyllous colonies are morphologically differentiated. *Cercospora pingtungensis* is tentatively reduced to synonymy with *P. fijiensis* as this species is very probably identical, but it is, of course, necessary to confirm this treatment by a re-examination of type material or a neotypification with material from Taiwan. The differentiation between *P. fijiensis* var. *fijiensis* and var. *difformis* is vague and barely justified. *Pseudocercospora fijiensis* is morphologically very variable, and the occurrence of morphological differences between epi- and hypophyllous colonies in *Pseudocercospora* spp. is not unusual and a common phenomenon in numerous species of this genus.

Gasparotto et al. (2005) recorded *Heliconia psittacorum* as host of *P. fijiensis*, based on positive results of inoculation tests. Morphological details of the fungus on *Heliconia psittacorum* were not given. As this host belongs to another family, cultures and molecular sequence analyses would be useful to confirm that *P. fijiensis* is able attack *Heliconia*.

***Pseudocercospora indonesiana* Arzanlou & Crous,**  
*Persoonia* 20: 29 (2008).  
(Fig. 131)

*Illustration:* Arzanlou et al. (2008: 29, fig. 9, 30, fig. 10).

*Description:* *In vitro* (on MEA): *Mycelium* submerged and superficial; submerged hyphae 2.5–4 µm wide, branched, septate, medium brown, thin-walled, smooth; aerial hyphae medium brown, thin-walled, smooth. *Conidiophores* solitary, arising from superficial hyphae, lateral, subcylindrical,



**Fig. 131.** *Pseudocercospora indonesiana* (CBS H-20045). **A.** Hyphae with conidiophores. **B.** Conidia. Bar = 10 µm. P.W. Crous del.

unbranched, to 30 µm long and 2–2.5 µm wide, 0–2-septate, medium brown, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, sympodial, conidiogenous loci inconspicuous. *Conidia* solitary, subcylindrical, straight to curved, (40–)78–95(–120) × 2–3 µm, 3–7-septate, guttulate, pale brown, thin-walled, smooth, apex rounded, base truncate to slightly obconically truncate, hila unthickened, not darkened.

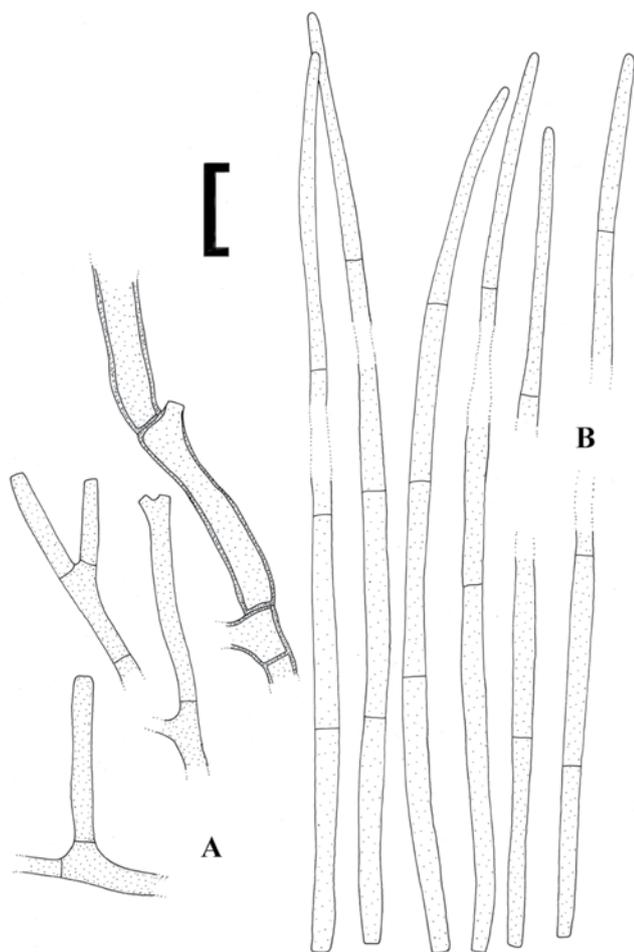
*Culture characteristics:* *Colonies* on MEA reaching 27 mm diam after 30 d at 24 °C, low convex, with abundant aerial mycelium and entire, smooth margin, surface pale mouse-grey to mouse-grey, dark mouse-grey in reverse. *Colonies* on OA reaching 35 mm diam after 47 d at 24 °C, effuse, with moderate aerial mycelium and entire, smooth margin, surface pale mouse-grey and olivaceous-black in reverse.

*Holotype:* **Indonesia:** *Western Sumatra:* Kumango, on *Musa* cv. Buai, *Musaceae*, 2004, I. Buddenhagen (CBS H-20045).  
*Ex-type culture:* CBS 122473.

*Host range and distribution:* Only known from the type collection.

***Pseudocercospora longispora* Arzanlou & Crous,**  
*Persoonia* 20: 30 (2008).  
(Fig. 132)

*Illustration:* Arzanlou et al. (2008: 30–31, figs 11–12).



**Fig. 132.** *Pseudocercospora longispora* (CBS H-20043). **A.** Hyphae with conidiophores. **B.** Conidia. Bar = 10 µm. P.W. Crous del.

**Description:** *In vitro:* Mycelium on MEA submerged and superficial; submerged hyphae 2–3 µm wide, branched, septate, medium brown, thin-walled, smooth; aerial hyphae medium brown, thin-walled, smooth, later hyphal cells becoming thick-walled, swollen, forming dark brown, monilioid, muriform cells, 5–17 × 7–12 µm. *Conidiophores* solitary, arising from superficial hyphae, lateral, straight, subcylindrical, unbranched or branched, to 30 µm long and 2–3 µm wide, 0–2-septate, medium brown, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, sympodial, conidiogenous loci inconspicuous. *Conidia* solitary, cylindrical to subcylindrical, widest in the middle, gradually tapering towards the apex and sometimes also base, straight to curved, 80–120 × 2.5–4 µm, pluriseptate, pale brown, thin-walled, smooth, apex subobtuse, base truncate to slightly obconically truncate, hila unthickened, not darkened.

**Culture characteristics:** *Colonies* on MEA reaching 15 mm diam after 30 d at 24 °C, erumpent, with moderately developed aerial mycelium and entire, smooth margin, surface buff to rosy-buff, mouse-grey to dark grey, dark mouse-grey in reverse. *Colonies* on OA reaching 15 mm diam after 30 d at 24 °C, effuse, with abundant aerial mycelium and entire, smooth margin, surface pale mouse-grey and dark mouse-grey in reverse.

**Holotype:** **Indonesia:** Western Sumatra: Kumango, on *Musa* cv. Buai, *Musaceae*, 2004, I. Buddenhagen (CBS H-20043). **Ex-type culture:** CBS 122470.

**Host range and distribution:** Only known from the type collection.

***Pseudocercospora musae* (Zimm.) Deighton, *Mycol. Pap.* 140: 148 (1976).**  
(Fig. 133)

**Basionym:** *Cercospora musae* Zimm., *Centralbl. Bakteriol., Abt. 2*, 8: 219 (1902).

**Synonyms:** *Cercospora musae* Masee, *Bull. Misc. Inform. Kew* 28: 159 (1914), *nom. illeg.* (ICN, Art. 53.1) [**type:** Fiji: on *Musa* sp., C. H. Knowles (K)].

*Mycosphaerella musicola* R. Leach, *Trop. Agric. (Trinidad)* 18: 92 (1941), *nom. inval.* (ICN, Art. 39.1).

*Mycosphaerella musicola* R. Leach, J.L. Mulder & R.H. Stover, *Trans. Brit. Mycol. Soc.* 67: 77 (1976) [**holotype:** Jamaica: on *Musa* × *paradisiaca* [× *sapientum*], Jan. 1959, R. Leach (K(M) IMI 75804a); **epitype** (designated in Arzanlou *et al.* 2008: 28): **Cuba:** Bayamo, on *Musa* × *paradisiaca*, 1 Dec. 1966, R. Uriaga (CBS H-20038), ex **epitype** culture K(M) IMI 123823 = CBS 116634].

**Literature:** Saccardo (1906: 610; 1931: 885), Chupp (1954: 402–403), Batista *et al.* (1965: 7), Meredith & Lawrence (1970a), Mulder & Stover (1976: 77), Mulder & Holliday (1974b), Sivanesan (1984: 209), Hsieh & Goh (1990: 243), Guo & Hsieh (1995: 218), Crous & Braun (1996b: 284), Guo *et al.* (1998: 230–231), Crous & Braun (2003: 286), Aptroot (2006: 139), Arzanlou *et al.* (2008: 28), Kamal (2010: 200), Phengsintham *et al.* (2013b: 116), Braun & Uriaga (2013a: 195).

**Illustrations:** Batista *et al.* (1965: 18, fig. 4), Meredith & Lawrence (1970a: 270, fig. 2), Mulder & Holliday (1974b, fig., unnumbered), Guo & Hsieh (1995: 220, fig. 186), Guo *et al.* (1998: 231, fig. 191), Aptroot (2006: 16, fig. 579), Arzanlou *et al.* (2008: 35, fig. 18 c, f), Phengsintham *et al.* (2013b: 11, fig. 116, 118, fig. 117).

**Description:** *Leaf spots* amphigenous, subcircular, elliptical, oblong or somewhat irregular, 2–50(–75) mm diam, scattered to confluent, brownish, reddish brown, dingy greyish brown or grey, margin brown or purplish to reddish. *Caespituli* amphigenous, punctiform, dark. *Mycelium* internal. *Stromata* substomatal to immersed, subglobose, 15–40 µm diam, brown to blackish brown. *Conidiophores* in small to moderately large, usually dense fascicles, mostly 5–20, arising from stromata, sporodochium-like, emerging through stomata or erumpent, erect, straight to slightly curved or sinuous, subcylindrical to conical, usually none or at most slightly geniculate, unbranched or only rarely branched, 5–30 × 2–6 µm, 0–2-septate, very pale olivaceous to olivaceous-brown, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 5–20 µm long, conidiogenous loci inconspicuous or visible as truncate tip, but always unthickened and not darkened. *Conidia* solitary, cylindrical to obclavate-cylindrical, straight to curved

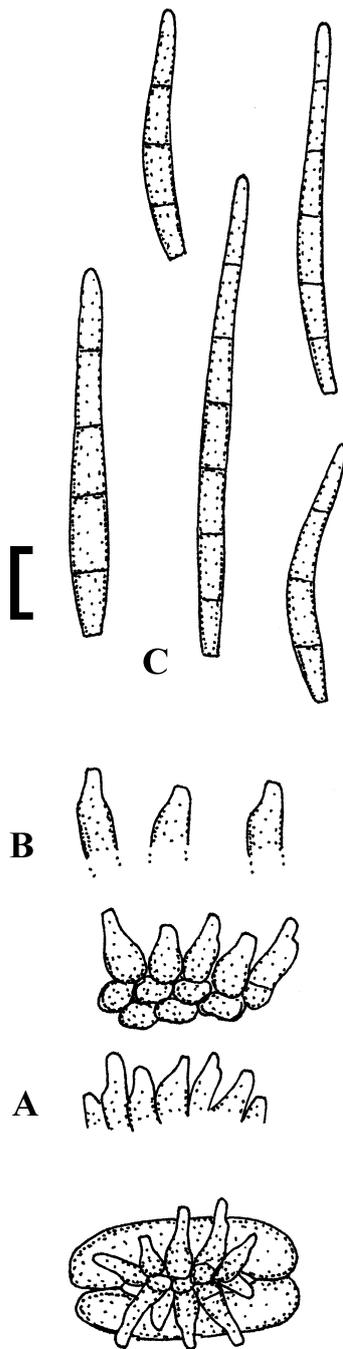


Fig. 133. *Pseudocercospora musae* (CBS H-20038). A. Conidiophore fascicles. B. Conidiophores. C. Conidia. Bar = 10  $\mu$ m.

or somewhat sinuous, (10–)20–80(–110)  $\times$  (2–)2.5–5(–6)  $\mu$ m *in vivo* (*in vitro* with a tendency to be somewhat longer and narrower, 2–3.5  $\mu$ m), (0–)2–7(–9)-septate, subhyaline to pale olivaceous, thin-walled, smooth, apex obtuse, rounded to somewhat narrowed, base rounded to obconically truncate, 1.5–2.5  $\mu$ m wide, hila unthickened, not darkened.

*Spermogonia* amphigenous, mainly hypophyllous, immersed, hour-glass-shaped to flask-shaped, (30–)45–90(–110)  $\mu$ m diam, wall composed of 2–3 layers of pale to medium brown rectangular-polygonal cells; *spermatia* rod-shaped, 2–6  $\times$  0.8–1.4  $\mu$ m, hyaline.

*Ascomata* amphigenous, immersed, somewhat erumpent, dark brown to blackish, ostiole small, 45–70  $\mu$ m

diam, aparaphysate; *asci* oblong-clavate, 29–36  $\times$  8–11  $\mu$ m; *ascospores* 14–18  $\times$  3–4  $\mu$ m, short subcylindrical, upper cells a little wider, medianly 1-septate, hyaline, with mucoid sheath, germinating from both polar ends, 4–5  $\mu$ m wide, germ tubes parallel to the long axis of the spore, not becoming distorted.

*Culture characteristics*: Colonies on PDA reaching 8.5 mm diam after 38 d at 26  $^{\circ}$ C (average, maximum 12 mm), at first pale to medium grey (after 2–3 d), later dark green to almost black (on V-8 juice agar pale to medium grey with more abundant aerial mycelium compared to PDA), aerial mycelium developed in clumps made of contorted, branched hyphae, older colonies somewhat raised, almost hemispherical in side view, margin lobed and irregular in surface view, centre finally becoming hollow, outer shell consisting of a thick, almost black rind made of dumb-bell-shaped hyphal cells; stromata not developed *in vitro*, but colonies sporulating on PDA after 2–3 d.

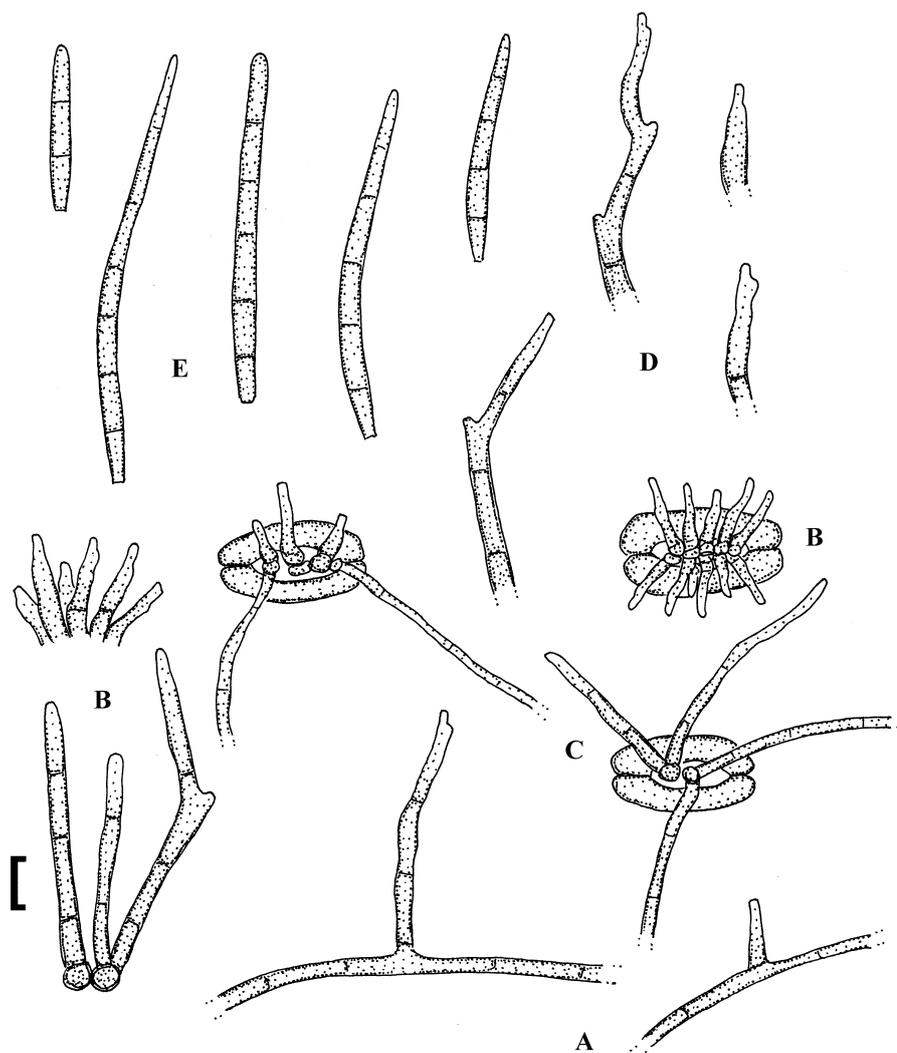
[Type: **Java**: Buitenzorg, on *Musa*  $\times$  *paradisiaca* [*sapientum*] (not preserved)]. **Neotype** (designated here, MycoBank MBT178162): **Cuba**: Bayamo, on *Musa*  $\times$  *paradisiaca*, 1 Dec. 1966, R. Urtiaga (CBS H-20038). *Ex-neotype culture*: K(M) IMI 123823 = CBS 116634.

*Hostrange and distribution*: On *Musa* (*acuminata* [*cavendishii*, ?*nana*], *balbiana* var. *liukuensis* [*liukuensis*], *banksii*, *basjoo*,  $\times$  *paradisiaca* [*sapientum*], *textilis*, *ventricosa*, *Musaceae* (widely distributed, wherever *Musa* spp. are cultivated or grow naturally), Africa (Angola, Cameroon, Cape Verde, Congo, Egypt, Ethiopia, Gabon, Ghana, Guinea, Guinea-Bissau, Ivory Coast, Kenya, Madagascar, Malawi, Mauritius, Mozambique, Nigeria, S $\tilde{a}$ o Tom $\acute{e}$  e Pr $\acute{i}$ ncipe, Sierra Leone, Somalia, South Africa, Tanzania, Togo, Uganda, Zambia, Zimbabwe), Asia (Brunei, Bhutan, Cambodia, China, India, Indonesia, Japan, Laos, Malaysia, Nepal, Papua New Guinea, Philippines, Sri Lanka, Taiwan, Thailand, Vietnam, Yemen), Australia, Oceania (American Samoa, Fiji, Hawaii, Palau, French Polynesia, Guam, Kiribati, Micronesia, New Caledonia, Niue, Norfolk Island, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu, Wallis and Futuna Islands), Central and South America (Argentina, Belize, Bolivia, Brazil, Colombia, Costa Rica, Ecuador, El Salvador, French Guiana, Guatemala, Guyana, Honduras, Nicaragua, Panama, Peru, Suriname, Venezuela), North America (Mexico; USA, Florida, Texas), West Indies (Antigua and Barbuda, Bahamas, Barbados, Cayman Islands, Cook Islands, Cuba, Dominican Republ., Grenada, Guadeloupe, Haiti, Jamaica, Martinique, Montserrat, Puerto Rico, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago).

***Pseudocercospora musae-sapientum*** (A.K. Kar & M. Mandal) U. Braun & Mouch., *New Zealand J. Bot.* **37**: 317 (1999); as "*musae-sapientii*". (Fig. 134)

*Basionym*: *Cercospora musae-sapientum* A.K. Kar & M. Mandal, *Norw. J. Bot.* **22**: 105 (1975); as "*musae-sapientii*".

*Literature*: Crous & Braun (2003: 287), Kamal (2010: 200).



**Fig. 134.** *Pseudocercospora musae-sapientum* (K(M) IMI 147922). **A.** Solitary conidiophores arising from superficial hyphae. **B.** Conidiophore fascicles. **C.** Conidiophores and superficial hyphae emerging through stomata. **D.** Conidiophores. **E.** Conidia. Bar = 10  $\mu$ m.

**Illustrations:** Kar & Mandal (1975: 105, fig. 1), Braun *et al.* (1999: 315, fig. 18).

**Description:** *Leaf spots* amphigenous, numerous, scattered to confluent, oblong, limited by veins, about 2–10  $\times$  0.2–4 mm, brown to deep brownish grey. *Caespituli* hypophyllous, punctiform to subeffuse, dark. *Mycelium* internal and external; superficial hyphae emerging through stomata, 1.5–3  $\mu$ m wide, branched, septate, olivaceous to pale olivaceous-brown, thin-walled, smooth. *Stromata* almost lacking or small, 10–35  $\mu$ m diam, substomatal, olivaceous-brown to brown. *Conidiophores* in loose, mostly small fascicles, emerging through stomata and solitary, arising from superficial hyphae, lateral, erect, straight, subcylindrical to geniculate, unbranched or occasionally branched, 15–120  $\times$  3–7  $\mu$ m, aseptate to pluriseptate throughout, olivaceous-brown to medium dark brown, wall thin to somewhat thickened, smooth; conidiogenous cells integrated, terminal and intercalary or conidiophores occasionally reduced to conidiogenous cells, about 10–30  $\mu$ m long, conidiogenous loci inconspicuous to denticle-like, but always unthickened, not darkened. *Conidia* solitary, obclavate-cylindrical, 30–100  $\times$  3–5  $\mu$ m, 3–8-septate, apex subacute to obtuse, base obconically truncate, hila unthickened, not darkened. *Conidia* solitary, obclavate

to cylindrical, straight to curved, 30–100  $\times$  3–5  $\mu$ m, 2–8-septate, pale olivaceous to olivaceous-brown, thin-walled, smooth, apex obtuse to subacute, base almost truncate or short to long obconically truncate, about 2–2.5  $\mu$ m wide, hila unthickened, not darkened.

**Holotype:** **India:** West Bengal: Midnapur, Daspur, on *Musa  $\times$  paradisiaca* [ *$\times$  sapientum*], 16 Jan. 1970 (K(M) IMI 147922).

**Host range and distribution:** On *Musa* ( *$\times$  paradisiaca*, *Musa* sp.), *Musaceae*, Asia (India, West Bengal), Oceania (New Caledonia, Vanuatu, Wallis and Futuna).

**Notes:** Beside type material, several collections of this species from Oceania, deposited at PC, have been examined. *Pseudocercospora musae-sapientum* is the only *Pseudocercospora* on banana which forms superficial hyphae with solitary conidiophores *in vivo*.

***Pseudocercospora musicola*** U. Braun, *New Zealand J. Bot.* **37**: 317 (1999).

(Fig. 135)

**Synonyms:** *Cercospora musicola* Sawada, *Agric. Res. Inst. Formosa Rep.* **85**: 116 (1943); as "*musaeicola*; *nom. inval.* (ICN, Art. 36.1).

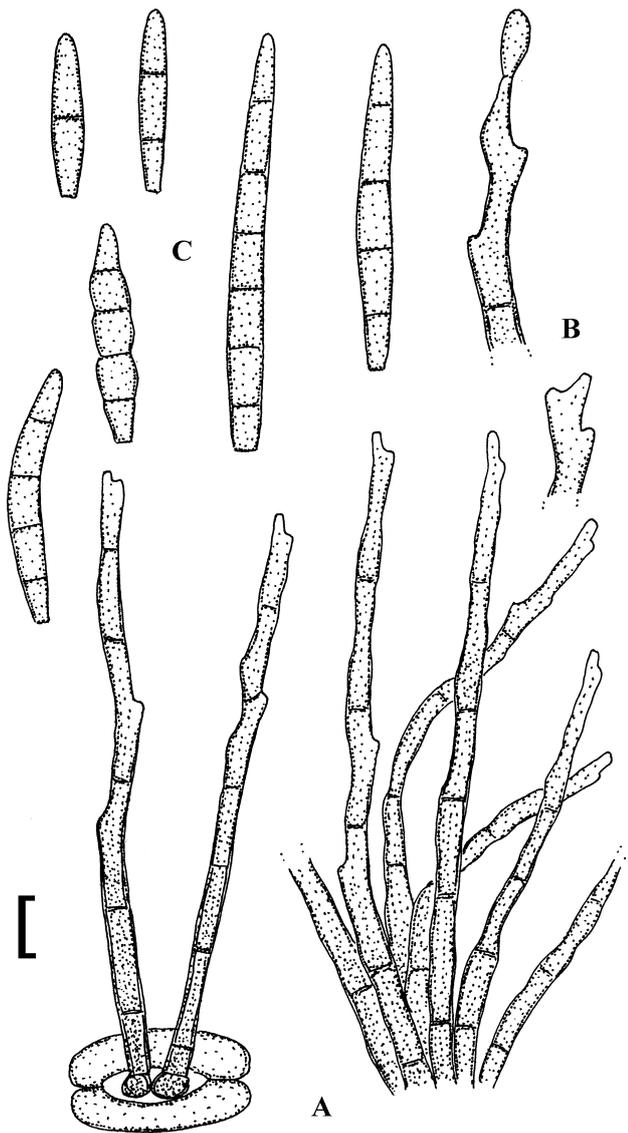


Fig. 135. *Pseudocercospora musicola* (BPI 438701). A. Conidiophore fascicles. B. Conidiophore tips. C. Conidia. Bar = 10  $\mu$ m.

*Cercospora musicola* Sawada ex Goh & W.H. Hsieh, *Cercospora and Similar Fungi from Taiwan*: 242 (1990); *nom. inval.* (ICN, Art. 37.1).

*Cercospora musae-liukuensis* Sawada, *Coll. Agric. Natl. Taiwan Univ., Spec. Publ.* 8: 221 (1959), *nom. nud.* [type: **Taiwan**: on *Musa balbisiana* var. *liukuensis* [*liukuensis*] (NTU-PPE, hb. Sawada)].

*Literature*: Chupp (1954: 403), Katsuki (1965: 48), Lin & Yen (1971: 318), Tai (1979: 891), Hsieh & Goh (1990: 202), Crous & Braun (2003: 287).

*Illustrations*: Lin & Yen (1971b: 319, fig. 1 D–G), Braun et al. (1999: 315, fig. 19).

*Description*: *Leaf spots* lacking or diffuse. *Caespituli* hypophyllous, arrangement linear, 2–15  $\times$  0.2–2 mm, reddish to dark brown, mostly dense. *Mycelium* internal; hyphae septate, branched, brown. *Stromata* lacking or small, only composed of a few swollen hyphal cells, substomatal.

*Conidiophores* solitary or in small to moderately large, usually loose fascicles, arising from internal hyphae or hyphal aggregations, emerging through stomata, geniculate-sinuous, unbranched, 50–180  $\times$  3–9  $\mu$ m, pluriseptate throughout, pale to medium brown, wall somewhat thickened, smooth or almost so; conidiogenous cells integrated, terminal and intercalary, about 10–30  $\mu$ m long, conidiogenous loci subdentate, but neither thickened nor darkened. *Conidia* solitary, obclavate-cylindrical (-fusiform), (20–)40–75  $\times$  (4–)5–8  $\mu$ m, 1–7-septate, occasionally constricted at the septa, pale yellowish or olivaceous to medium brown, wall thin to somewhat thickened, smooth, apex obtuse, base short obconically truncate, about 2–3  $\mu$ m wide, hila unthickened, not darkened.

*Holotype*: **Taiwan**: Taipei, on *Musa acuminata* [*cavendishii*], 1 Jul. 1909, K. Sawada (BPI 438701). *Isotype*: BPI 438702. *Paratype*: **Taiwan**: Taipei, on *Musa balbisiana* var. *liukuensis*, 18 Jul. 1911, Y. Fujikuro, [deposited as *Cercospora musae-liukuensis*] (BPI 43873).

*Host range and distribution*: On *Musa* (*acuminata*, *balbisiana* var. *liukuensis* [*liukuensis*], *basjoo*,  $\times$ *paradisiaca*), *Musaceae*, Asia (Taiwan).

*Note*: The holotype of this species is syntype material of the invalid designation *Cercospora musicola*.

***Pseudocercospora thailandica*** Crous, Himaman & M.J. Wingf., *Stud. Mycol.* 50: 465 (2004). (Fig. 136)

*Synonym*: *Mycosphaerella thailandica* Crous, Himaman & M.J. Wingf., *Stud. Mycol.* 50: 465 (2004) [*holotype*: see type of *P. thailandica*].

*Illustration*: Crous et al. (2004: 466, figs 11–15).

*Description*: *Leaf spots* amphigenous, irregular blotches covering large parts of the leaf lamina, associated with symptoms including tip blight or lesions all along the margin of the leaf, frequently extending to the middle of the leaf lamina, medium brown, margin dark brown, raised. *Caespituli* amphigenous, punctiform, brown. *Mycelium* internal. *Stromata* well-developed, immersed, to 25  $\mu$ m wide and 30  $\mu$ m high, brown. *Conidiophores* in dense fascicles, arising from stromata, erect, straight to curved, subcylindrical, unbranched, 10–20  $\times$  5–5  $\mu$ m, 0–2-septate, pale brown, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 10–15  $\mu$ m long, conidiogenous loci inconspicuous, truncate, unthickened, not darkened. *Conidia* solitary, narrowly obclavate-cylindrical, straight to somewhat curved, (25–)30–45(–60)  $\times$  2–2.5(–3)  $\mu$ m, 3–6-septate, pale brown, thin-walled, smooth, apex subobtuse, base short obconically truncate.

*Spermatogonia* intermixed with and similar to ascospores in general morphology; *spermatia* rod-shaped, 3–5  $\times$  1  $\mu$ m, hyaline.

*Sexual morph*: *Ascomata* amphigenous, subepidermal, becoming erumpent, to 80  $\mu$ m diam, black, ostiole 5–10  $\mu$ m diam, wall composed of 2–3 layers, medium brown, *textura*

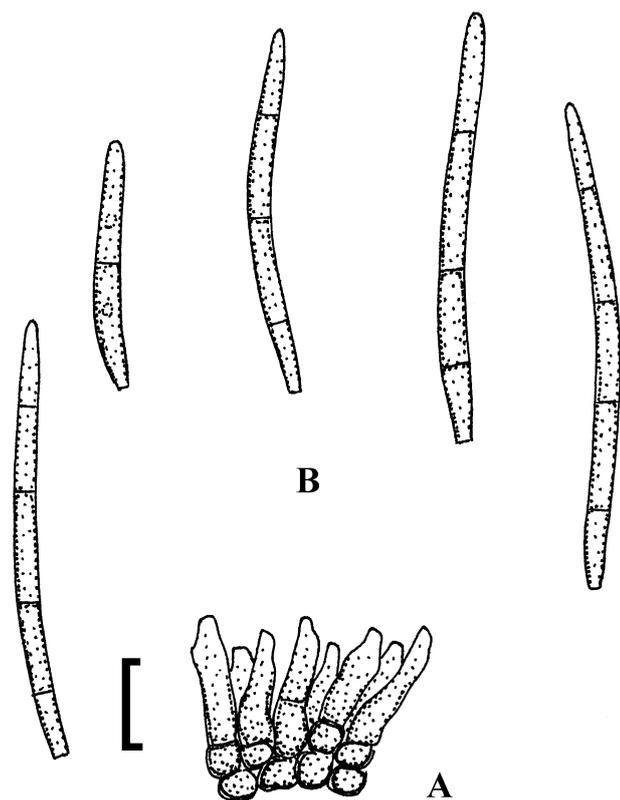


Fig. 136. *Pseudocercospora thailandica* (CBS H-9875). A. Conidiophore fascicle. B. Conidia. Bars = 10  $\mu$ m.

*angularis*; ascifasciculate, obovoid to narrowly ellipsoid, straight to slightly curved, sessile, 30–40  $\times$  6–8  $\mu$ m, bitunicate, 8-spored; ascospores tri- to multiseriate, overlapping, fusoid-ellipsoid, straight to slightly curved, (9–) 10–11(–12)  $\times$  (2–) 2.5–3  $\mu$ m, medianly 1-septate, slightly constricted at the septum, widest in the middle of the upper cell, hyaline, ends obtuse, attenuated towards both ends, but more prominently to the base, germination (on MEA after 24 h) with germ tubes parallel to the long axis of the spore, developing several lateral branches, constricted at the septum.

*In culture*: Colonies slightly erumpent, with smooth regular margin, fast growing, covering the dish after 60 d, aerial mycelium fluffy, surface grey-olivaceous, reverse olivaceous-black.

*Holotype*: **Thailand**: Chachoengsao Province: Sanamchaikhet, on *Acacia mangium*, 28 May 2003, K. Pongpanich (CBS H-9875). *Ex-type culture*: CBS 116367

*Host range and distribution*: On *Acacia mangium*, *Fabaceae*, and *Musa* sp., *Musaceae*, Asia (Thailand), West Indies (Windward Islands).

*Notes*: *Pseudocercospora thailandica* is a primary pathogen of *Acacia mangium* in Thailand, although Crous *et al.* (2004) assigned *Musa* sp. to the host range of this species based on morphology and DNA similarity.

## Zasmidium

### Key to *Zasmidium* species on *Musaceae*

(morphological differentiation difficult, sequence analyses more reliable)

- |       |  |   |
|-------|--|---|
| 1     | Conidia rather long, 55–200 $\times$ 2.6–3.2 $\mu$ m .....   | <b>Zasmidium sp.</b> (see notes under <i>Z. musae</i> ) |
|       | Conidia shorter, 6–83(–120) $\mu$ m .....  | 2   |
| 2 (1) | Conidia rather long and narrow, 50–83 $\times$ 2–2.5 $\mu$ m;<br>conidiogenous loci and hila 0.5–1 $\mu$ m diam .....  | <b>Z. queenslandicum</b>                                |
|       | Conidia shorter, 6–65(–120) $\times$ 1.5–4.5 $\mu$ m; conidiogenous loci and hila 1–1.5 $\mu$ m diam .....   | 3   |
| 3 (2) | Conidia solitary, small, (7–)27–40(–70) $\times$ 1.5–3 $\mu$ m .....   | <b>Z. musae</b>   |
|       | Conidia solitary to catenate, on average somewhat longer and slightly wider,<br>usually (6–)35–65(–120) $\times$ 2–4 $\mu$ m .....   | 4   |
| 4 (3) | Conidia solitary as well as catenate, at least <i>in vivo</i> ; conidiophores solitary and <i>in vivo</i><br>also fasciculate, arising from stromata, to 80 $\mu$ m long; greasy spot disease of citrus,<br>rarely on banana ..... | <b>Z. citri-griseum</b>                                 |
|       | Only known <i>in vitro</i> ; conidia finely verruculose, genetically distinct but morphologically<br>barely distinguishable <i>in vitro</i> .....  | <b>Z. musicola</b>                                      |

### *Zasmidium* species on *Musaceae*

***Zasmidium citri-griseum*** (F.E. Fisher) U. Braun & Crous, **comb. nov.**

MycoBank MB809015

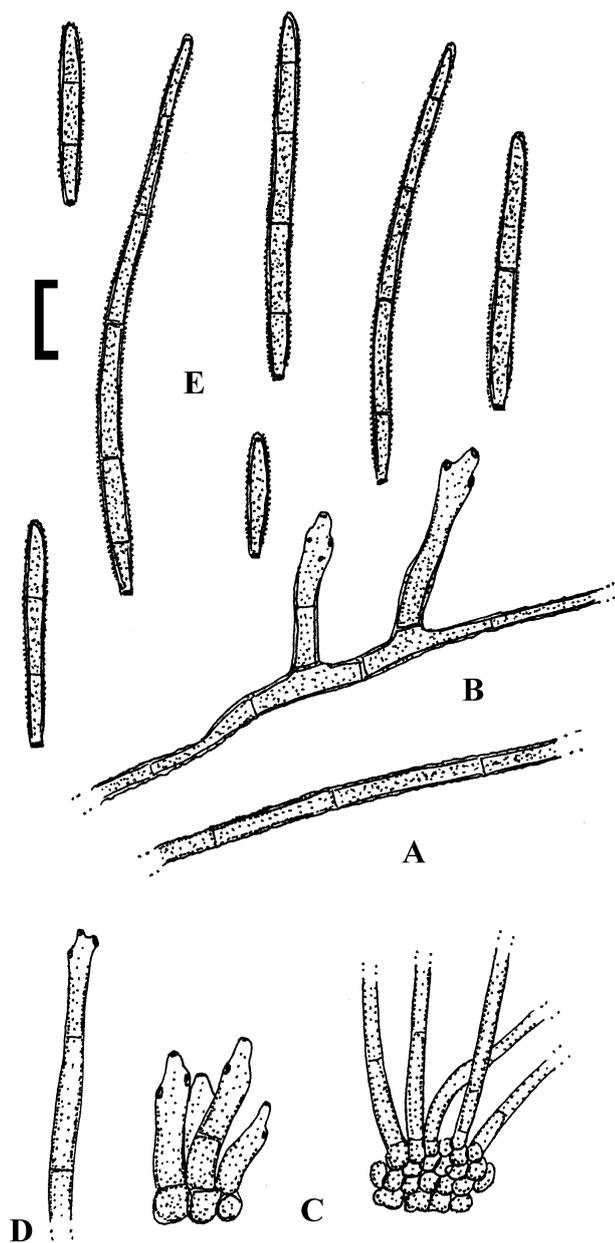
(Fig. 137)

*Basionym*: *Cercospora citri-grisea* F.E. Fisher, *Phytopathology* **51**: 300 (1961).

*Synonyms*: *Stenella citri-grisea* (F.E. Fisher) Sivan., *Bitunicate Ascomycetes and their Anamorphs*: 226 (1984).

?*Mycosphaerella citri* Whiteside, *Phytopathology* **62**: 263 (1972) [*isotype*: **USA**: Florida: University of Florida, Citrus Experimental Station, on *Citrus paradisi*, 1969, J. O. Whiteside, no. 108 (K(M) 57614), dried culture; topotype material: Jul. 1996 (K(M) IMI 141543)].

*Zasmidium citri* (Whiteside) Crous, *Persoonia* **23**: 105 (2009).



**Fig. 137.** *Zasmidium citri-griseum* (K(M) IMI 148810). **A.** Superficial hypha. **B.** Superficial hypha with solitary conidiophore. **C.** Conidiophore fascicles. **D.** Conidiophore. **E.** Conidia. Bar = 10 µm.

**Literature:** Sivanesan & Holliday (1976), Sivanesan (1984: 226), Hsieh & Goh (1990: 295), Crous & Braun (2003: 125), Pretorius *et al.* (2003), Crous *et al.* (2004: 464–465), Maxwell *et al.* (2005), Aptroot (2006: 63), Mondal & Timmer (2006), Arzanlou *et al.* (2008), Crous *et al.* (2009).

**Illustrations:** Sivanesan & Holliday (1976: fig., unnumbered), Sivanesan (1984: 227, fig. 122), Pretorius *et al.* (2003: 300, fig. 4), Crous *et al.* (2004: 465, fig. 10), Aptroot (2006: 12, fig. 194).

**Description:** On leaves, fruits and occasionally twigs, mainly causing citrus greasy spot, leaf spots amphigenous, shape and size variable, circular to angular-irregular, small to large, covering large leaf segments between margin and

mid rib, deep olivaceous, medium brown to dark brown or even blackish, tar-like, margin diffuse, yellowish green to distinct, raised, dark brown, on fruits mainly formed as blackish specks. *Colonies* amphigenous. *Mycelium* internal and external; internal hyphae hyaline to pale, superficial hyphae emerging through stomata, branched, septate, 2–3 µm wide, pale olivaceous to red-brown or medium brown, thin-walled, verruculose. *Stromata* lacking or small, external, dark brown or with small stromatic hyphal aggregations in the substomatic cavities. *Conidiophores* solitary, arising from superficial hyphae, lateral, or in loose fascicles, arising from stromatic hyphal aggregations, erect, subcylindrical, straight to somewhat flexuous or geniculate-sinuuous in the fertile portion, unbranched, 5–80 × 2.5–6 µm, 0–6-septate, deep olivaceous to red-brown or medium brown, thin-walled, smooth to verruculose; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, about 5–30 µm long, sympodial, conidiogenous loci conspicuous, flat, non-protuberant to subdentate, flat-tipped, somewhat thickened and darkened, about 1–1.5 µm wide. *Conidia* solitary or catenate, in simple or occasionally branched chains, subcylindrical to narrowly obclavate-cylindrical (0–1-septate conidia sometimes short cylindrical to ellipsoid-fusoid), straight to somewhat curved, 6–70(–120) × 2–4.5 µm, (0–)1–6(–10)-septate, pale olivaceous to pale brown, thin-walled, verruculose, apex obtuse or subobtuse to truncate in catenate conidia, base obconically truncate, 1–2 µm wide, hila thickened and darkened.

[**Holotype:** USA: Florida: Polk County, Babson Park, on *Citrus limon*, 15 Jan. 1958, F. E. Fisher (probably not preserved)]. **Neotype (designated here, MycoBank MBT178163):** USA: Florida: Lake Alfred & Haines City, on *Citrus* sp., May 1970, F. E. Fisher (K(M) IMI 148810).

**Host range and distribution:** *Acacia mangium*, Fabaceae; *Aeglopsis chevalieri*, *Citrus* (*aurantifolia*, ×*jambhiri*, *limon*, ×*microcarpa* [×*Citrofortunella mitis*], *paradisi*, *reticulata* [*tangerina*], *sinensis*, *trifoliata* [*Poncirus trifoliata*], *Citrus* spp.), *Fortunella* sp., *Murraya paniculata*, Rutaceae; *Musa* sp., Musaceae; Africa (Gabon), Asia (China [Hong Kong], Japan, Thailand, Taiwan), Australia, North America (Mexico; USA, Florida, New Jersey, Texas), South and Central America (Argentina, Bolivia, Costa Rica, El Salvador, Paraguay, Suriname, Venezuela), Oceania (Hawaii, Tonga), West Indies (Cuba, Dominican Republ., Haiti, Puerto Rico, Trinidad and Tobago, Virgin Islands).

**Notes:** According to the current ICN, *Cercospora citri-grisea* is the oldest valid name for this species and has priority. Furthermore, it is still unclear and unproven if *C. citri-grisea* and *Mycosphaerella citri* are actually conspecific. This species was regarded as a species complex by Pretorius *et al.* (2003), but maintained as a single species with wider host range in Crous *et al.* (2004), who proved by means of molecular sequence analyses that *Zasmidium citri-griseum* is able to infect *Acacia mangii* (in Thailand) and *Musa* sp. (in North America, USA, Florida). Arzanlou *et al.* (2008) listed *Musa* sp. from Tonga as host, Maxwell *et al.* (2005) revealed infections of this species on *Eucalyptus camaldulensis* in

Vietnam, and Crous *et al.* (2009) added *Eucalyptus* sp. from Thailand as proven host.

The genetic connexion between *Zasmidium citri-griseum* and *Mycosphaerella citri* is unclear, not definitively proven and may be questioned. Aptroot (2006) examined iso- and topotype material of *M. citri* and found the isotype morphologically indistinguishable from *Davidiella ammophilae*. Topotype material was re-identified as saprobic *Mycosphaerella punctiformis*. However, the *Davidiella* morphology of *M. citri* is in contradiction with the phylogenetic position of *Z. citri-griseum*, which clusters with other *Zasmidium* species in *Mycosphaerellaceae* (Pretorius *et al.* 2003, Crous *et al.* 2004, Arzanlou *et al.* 2008, Crous *et al.* 2009) and not in *Cladosporiaceae* (*Cladosporium/Davidiella* clade). *Mycosphaerella citri* is morphologically characterised as follows: *Spermogonia* formed prior to ascomata, with rod-shaped, colourless spermatia,  $2\text{--}3.5 \times 1 \mu\text{m}$ ; ascomata on decomposing leaves, amphigenous, immersed, to  $90 \mu\text{m}$  diam; *asci* broadly ellipsoid,  $25\text{--}35 \times 8\text{--}10 \mu\text{m}$ , 8-spored; *ascospores* slightly fusiform-ellipsoid to narrowly obovoid, with upper cells slightly wider,  $6\text{--}12 \times 2\text{--}3 \mu\text{m}$ ,  $\pm$  medianly 1-septate, hyaline, with minute oil droplets when fresh. Further research on the true identity of *M. citri*, and allied species in this complex is needed.

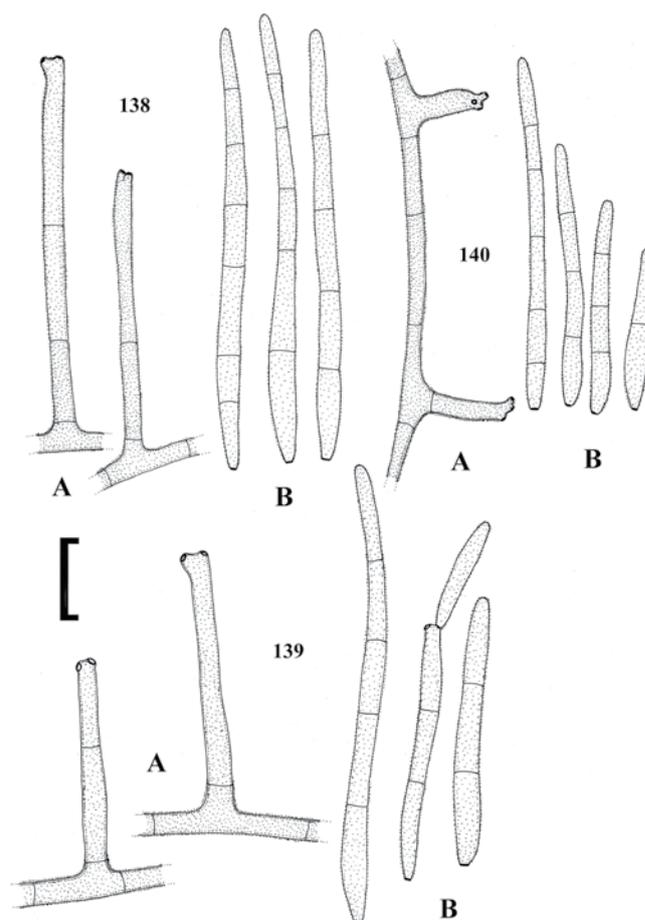
***Zasmidium musae* (Arzanlou & Crous) Crous & U. Braun, *Schlechtendalia* 20: 102 (2010).**  
(Fig. 138)

*Basionym:* *Stenella musae* Arzanlou & Crous, *Persoonia* 20: 31 (2008).

*Illustration:* Arzanlou *et al.* (2008: 31–32, figs 13, 14a).

*Description:* *In vitro* (on MEA): *Mycelium* submerged and superficial; submerged hyphae  $2\text{--}3 \mu\text{m}$  wide, thin-walled, smooth to verrucose, subhyaline to medium brown, with thin septa; aerial hyphae  $2\text{--}2.5 \mu\text{m}$  wide, coarsely verrucose, olivaceous-brown to medium brown, rather thick-walled, with thin septa. *Conidiophores* arising from superficial hyphae, erect, straight subcylindrical to geniculate-sinuuous, unbranched, to  $30 \mu\text{m}$  long and  $2\text{--}2.5 \mu\text{m}$  wide, 0–3-septate, medium brown, wall rather thick, verruculose; conidiogenous cells integrated, terminal, sometimes intercalary or conidiophores reduced to conidiogenous cells, sympodial, subcylindrical, tapering towards flat-tipped subdentate apical conidiogenous loci,  $1\text{--}1.5 \mu\text{m}$  diam, thickened and darkened. *Conidia* solitary, subcylindrical to obclavate, straight to somewhat curved,  $(7\text{--})27\text{--}40\text{--}(70) \times 1.5\text{--}3 \mu\text{m}$ , 0–7-septate, pale brown, thin-walled, verruculose, apex subobtuse, base short to long obconically truncate or subtruncate,  $1\text{--}1.5 \mu\text{m}$  wide, hila thickened and darkened.

*Culture characteristics:* *Colonies* on MEA reaching 30 mm after 30 d at  $24^\circ\text{C}$ , erumpent, unevenly folded, with moderate aerial mycelium and entire smooth margin, surface pale mouse-grey to mouse-grey, in reverse dark mouse-grey. *Colonies* on OA reaching 48 mm after 30 d at  $24^\circ\text{C}$ , effuse, with moderately developed aerial mycelium and entire margin, pale mouse-grey to mouse-grey, in reverse dark mouse-grey.



**Figs 138–140.** 138. *Zasmidium musae* (CBS H-2047). 139. *Z. musicola* (CBS H-2046), 140. *Z. queenslandicum* (CBS H-2050). **A.** Hyphae with conidiophores. **B.** Conidia. Bar =  $10 \mu\text{m}$ . P.W. Crous del.

*Holotype:* **Tonga:** ACIAR Plot, Tongatapu, on *Musa* cv. TU8 AAAA, Mar. 1990, R. A. Fullerton (CBS H-20047). *Ex-type culture:* CBS 122476.

*Host range and distribution:* On *Musa* sp., *Musaceae*, Oceania (Tonga), West Indies (St. Lucia).

*Notes:* This and all other *Zasmidium* species on banana are only known *in vitro*. All of them are morphologically similar and only gradually differentiated, but, on the other hand, genetically clearly distinct and form separate clusters, even in pure ITS analyses (Arzanlou *et al.* 2008). There is a fourth unnamed *Zasmidium* species discussed and illustrated in Stover (1994) who coined the name “*Cercospora non-violentum*” (not formally published) which was considered the asexual morph of *Mycosphaerella musae* (Speg.) Syd. & P. Syd. and a prevalent co-inhabitant with Black Leaf Streak and Sigatoka. However, the conspecificity of this *Zasmidium* and *M. musae* is uncertain and has to be proven by new collections and epitypifications of *M. musae* and other confusable *Mycosphaerella* spp. that have in the past been isolated from *Mycosphaerella* speckle symptoms on banana.

**Zasmidium musicola** (Arzanlou & Crous) Crous & U. Braun, *Schlechtendalia* **20**: 102 (2010).

(Fig. 139)

*Basionym*: *Stenella musicola* Arzanlou & Crous, *Persoonia* **20**: 33 (2008).

*Illustration*: Arzanlou et al. (2008: 32–33, figs 14c, 16).

*Description*: *In vitro* (on MEA): *Mycelium* submerged and superficial; submerged hyphae 2–3 µm wide, thin-walled, smooth to verrucose, subhyaline to olivaceous-brown, with thin septa; aerial hyphae 2–2.5 µm wide, coarsely verrucose, olivaceous-brown, rather thick-walled, with thin septa. *Conidiophores* arising from superficial hyphae, erect, straight, subcylindrical to geniculate-sinuous, unbranched, (18–) 30–36(–45) × (2–)2.5–3(–4) µm, 0–2-septate, sometimes continuous with its supporting hypha, pale brown, rather thick-walled, finely verruculose; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, smooth to verruculose, sometimes with swollen apex, sympodial, conidiogenous loci truncate, flat-tipped, 1–1.5 µm diam, thickened and darkened. *Conidia* solitary, rarely in short unbranched chains, subcylindrical to obclavate, (7–) 37–57(–120) × 2–4 µm, aseptate to pluriseptate, medium brown, thin-walled, finely verruculose, apex obtuse, base subtruncate or short to long obconically truncate, 1–1.5 µm wide, hila thickened and darkened.

*Culture characteristics*: *Colonies* on MEA reaching 28 mm after 30 d at 24 °C, effuse, slightly raised at the centre, with moderate, velvety to hairy aerial mycelium, folded, with entire smooth margin, surface pale mouse-grey to mouse-grey, in reverse dark mouse-grey. *Colonies* on OA reaching 39 mm after 30 d at 24 °C, effuse, with moderately velvety or hairy aerial mycelium and entire margin, pale mouse-grey to mouse-grey, in reverse olivaceous.

*Holotype*: **India**: *Tamila Nadu*: Tiruchirapally, on *Musa* cv. Grand Nain AAA (Cav.), *Musaceae*, 2005, I. Buddenhagen (CBS H-20046). *Ex-type culture*: CBS 122479.

*Host range and distribution*: Only known from the type collection.

**Zasmidium queenslandicum** (Arzanlou & Crous) Crous & U. Braun, *Schlechtendalia* **20**: 103 (2010).

(Fig. 140)

*Basionym*: *Stenella queenslandica* Arzanlou & Crous, *Persoonia* **20**: 34 (2008).

*Illustration*: Arzanlou et al. (2008: 32, fig. 14b, 34, fig. 17).

*Description*: *In vitro* (on MEA): *Mycelium* submerged and superficial; submerged hyphae 2–3 µm wide, thin-walled, smooth, subhyaline to olivaceous-brown, with thin septa; aerial hyphae 2–2.5 µm wide, coarsely verrucose, olivaceous-brown, rather thick-walled, with thin septa. *Conidiophores* arising from superficial hyphae, erect, straight subcylindrical to geniculate-sinuous, unbranched, to 40 µm long, and 2–3 µm wide, 0–4-septate, pale brown, thin-walled, verruculose; conidiogenous cells integrated, terminal or

conidiophores reduced to conidiogenous cells, sympodial, smooth to finely verruculose, conidiogenous loci flat-tipped, 1 µm diam, thickened and darkened-refractive. *Conidia* solitary, subcylindrical to obclavate, straight to curved, 50–83 × 2–2.5 µm, aseptate to pluriseptate, medium brown, thin-walled, verruculose, apex obtuse or subobtuse, base short to long obconically truncate or subtruncate, 0.5–1 µm wide, hila thickened and darkened-refractive.

*Culture characteristics*: *Colonies* on MEA reaching 24 mm after 30 d at 24 °C, effuse, slightly elevated at the centre, with abundant aerial mycelium and entire smooth margin, surface mouse-grey to dark mouse-grey, in reverse dark mouse-grey. *Colonies* on OA reaching 41 mm after 30 d at 24 °C, effuse, with moderately developed aerial mycelium and entire, smooth margin, surface olivaceous-grey, in reverse iron-grey.

*Holotype*: **Australia**: *Queensland*: Mount Lewis, Mount Lewis Rd., 16° 34' 47.2" S, 145° 19' 7" E, 538 m alt, on *Musa banksii*, *Musaceae*, Aug. 2006, P. W. Crous, W. Gams & B. Summerell (CBS H-20050). *Ex-type culture*: CBS 122475.

*Host range and distribution*: Only known from the type collection.

## Nartheciaceae

### Cercospora

#### Doubtful, excluded and insufficiently known species

*Cercospora narthecii* F.L. Balf.-Browne, *Trans. & Proc. Bot. Soc. Edinburgh* **35**: 434 (1951).

*Synonyms*: *Napicladium ossifragi* Rostr., *Bot. Færøes* **1**: 316 (1901) [*neotype* (designated by Schubert et al. 2007: 135): **Denmark**: Undallslund, on *Narthecium ossifragum*, 13 Sep. 1885, E. Rostrup (CP)].

*Heterosporium magnusianum* Jaap, *Schriften Naturwiss. Vereins Schleswig-Holstein* **12**: 346 (1902) [*lectotype* (designated by Schubert et al. 2007: 135): **Germany**: Hamburg, Eppendorfer Moor, on *Narthecium ossifragum*, 12 Sep. 1887, O. Jaap (HBG)].

*Heterosporium ossifragi* (Rostr.) Lind, *Danish Fungi*: 531 (1913).

*Cladosporium magnusianum* (Jaap) M.B. Ellis, *More Dematiaceous Hyphomycetes*: 337 (1976).

*Cladosporium ossifragi* (Rostr.) U. Braun & K. Schub., *Stud. Mycol.* **58**: 133 (2007).

*Literature*: Crous & Braun (2003: 289).

*Holotype*: **UK**: *Scotland*: Southerland, Inchnadamph forest, on *Narthecium ossifragum*, June 1948, F. L. Balfour-Browne (K(M) 191244).

*Notes*: *Cercospora narthecii* was described to have long conidiophores, 100–150 × 5–6 µm, and ellipsoid, aseptate conidia, 12–15 × 4–5 µm, occasionally formed in chains, hyaline to olivaceous (Balfour-Browne 1951). Type material of this species has been examined and proved to belong to

*Cladosporium* (conidiogenous loci and hila coronate). The fructification is rather immature and the conidia resemble those of *Cladosporium herbarum*, but due to non-nodulose

conidiophores this species is probably a synonym of *Cladosporium ossifragi*, which is common on *Narthecium ossifragum*.

## Orchidaceae

### Cercospora

#### Key to *Cercospora* species on Orchidaceae

- 1 Stromata lacking or small; conidiophores very short, 10–25 µm; conidia narrow, 40–100 × 2–3 µm; on *Cephalanthera*, Europe ..... [C. cephalantherae, see Doubtful, excluded and insufficiently known species]  
 Stromata developed, 20–75 µm diam; conidiophores mostly much longer; conidia broader, 3–5 µm ..... 2
- 2 (1) Conidia subhyaline to brown; on *Eulophia* sp., India ..... [C. eulophiae, see Doubtful, excluded and insufficiently known species]  
 Conidia hyaline ..... 3
- 3 (2) Conidiophores relatively short, 10–50 µm, 0–3-septate; on *Cypripedium* and *Epipactis* spp., Europe and North America ..... C. epipactidis  
 Conidiophores much longer, usually 50–285 µm, pluriseptate; on *Habenaria* and *Pecteilis* spp. .... C. habenariicola

#### *Cercospora* species on Orchidaceae

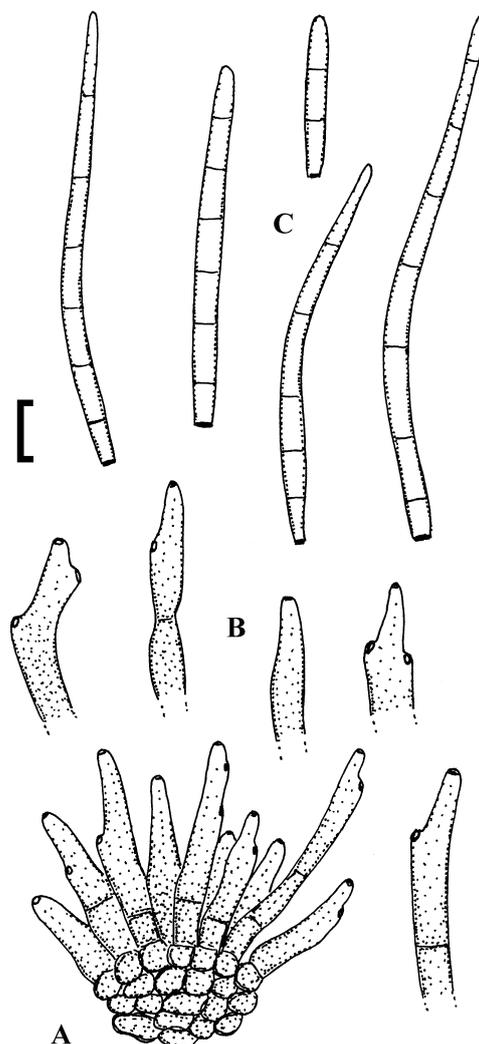
***Cercospora epipactidis*** C. Massal., *Ann. Mycol.* 9: 256 (1911).

(Fig. 141)

*Literature:* Saccardo (1913: 1430), Chupp (1954: 425), Braun & Mel'nik (1997: 58), Crous & Braun (2003: 175).

*Exsiccatae:* Syd., *Mycoth. Germ.* 2035.

*Description:* Leaf spots amphigenous, oblong or streak-like, between veins, dark purplish violet to reddish dark brown, 5–40 × 1–2 mm or confluent and larger, margin indefinite. *Caespituli* hypophyllous, punctiform to minutely pustulate, dark brown to blackish. *Mycelium* internal. *Stromata* substomatal to immersed, 20–60 µm diam, subglobose to irregular, dark brown. *Conidiophores* in small to moderately large fascicles, loose to dense, pale to medium brown, paler towards the tip, arising from stromata, through stomata or erumpent, erect, straight to curved-flexuous, geniculate-sinuous, unbranched, 10–50 × 3–6 µm, 0–3-septate, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 10–25 µm long, conidiogenous loci conspicuous, thickened and darkened, about 2–2.5 µm diam. *Conidia* solitary, cylindrical to obclavate-subcylindrical, occasionally subacicular, 25–120(–150) × 3–5 µm, 3–10-septate, hyaline, thin-walled, smooth,



**Fig. 141.** *Cercospora epipactidis* (LEP, Russia, Tersk, 2 Jul. 1914, Woronichin). **A.** Conidiophore fascicle. **B.** Conidiophores. **C.** Conidia. Bar = 10 µm.

apex obtuse to subacute, base truncate to short obconically truncate, 1.5–3 µm wide, hila thickened and darkened.

**Holotype: Italy:** S. Michele near Verona, on *Epipactis palustris*, Aug. 1910, C. Massalongo (VER).

**Host range and distribution:** On *Cypripedium guttatum*, *Epipactis (atrorubens [rubiginosa], helleborine [latifolia], palustris)*, *Orchidaceae*, Asia (Russia, West Siberia), Europe (Czech Republic, Italy, Germany, Romania, Russia), North America (USA, Florida).

**Notes:** A true *Cercospora* s. str. distinct from *C. apii* s. lat. by having obclavate-cylindrical conidia. A single Asian collection of this species from West Siberia has been examined (Novosibirsk, Tersk, on *Epipactis latifolia*, 2 Jul. 1914, Woronichin, LEP).

***Cercospora habenariicola* Meeboon, Hidayat & C. Nakash., *Mycotaxon* 99: 118 (2007).**  
(Fig. 142)

**Literature:** To-anun et al. (2011: 72), Patil et al. (2012).

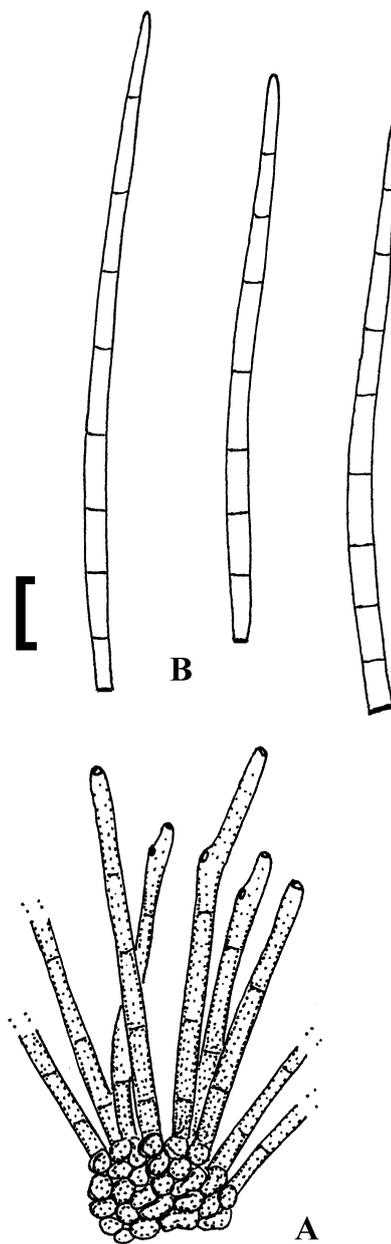
**Illustrations:** Meeboon et al. (2007: 119, figs 1–2), To-anun et al. (2011: 72, fig. 55), Patil et al. (2012; 113, figs 1–6).

**Description:** Leaf spots amphigenous, circular, subcircular to somewhat angular-irregular, about 3–30 mm diam, at first pale greenish to ochraceous, later brown to dark brown, finally with greyish brown centre and darker margin, surrounded by a brownish halo, sometimes zonate. *Caespituli* amphigenous, mainly hypophyllous, punctiform, ochre-yellow, velvety. *Mycelium* internal. *Stromata* well-developed, substomatal to intraepidermal, 25–75 µm diam, subglobose, brown to blackish brown. *Conidiophores* numerous, in loose to dense fascicles, arising from stromata, through stomata or erumpent, erect to decumbent, straight, subcylindrical, geniculate-sinuous, unbranched or rarely branched, 50–285 × 3–7.5 µm, rarely to 950 µm long, 2–9-septate, pale yellow to pale brown, wall thin or slightly thickened, smooth; conidiogenous cells integrated, terminal, sympodial, conidiogenous loci conspicuous, about 2.5–3.5 µm diam, thickened and darkened. *Conidia* solitary, subacicular to narrowly obclavate, 35–110 × 3–5 µm, mostly 3–10-septate, hyaline, thin-walled, smooth, apex pointed, base obconically truncate, 1.2–3 µm wide, hila thickened and darkened.

**Holotype: Thailand: Chiang Mai Province:** Queen Sirikit Botanic Garden, on *Habenaria susannae*, 14 Jul. 2006, J. Meeboon, JM 155 (CMU 27883).

**Host range and distribution:** On *Habenaria (heyneana, longicorniculata, roxburghii)*, *Pecteilis susannae [Habenaria susannae]*, *Orchidaceae*, Asia (India, Karnataka, Maharashtra; Thailand).

**Notes:** *Cercospora habenariicola* is characterised by having obclavate conidia, about 3–5 µm wide, with obconically truncate bases. It is not quite clear if Indian collections on all hosts recorded by Patil et al. (2012) are truly conspecific with



**Fig. 142.** *Cercospora habenariicola* (CMU 27883). **A.** Conidiophore fascicle. **B.** Conidia. Bar = 10 µm.

*C. habenariicola*. Indian specimens on *Habenaria furcifera [ovalifolia]*, *Peristylus densus*, *P. goodyeroides* as well as *Pecteilis gigantea* are described as having much narrower conidia, only 2–2.5 µm wide, which are, according to Patil et al. (2012; 113, fig. 6) rather acicular as far as longer conidia are concerned. It is possible that two different species are involved, viz. *C. habenariicola* and a *Cercospora* belonging to the *C. apii* s. lat. complex.

#### **Doubtful, excluded and insufficiently known species**

*Cercospora cephalantherae* Ondřej & Závřel, Čas. Slez. Mus. Opavě, ser. A., *Hist. Nat.*, 20: 22 (1971); as "*cephalenterae*".

**Illustration:** Ondřej & Závřel (1971: 23, fig. 2).

**Description:** Leaf spots amphigenous, brown or black, vein-limited, confluent. *Mycelium* internal. *Stromata* probably not developed. *Conidiophores* fasciculate, straight, curved or flexuous, short, unbranched, 10–25 × 3.5 µm, pale brown, septate at the base. *Conidia* solitary, obclavate-cylindrical, filiform, 40–80(–100) × 2–3 µm, hyaline, 4–8-septate, apex subacute or subobtuse, base almost truncate to short obconically truncate.

**Holotype:** **Czech Republic:** *Moravia:* Štramberk, Kotouč, on *Cephalanthera damasonium* [alba], *Orchidaceae*, 20 Aug. 1950, H. Zavřel (not preserved).

**Host range and distribution:** Only known from the type collection.

**Notes:** Ondřej & Zavřel (1971) mentioned that the type of this species is deposited at BRA, but according to the curator of this herbarium type material could not be traced. Based on the original description and illustration, this species is probably a true *Cercospora s. str.*

*Cercospora epidendronis* Bolick, *nom. nud.*

**Notes:** According to Alfieri *et al.* (1984) and Farr *et al.* (1989: 609) [on *Epidendrum* sp., USA, Florida].

*Cercospora eulophiae* M.S. Patil, *Indian Phytopathol.* **31:** 328 “1978” (1979).

**Literature:** Crous & Braun (2003: 178), Kamal (2010: 43).

**Illustration:** Patil (1978: 328, fig. 3).

**Description:** Leaf spots amphigenous, circular to angular, 3–5 mm diam, brown with pale centre. *Caespituli* hypophyllous, olivaceous-brown. *Mycelium* internal. *Stromata* 30–70 µm diam, globose, brown. *Conidiophores* in small to moderately large fascicles, 5–12, arising from stromata, erect, straight to flexuous, non-geniculate, unbranched, 50–195 × 5 µm, pluriseptate, olivaceous-brown, paler towards the tip; conidiogenous loci distinct, prominent. *Conidia* solitary, acicular, obclavate, straight to curved, 75–250 × 3.2–4 µm, 3–5-septate, subhyaline to brown, apex acute or subobtuse, base truncate to obconically truncate.

**Holotype:** **India:** *Maharashtra:* Kolhapur, on *Eulophia* sp., *Orchidaceae*, 18 Aug. 1977, M. S. Patil (HCIO 32545).

**Host range and distribution:** Only known from the type collection.

**Notes:** Type material of this species was not available for a re-examination. Details of the conidiogenous loci and conidial hila are not given in the original description and subhyaline to brown conidia are not in favour of *Cercospora s. str.*, i.e. it cannot be excluded that *C. eulophiae* belongs to another cercosporoid genus, e.g. *Pseudocercospora*. A revision of the type material is necessary.

## ***Pseudocercospora***

### **Key to *Pseudocercospora* species on *Orchidaceae***

- |       |  |                                |
|-------|--|--------------------------------|
| 1     | <i>Mycelium in vivo</i> internal and external; superficial hyphae with solitary conidiophores developed .....  | 2                              |
|       | <i>Mycelium in vivo</i> internal; superficial hyphae with solitary conidiophores lacking .....   | 4                              |
| 2 (1) | <i>Stromata</i> large, 10–100 µm diam; conidia narrow, 1.5–3 µm; on <i>Cymbidium</i> , New Zealand .....   | <b><i>P. cymbidiicola</i></b>  |
|       | <i>Stromata</i> smaller, 10–50 µm diam; conidia broader, 2–5 µm; on other hosts .....  | 3                              |
| 3 (2) | On <i>Dendrobium</i> spp. ....   | <b><i>P. dendrobii</i></b>     |
|       | On <i>Peristeria</i> spp. ....   | <b><i>P. peristeriae</i></b>   |
| 4 (1) | <i>Stromata</i> lacking or small, 10–25 µm diam; conidiophores loosely fasciculate and long,<br>50–250 × 3–6 µm, pluriseptate; on hosts of various genera .....  | <b><i>P. odontoglossi</i></b>  |
|       | <i>Stromata</i> always developed, 10–200 µm diam; conidiophores much shorter,<br>10–60 µm long, 0–3-septate .....  | 5                              |
| 5 (4) | Conidia narrow, 10–85 × 1–3 µm; on <i>Epidendrum</i> , Brazil .....  | <b><i>P. epidendri</i></b>     |
|       | Conidia broader, 2.5–5 µm .....  | 6                              |
| 6 (5) | Conidia subcylindrical to attenuated towards the apex, broadly acicular, base truncate,<br>2.5–4 µm wide; on <i>Lycaste</i> sp., Colombia .....  | <b><i>P. orchidacearum</i></b> |
|       | Conidia obclavate-cylindrical, base usually obconically truncate, (1–)1.5–2.5(–3) µm wide .....  | 7                              |
| 7 (6) | <i>Stromata</i> small, 10–40 µm diam; conidiophores 5–15 per fascicle; conidiogenous loci<br>paracercosporoid, i.e. ranging from inconspicuous to subconspicuous by being<br>slightly thickened and darkened around the ultimate rim (ring-like in front view);<br>on <i>Cypripedium</i> spp., North America ..... | <b><i>P. cypripedii</i></b>    |

Stromata larger, 20–90 µm diam; conidiophores usually numerous in dense fascicles;  
conidiogenous loci inconspicuous, unthickened, not darkened, not paracercosporoid;  
on *Cattleya*, *Jumenella*, *Odontoglossum* and *Oncidium* spp. .... ***P. angraeci***

### *Pseudocercospora* species on Orchidaceae

#### *Pseudocercospora angraeci* (Feuilleb. & Roum.) U.

Braun & Urtiaga, *Mycosphere* 4: 596 (2013)

(Fig. 143)

*Basionym*: *Cercospora angraeci* Feuilleb. & Roum., *Rev. Mycol.* 5: 177 (1883); as “*angrecl*”.

*Literature*: Saccardo (1886: 478), Chupp (1954: 424), Crous & Braun (2003: 58).

*Illustration*: Braun & Urtiaga (2013b: 597, fig. 3).

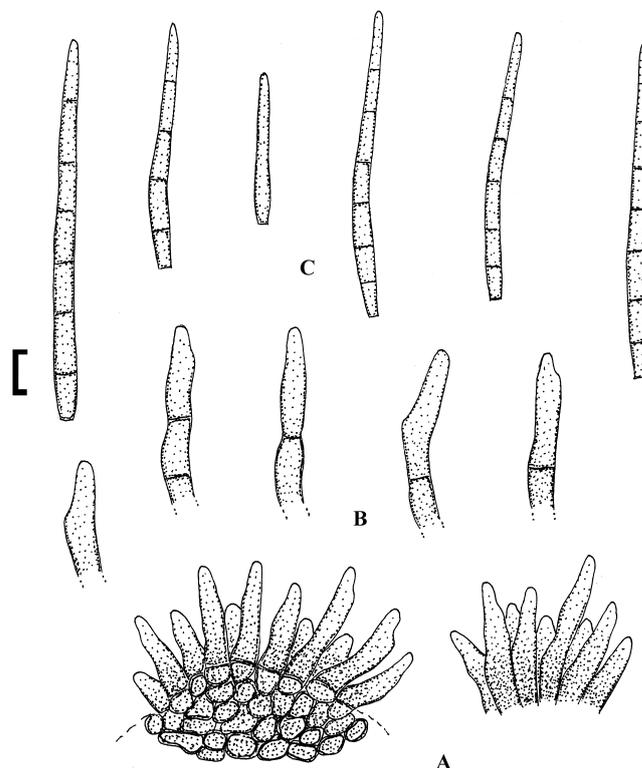
*Exsiccatae*: Roum., *Fungi Sel. Exs.* 2522.

*Description*: *Leaf spots* small to large, 1–25 mm diam or confluent and larger, subcircular to somewhat irregular, dingy grey to blackish, mainly due to abundant colonies, margin indistinct or darker. *Caespituli* amphigenous, punctiform, scattered to gregarious, dark brown to blackish. *Mycelium* internal. *Stromata* substomatal to intraepidermal or deeply immersed, large, 20–100 µm diam, medium to dark olivaceous-brown or brown. *Conidiophores* in dense fascicles, usually numerous, arising from stromata, erumpent, straight to somewhat sinuous, but not or barely geniculate, unbranched, subcylindrical to somewhat attenuated towards the tip, apex usually obtuse, (5–)10–40(–60) × 2.5–5 µm, 0–3-septate, pale to medium olivaceous or olivaceous-brown, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 10–25 µm long, sympodial or rarely percurrent, conidiogenous loci inconspicuous or visible as truncate tip, 1.5–3 µm wide, but always unthickened and not darkened. *Conidia* solitary, obclavate-cylindrical, occasionally subacicular, straight to somewhat curved, 20–85(–100) × 2.5–5 µm, (0–)2–8-septate, pale olivaceous to olivaceous-brown, thin-walled, smooth, apex obtuse to subacute, base truncate to mostly short obconically truncate, (1–)1.5–2.5(–3) µm wide, hila unthickened, not darkened.

*Syntypes*: **Réunion**: on *Jumenella fragrans* [*Angraecum fragrans*], Oct. 1882 [Roum., *Fungi Sel. Exs.* 2522] (B, LEP, PC).

*Host range and distribution*: On *Cattleya (mossiae)*, *Cattleya* sp.), *Jumenella fragrans*, *Laelia* sp., *Oncidium (alexandrae)* [*Odontoglossum crispum*], *Oncidium* sp.), *Sobralia (xantholeuca)*, *Sobralia* sp.), *Orchidaceae*, Africa (Réunion [Island of Bourbon]), Europe (France; UK, England), North America (Mexico; USA, Florida), South America (Guatemala, Venezuela).

*Notes*: All syntype collections examined were in poor condition, and not suitable to serve as a lectotype. Braun & Urtiaga (2013b) examined a collection from Venezuela,



**Fig. 143.** *Pseudocercospora angraeci* (K(M) IMI 180170). **A.** Conidiophore fascicles. **B.** Conidiophores. **C.** Conidia. Bar = 10 µm.

in better agreement with the description, on which the reallocation to *Pseudocercospora*, and the present description and illustration are based. Furthermore, some collections on *Sobralia* spp. deposited at BPI have been examined and proved to represent *P. angraeci*.

#### *Pseudocercospora cymbidiicola* U. Braun & C.F.

Hill, *Mycol. Progr.* 1: 23 (2002).

(Fig. 144)

*Literature*: Nakashima et al. (2006), Han et al. (2007).

*Illustrations*: Braun & Hill (2002: 24, fig. 5), Han et al. (2007: 127–128, figs 1–2).

*Description*: *Leaf spots* lacking or amphigenous, subcircular to irregular, later effuse, large, 5–20 mm diam or even larger, covering large leaf segments or almost entire leaves, dingy greyish brown to dark brown, margin indefinite. *Caespituli* amphigenous, variable, punctiform to subeffuse, greyish to dark brown or even blackish. *Mycelium* internal and external; superficial hyphae sparingly branched, septate, 1.5–3 µm wide, pale olivaceous, thin-walled, smooth. *Stromata* lacking, small to well-developed, 10–100 µm diam, substomatal to intraepidermal, brown. *Conidiophores* in small, loose to large, dense fascicles, arising from internal hyphae or stromata, often with numerous short conidiophores arising from

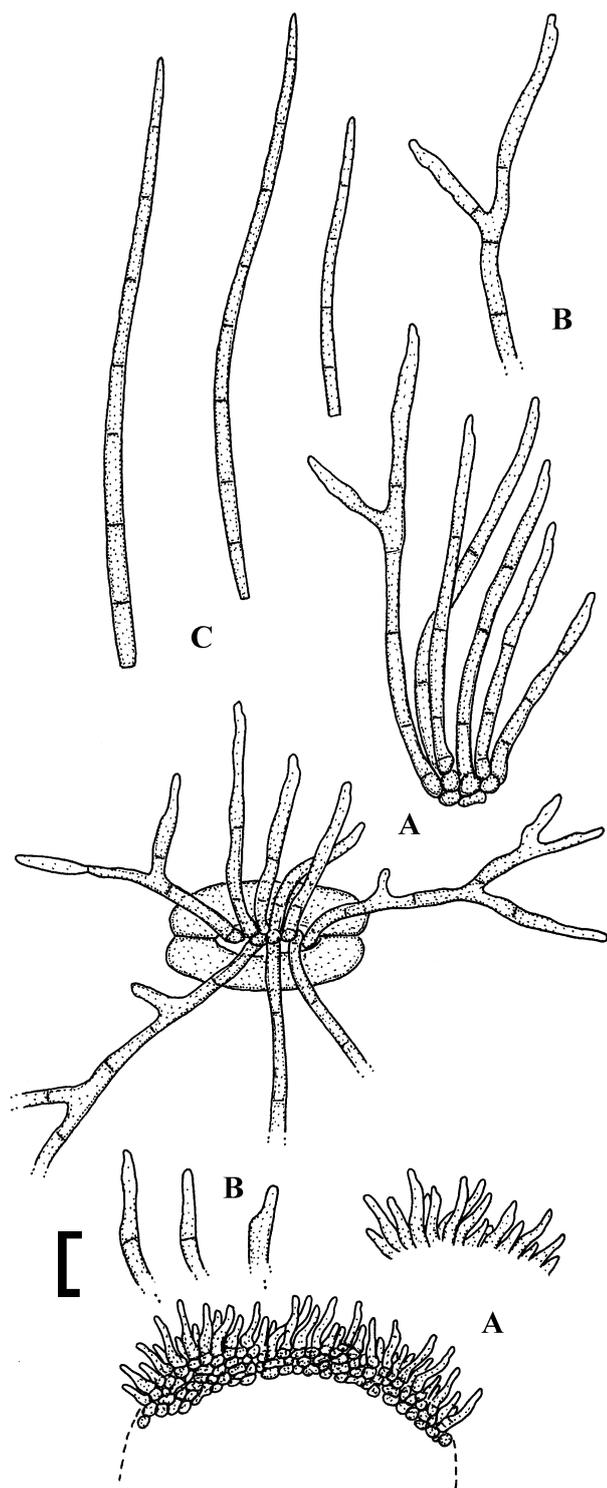


Fig. 144. *Pseudocercospora cymbidiicola* (HAL 1585 F). A. Conidiophore fascicles. B. Conidiophores. C. Conidia. Bar = 10 µm.

large stromata, forming sporodochial conidiomata, solitary conidiophores arising from superficial hyphae also formed, solitary, lateral, conidiophores erect, long conidiophores sometimes decumbent (differentiation between decumbent conidiophores and superficial hyphae often difficult), subcylindrical-filiform to somewhat geniculate-sinuous, unbranched, 5–100 × (1.5–)2–5(–5.5) µm, aseptate to pluriseptate throughout, pale olivaceous to olivaceous-brown,

thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 5–30 µm long, conidiogenous loci inconspicuous, neither thickened nor darkened. *Conidia* solitary, acicular to cylindrical-filiform, 50–110 × (1.5–)2–2.5(–3) µm, indistinctly 3–12-septate, distance between septa 5–15 µm, subhyaline to pale olivaceous, thin-walled, smooth, apex subacute, base truncate, 1.5–2 µm wide, hila neither thickened nor darkened.

**Holotype:** New Zealand: Auckland, Mt Albert, on *Cymbidium* sp., 24 Sep. 2000, C. F. Hill 303 (HAL 1585 F). **Isotype:** PDD 71965. **Paratype:** New Zealand: Auckland, Mt Eden, on *Cymbidium* sp., 19 Apr. 1979, F. J. Newhook (K(M) IMI 239798), deposited as *Pseudocercospora* sp.

**Host range and distribution:** On *Cymbidium* sp., *Orchidaceae*, Asia (Japan, Korea), New Zealand.

***Pseudocercospora cypripedii*** (Ellis & Dearn.) U. Braun & Crous, *Mycosphaerella and Anam.*: 152 (2003).

(Fig. 145)

**Basionym:** *Cercospora cypripedii* Ellis & Dearn., *Canad. Inst. Trans.* 6: 637 (1899).

**Literature:** Saccardo (1902: 1073), Chupp (1954: 425).

**Exsiccatae:** Rogerson *et al.*, *Fungi Bor.-Amer. Exs.* 317.

**Description:** *Leaf spots* oblong, spread between veins, 1–3 mm wide, dark brown to blackish, sometimes in long streaks. *Caespituli* amphigenous, often epiphyllous, punctiform, dark. *Mycelium* internal. *Stromata* substomatal to immersed, 10–40 µm diam, dark brown, composed of brown swollen hyphal cells, 2–5 µm wide. *Conidiophores* in small to moderately large fascicles, mostly 5–15, loose to mostly moderately dense, arising from stromata, through stomata or erumpent, erect, straight to curved or somewhat geniculate-sinuous, unbranched, 10–40 × 3–5 µm, 0–2-septate, pale to medium dark brown, wall thin, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 10–25 µm long, conidiogenous loci inconspicuous to subconspicuous by being paracercosporalike, i.e. with minute thickened and darkened outer rim, visible in front view as minute circle, 1–2 µm diam. *Conidia* solitary, obclavate to obclavate-cylindrical, straight to curved, 30–150 × 3–5 µm, 3–8-septate, pale olivaceous, thin-walled, smooth, apex acute to subobtuse, base subtruncate or short to long obconically truncate, 1.5–2 µm wide, hila unthickened, not darkened or at most somewhat refractive or ultimate rim slightly darker.

**Lectotype (designated here,** MycoBank MBT178164): **Canada:** *Ontario:* shore of Lake Huron near Southampton and Komoka, on *Cypripedium* sp., 20 Aug. 1898, J. Dearness 2883 (NY 838300). **Isolectotype:** DAOM.

**Host range and distribution:** On *Cypripedium* (*acale*, *calceolus*, *candidum*, *parviflorum* var. *pubescens* [*pubescens*], *reginae* [*spectabile*], *Cypripedium* sp.), *Orchidaceae*, North

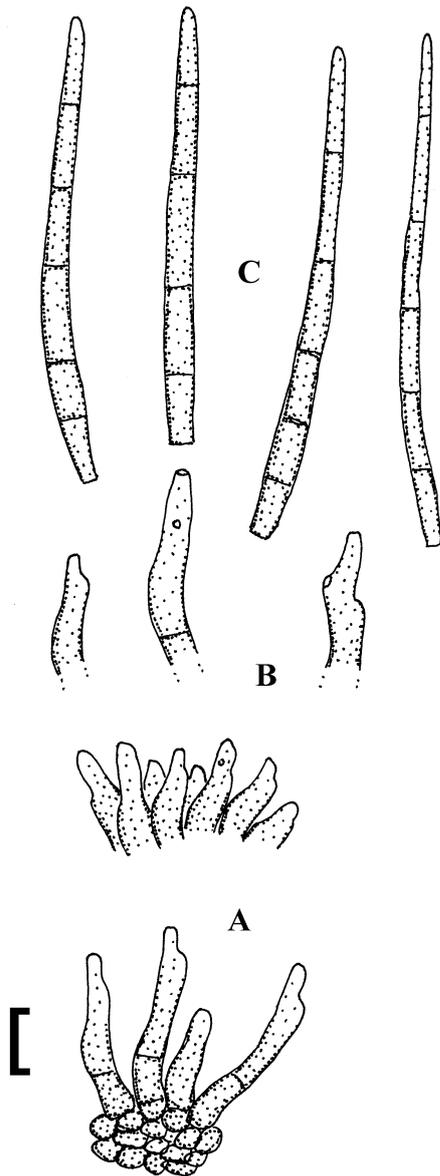


Fig. 145. *Cercospora cyripedii* (NY 838300). A. Conidiophore fascicles. B. Conidiophores. C. Conidia. Bar = 10  $\mu$ m.

America (Canada; USA, Florida, Iowa, Massachusetts, New York, Wisconsin).

Notes: Based on conidiogenous loci ranging from being inconspicuous to subconspicuous, i.e., ultimate rim slightly thickened and darkened, this species seems to be intermediate between *Cercospora* s. str. and *Passalora*. However, the loci are rather *Paracercospora*-like and the conidia are subhyaline to very pale olivaceous, so that this species is better placed in *Pseudocercospora*.

***Pseudocercospora dendrobii*** Goh & W.H. Hsieh, in Hsieh & Goh, *Cercospora and Similar Fungi from Taiwan*: 255 (1990).

(Fig. 146)

Synonyms: *Cercospora dendrobii* H.C. Burnett, *Proc. Florida State Hort. Soc.* 77: 465 "1964" (1965) [holotype: USA: Florida: Winter Haven, on *Dendrobium* sp., 17 Jan. 1962, H. C. Burnett (CUP 41041)].

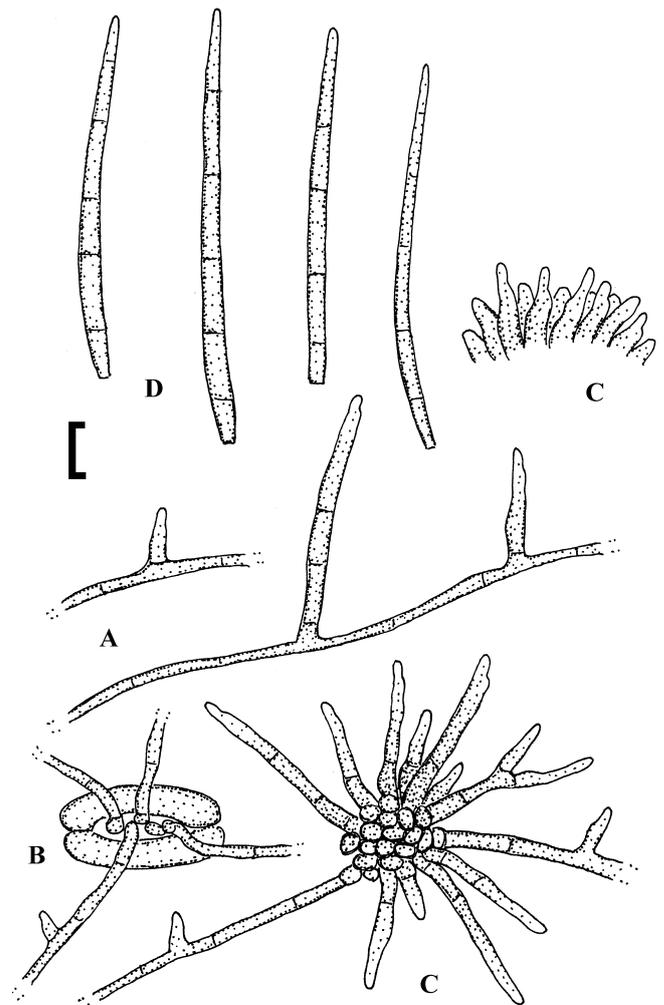


Fig. 146. *Pseudocercospora dendrobii* (CUP 41041). A. Solitary conidiophores arising from superficial hyphae. B. Superficial hyphae emerging through a stoma. C. Conidiophore fascicle. D. Conidia. Bar = 10  $\mu$ m.

*Pseudocercospora dendrobii* (H.C. Burnett) U. Braun & Crous, in Crous & Braun, *Mycosphaerella and Anam*: 452 (2003), *nom. illeg.* (ICN, Art. 53.1).

Literature: Guo & Hsieh (1995: 239), Guo et al. (1998: 250), Braun & Crous (2005: 408; 2007: 61).

Illustrations: Guo & Hsieh (1995: 240, fig. 202), Hsieh & Goh (1990: 256, fig. 196), Guo et al. (1998: 250, fig. 207), Braun & Crous (2007: 57, fig. 4).

Description: Leaf spots amphigenous, at first small, later forming large patches, 2–30 mm diam or confluent and larger, covering large leaf segments or almost entire leaves. Caespituli hypophyllous, punctiform, dense, greyish brown to medium dark brown. Mycelium internal and external; superficial hyphae branched, septate, 1.5–4.5  $\mu$ m wide, pale olivaceous to medium olivaceous-brown, thin-walled, smooth. Stromata 10–40  $\mu$ m diam, substomatal, olivaceous-brown. Conidiophores in small to moderately large fascicles, loose to dense, arising from stromata or solitary, arising from superficial

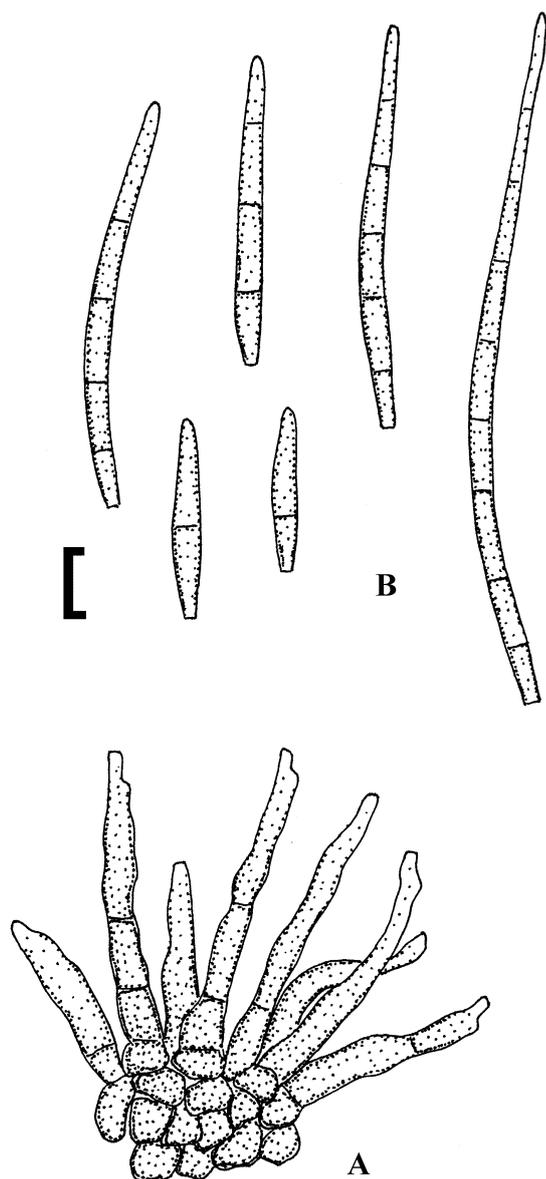


Fig. 147. *Pseudocercospora epidendri* (VIC 30553). A. Conidiophore fascicle. B. Conidia. Bar = 10  $\mu$ m.

hyphae, lateral, rarely terminal, erect to decumbent, straight, subcylindrical-conical to geniculate-sinuuous, unbranched or occasionally branched, 10–100  $\times$  2–5  $\mu$ m, continuous to pluriseptate, olivaceous to olivaceous-brown, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 10–30  $\mu$ m long, conidiogenous loci inconspicuous to subdenticulate, but always unthickened, not darkened. *Conidia* solitary, narrowly obclavate to subacicular, 15–80  $\times$  2–4.5  $\mu$ m, 3–8-septate, pale olivaceous to olivaceous-brown, thin-walled, smooth, apex subacute, base truncate to obconically truncate, (1–)1.5–2.5(–3)  $\mu$ m wide, hila neither thickened nor darkened.

**Holotype: Taiwan:** Taichung Hsien, Tali, on *Dendrobium* sp., 27 Nov. 1986, T. K. Goh (NCHUPP-233).

**Host range and distribution:** On *Dendrobium* spp., *Orchidaceae*, Asia (Japan, Taiwan), North America (USA, Florida), Hawaii.

***Pseudocercospora epidendri*** Meiriele Silva & O.L. Pereira, *Mycotaxon* 11: 898 (2011). (Fig. 147)

**Illustration:** Silva & Pereira (2011: 96–99, plates 1–6).

**Description:** *Leaf spots* amphigenous, distinct, scattered, irregular, 3–12 mm diam, pale brown, margin black. *Caespituli* hypophyllous, punctiform, brown. *Mycelium* internal. *Stromata* well-developed, immersed, later erumpent, 47.5–166  $\mu$ m wide and 57–213  $\mu$ m high, brown. *Conidiophores* in loose to dense fascicles, arising from stromata, erect, straight to curved, subcylindrical to geniculate-sinuuous, unbranched, 10–57  $\times$  2–6  $\mu$ m, 0–2-septate, brown, paler towards the tip, thin-walled, smooth; conidiogenous cells integrated, terminal, pale brown or conidiophores reduced to conidiogenous cells, conidiogenous loci inconspicuous to subdenticulate, but always unthickened, not darkened. *Conidia* solitary, obclavate-subcylindrical to subacicular, straight to curved, 10–85  $\times$  1–3  $\mu$ m, 1–9-septate, pale brown, thin-walled, smooth, apex pointed or subobtuse, base rounded or short to long obconically truncate, about 1–1.5  $\mu$ m wide, hila unthickened, not darkened.

**Holotype: Brazil: Minas Gerais:** Araponga, Parque Estadual da Serra do Brigadeiro, on *Epidendrum secundum*, *Orchidaceae*, 8 Jan. 2008, O. L. Pereira (VIC 30553). **Ex-type culture:** OLP 30553.

**Host range and distribution:** Only known from the type collection.

***Pseudocercospora odontoglossi*** (Prill. & Delacr.) U. Braun, *Mycol. Progr.* 1: 23 (2002). (Fig. 148)

**Basionym:** *Cercospora odontoglossi* Prill. & Delacr., *Bull. Soc. Mycol. France.* 9: 271 (1893).

**Literature:** Saccardo (1895: 629), Lindau (1910: 91), Chupp (1954: 426), Ellis (1976: 278), Crous & Braun (2003: 296).

**Illustration:** Ellis (1976: 277, fig. 211 A).

**Description:** *Leaf spots* lacking or indistinct, forming yellowish to brownish discolorations with indistinct margin, turning to dark olivaceous patches by abundant fructification. *Caespituli* hypophyllous, effuse, thin, velvety, dark olivaceous. *Mycelium* internal. *Stromata* lacking or only with small, substomatal stromatic hyphal aggregations, 10–25  $\mu$ m diam, brown. *Conidiophores* solitary or in small, divergent fascicles, 2–7, arising from internal hyphae or hyphal aggregations, emerging through stomata, erect, occasionally decumbent, usually distinctly to strongly geniculate-sinuuous, with constrictions, unbranched or branched, long, 50–250  $\times$  3–6  $\mu$ m, pluriseptate throughout, pale to medium dark brown, wall somewhat thickened, smooth; conidiogenous cells integrated, terminal and intercalary, 10–40  $\mu$ m long, conidiogenous loci inconspicuous to mostly conspicuous by being distinctly subdenticulate to denticulate, but wall of the loci always unthickened and not darkened. *Conidia* solitary, obclavate,

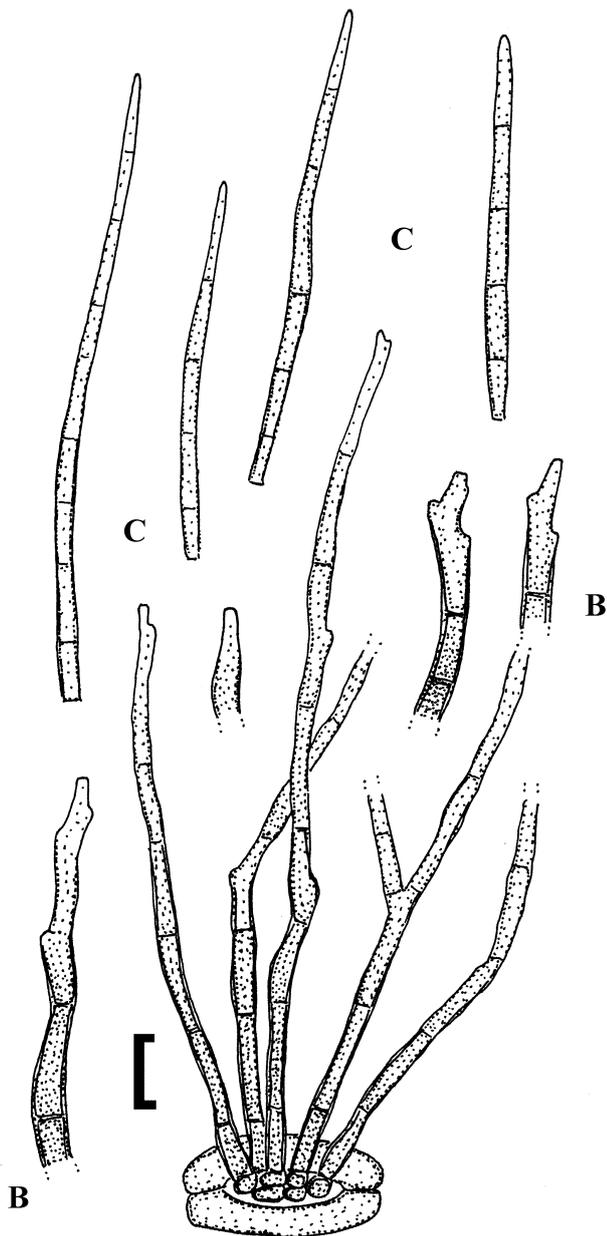


Fig. 148. *Pseudocercospora odontoglossi* (K(M) IMI 95083). A. Conidiophore fascicle. B. Conidiophore tips. C. Conidia. Bar = 10  $\mu$ m.

cylindrical-obclavate, subacicular, short conidia sometimes fusiform, 30–105  $\times$  3–5  $\mu$ m, 3–8-septate, pale olivaceous to olivaceous-brown, thin-walled, smooth, apex obtuse to acute, base truncate to obconically truncate, 1.5–3  $\mu$ m wide, hila unthickened, not darkened.

[Type: **France**: Versailles, greenhouse, on *Oncidium alexandrae* [*Odontoglossum crispum*], Ed. André (not preserved)]. **Neotype** (designated here, MycoBank MBT178165): **New Zealand**: Auckland, Mt Eden, on *Odontoglossum* sp., Apr. 1954, F. J. Newhook (K(M) IMI 95083).

**Host range and distribution**: *Brassia* sp., *Cattleya* sp., *Cymbidium* sp., *Dendrobium* sp., *Epidendrum* sp., *Laelia* sp., *Laeliocattleya* sp., *Odontoglossum* sp., *Oncidium alexandrae*,

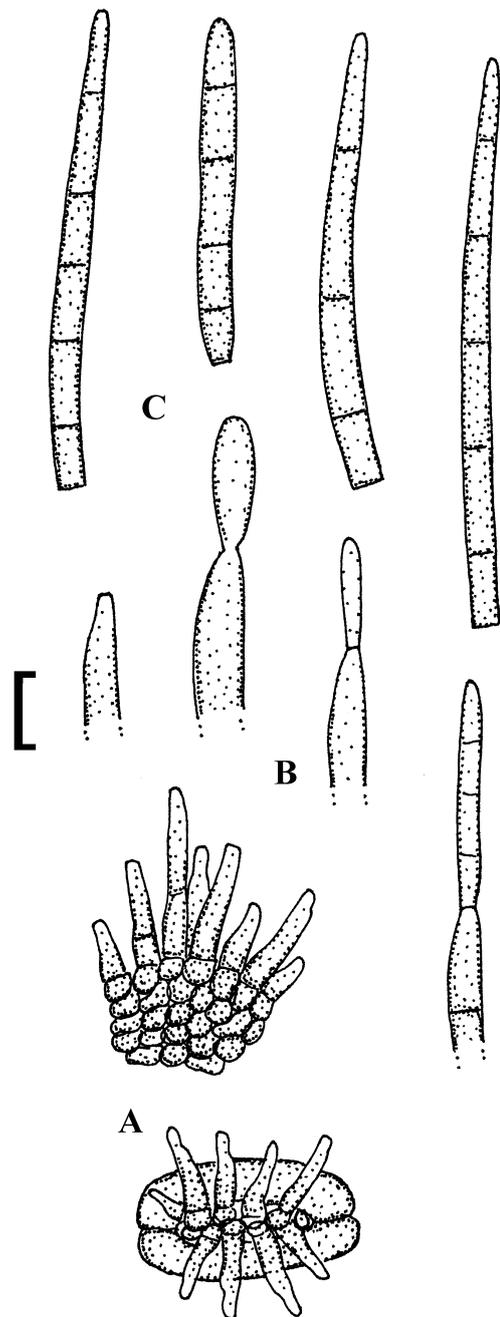


Fig. 149. *Pseudocercospora orchidacearum* (BPI 435447). A. Conidiophore fascicles. B. Conidiophores. C. Conidia. Bar = 10  $\mu$ m.

*Orchidaceae*, Europe (France, Great Britain), New Zealand, North America (Mexico; USA, Florida, Massachusetts, Texas).

***Pseudocercospora orchidacearum* U. Braun, sp. nov.**

MycoBank MB809024  
(Fig. 149)

**Diagnosis**: Distinguished from *Pseudocercospora angraeci* and *P. cyripedii* by its cylindrical to broadly acicular conidia with truncate base, 2.5–4  $\mu$ m wide, and from *P. cyripedii* in addition in having inconspicuous, non-paracercosporoid conidiogenous loci.

**Description:** *Leaf spots* amphigenous, variable, formed as oblong discolorations between veins, to 20 × 5 mm or even longer, pale to darker by abundant colonies. *Caespituli* amphigenous, punctiform, scattered, dark brown to blackish. *Mycelium* internal. *Stromata* substomatal to intraepidermal, immersed, 10–60 µm diam, medium brown, composed of swollen hyphal cells, circular to somewhat irregular in outline, 2.5–6 µm diam, wall somewhat thickened. *Conidiophores* in small to moderately large, loose to dense fascicles, arising from stromata, emerging through stomata or erumpent, erect, straight to curved, subcylindrical or somewhat attenuated towards the tip, not or barely geniculate, unbranched, apex rounded to truncate, 10–55 × 3–5 µm, with attached conidia occasionally to 70 µm long, 0–2-septate, pale olivaceous to medium olivaceous-brown, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 10–25 µm long, mostly unilocal, conidiogenous loci inconspicuous or visible as truncate apex, 2–4 µm wide, but always unthickened and not darkened. *Conidia* solitary, subcylindrical to attenuated towards the apex, i.e. broadly acicular, 25–65 × 3–4.5 µm, (2–)3–6(–7)-septate, subhyaline to pale olivaceous to olivaceous-brown, thin-walled, smooth, apex obtuse to somewhat pointed, base truncate, 2.5–4 µm wide, hila unthickened, not darkened.

**Holotype:** **Colombia:** intercepted at Miami, Florida, USA, on *Lycaste* sp., *Orchidaceae*, 3 Dec. 1951, A. S. Mills, 2275 (BPI 435447).

**Host range and distribution:** Only known from the type collection.

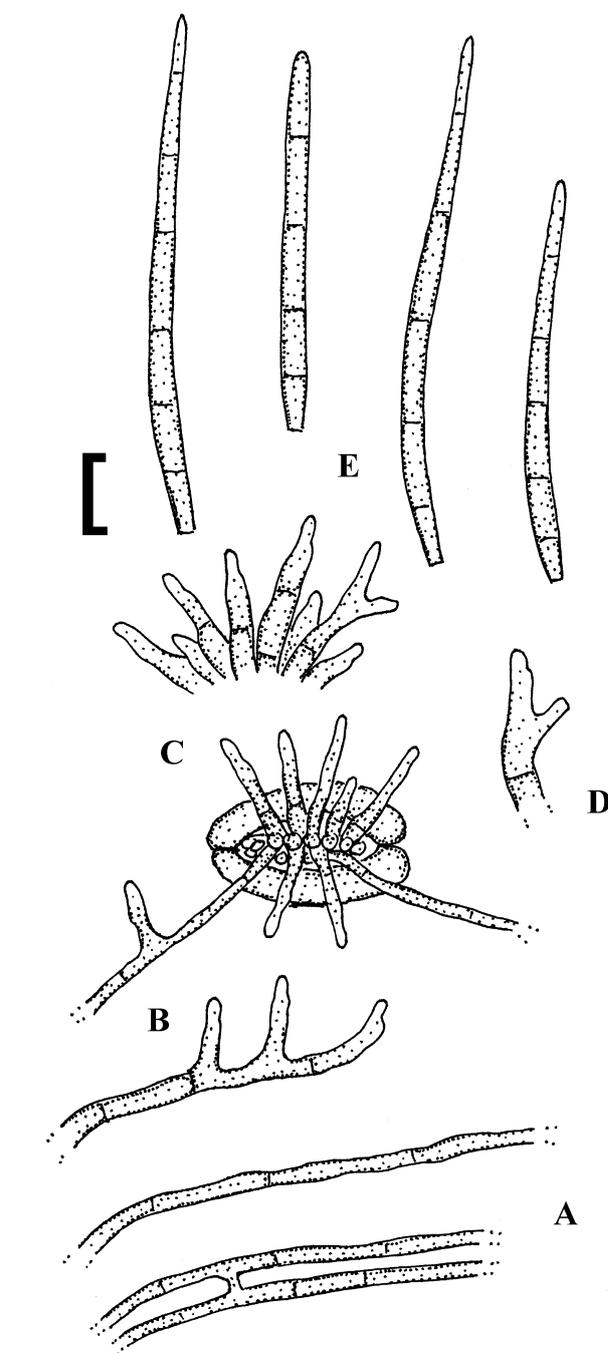
**Notes:** This species resembles *Pseudocercospora cypripedii* and *P. angraeci*, but differs in having cylindrical to broadly acicular conidia with broad truncate base, 2.5–4 µm. Furthermore, *P. cypripedii* has paracercosporoid conidiogenous loci.

***Pseudocercospora peristeriae*** (H.C. Burnett) U. Braun & Crous, *Mycosphaerella and Anam.*: 316 (2003).  
(Fig. 150)

**Basionym:** *Cercospora peristeriae* H.C. Burnett, *Proc. Florida State Hort. Soc.* **77**: 465 “1964” (1965).

**Synonym:** *Cercospora peristeriae* H.C. Burnett, *Bull. State Pl. Board Florida* **12**: 16 (1958), *nom. inval.* (ICN, Art. 39.1).

**Description:** *Leaf spots* amphigenous, large, oblong to irregular, 5–50 mm diam, brown, margin indefinite. *Caespituli* hypophyllous, punctiform to confluent and dense or subeffuse, dingy greyish brown to medium brown. *Mycelium* internal and external; superficial hyphae branched, occasionally anastomosing, septate, subhyaline to pale olivaceous, thin-walled, smooth, 1.5–4.5 µm wide. *Stromata* substomatal, 10–50 µm diam, immersed to erumpent, brown. *Conidiophores* in small to moderately large fascicles, loose to moderately dense, arising from stromata, through stomata or solitary, arising from superficial hyphae, lateral or occasionally terminal, erect to decumbent, subcylindrical, conical, straight, curved,



**Fig. 150.** *Pseudocercospora peristeriae* (CUP 41003). **A.** Superficial hyphae. **B.** Superficial hyphae with solitary conidiophores. **C.** Conidiophore fascicles. **D.** Conidiophores. **E.** Conidia. Bar = 10 µm.

flexuous to geniculate-sinuous, simple or branched, with swellings and constrictions, 10–60 × 2.5–6 µm, 0–3-septate, subhyaline, pale olivaceous to olivaceous-brown, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 10–25 µm long, conidiogenous loci inconspicuous, unthickened, not darkened. *Conidia* solitary, narrowly obclavate to obclavate-cylindrical, rarely subacicular, 40–100 × 2–5 µm, 3–8-septate, subhyaline to pale olivaceous, apex subacute to subobtuse, base subtruncate to short obconically truncate, 1–2 µm wide, hila unthickened, not darkened.

[Type: USA: Florida: on *Peristeria elata* (CUP '3580'), not traced]. Neotype (designated here, MycoBank MBT178166): USA: Florida: Gainesville, on *Peristeria elata*, Apr. 1957, H. C. Burnett (CUP 41003).

**Host range and distribution:** On *Peristeria elata* and an unnamed orchid, *Orchidaceae*, North America (USA, Florida).

**Notes:** Burnett (1965) cited "CUP 3580" without any other details of this collection as type. This collection could not

be traced at CUP, but another authentic sample marked as "*Cercospora* sp. nov." (on *Peristeria elata*, USA, Florida, Gainesville, Apr. 1957, H.C. Burnett, CUP 41003) was found, which is designated as neotype. Based on the examination of this collection, it could be demonstrated that this fungus belongs in *Pseudocercospora* (conidiogenous loci inconspicuous). Some superficial hyphae with solitary conidiophores, not described by Burnett (1965), were also observed. *Pseudocercospora peristeriae* and *P. dendrobii* are morphologically very similar.

## Zasmidium

### Key to *Zasmidium* species on *Orchidaceae*

- Conidiophores consistently solitary, arising from superficial hyphae, 3–80 × 1.5–5 μm, fasciculate conidiophores not developed; conidia 4–140 × 1–4 μm; on *Vanda*, Asia ..... **Z. orchidacearum**
- Conidiophores solitary as well as fasciculate, longer and broader, 60–230 × 5–7 μm; conidia shorter and broader, 17–55 × 5–6 μm; on *Cyrtopodium*, South America ..... **Z. cyrtopodii**

### *Zasmidium* species on *Orchidaceae*

***Zasmidium cyrtopodii*** (Dorn.-Silva, Pereira-Cavalho & Dianese) U. Braun & Dianese, **comb. nov.**

MycoBank MB809029

(Fig. 151)

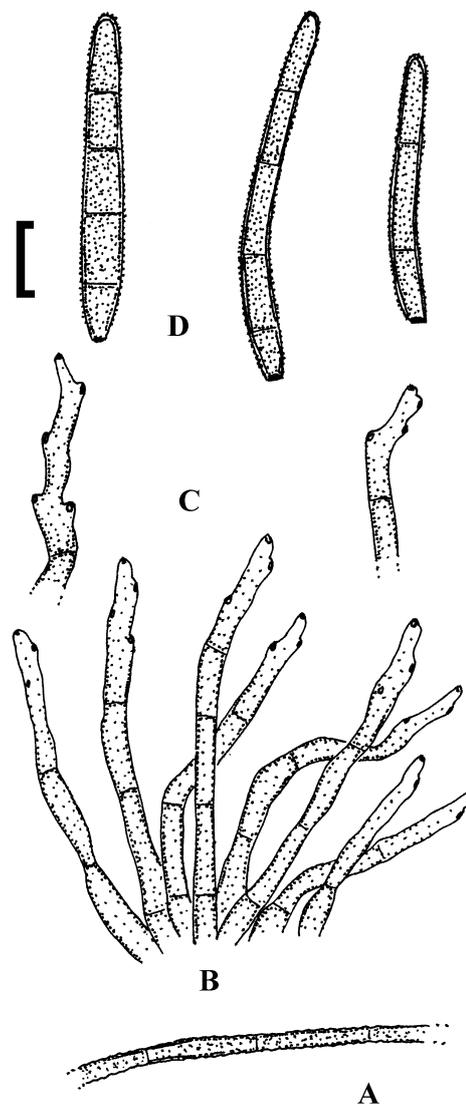
**Basionym:** *Stenella cyrtopodii* Dorn.-Silva, Pereira-Cavalho & Dianese, *Mycologia* **99**: 756 (2008).

**Illustration:** Dornelo-Silva et al. (2008: 758, figs 22–30).

**Description:** Leaf spots amphigenous, elliptical, 5–25 × 3–10 mm, sometimes confluent, dark brown. Colonies amphigenous, effuse, velutinous, downy, olivaceous-brown to brown. Mycelium internal and external; internal hyphae intercellular, branched, septate, 5–7 μm wide, sometimes moniloid, dark brown; superficial hyphae branched, septate, 3–4 μm wide, light brown to brown, verruculose. Stromata well-developed, subcuticular, immersed to somewhat erumpent, about 25–50 μm diam, *textura angularis*, cells 3–9 μm diam, brown. Conidiophores fasciculate, arising from stromata, 60–230 × 5–7 μm, or solitary, arising from superficial hyphae, lateral or terminal, 9–28 μm long, conidiophores erect, almost straight to somewhat curved, geniculate-sinuuous, unbranched, pigmented, wall smooth; conidiogenous cells integrated, terminal and intercalary, with 1–8 conspicuous conidiogenous loci, thickened and darkened. Conidia solitary or in short chains, cylindrical or subcylindrical, straight, 17–55 × 5–6 μm, 2–7-septate, pigmented, verruculose, apex obtuse, rounded, base short obconically truncate, hila thickened and darkened.

**Holotype:** Brazil: Distrito Federal: Planaltina, Estação Ecológica de Águas Emendadas, on *Cyrtopodium eugenii*, 23 Jan. 1998, D. Dornelo-Silva 9 (UB, Mycol. Coll. 15854).

**Host range and distribution:** On *Cyrtopodium eugenii*, *Orchidacearum*, South America (Brazil).



**Fig. 151.** *Zasmidium cyrtopodii* (UB, Myc. Coll. 15854). **A.** Superficial hypha. **B.** Conidiophore fascicle. **C.** Conidiophores. **D.** Conidia. Bar = 10 μm.

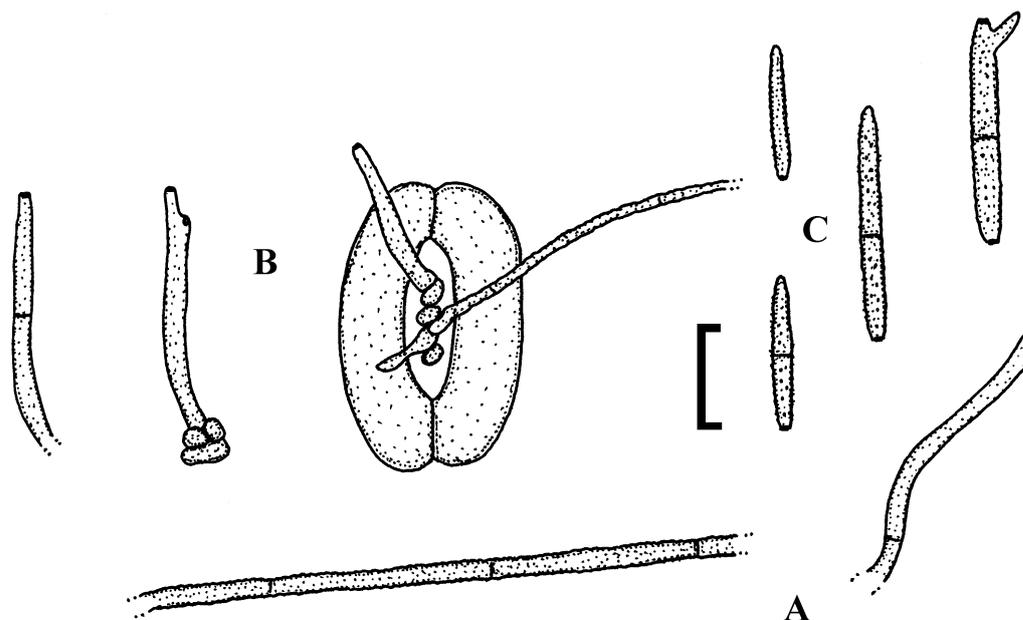


Fig. 152. *Zasmidium orchidacearum* (HAL 1595 F). A. Superficial hyphae. B. Conidiophores. C. Conidia. Bar = 10  $\mu$ m.

***Zasmidium orchidacearum*** (U. Braun & Sivap.) U. Braun, *Schlechtendalia* **20**: 102 (2010). (Fig. 152)

*Basionym*: *Stenella orchidacearum* U. Braun & Sivap., *Fungal Diversity* **3**: 23 (1999).

*Illustration*: Braun & Sivapalan (1999: 25, fig. 15).

*Description*: *Leaf spots* lacking, diffuse or subcircular to irregular and large, to 4  $\times$  1.5 cm, dingy greyish brown, margin indefinite. *Colonies* hypophyllous, effuse, thin and inconspicuous to velvety, dull greyish brown. *Mycelium* internal and external; superficial hyphae branched, septate, 1–3.5  $\mu$ m wide, subhyaline, pale yellowish, olivaceous-brown or pale brown, thin-walled, verruculose. *Stromata* lacking to well-developed, substomatal or intraepidermal, 10–50  $\mu$ m diam, brown. *Conidiophores* solitary, arising from superficial hyphae, lateral and occasionally terminal, rarely in small, loose fascicles, arising from stromata or erumpent through the cuticle, erect, straight, unbranched, subcylindrical to strongly geniculate-sinuous, nodulose, 3–80  $\times$  1.5–5  $\mu$ m, 0–5-septate, pale olivaceous, olivaceous-brown to medium brown, thin-walled, smooth or almost so; conidiogenous

cells integrated, terminal or intercalary, 3–30  $\times$  1.5–4  $\mu$ m, proliferation mostly sympodial, occasionally percurrent; conidiogenous loci often aggregated, minute, 0.5–1.5  $\mu$ m diam, planate, somewhat thickened and darkened. *Conidia* solitary, cylindrical-filiform, occasionally narrowly obclavate, small conidia fusiform or narrowly ellipsoid-ovoid, 4–140  $\times$  1–4  $\mu$ m, 0–10-septate, subhyaline, pale olivaceous or olivaceous-brown, thin-walled, verruculose, apex obtuse to subacute, base truncate or somewhat obconically truncate, 0.5–3  $\mu$ m wide, hila slightly thickened and darkened.

*Holotype*: **Malaysia**: *Sabah*: Jesselton, on *Vanda* sp., 25 Feb. 1966, *Tay Eng Bok*, PP 630/60 (K(M) IMI 119139). *Paratypes*: **Brunei**: Tutong, on leaves of an unidentified orchid, 26 Aug. 1996, *H. Fuziah* 7733 (HAL 1595 F, Hb. Brunei Agricultural Research Centre, Kilanas, Brunei).

*Host range and distribution*: Only known from the type collections.

*Notes*: *Stenella* sp. on *Vanda* sp. was reported by Peregrine & Ahmad (1982). This material could not be traced, but another collection on *Vanda* sp. from Sabah has been examined.

## Pontederiaceae

### Cercospora

#### Key to *Cercospora* species on *Pontederiaceae*

- 1 Conidiophores uniformly short and aseptate, 5–25  $\times$  1.5–4  $\mu$ m, hyaline to only faintly pigmented, pale yellowish to very pale brownish; conidia acicular to narrowly subcylindrical, short and narrow, 15–45  $\times$  1–2.5  $\mu$ m, only with 1–2(–3) septa; on *Pontederia cordata* ..... **C. pontederiae**
- Conidiophores much longer and pluriseptate, to 375  $\mu$ m; conidia also much longer, wider and pluriseptate, 25–350  $\times$  2–5  $\mu$ m; on *Eichhornia crassipes* ..... 2

- 2 (1) Conidia subacicular-filiform to narrowly obclavate, base of most conidia short to long obconically truncate, narrow, 1.5–2 µm wide ..... **C. piaropi**  
 Conidia acicular, base truncate, 2.5–4 µm wide ..... **C. rodmanii**

### *Cercospora* species on *Pontederiaceae*

***Cercospora piaropi*** Tharp, *Mycologia* 9: 113 (1917).

(Fig. 153)

*Synonym:* *Cercosporina piaropi* (Tharp) Sacc., *Syll. Fung.*

25: 914 (1931).

*Literature:* Saccardo (1931: 914), Chupp (1954: 457), Vasudeva (1963: 165), Crous & Braun (2003: 324), Kamal (2010: 75), Conway (1976a), Groenewald *et al.* (2010, 2013), Montenegro-Calderón *et al.* (2011).

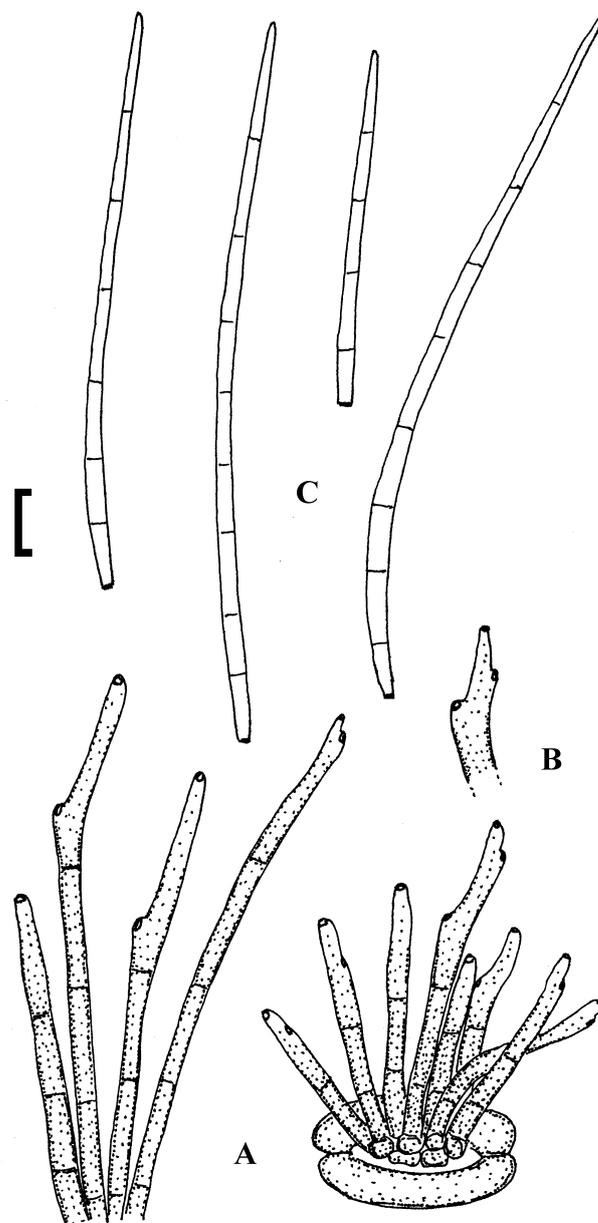
*Illustration:* Conway (1976a: 1081, figs 1 right, 4–5).

*Description:* Leaf spots amphigenous, subcircular to oval, 0.5–5 mm diam, dark brown, later with paler brown or greyish brown centre and darker margin. *Caespituli* amphigenous, often epiphyllous. *Mycelium* internal. *Stromata* lacking or small, formed as small, substomatal aggregations of swollen hyphal cells, brown, 10–20 µm diam. *Conidiophores* solitary or in small fascicles, 2–10, arising from internal hyphae or stromatic hyphal aggregations, through stomata, erect, straight, subcylindrical to curved, moderately geniculate-sinuuous, unbranched, 10–200 × 2.5–5 µm, continuous to pluriseptate, brown to medium brown throughout or paler towards the tip, wall thin or almost so, smooth; conidiogenous cells integrated, terminal, occasionally intercalary, about 10–40 µm long, conidiogenous loci conspicuous, 1.5–2.5 µm diam, thickened and darkened. *Conidia* solitary, subacicular-filiform to narrowly obclavate, 25–220 × 2–4(–5) µm, 2- to pluriseptate, hyaline, thin-walled, smooth, apex pointed, base almost truncate to usually short to long obconically truncate, 1.5–2 µm wide, hila thickened and darkened.

*Holotype:* USA: Texas: Palestine, on *Eichhornia crassipes*, 30 Oct. 1914, Lewis & Tharp, 183 (BPI 439685).

*Host range and distribution:* On *Eichhornia crassipes*, *Pontederiaceae*, Africa (South Africa, Nigeria, Zambia), Asia (India, Bihar, Karnataka; Sri Lanka), North America (Mexico; USA, Florida, Louisiana, Texas), South America (Brazil, Venezuela).

*Notes:* A true *Cercospora* s. str. distinct from *C. apii* s. lat. and *C. rodmanii* by having narrowly obclavate-filiform conidia with obconically truncate base, only 1.5–2 µm wide. Several collections from Brazil, India, South Africa and Sri Lanka have been examined, but it is not clear if all records of *C. piaropi* pertain to this species. It is possible that some of them refer to *C. rodmanii*. *Cercospora piaropi* and *C. rodmanii* are two very similar, confusable species on *Eichhornia*. Tessmann *et al.* (2001) reduced *C. rodmanii* to synonym with *C. piaropi*, but based on results of molecular sequence analyses and morphology, Braun & Crous (2001), Groenewald *et al.* (2010,



**Fig. 153.** *Cercospora piaropi* (BPI 439685). **A.** Conidiophore fascicles. **B.** Conidiophore tip. **C.** Conidia. Bar = 10 µm. U. Braun del.

2013) and Montenegro-Calderón *et al.* (2011) confirmed that two separate species are involved. *Cercospora piaropi*, characterised by its mostly narrowly obclavate-filiform conidia with obconically truncate base, belongs to a clade treated as "*Cercospora* cf. *flagellaris*" in Groenewald *et al.* (2010) and was proven to be biologically confined to *Eichhornia* as host (Montenegro-Calderón *et al.* 2011), whereas *C. rodmanii*, a *C. apii*-like species with acicular conidia and truncate base, forms a clade of its own, but differs biologically by being plurivorous, which is not surprising for a species of the *C. apii* complex.

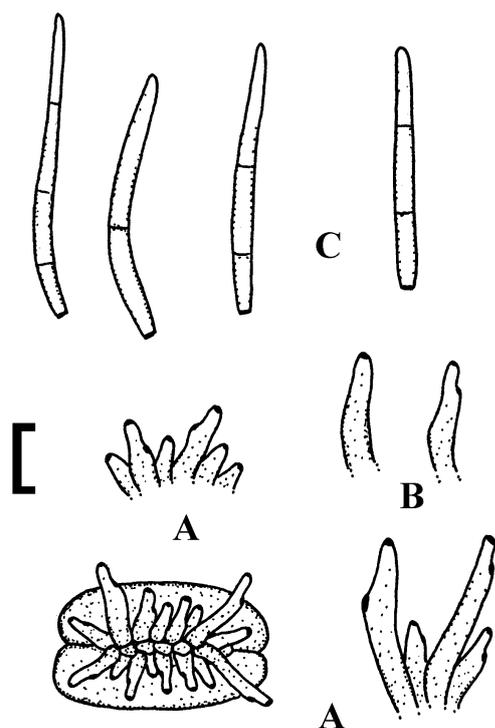


Fig. 154. *Cercospora pontederiae* (DAOM, Dearness 1800). A. Conidiophore fascicles. B. Conidiophores. C. Conidia. Bar = 10  $\mu$ m.

***Cercospora pontederiae*** Ellis & Dearn., *Canad. Rec. Sci.* 5: 270 (1893).

(Fig. 154)

*Synonym:* *Cercosporella pontederiae* (Ellis & Dearn.) Davis, *Trans. Wisconsin Acad. Sci.* 22: 182 (1926).

*Literature:* Saccardo (1895: 629), Chupp (1954: 458), Braun (1995a: 126), Crous & Braun (2003: 333).

*Illustration:* Braun (1995: 125, fig. 111).

*Description:* Leaf spots amphigenous, irregular, indefinite, brownish to reddish brown discolorations. *Caespituli* usually epiphyllous, inconspicuous. *Mycelium* internal; hyphae narrow, branched, septate, subhyaline. *Stromata* formed as small substomatal hyphal aggregations, hyaline to faintly pigmented, composed of a few slightly swollen hyphal cells. *Conidiophores* in small, loose to dense fascicles, arising from internal hyphae or hyphal aggregations, emerging through stomata, straight, subcylindrical to geniculate-sinuous, unbranched, 5–25  $\times$  1.5–4  $\mu$ m, aseptate, hyaline to faintly pigmented, pale yellowish to very pale brownish, thin-walled, smooth; conidiophores reduced to conidiogenous cells, conidiogenous loci conspicuous but minute, 1–1.5  $\mu$ m diam, thickened and darkened. *Conidia* solitary, acicular to narrowly subcylindrical, 15–45  $\times$  1–2.5  $\mu$ m, 1–2(–3)-septate, hyaline, thin-walled, smooth, apex subacute, base  $\pm$  truncate, 0.8–2  $\mu$ m wide, thickened and darkened.

*Lectotype* (designated by Braun 1995: 126): **Canada:** Ontario: Niagara-on-the-Lake, on *Pontederia cordata*, 8 Aug. 1891, J. Dearness, no. 1800 (DAOM).

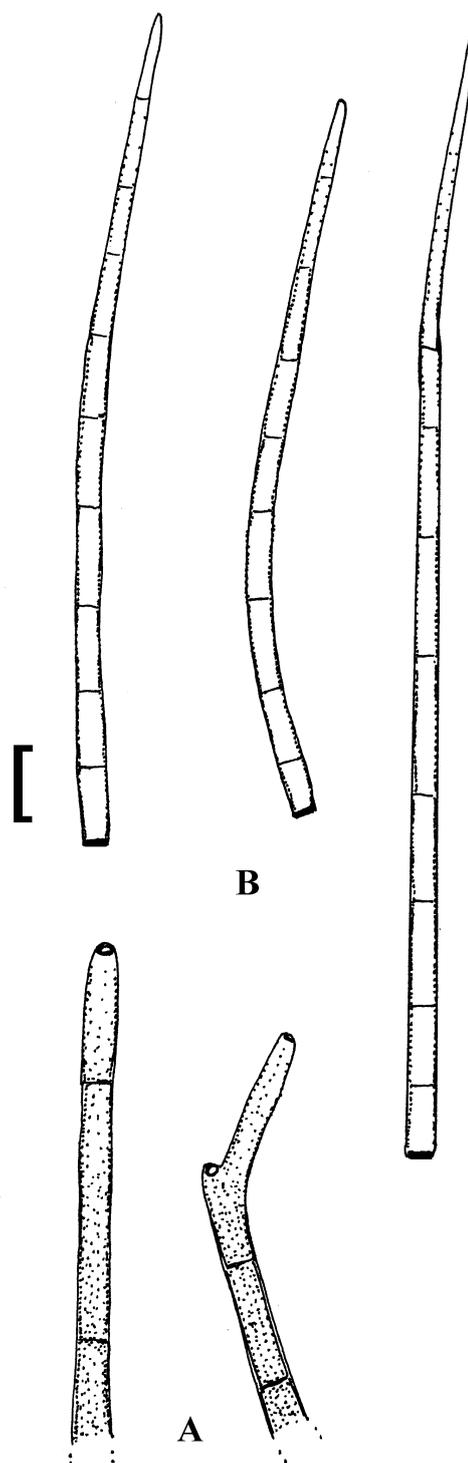


Fig. 155. *Cercospora rodmanii* (BPI 440487). A. Conidiophores. B. Conidia. Bar = 10  $\mu$ m.

*Host range and distribution:* On *Pontederia cordata*, *Pontederiaceae*, North America (Canada; USA, Texas, Wisconsin).

***Cercospora rodmanii*** Conway, *Canad. J. Bot.* 54: 1082 (1976).

(Fig. 155)

*Literature:* Crous & Braun (2003: 356), Groenewald *et al.* (2010, 2013), Montenegro-Calderón *et al.* (2011).

*Illustration:* Conway (1976a: 1081, fig. 1 left, 2–3).

*Description:* Leaf spots punctiform to circular or subcircular, 1–3 mm diam, sometimes confluent and larger, blackish, causing chlorosis of leaves and petioles. *Caespituli* amphigenous. *Mycelium* internal. *Stromata* small, but mostly developed, substomatal to immersed, 10–30 µm diam, brown. *Conidiophores* in fascicles, 3–12, arising from stromata, through stomata or erumpent, erect, straight, subcylindrical to somewhat geniculate-sinuuous, unbranched, 65–375 × 4–5 µm, pluriseptate, brown, wall thin or almost so, smooth; conidiogenous cells integrated, terminal, conidiogenous loci conspicuous, about 2.5–3.5 µm diam, thickened and darkened. *Conidia* solitary, acicular, straight to curved, 60–350 × 4–5 µm, pluriseptate, hyaline, thin-walled, smooth, apex pointed, base truncate, 2.5–4 µm, hila thickened and darkened.

*Holotype:* USA: Florida: Lake Alice, Gainesville, University of Florida Campus, on *Eichhornia crassipes*, 19 Nov. 1974, K. E. Conway (BPI 440487).

*Host range and distribution:* On *Eichhornia crassipes*, *Pontederiaceae*, Africa (South Africa, Zambia), North America (Mexico; USA, Florida, Texas), South America (Brazil, Venezuela).

*Notes:* A true, plurivorous species of *Cercospora* s. str. belonging to the *C. apii* s. lat. complex, distinct from *C. piaropi* by having acicular conidia with truncate base. Tessmann et al. (2001) considered *C. rodmanii* a synonym of *C. piaropi*, but the two species are genetically and morphologically distinct (see *C. piaropi*).

## Smilacaceae

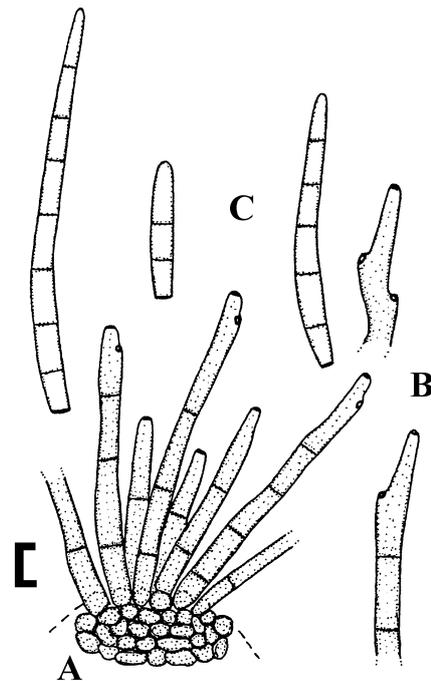
### Cercospora

A single species.

***Cercospora smilacigena*** U. Braun & Crous,  
*Mycotaxon* 92: 398 (2005).  
(Fig. 156)

*Illustration:* Braun & Crous (2005: 397, fig. 3).

*Description:* Leaf spots amphigenous, subcircular to irregular, 2–10 mm wide, centre pale greenish, whitish, yellowish to ochraceous, later becoming darker by abundant fructification, with narrow margin or halo, brownish, reddish, purple-violet, occasionally somewhat raised. *Caespituli* amphigenous, punctiform, dark brown, scattered to dense. *Mycelium* internal. *Stromata* substomatal to intraepidermal, erumpent, 10–150 µm diam, medium brown, composed of swollen hyphal cells, 2–8 µm diam. *Conidiophores* in small to mostly large fascicles, mostly more or less loose, arising from stromata, erect, straight, subcylindrical to somewhat geniculate-sinuuous, unbranched, 20–110 × 3–8 µm, pluriseptate, subhyaline to paler olivaceous or olivaceous-brown, smooth, wall thin to slightly thickened; conidiogenous cells integrated, terminal,



**Fig. 156.** *Cercospora smilacigena* (NY 945706). **A.** Conidiophore fascicle. **B.** Conidiophore tips. **C.** Conidia. Bar = 10 µm.

occasionally intercalary, 10–60 µm long, conidiogenous loci conspicuous, thickened and darkened, 2–3 µm diam. *Conidia* solitary, obclavate-cylindrical, 25–100 × 4–7 µm, (1–)3–8(–12)-septate, colourless, smooth, thin-walled, apex obtuse, base truncate to usually obconically truncate, 2–3 µm wide, hila thickened and darkened.

*Holotype:* Colombia: Bonda, on leaves of *Smilax* sp., *Smilacaceae*, 16 Nov. 1898, C. F. Baker 98 (NY 945706).

*Host range and distribution:* Only known from the type collection.

### Doubtful, excluded and insufficiently known species

*Cercospora miyakei* Henn., *Bot. Jahrb. Syst.* 37: 166 (1906).

(Fig. 157)

*Synonym:* ***Exosporium miyakei*** (Henn.) U. Braun & C. Nakash., **comb. nov.**

MycoBank MB809016

*Basionym:* *Cercospora miyakei* Henn., *Bot. Jahrb. Syst.* 37: 166 (1906).

*Literature:* Saccardo (1913: 1429), Chupp (1954: 350), Katsuki (1965: 43).

*Illustration:* Chupp (1954: 349, fig. 143).

*Description:* Leaf spots amphigenous, circular to angular-irregular, 2–6 mm diam, often vein-limited, confluent, pale to medium dark brown or with paler centre, surrounded by a dark margin, dark brown to blackish, occasionally entire spots

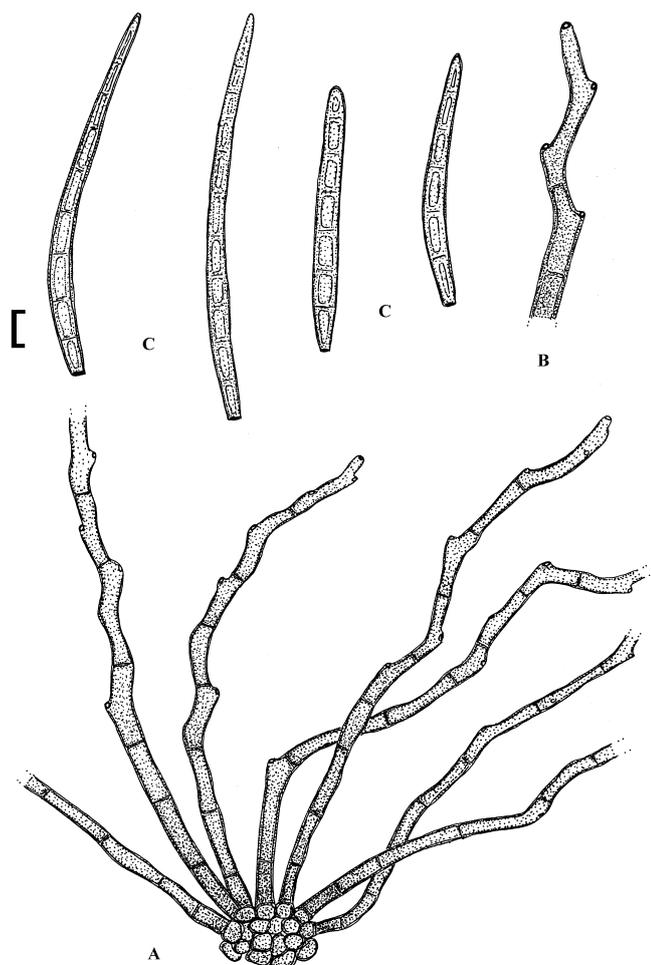


Fig. 157. *Exosporium miyakei* (B 700014862). A. Conidiophore fascicle. B. Conidiophore tip. C. Conidia. Bar = 10  $\mu$ m.

blackish. *Caespituli* amphigenous, mainly hypophyllous, punctiform, scattered to aggregated. *Mycelium* internal. *Stromata* substomatal to immersed, globose, 10–70  $\mu$ m diam, brown to dark brown, cells 2–8  $\mu$ m diam, brown, wall somewhat thickened. *Conidiophores* in loose, occasionally denser fascicles, arising from stromata, through stomata or erumpent, erect, straight to curved, flexuous, filiform to strongly geniculate-sinuous throughout or only in the upper half, simple or occasionally branched, irregular in width, (30–)60–200(–250)  $\times$  3–6  $\mu$ m, uniformly medium brown or tips slightly paler, 1- to pluriseptate, cells 10–45  $\mu$ m long, smooth, wall thickened, to 0.8  $\mu$ m; conidiogenous cells integrated, terminal and intercalary, 10–35  $\mu$ m long, conidiogenous loci conspicuous, often on shoulders caused by geniculation due to sympodial proliferation, 1.5–2  $\mu$ m diam, in front view circular, somewhat thickened and above all darkened, with small central pore, conidiogenesis tretic. *Conidia* solitary, occasionally catenulate, obclavate-cylindrical, straight to somewhat curved, 30–150  $\times$  4–9  $\mu$ m, 5–12-distoseptate, pale olivaceous to medium olivaceous-brown, outer wall thin, but appearing thick-walled due to the inner wall structure responsible for distoseptation, smooth or almost so, apex obtuse, base gradually or short obconically truncate, 1.5–2  $\mu$ m wide, with darkened or darkened-refractive hila.

*Lectotype* (designated here, MycoBank MBT178167): **Japan**: Tokyo, Meguro, on *Smilax nipponica*, 9 Oct. 1904, J. Miyake 9 (B 700014862). *Isolectotypes*: CUP 40319, TNS-F-15260.

*Host range and distribution*: On *Heterosmilax japonica*, *Smilax nipponica*, *Smilacaceae*, Asia (China, Japan).

*Notes*: Chupp (1954) excluded this species from *Cercospora* and classified it as helminthosporioid, which was confirmed by Crous & Braun (2003). Lectotype and isolectotype material has recently been re-examined. Due to fasciculate conidiophores arising from well-developed stromata, thickened and darkened conidiogenous loci and hila with distinct central pore and scolecosporous, thick-walled, distoseptate conidia, this species is better reallocated to *Exosporium*.

*Cercospora petersii* (Berk. & M.A. Curtis) G.F. Atk., *J. Elisha Mitchell Sci. Soc.* **8**: 57 (1892).

(Fig. 158)

*Basionym*: *Helminthosporium petersii* Berk. & M.A. Curtis, *Grevillea* **3**: 102 (1875).

*Synonyms*: *Exosporium petersii* (Berk. & M.A. Curtis) U. Braun, **comb. nov.**

MycoBank MB809016

*Basionym*: *Helminthosporium petersii* Berk. & M.A. Curtis, *Grevillea* **3**: 102 (1875).

*Cercospora mississippiensis* Tracy & Earle, *Bull. Torrey Bot. Club* **22**: 179 (1895) [*lectotype* (designated here, MycoBank MBT178168): **USA**: Mississippi: Starkville, on *Smilax glauca*, 28 Oct. 1893, S. M. Tracy (BPI 438529); *isolectotypes*: BPI 438534; NY 937094, 937095; OSU 9903; *syntypes*: NY 937094, 937096].

*Pseudocercospora mississippiensis* (Tracy & Earle) R.F. Castañeda & U. Braun, *Cryptog. Bot.* **1**: 52 (1989).

?*Cercospora confusa* G.F. Atk., undescribed *vide* Chupp (1954: 352).

*Literature*: Saccardo (1895: xlvi), Chupp (1954: 349, 352), Crous & Braun (2003: 277–278).

*Illustration*: Chupp (1954: 352, fig. 145).

*Exsiccatae*: Nash, Pl. Florida 2125. Ravenel, *Fungi Amer. Exs.* 166, 616. Selys & Earle, *Econ. Fungi* 199.

*Description*: *Leaf spots* amphigenous, circular, subcircular to somewhat angular-irregular, 1–8 mm diam, occasionally confluent and larger, at first dark purple to blackish, later with paler centre, pale to medium dark brown, finally greyish brown to dingy grey, margin darker, often somewhat raised, narrow to moderately wide, brown to blackish, sometimes reddish brown to violet, or leaf spots sometimes somewhat zonate, with brown centre, followed by a dark brown to blackish ring-shaped zone surrounded by a paler narrow border. *Caespituli* amphigenous, mainly hypophyllous, conspicuous, finely to conspicuously punctiform or even coremioid, dark brown to blackish. *Mycelium* internal; occasionally with superficial hyphae, branched, septate, 2–5  $\mu$ m wide, pale brown.

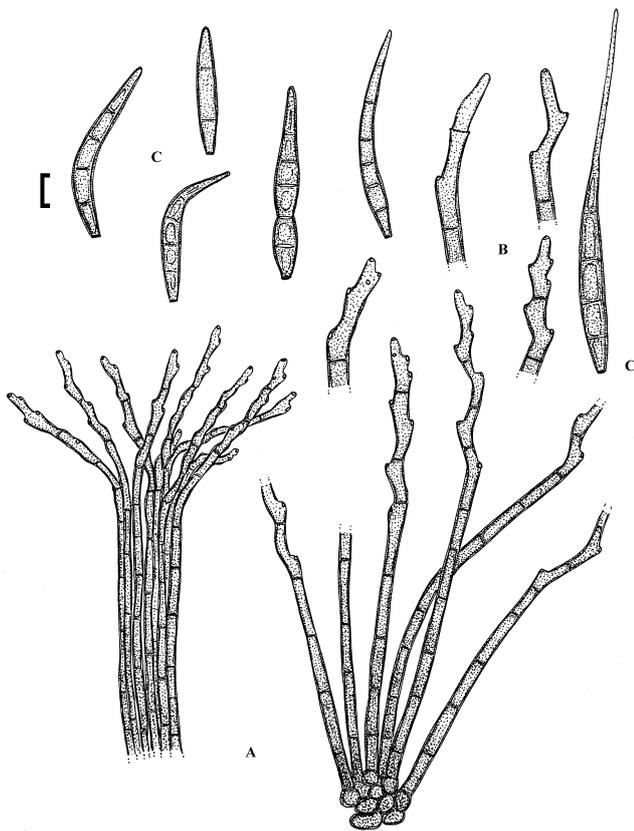


Fig. 158. *Exosporium petersii* (K(M) 190719). A. Conidiophore fascicles. B. Conidiophore tips. C. Conidia. Bar = 10  $\mu$ m.

*Stromata* small, a few aggregated swollen hyphal cells or larger, 10–40  $\mu$ m diam, substomatal or intraepidermal, medium to dark brown, cells 2–10  $\mu$ m diam. *Conidiophores* in loose to dense, sometimes coremioid fascicles, 2–25, arising from stomatic cells or stromata, emerging through stomata or erumpent, erect, lower part straight, subcylindrical, upper fertile part geniculate-sinuous, usually strongly so, not or only rarely branched, 30–250  $\times$  3–6  $\mu$ m, pluriseptate throughout, medium to dark brown, wall thin to slightly thickened, to 1  $\mu$ m, smooth; conidiogenous cells integrated, terminal and intercalary, 10–40  $\mu$ m long, proliferation sympodial and occasionally also percurrent, enteroblastic, leaving a conspicuous fringe; conidiogenous loci conspicuous, terminal and lateral or often on shoulders caused by sympodial proliferation, sometimes subdenticulate, slightly thickened, darkened, in front view visible as small dark circles with minute centre pore, 1–2  $\mu$ m diam. *Conidia* solitary, distinctly obclavate, often with broad dark base and narrow, pale beak (almost alternarioid), the beak may be very long in some conidia, small conidia occasionally broadly fusiform, (20–)30–120(–130)  $\times$  4–8  $\mu$ m, 2–9(–11)-distoseptate, pale to medium olivaceous-brown, wall thin, but often appearing somewhat thicker by a second inner wall layer, compound width to 1.5  $\mu$ m, smooth, apex obtuse or subobtuse, base short obconically truncate, 1.5–2  $\mu$ m wide, hila slightly thickened, darkened-refractive.

*Lectotype* (designated here, MycoBank MB178169): **USA:** South Carolina: on *Smilax glauca*, Peters, herb. Curtis no.

4942 (K(M) 190719). *Isolectotype*: BPI 864486 (ex herb. Curtis 313). *Syntype*: K(M) 190718.

*Host range and distribution*: On *Smilax* (*glauca*, *pseudochina* [*tamnifolia*], *rotundifolia*, *tamnoides* [*hispida*], *Smilax* sp.), *Smilacaceae*, North America (Mexico; USA, Alabama, Arkansas, Delaware, Florida, Georgia, Illinois, Maryland, Montana, New York, North Carolina, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, Washington DC, West Virginia, Wisconsin).

*Notes*: The examination of type material and numerous other collections of *Cercospora petersii* revealed that this species has to be excluded from the cercosporoid fungi and is better assigned to *Exosporium*. It seems to be close to the Asian *E. miyakei*, which differs, however, in having much larger stromata and obclavate-cylindrical conidia. *E. petersii* has been recorded from different *Smilax* species. It was not possible to re-examine and check material on all recorded hosts. *Smilax glauca* seems to be the most common host (numerous collections on this host, deposited under different names, e.g. *Cercospora smilacis*, *C. smilacina*, etc., have been examined and all of them are true *E. petersii*, e.g. BPI 441298–441302, 441303, 441305, 441307, 441349–441355, 868949, and 864660). A single collection deposited as *C. smilacis* on *Smilax tamnoides* [*hispida*] from Illinois (BPI 441361) proved to be *E. petersii*, but the host identification could not be checked. *Cercospora* s. lat. species on *Smilax* spp. are often confused and identifications are often not reliable, for instance, all examined collections on *Smilax laurifolia* proved to be misidentified and turned out to belong to *Pseudocercospora smilacicola*.

Chupp (1954) treated *Cercospora mississippiensis* and *C. petersii*, both described on *Smilax glauca* from the USA, as two distinct species and confused several cercosporoid fungi on *Smilax* species. Castañeda & Braun (1989) introduced the combination *Pseudocercospora mississippiensis* based on Cuban collections on *Smilax laurifolia* and *Smilax* sp. and Chupp's (1954) description. Type material had not been re-examined. However, the re-examination of type material of *C. mississippiensis* and numerous additional samples showed that this species is conspecific with *C. petersii*. Material on *Smilax glauca* from Cuba and North America previously assigned to *C. mississippiensis* and *C. petersii*, respectively, proved to represent a true *Pseudocercospora*, superficially confusable with *Exosporium petersii* but readily distinguishable by having unthickened, not darkened conidiogenous loci and euseptate conidia, which is described as *Pseudocercospora smilacicola*.

*Cercospora mississippiensis* has been recorded on *Smilax auriculata*, *S. hispida*, *S. pseudochina* [*S. tamnifolia*], *S. riparia* and *S. tamnoides*. It is unclear if all records on these hosts belong to *E. petersii*. Re-examinations are necessary.

Material recorded from Laos as *C. petersii* on *Smilax chinensis* (Phensingtham et al. 2013b: 154) has been re-examined (duplicate deposited as HAL 2660 F) and proved to be *Passalora smilacis*.

**Passalora****Key to *Passalora* species on *Smilacaceae***

- 1 Conidia obclavate-cylindrical, thin-walled, euseptate; conidiogenous cells with thickened and darkened conidiogenous loci ..... 2  
 Conidia distoseptate; conidiogenous loci thickened and darkened, with conspicuous central pore ..... 3
- 2 (1) Conidiophores long, 10–130 × 2.5–7 µm, 0–12-septate, olivaceous to dark olivaceous-brown or medium brown throughout or tips paler, wall to 1 µm thick ..... ***P. smilacis***  
 Conidiophores uniformly short, 5–30 × 2–5 µm, 0–1(–2)-septate, subhyaline to pale olivaceous-brown, paler towards the tip, thin-walled ..... ***P. pallidissima***
- 3 (1) Stromata lacking or small, 10–40 µm diam; conidia distinctly obclavate, often with long, narrow, paler beak; on *Smilax* spp. in North America ..... see ***Exosporium petersii***  
 Stromata well-developed, 10–70 µm diam; conidia obclavate-cylindrical; on *Smilax* spp. in Asia ..... see ***Exosporium miyakei***

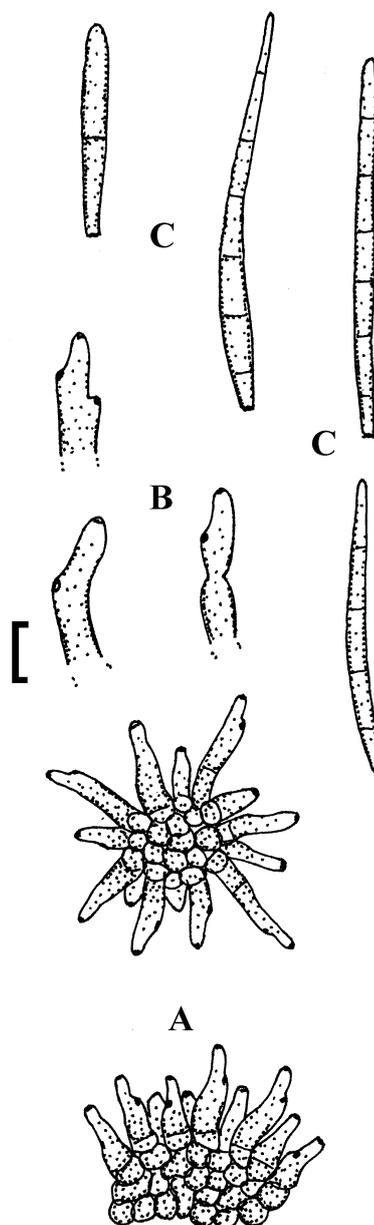
***Passalora* species on *Smilacaceae******Passalora pallidissima* (Chupp) U. Braun, **comb. nov.****

MycoBank MB809018

(Fig. 159)

*Basionym:* *Cercospora pallidissima* Chupp, *Monograph of Cercospora*: 350 (1954).*Synonym:* *Pseudocercospora pallidissima* (Chupp) Deighton, *Mycol. Pap.* **140**: 149 (1976).*Literature:* Chupp (1954: 350), Crous & Braun (2003: 304), Braun & Crous (2005: 413).*Illustration:* Chupp (1954: 349, fig. 144).

*Description:* Leaf spots amphigenous, 2–15 mm diam, circular to angular-irregular, sometimes vein-limited, brown, later dull grey, with darker margin or marginal line, brown to reddish brown, narrow. *Caespituli* amphigenous, mainly hypophyllous, punctiform, scattered to somewhat aggregated, medium to dark brown. *Mycelium* internal. *Stromata* well-developed, substomatal to immersed, globose, 20–70 µm diam, medium brown. *Conidiophores* fasciculate, arising from stromata, in small to moderately large fascicles, mostly 2–15, divergent to dense, erect, straight to slightly curved, subcylindrical to conical, somewhat narrowed towards the tip, barely or only slightly geniculate, unbranched, 5–30 × 2–5 µm, 0–1(–2)-septate, subhyaline to pale olivaceous-brown, paler towards the tip, thin-walled, smooth; conidiophores integrated, terminal or conidiophores often reduced to conidiogenous cells, conidiogenous loci conspicuous, slightly thickened and somewhat darkened-refractive, 0.8–1.5 µm diam. *Conidia* solitary, obclavate-cylindrical, straight to somewhat curved, 25–70 × 2–5 µm, 1–7-septate, subhyaline to very pale yellowish or olivaceous, thin-walled, smooth or almost so, apex obtuse, subobtuse or subacute, base subtruncate to short obconically truncate, 1–1.5 µm wide, hila almost unthickened to slightly thickened, somewhat darkened-refractive.



**Fig. 159.** *Passalora pallidissima* (CUP 40454). **A.** Conidiophore fascicles. **B.** Conidiophores. **C.** Conidia. Bar = 10 µm.

**Holotype:** Brazil: São Paulo, Campinas, Bosque dos Jequitibas, on *Smilax* sp., *Smilacaceae*, 5 Sep. 1943, A. P. Viégas & A. R. Teixeira 4276 (CUP 40454).

**Host range and distribution:** Only known from the type collection.

**Notes:** Deighton (1976) introduced the combination *Pseudocercospora pallidissima*, but it is quite unclear on which collections his reallocation was based. It seems that type material of this species was not examined by Deighton. The type collection does not contain any corresponding annotations. Due to the conspicuous conidiogenous loci and conidial hila, *Cercospora pallidissima* is better placed in *Passalora*. This species is probably only known from the type collection in Brazil. Indian records of "*Pseudocercospora pallidissima*" on *Smilax* spp., including *P. pallidissima* var. *constrictoflexuosa*, are distinguished by having strongly geniculate-sinuous conidiophores, inconspicuous conidiogenous loci (unthickened, not darkened) and belong to separate species of the genus *Pseudocercospora* (see *P. constrictoflexuosa* and *P. smilacis*). A record of *P. pallidissima* on *S. anceps* [*kraussiana*] from South Africa (Crous & Braun 1996b) refers to a true *Pseudocercospora* (see *Pseudocercospora pycnidiooides*). Other records on *S. aspera* (Crous & Braun 2003) and *S. laurifolia* from North America (Braun & Crous 2005) are unclear, have to be proven and seem to belong to *Pseudocercospora* species as well.

**Passalora smilacis** (Thüm.) U. Braun, *Arnoldia* 14: 30 (1997).  
(Fig. 160)

**Basionym:** *Cercospora smilacis* Thüm., *Contrib. Fl. Mycol. Lusit.* 2: 14 (1879).

**Synonyms:** *Cercospora smilacina* Sacc., *Michelia* 2: 364 (1881) [**holotype:** France: Collioure, on *Smilax aspera*, O. Debeaux (PAD); **isotypes:** Roum., *Fungi Gall. Exs.* 723].

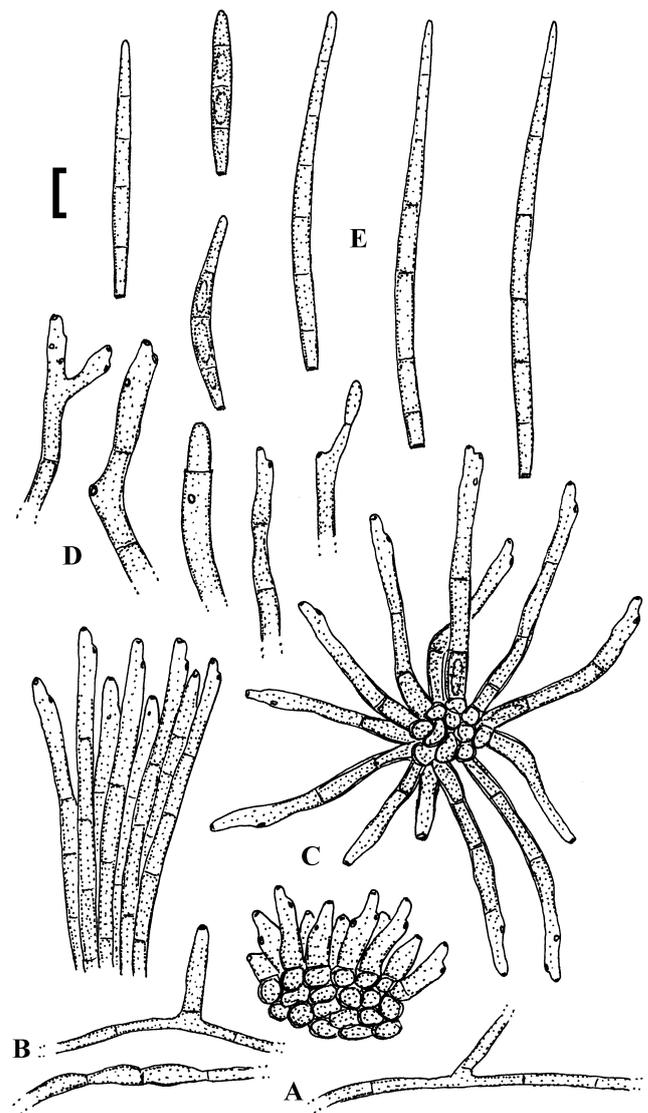
*Cercospora smilacis* var. *asperae* Gonz. Frag., *Trab. Mus. Nac. Ci. Nat., Madrid, ser. Bot.*, 9: 66 (1916) [**holotype:** Spain: Barcelona, on *Smilax aspera*, 20 Sep. 1915, Sennen (MA)].

**Literature:** Saccardo (1886: 476), Lindau (1910: 799), Gonzáles Frago (1927: 230), Chupp (1954: 354), Ellis (1976: 271), Braun & Mel'nik (1997: 93), Crous & Braun (2003: 378–379), Phensingtham *et al.* (2013b: 154, as *Cercospora petersii*).

**Illustration:** Ellis (1976: 272, fig. 206A).

**Exsiccatae:** Kabát & Bubák, *Fungi Imperf. Exs.* 198. *Herb. Crypt. Ind. Orient. Exs.* 27 (as *Cercospora mississippiensis*). *Krypt. Exs.* 728a,b. Migula, *Krypt. Germ. Austr. Helv. Exs.* 179. Rabenh., *Fungi Eur. Exs.* 2975. Roum., *Fungi Gall. Exs.* 723. D. Sacc., *Mycoth. Ital.* 396. Thüm., *Mycoth. Univ.* 1670. Triebel, *Microf. Exs.* 245.

**Description:** *Leaf spots* amphigenous, circular to somewhat angular-irregular, 1–12 mm diam, sometimes confluent, pale to dark brown or reddish brown with narrow to moderately wide, darker border, sometimes somewhat raised and with yellowish halo, occasionally entire spots almost black. *Caespituli*



**Fig. 160.** *Passalora smilacis* (HAL, Thüm., *Mycoth. Univ.* 1670). **A.** Superficial hyphae. **B.** Superficial hypha with solitary conidiophore. **C.** Conidiophore fascicles. **D.** Conidiophores. **E.** Conidia. Bar = 10  $\mu$ m.

amphigenous, punctiform, scattered to dense, dark brown to blackish. *Mycelium* internal, sometime also external; internal hyphae 1.5–5  $\mu$ m wide, branched, septate, subhyaline to medium olivaceous-brown; superficial hyphae when present sparingly branched, 1.5–3.5  $\mu$ m wide, septate, occasionally constricted at the septa, subhyaline, pale greenish, yellowish to olivaceous-brown, thin-walled, smooth, but solitary conidiophores arising from superficial hyphae rare. *Stromata* well-developed, substomatal to intraepidermal, immersed, 10–80  $\mu$ m diam, brown to dark brown. *Conidiophores* in small to large fascicles, rarely solitary, arising from stromata, rather variable, loose to dense, sometimes very dense, almost coremioid, uniformly short conidiophores when dense forming almost sporodochial conidiomata, long conidiophores when dense sometimes almost coremioid, occasionally with solitary conidiophores arising from superficial hyphae, lateral, conidiophores erect, straight, subcylindrical to strongly geniculate-sinuous, simple or occasionally branched, 10–130  $\times$  2.5–7  $\mu$ m, 0–12-septate, olivaceous to dark olivaceous-brown or medium brown throughout or tips paler, wall to 1  $\mu$ m

thick, above all below, smooth; conidiogenous cells integrated, terminal, sometimes conidiophores reduced to conidiogenous cells, 10–35 µm long, proliferation sympodial, occasionally percurrent, conidiogenous loci minute but conspicuous, 1–1.5(–2) µm diam, almost unthickened to slightly thickened and somewhat darkened-refractive, in front view visible as minute dark circle. *Conidia* solitary, obclavate-cylindrical, 20–90(–120) × (2–)3–6 µm, 1–12-septate, subhyaline to pale olivaceous or brownish, thin-walled, smooth, apex obtuse or subobtuse, base rounded to short obconically truncate, 1–2 µm wide, hila slightly thickened and somewhat darkened-refractive.

**Lectotype (designated here, MycoBank MBT178170):** Portugal: Coimbra, on *Smilax aspera* [*mauritanica*], May 1879, F. Moller (BPI 441368). **Topotypes** (Jul. 1879): Thüm., Mycoth. Univ. 1670, e.g. BPI 441367, 441368, CUP 41239, HAL, LEP.

**Host range and distribution:** On *Smilax* (*aspera* [*goetzeana*, *mauritanica*, *nigra*], *bona-nox*, *chinensis*, *excelsa*, *guianensis* [*macrophylla*], *havanensis*, *herbacea*, *Smilacaceae*, Africa (Algeria, Canary Islands, Kenya, Libya, Morocco), Asia (India, Himachal Pradesh; Iran, Israel, Jordan, Laos, Nepal, Turkey), Caucasus (Georgia), Europe (Cyprus, France, Italy, Greece, Malta, Montenegro, Portugal, Russia, Spain, including Balearic Islands, Turkey, former Yugoslavia), North America (USA, Colombia, Connecticut, Delaware, District of Columbia, Florida, Georgia, Indiana, Iowa, Kansas, Louisiana, Maryland, Minnesota, Mississippi, Missouri,

North Carolina, Nebraska, New Jersey, New York, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, Washington DC, West Virginia), South America (Brazil, Uruguay, Venezuela).

**Notes:** The generic affinity of *Cercospora smilacis* is uncertain and needs to be established by means of molecular sequence analyses. Due to the pigmented conidia and conspicuous conidiogenous loci, this species has been assigned to *Passalora*, which is the best solution for now, but the loci are in front view visible as minute circles and hence somewhat paracercosporoid. Moreover, the loci resemble those of *Exosporium miyakei* and *E. petersii*. Relations between these species are also unclear. Collections of *Cercospora s. lat.* on *Smilax* spp. in herbaria are often misidentified. Records of *C. smilacis* and *C. smilacina* on *Smilax brasiliensis* belong to *Pseudocercospora pycnidioides*, other samples on *Smilax auriculata* and *S. laurifolia* to *Pseudocercospora smilacicola* and all collections on *S. glauca* have to be assigned to *Exosporium petersii*, but North American specimens on *S. bona-nox* and *S. herbacea* (e.g. BPI 441356, 441357) represent genuine *Passalora smilacis*. Several collections of *P. smilacis* from Asia have been examined, e.g. from India on *S. aspera*, from Laos on *S. chinensis* and from Turkey on *S. excelsa* (BPI 441296). Records of *C. smilacis* from Jamaican and Mexico are unproven and doubtful. True *Passalora smilacis* is distributed in North America, but it is unclear if all records from all states of the USA being correct. It was not possible to confirm the identity of material from all recorded areas.

## *Pseudocercospora*

### Key to *Pseudocercospora* species on *Smilacaceae*

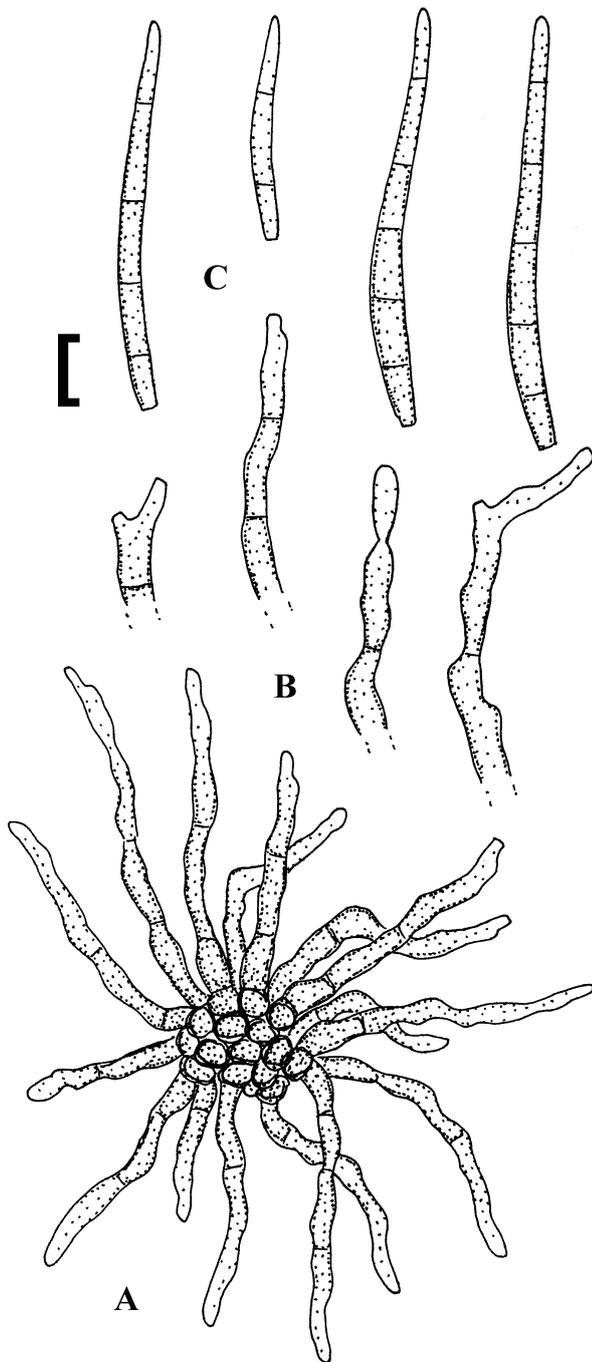
- 1 Conidiophores very long, 20–350 µm, thick-walled, subcylindrical, straight to curved, only terminal fertile part of long conidiophores geniculate-sinuous, unbranched; stromata lacking or small, 10–40 µm diam ..... **P. smilacicola**
- Conidiophores much shorter, about 10–80 µm, thin-walled or almost so; either non-geniculate or strongly geniculate-sinuous throughout; stromata well-developed, 20–100 µm ..... 2
- 2 (1) Conidiophores straight, subcylindrical-conical, neither geniculate-sinuous nor denticulate, usually unilocal, occasionally percurrent with fine annellations, unbranched; Africa and South America ..... **P. pycnidioides**
- Conidiophores strongly geniculate-sinuous, often with constrictions and subdenticulate, sympodial, multilocal, unbranched or often branched; Asia (India) ..... 3
- 3 (2) Stromata 20–50 µm diam; conidiophores 10–60 × 3–6 µm, unbranched; conidia subhyaline; on *Smilax perfoliata* ..... **P. constrictoflexuosa**
- Stromata larger, 40–80 µm diam; conidiophores simple or often branched, longer, 60–75 × 3–4 µm; conidia pale brown; on *Smilax aspera* ..... **P. smilacis**

### *Pseudocercospora* species on *Smilacaceae*

***Pseudocercospora constrictoflexuosa*** (U. Braun)  
U. Braun, **comb. stat. nov.**  
MycoBank MB809019  
(Fig. 161)

**Basionym:** *Pseudocercospora pallidissima* var. *constrictoflexuosa* U. Braun, *Monogr. Cercosporiella, Ramularia Allied Genera (Phytopath. Hyphom.)*. 1: 198 (1995).

**Illustration:** Braun (1995a: 197, fig. 193).



**Fig. 161.** *Pseudocercospora constrictoflexuosa* (K(M) IMI 235973). A. Conidiophore fascicle. B. Conidiophores. C. Conidia. Bar = 10  $\mu$ m.

**Description:** *Leaf spots* amphigenous, angular-irregular, 2–8 mm diam, pale, greenish white, surrounded by a narrow dark brown to blackish brown margin or marginal line. *Caespituli* amphigenous, punctiform, scattered, blackish brown. *Mycelium* internal. *Stromata* substomatal to intraepidermal, 20–50  $\mu$ m diam, brown. *Conidiophores* in moderately large fascicles, arising from stromata, through stomata or erumpent, erect, straight to curved or flexuous, subcylindrical, mostly strongly geniculate-sinuous, with constrictions, unbranched, 10–60  $\times$  3–6  $\mu$ m, 0–5-septate, olivaceous to medium brown, paler above, pale olivaceous or subhyaline, wall thin to slightly thickened, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells,

10–30  $\mu$ m long, conidiogenous loci inconspicuous or subdenticulate, but always unthickened and not darkened. *Conidia* solitary, obclavate-subcylindrical, rarely subacicular, 30–70  $\times$  (2.5–)3–5  $\mu$ m, 2–6-septate, subhyaline or only with a faintly chlorine tinge, thin-walled, smooth, apex subacute or subobtuse, base short obconically truncate, 1.5–2.5  $\mu$ m wide, hila unthickened, not darkened.

**Holotype:** **India:** Uttar Pradesh: Gorakhpur, on *Smilax perfoliata* [*prolifera*], *Smilacaceae*, 28 Feb. 1979, B. Rai (K(M) IMI 235973).

**Host range and distribution:** Only known from the type collection.

**Notes:** Due to its pale conidia, this Indian fungus was described as variety of *Pseudocercospora pallidissima*. However, the basionym, *Cercospora pallidissima*, proved to be a species of *Passalora*, and owing to strongly geniculate-sinuous conidiophores with numerous constrictions, this species is closer to the Indian *P. smilacis*, from which it differs in having quite distinct leaf spots, much smaller stromata and shorter conidiophores as well as subhyaline conidia. Type material of *P. constrictoflexuosa* contains traces of *Zasmidium smilacis*.

***Pseudocercospora pycnidioides*** (Chupp) U. Braun & Crous, *Mycosphaerella and Anam.* 1: 345 (2003). (Fig. 162)

**Basionym:** *Cercospora pycnidioides* Chupp, *Monograph of Cercospora*: 353 (1954).

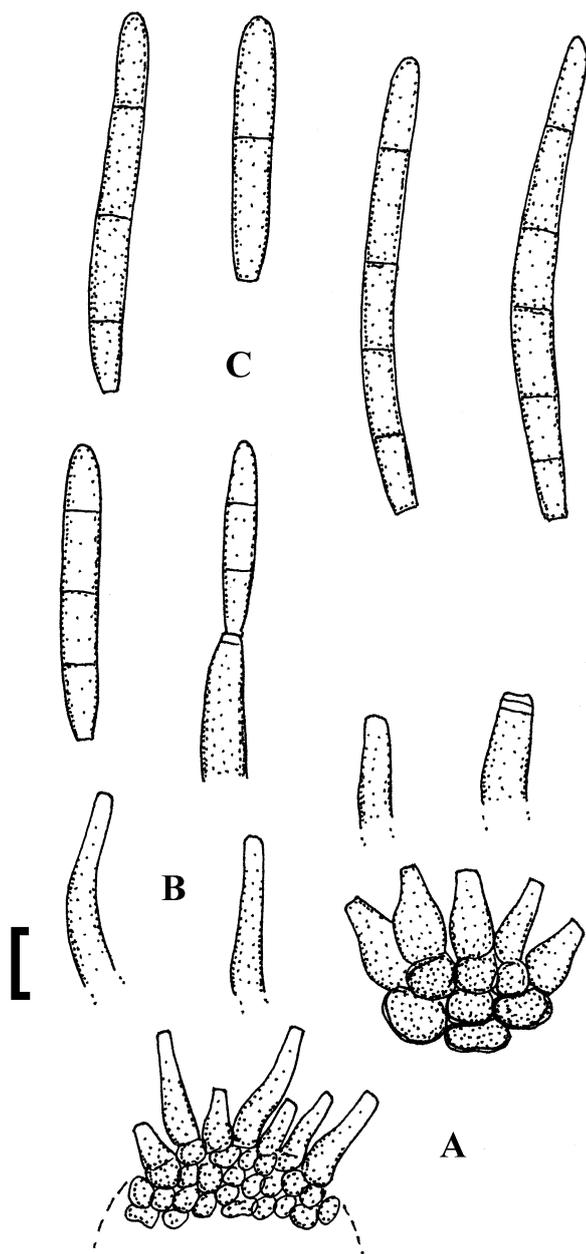
**Synonym:** *Cercospora smilacina* Speg., *Rev. Mus. La Plata* 15: 46 (1908), *nom. illeg.* (ICN, Art. 53.1), non *C. smilacina* Sacc. 1881.

**Literature:** Chupp (1954: 353), Crous & Braun (1996b: 293, as *Pseudocercospora pallidissima*).

**Illustration:** Chupp (1954: 353, fig. 146).

**Exsiccatae:** Herter, *Pl. Uruguayenses Exs.* 1486, as *Cercospora smilacis*.

**Description:** *Leaf spots* amphigenous, circular, 1–20 mm diam, pale brown to brown with darker brown border. *Caespituli* amphigenous, punctiform, dark. *Mycelium* internal; occasionally with a few superficial hyphae. *Stromata* substomatal to immersed, well-developed, 20–150  $\mu$ m diam, pycnidioid, brown to dark brown, composed of swollen hyphal cells, 2–12  $\mu$ m diam, thick-walled. *Conidiophores* in dense, compact fascicles, arising from stromata, forming sporodochial conidiomata, occasionally solitary, arising from superficial threads between stromata when formed, erect, straight to curved, subcylindrical-conical, not geniculate, unbranched, short, 5–60  $\times$  3–6  $\mu$ m, 0–2-septate, pale to medium olivaceous-brown, darker in mass, wall thin to slightly thickened, smooth to finely roughened; conidiogenous cells integrated, terminal, but conidiophores often reduced to conidiogenous cells, 5–25  $\mu$ m long, without distinct proliferation or percurrent, with 1–2 irregular fine annellations,



**Fig. 162.** *Pseudocercospora pycnidioides* (LPS 953). **A.** Conidiophore fascicles. **B.** Conidiophores. **C.** Conidia. Bar = 10  $\mu$ m.

rarely sympodial, conidiogenous loci inconspicuous, neither thickened nor darkened. *Conidia* solitary, cylindrical to obclavate-cylindrical, 20–85(–100)  $\times$  3.5–6  $\mu$ m, 1–7-septate, subhyaline, pale olivaceous to olivaceous-brown or brown, wall thin to slightly thickened, smooth to faintly roughened, apex obtuse, base short obconically truncate, 2–2.5  $\mu$ m wide, hila unthickened, not darkened.

**Lectotype (designated here, MycoBank MBT178171):** Brazil: São Paulo, on *Smilax* sp., A. Usteri 953 (LPS 953). **Isolectotype:** CUP 41237.

**Host range and distribution:** On *Smilax* (*anceps* [*kraussiana*], *brasiliensis*, *Smilax* sp.), *Smilacaceae*, Africa (South Africa, Zambia), South America (Brazil, Uruguay).

**Notes:** *Cercosporoid* species on *Smilax* have often been confused. Many collections in herbaria are misidentified. Numerous collections are deposited under *C. smilacina*, but almost all of them are based on wrong identifications as already mentioned in Chupp (1954). Records from India on *S. guianensis* [*macrophylla*] (Crous & Braun 2003) are also doubtful, unverified and not included in Kamal (2010). A collection from Zambia [near Victoria Falls, on *Smilax* sp., 13 Mar. 2006, Ch. Hahn (GZU 21-2007)] is an additional sample that agrees with type material of this species, at least morphologically. Material previously recorded from South Africa as "*Pseudocercospora pallidissima*" (Crous & Braun 1996b: 293) has been re-examined and proved to be a collection belonging to *P. pycnidioides* as well [South Africa: Mpumalanga, Nelspruit district, Schagen, on living leaves of *Smilax anceps* [*kraussiana*], June 1939, L. C. C. Liebenberg (PREM 32922)]. Type material of *Cercospora pallidissima* has been re-examined and proved to be a species of *Passalora* due to thickened and darkened conidiogenous loci and conidial hila.

***Pseudocercospora smilacicola* U. Braun, sp. nov.**  
MycoBank MB809025  
(Fig. 163)

**Etymology:** "smilacicola", derived from the host genus (inhabitant of *Smilax*).

**Synonym:** *Cercospora petersii* f. *smilacis-beyrichii* Ellis, in Nash, Pl. Florida 2073 (1895).

**Missapplied names:** *Cercospora mississippiensis* auct. non Tracy & Earle and *Pseudocercospora mississippiensis* auct.

**Literature:** Castañeda Ruiz & Braun (1989: 52), Kim & Shin (1999b), Shin & Kim (2001: 206), all as *Pseudocercospora mississippiensis*.

**Illustrations:** Castañeda Ruiz & Braun (1989: 48, plate 4, fig. 24), Shin & Kim (2001: 207, fig. 93), all as *Pseudocercospora mississippiensis*.

**Exsiccatae:** Nash, Pl. Florida 1788, 1893, 2073 (as *Cercospora petersii*).

**Diagnosis:** Morphologically resembling *Exosporium petersii* but conidiogenous loci and conidial hila unthickened and conidia euseptate.

**Description:** *Leaf spots* amphigenous, subcircular to angular-irregular, 1–10 mm diam, at first pale, later very dark brown, finally with paler centre, brownish to greyish brown, occasionally somewhat zonate, with darker brown to blackish border or marginal line, sometimes somewhat raised, sometimes surrounded by a diffuse lighter halo. *Caespituli* amphigenous, mainly hypophyllous, very dark, brown to black, punctiform, scattered. *Mycelium* internal; hyphae branched, septate, 1.5–3  $\mu$ m wide, pale. *Stromata* lacking or 10–60  $\mu$ m diam, substomatal, brown to dark brown, composed of swollen hyphal cells, rounded to somewhat angular-irregular in outline, 2–7  $\mu$ m diam. *Conidiophores* in small to moderately rich fascicles, mostly 5–20, divergent to dense, occasionally almost coremioid, arising from

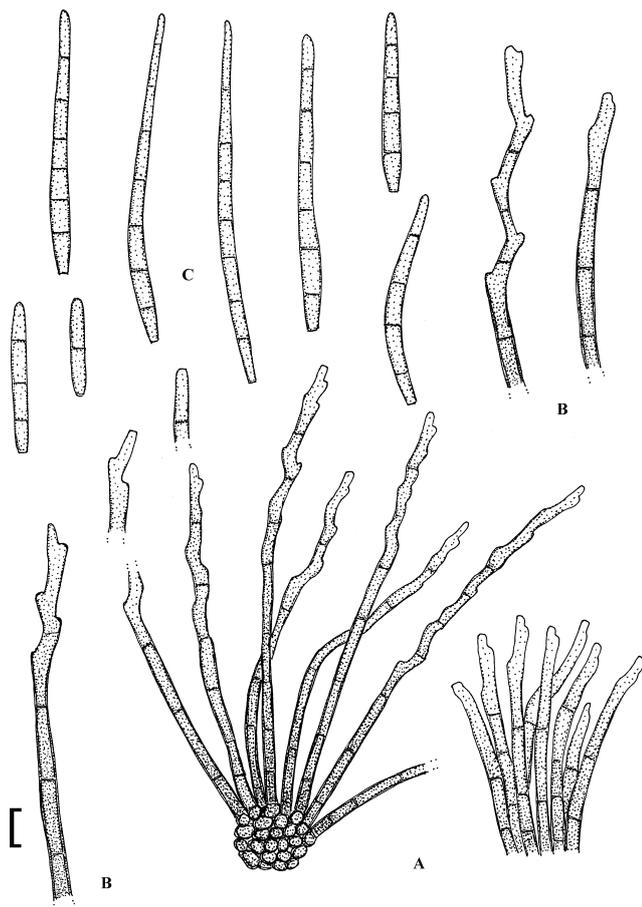


Fig. 163. *Pseudocercospora smilacicola* (HAL 2657 F). A. Conidiophore fascicles. B. Conidiophores. C. Conidia. Bar = 10  $\mu$ m.

internal hyphae or stromata, emerging through stomata, erect, straight to curved, subcylindrical, upper fertile part distinctly, often strongly geniculate-sinuous, at least in older long conidiophores, but not denticulate, unbranched, 20–250  $\times$  3–6  $\mu$ m, pluriseptate throughout, pale to medium olivaceous-brown when young, later medium to darker olivaceous-brown or brown, but tips usually paler, sometimes much paler, wall thin to somewhat thickened, to 0.8  $\mu$ m, smooth; conidiogenous cells integrated, terminal and intercalary, 10–40  $\mu$ m long, conidiogenous loci inconspicuous or visible as “shoulders” caused by sympodial proliferation, but always unthickened and not darkened, at most somewhat refractive. *Conidia* solitary, obclavate to obclavate-cylindrical, shorter conidia often subcylindrical, straight to somewhat curved, 20–120  $\times$  3–7  $\mu$ m, 1–11-septate, subhyaline to pale olivaceous, thin-walled, smooth, apex obtuse to somewhat pointed, base short or long obconically truncate, 1.5–3  $\mu$ m wide, hila unthickened, not darkened.

**Holotype:** Cuba: Matanzas: San Miguel de los Baños, on *Smilax laurifolia* [*lanceolata*], 11 Mar. 1987, R. F. Castañeda (HAL 2657 F). **Isotype:** INIFAT C87/14.

**Host range and distribution:** On *Smilax* (*auriculata* [*beyrichii*], *laurifolia*, *pseudochina*, *riparia*, *rotundifolia*, *Smilax* sp.), *Smilacaceae*, Asia (Japan, Korea), North America (USA, Georgia, Florida, Louisiana, Mississippi, Pennsylvania), West Indies (Cuba).

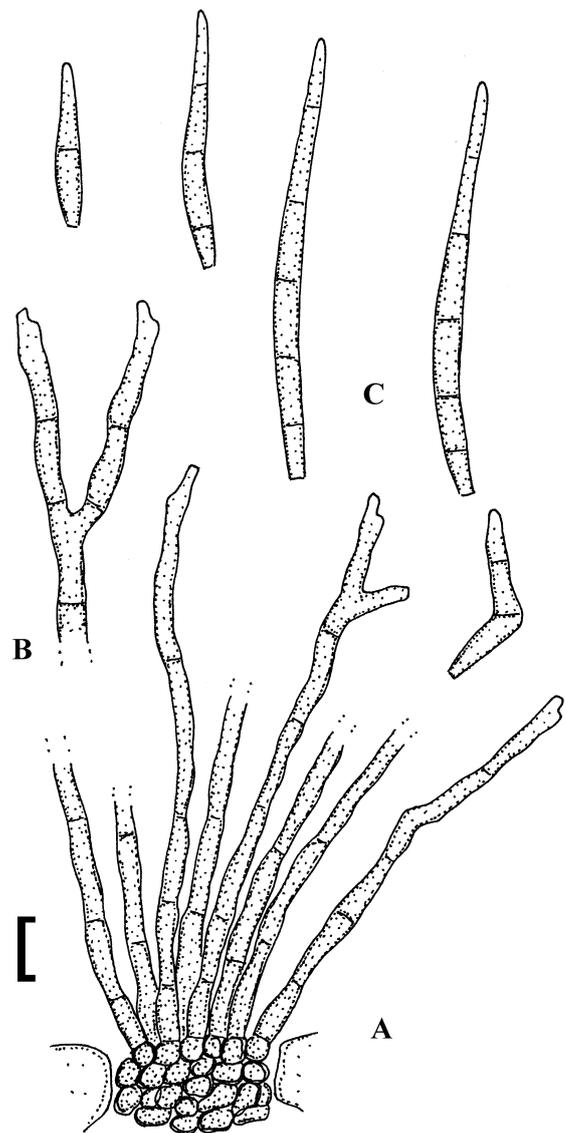


Fig. 164. *Pseudocercospora smilacis* (K(M) IMI 291864). A. Conidiophore fascicle. B. Conidiophore tip. C. Conidia. Bar = 10  $\mu$ m.

**Notes:** *Pseudocercospora smilacicola* comprises several collections of cercosporoid fungi previously referred to as *Cercospora petersii* and *C.* (or *Pseudocercospora*) *mississippiensis*. Although superficially similar and confusable, the new species is easily distinguishable from *Exosporium petersii* (= *C. mississippiensis*) by having unthickened, not darkened conidiogenous loci and hila as well as euseptate conidia. “*Pseudocercospora mississippiensis*” on *Smilax riparia* from Korea (Shin & Kim 2001) is morphologically indistinguishable from Cuban and North American collections of *P. smilacicola* (all examined North American collections on *Smilax laurifolia*, e.g. BPI 441364 from Florida, belong to this species). Some North American samples on *Smilax auriculata* (BPI 438526, 439606–439607, 441343–441344) and single samples on *Smilax pseudochina* (BPI 441369) and *S. rotundifolia* (BPI 441314), deposited as *C. smilacis*, proved to be *P. smilacicola*. Furthermore, an unpublished collection on *Smilax* sp. from Japan deposited as MUMH 11273 agrees morphologically well with *P. smilacicola*.

**Pseudocercospora smilacis** Budathoki & S.K. Singh,  
*Mycol. Res.* **99**: 232 (1995).  
(Fig. 164)

*Literature*: Kamal (2010: 206, as *P. pallidissima*).

*Illustration*: Budathoki & Singh (1995: 231, fig. 3).

*Description*: *Leaf spots* amphigenous, circular, 1–6 mm diam, dark brown. *Caespituli* hypophyllous. *Mycelium* internal; hyphae branched, septate, subhyaline, thin-walled, smooth. *Stromata* substomatal, subglobose, pseudoparenchymatic, 40–80 µm diam, brown. *Conidiophores* in loose fascicles, arising from stromata, erect, straight to flexuous, subcylindrical to strongly geniculate-sinuous, simple

or branched, 60–75 × 3–4 µm, septate, brown to dark brown, thin-walled, smooth; conidiogenous cells integrated, terminal and intercalary, about 10–25 µm long, conidiogenous loci inconspicuous to subdenticulate, but always unthickened and not darkened. *Conidia* solitary obclavate(-subcylindrical), straight to curved, 30–80 × 3–6.5 µm, 1–8-septate, pale brown, thin-walled, smooth, apex acute to obtuse, base short obconically truncate, 1.5–3 µm wide, hila unthickened, not darkened.

*Holotype*: **Nepal**: Kathmandu Valley, Godawari, on *Smilax aspera*, Nov. 1985, U. Budathoki KU 59 (K(M) IMI 291864).

*Host range and distribution*: On *Smilax aspera*, *Smilacaceae*, Asia (India, Himachal Pradesh; Nepal).

## Zasmidium

### Key to *Zasmidium* species on *Smilacaceae*

- 1 *In vivo* superficial hyphae lacking; conidiophores solitary or fasciculate, arising from stromata; conidia long and broad, 15–110 × 3–9 µm, pluriseptate (1–14); on *Smilax perfoliata* ..... **Z. indicum**  
*In vivo* at least partly with superficial mycelium, hyphae verruculose; solitary conidiophores arising from superficial hyphae present ..... 2
- 2 (1) Conidiophores consistently short, 10–30 µm, 0–1-septate; conidia solitary, smooth, at most some conidia faintly rough-walled with age, 15–60 × (2.5–)3–5(–5.5) µm; on *Smilax* sp., India ..... **Z. mycovellosielloides**  
Conidiophores much longer, 50–165 µm, 1–12-septate and conidia verruculose or 12–85 µm and 1–4-septate, but then conidia 4–6.5 µm wide, 1–6-septate and verrucose ..... 3
- 3 (2) Conidiophores consistently solitary, arising from superficial hyphae; conidia solitary as well as catenate, narrow, 2–4 µm; on *Smilax* spp. .... **Z. smilacis**  
Conidiophores emerging through stomata as well as solitary, arising from superficial hyphae; conidia solitary, much broader, 4–6.5 µm; on *Smilax ovalifolia* ..... **Z. smilacis-macrophyllae**

### *Zasmidium* species on *Smilacaceae*

***Zasmidium indicum*** (Kamal & R.P. Singh) U. Braun,  
**comb. nov.**

MycoBank MB809020

(Fig. 165)

*Basionym*: *Verrucispora indica* Kamal & R.P. Singh, *Canad. J. Bot.* **56**: 2785 (1978).

*Synonym*: *Sirosporium indicum* (Kamal & R.P. Singh) D.E. Shaw, Alcorn & B. Sutton, *Austral. Syst. Bot.* **6**: 274 (1993).

*Literature*: Kamal (2010: 274).

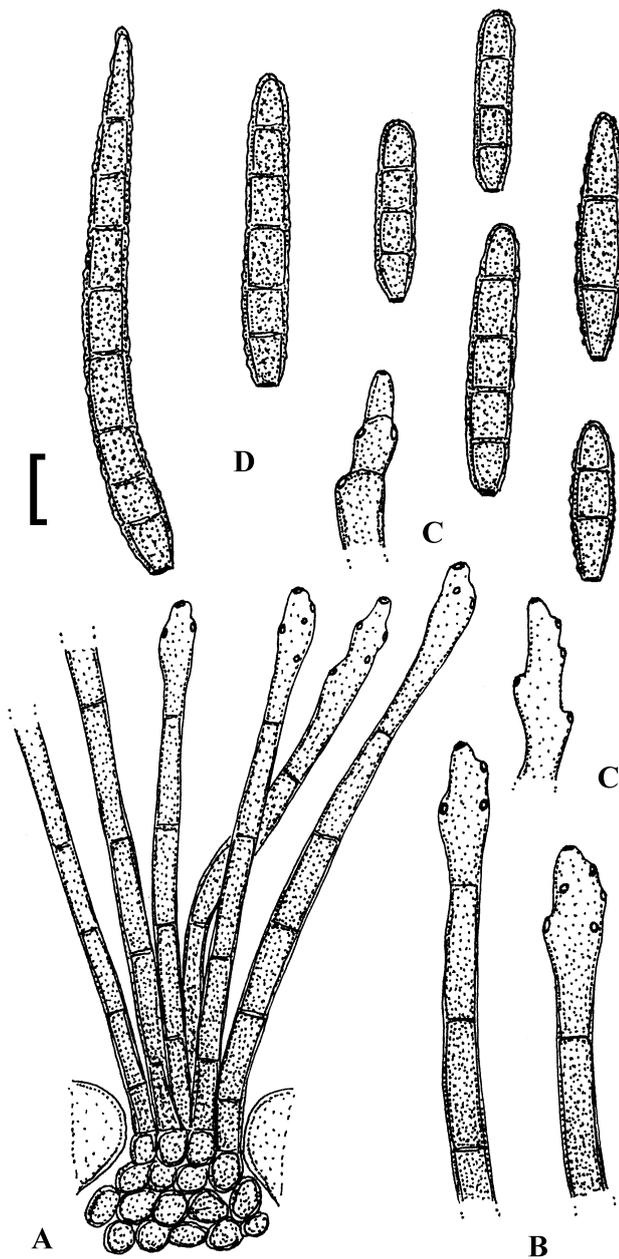
*Illustrations*: Kamal & Singh (1978: 2786, fig. 1), Kamal (2010: 275, fig. 46).

*Description*: *Leaf spots* amphigenous, circular, 2.5–12 mm diam, centre dark brown, finally almost blackish, margin pale. *Caespituli* punctiform, blackish. *Mycelium* internal; hyphae branched, septate, colourless, smooth. *Stromata* well-developed, substomatal to intraepidermal,

pseudoparenchymatic, 20–85 µm diam, medium to dark brown or reddish brown, cells rounded to angular, 2.5–7 µm diam. *Conidiophores* in loose to moderately dense fascicles, arising from stromata, through stomata or erumpent, subcylindrical, straight to somewhat curved-flexuous, apical part often somewhat swollen or somewhat geniculate, 70–210 µm long and 3–5.5 µm wide, brown or reddish brown, wall thickened, smooth or almost so; conidiogenous cells integrated, terminal, 5–20 µm long, sympodial, somewhat paler, with a single or several distinct conidiogenous loci, thickened and darkened, about 2–2.5 µm diam. *Conidia* solitary, cylindrical or somewhat obclavate-cylindrical, 15–110 × 3–9 µm, 0–10-septate, wall thickened, pale brown or reddish brown, verrucose, apex obtuse, base short obconically truncate, 2–2.5 µm wide, hila somewhat thickened and darkened.

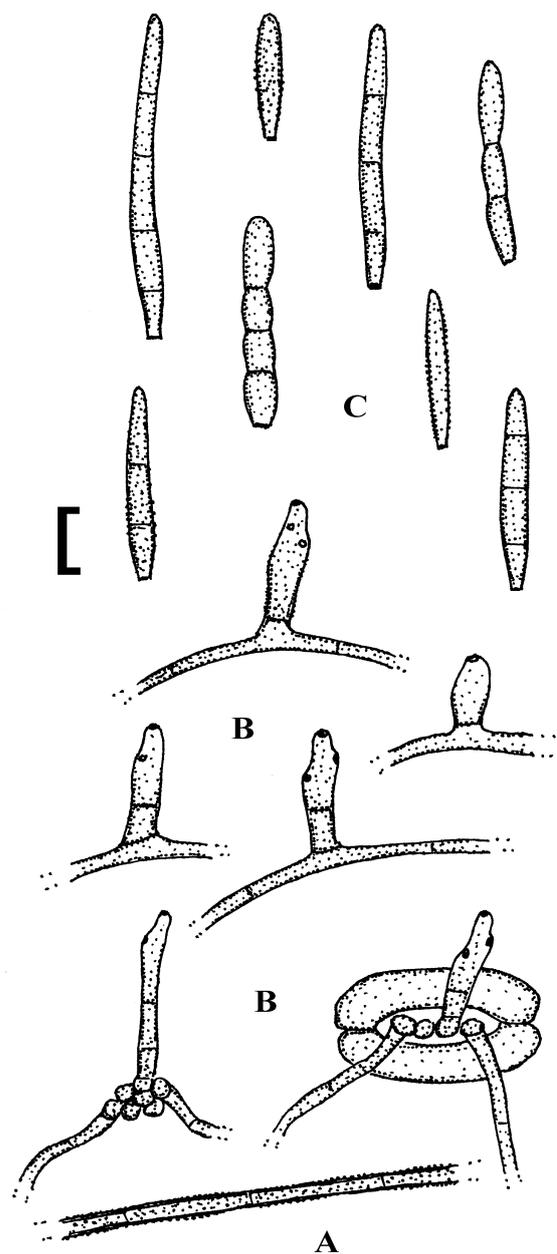
*Holotype*: **India**: *Uttar Pradesh*: Gorakhpur, on *Smilax perfoliata* [*prolifera*], Feb. 1976, R. P. Singh 190 (K(M) IMI 210821).

*Host range and distribution*: On *Smilax perfoliata* [*prolifera*], *Smilacaceae*, Asia (India, Uttar Pradesh).



**Fig. 165.** *Zasmidium indicum* (K(M) IMI 210821). **A.** Conidiophore fascicle. **B.** Conidiophores. **C.** Conidiophore tip. **D.** Conidia. Bar = 10  $\mu$ m.

**Notes:** This species belongs to a group of *Zasmidium* species without any superficial mycelium *in vivo*. It is a typical member of the former genus *Verrucisporota*, which has been reduced to synonymy with *Zasmidium* (see Braun et al. 2013). McKenzie (1982) discussed *Verrucispora indica*, compared it with *Biharia smilacis* and considered the two species conspecific. Kamal (2010) followed McKenzie's (1982) treatment, but Shaw & Alcorn (1993) maintained two different species, introduced the new name *Stenella smilacicola* for *Biharia smilacis* under *Stenella* and reallocated *Verrucispora indica* to *Sirosporium*. Conidiophores and conidia of these species are, indeed, very similar, but they occur on two different *Smilax* spp. and superficial mycelium with solitary conidiophores is lacking in *V. indica*. Therefore, they are maintained as two different species.



**Fig. 166.** *Zasmidium mycovelloiselloides* (BPI 438522). **A.** Superficial hypha. **B.** Solitary conidiophores arising from superficial hyphae. **C.** Conidia. Bar = 10  $\mu$ m.

***Zasmidium mycovelloiselloides* U. Braun, sp. nov.**  
Mycobank MB809026  
(Fig. 166)

**Etymology:** *mycovelloiselloides* = resembling species of the former genus *Mycovelloisella*.

**Diagnosis:** Resembling *Zasmidium smilacis-macrophyllae*, but conidiophores shorter, 10–30  $\mu$ m, 0–1-septate, and narrower, paler, and above all smooth conidia.

**Description:** Leaf spots amphigenous, circular, subcircular to irregular, 2–25 mm diam or confluent and larger, brownish, later pale, surrounded by a darker margin, medium to dark brown. Colonies amphigenous, inconspicuous (surrounded

by distinct punctiform immature fruiting bodies which might be immature spermogonia or ascomata). *Mycelium* internal and external; superficial hyphae branched, 1–5 µm wide, thin-walled, subhyaline, pale olivaceous to pale brown or olivaceous-brown, smooth to verruculose, wider fertile hyphae usually smooth and darker, paler hyphae without conidiophores often somewhat verruculose. *Stromata* lacking or small, substomatal to epidermal, brown, composed of some swollen hyphal cells, 3–7 µm wide, wall somewhat thickened. *Conidiophores* solitary, arising from superficial hyphae, occasionally arising from stromatic hyphae cells, solitary or in small groups, erect, straight, subcylindrical-conical, barely geniculate-sinuuous, unbranched, 10–30 × 2–5 µm, 0–1-septate, pale to medium brown or olivaceous-brown, thin-walled, smooth or faintly rough with age; conidiophores usually reduced to conidiogenous cells, occasionally integrated, terminal, 10–25 µm long, with a single to several conspicuous conidiogenous loci near the apex, thickened and darkened, 1–1.5 µm diam. *Conidia* solitary, obclavate-subcylindrical, short conidia ellipsoid-ovoid, straight to slightly curved, 15–60 × (2.5–)3–5(–5.5) µm, (0–)1–3(–4)-septate, subhyaline to pale olivaceous or olivaceous-brown, thin-walled, smooth, some conidia rough-walled with age, apex obtuse, base short obconically truncate, 1–1.5 µm wide, hila slightly thickened and darkened.

**Holotype:** India: Karnataka: Bangalore, Yercaud, on *Smilax* sp., *Smilacaceae*, 25 Feb. 1965, R. Swaminathan & V. Raghunath (BPI 438522).

**Host range and distribution:** Only known from the type collection.

**Notes:** The host leaves are only identified as *Smilax* sp. They are very large, to about 20 × 15 mm, broadly oval-elliptical and remind one of leaves of *Smilax macrophylla*. *Zasmidium smilacis-macrophyllae* is a comparable species but differs in having much longer, septate conidiophores and broader, darker, verruculose conidia.

**Zasmidium smilacicola** (D.E. Shaw & Alcorn) U. Braun, **comb. nov.**

MycoBank MB809021

(Fig. 167)

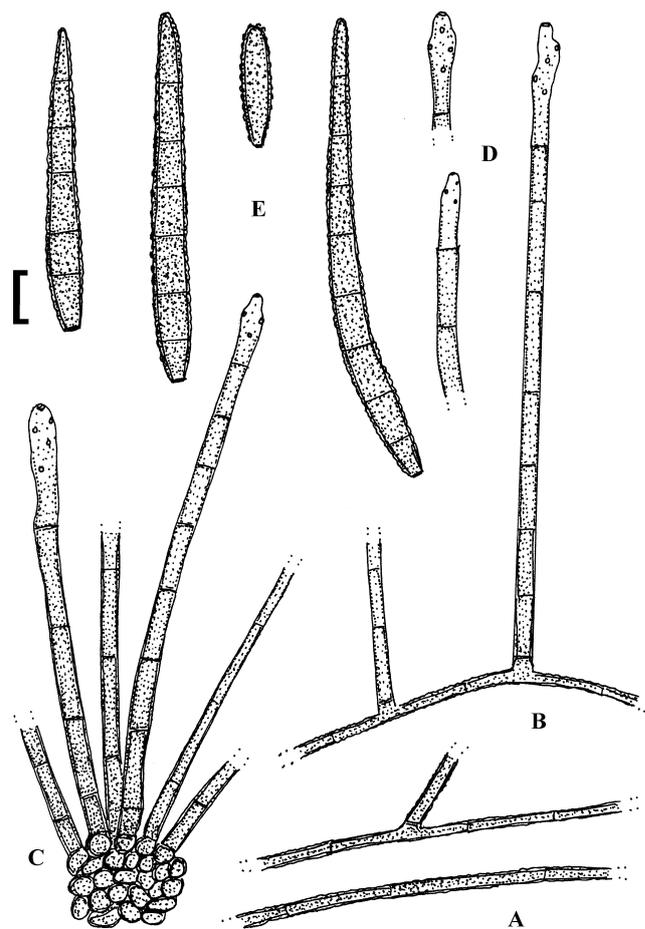
**Basionym:** *Stenella smilacicola* D.E. Shaw & Alcorn, *Australian Systematic Botany* 6: 274 (1993).

**Synonyms:** *Biharia smilacis* Agarwal, *J. Indian Bot. Soc.* 39: 354 (1960), non *Zasmidium smilacis* (P. Kumar, D.N. Shukla & Kamal) Kamal 2010.

*Verrucispora smilacis* (Agarwal) McKenzie, *New Zealand J. Bot.* 20: 252 (1982).

*Stenella liliacearum* N. Sharma, Soni & R.K. Verma, *Indian J. Trop. Biodiv.* 14: 36 (2006) [**holotype:** India: Madhya Pradesh: Balaghat, Supkhar, on *Smilax ovalifolia* [*macrophylla*], 19 Dec. 2004, R. K. Verma (Hb. Tropical Research Institute Jabalpur, TF213); **isotype:** HClO 45901].

**Literature:** Subramanian (1971: 225), McKenzie (1982), Shaw & Alcorn (1993).



**Fig. 167.** *Zasmidium smilacicola* (K(M) IMI 75641). **A.** Superficial hyphae. **B.** Solitary conidiophores arising from superficial hypha. **C.** Conidiophore fascicle. **D.** Conidiophore tips. **E.** Conidia. Bar = 10 µm.

**Illustrations:** Agarwal & Beliram (1960: 355, figs 1–2), Sharma *et al.* (2006: 36, fig. 2).

**Description:** *Leaf spots* amphigenous, circular to irregular, to 20 mm diam, medium to dark brown, margin indefinite or narrow and somewhat darker. *Caespituli* amphigenous, rather inconspicuous to delicately punctiform, dark brown to blackish or greyish black. *Mycelium* internal and external; superficial hyphae branched, septate, 1.5–4(–6) µm wide, thin-walled, subhyaline to brownish, verruculose. *Stromata* immersed, to 50 µm diam, brown. *Conidiophores* in small to moderately large, loose fascicles, arising from stromata or solitary, arising from superficial hyphae, erect, straight, subcylindrical-filiform to slightly sinuous or subgeniculate, unbranched, (12.5–)60–250 × 2.5–6 µm, occasionally with intercalary swellings, to 8 µm wide, often with percurrent rejuvenations giving rise to new conidiogenous cells (visible as fine annellations), pluriseptate, septa thin and not very conspicuous, wall thin to somewhat thickened, brown, tips often paler, smooth; conidiogenous cells integrated, terminal, 10–40 µm long, apex of conidiogenous cells often somewhat swollen, with a single to several distinct conidiogenous loci, often numerous and aggregated, about 2 µm diam, slightly thickened and darkened. *Conidia* solitary, ellipsoid-ovoid, cylindrical to obclavate, 15–75(–105) × 3–9 µm, 0–7(–15)-septate, brown,

wall somewhat thickened, verrucose, apex obtuse, rounded, base rounded to short obconically truncate, 1.5–2 µm wide, hila almost unthickened or slightly so, somewhat darkened-refractive.

**Lectotype (designated here, MycoBank MBT178172):** India: *Madhya Pradesh*: Jabalpur, on *Smilax ovalifolia* [*macrophylla*], 26 Dec. 1958, G. P. Agarwal 3 (K(M) IMI 75641). **Isolectotype:** Mahakoshal Mahavidyalaya, Jabalpur, India, Botany Department, Herbarium [now Gov. Model Science College, Rani Durgawati University, Jabalpur] (unclear if still maintained).

**Host range and distribution:** On *Smilax ovalifolia*, *Smilacaceae*, Asia (India, *Madhya Pradesh*).

**Notes:** See comments under *Zasmidium indicum*. Superficial hyphae with solitary conidiophores were neither mentioned in the original description nor depicted in the illustration, but they are present in type material and abundant.

**Zasmidium smilacis** (P. Kumar, D.N. Shukla & Kamal) Kamal, *Cercosporoid Fungi of India*: 248 (2010). (Fig. 168)

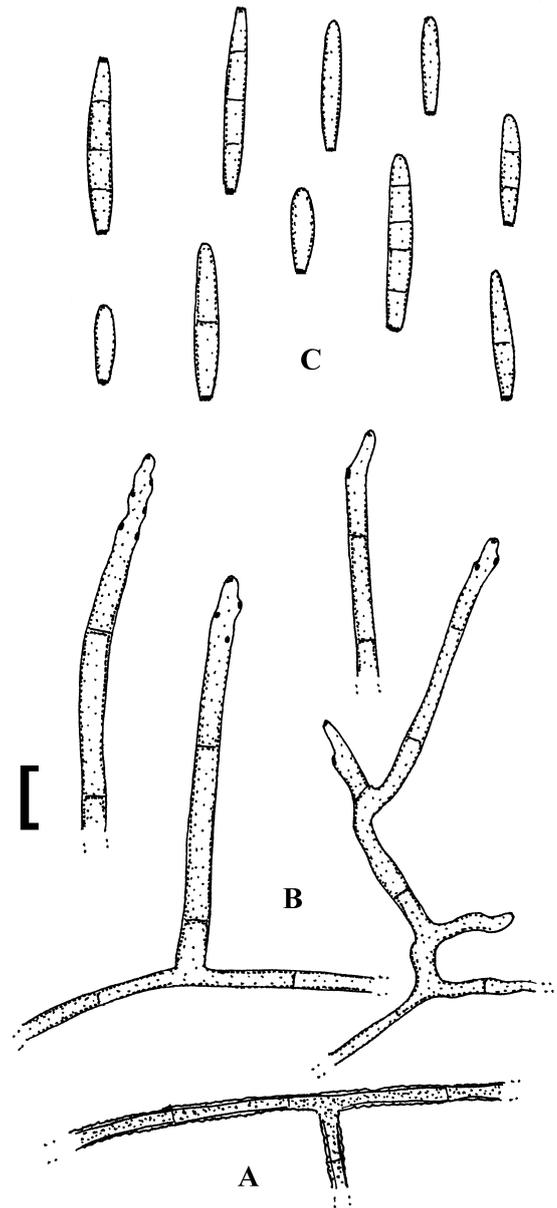
**Basionym:** *Stenella smilacis* P. Kumar, D.N. Shukla & Kamal, *Curr. Sci.* **49**: 234 (1980).

**Synonym:** *Veronaea smilacis* R.P. Singh, Kamal & Abassi, *Curr. Sci.* **50**: 237 (1981) [**holotype:** India: U.P.: Gorakhpur, Gorakhpur Forest Division, Madhauria range, on *Smilax macrophylla*, Feb.–Mar. 1978, R. P. Singh 310 (not preserved)].

**Literature:** de Hoog et al. (1983: 487), Braun & Castañeda Ruiz (1991: 296).

**Illustrations:** Kumar et al. (1980: 235, fig. 1), Braun & Castañeda Ruiz (1991: 295, fig. 31), Kamal (2010: 249, fig. 35).

**Description:** Leaf spots lacking or amphigenous, only formed as pale yellowish discolorations, diffuse, or forming yellowish to brown, irregularly shaped patches. Colonies hypophyllous, olivaceous-brown. Mycelium internal and external, superficial hyphae straight to flexuous, branched, 2–5 µm wide, septate, pigmented, ± dimorphic, somewhat broader hyphae darker, wall slightly thickened and smooth or almost so or hyphae narrower, paler and verruculose. Conidiophores solitary, arising from superficial hyphae, lateral and sometimes terminal, erect, straight, subcylindrical-filiform to slightly geniculate-sinuous, unbranched, long, 50–165 × 3–5.5 µm, 1–12-septate, brown, often somewhat paler towards the tip, wall thin to somewhat thickened, smooth or almost so; conidiogenous cells integrated, terminal, about 10–30 µm long, sympodial, with conspicuous conidiogenous loci, often numerous and aggregated, somewhat thickened and darkened, about 1 µm diam. Conidia solitary as well as catenate, shape variable, ellipsoid-ovoid, subcylindrical, fusiform, somewhat clavate or obclavate, 5–75 × 2–4 µm, 0–6-septate, hyaline, subhyaline to pale olivaceous, smooth or almost so, ends rounded to truncate, 1–1.5 µm wide, hila somewhat thickened and darkened.



**Fig. 168.** *Zasmidium smilacis* (K(M) IMI 227071). **A.** Superficial hypha. **B.** Solitary conidiophores arising from superficial hyphae. **C.** Conidia. Bar = 10 µm.

**Holotype:** India: U.P.: Gorakhpur, on *Smilax ovalifolia* [*macrophylla*], Mar. 1978, P. Kumar 103 (K(M) IMI 227071).

**Host range and distribution:** On *Smilax* (*ovalifolia*, *mollis*, *perfoliata* [*prolifera*]), *Smilacaceae*, Asia (India, Uttar Pradesh), West Indies (Cuba).

**Notes:** Singh et al. (1981: 237, fig. 1) described and illustrated *Veronaea smilacis*. Type material was said to be deposited at IMI as “IMI 212616”, but this material was apparently not retained (B. Aguirre-Hudson, K, *in litt.*). In the IMI accession books, IMI 212616 is listed as discarded and the substrate (host plant) is recorded as *Coffea*. It is quite unclear if the authors deposited type material of *V. smilacis* at all, but that there could be some error in the accession number cannot be discounted. In any case, the description of this species is close to *Zasmidium smilacis* (conidia 14–32.5 × 2–4 µm,

(1–)3–6(–12)-septate). This species is probably conspecific with *Z. smilacis* as already supposed by de Hoog *et al.* (1983). Kamal (2010), one of the authors of *V. smilacis*, reduced this name to synonym with *Z. smilacis*.

**Zasmidium smilacis-macrophyllae** (S. Chaudhary & R.K. Chaudhary) Kamal, *Cercosporoid Fungi of India*: 250 (2010).

(Fig. 169)

*Basionym*: *Stenella smilacis-macrophyllae* S. Chaudhary & R.K. Chaudhary, in Rao *et al.*, *Frontiers of Fungal Diversity in India (Prof. Kamal Festschrift)*: 601 (2003).

*Illustration*: Chaudhary & Chaudhary (2003: 602, fig. 7).

*Description*: Leaf spots amphigenous, circular, rarely subcircular, centre black, margin dark brown. Colonies hypophyllous, dark to blackish brown. Mycelium internal and external; superficial hyphae branched, septate, 2–3 µm wide, olivaceous-brown, verruculose. Stromata present, but only reduced to a few swollen substomatal cells. Conidiophores emerging through stomata, in small, loose fascicles and solitary, arising from superficial hyphae, lateral or sometimes terminal, erect, straight to curved, flexuous, subcylindrical, unbranched or rarely branched, 12–85 × 3–4.5 µm, 1–4-septate, brown to dark brown, smooth; conidiogenous cells integrated, terminal and intercalary, with distinct conidiogenous loci. Conidia solitary, cylindrical or subcylindrical, straight to somewhat curved, 15–45 × 4–6.5 µm, 1–6-septate, occasionally somewhat constricted at the septa, dark brown, wall thickened, verruculose, apex rounded, base rounded to somewhat attenuated, with a distinct hilum.

*Holotype*: India: Uttar Pradesh: Nichlaur Forest, on *Smilax ovalifolia* [*macrophylla*], Smilacaceae, Sep. 1997, S. Chaudhary (HCIO 43689). *Isotype*: GPU 9021.

*Host range and distribution*: Only known from the type collection.

## Typhaceae

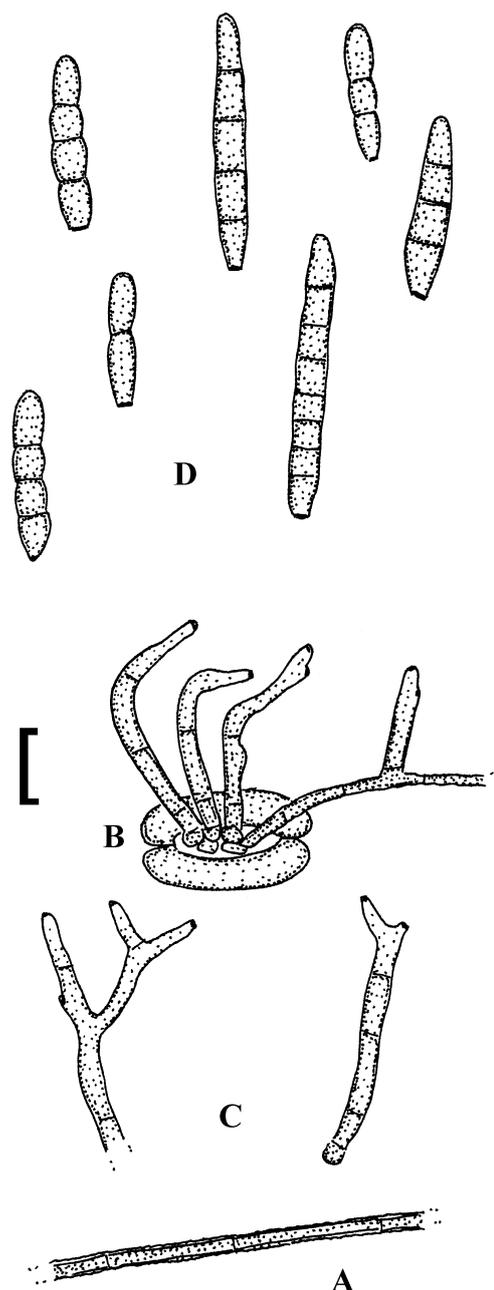
### Doubtful, excluded and insufficiently known species

*Cercospora typhae* N.P. Golovina, *Novosti Sist. Nizsh. Rast.* 1: 212 (1964).

*Literature*: Braun & Mel'nik (1997: 98), Crous & Braun (2003: 414).

*Description*: Leaf spots indistinct, oblong, brown or olivaceous-brown. Conidiophores 70–110 × 5–6 µm, unbranched, olivaceous-brown, septate below. Conidia cylindrical to obclavate, at first one-celled, later 3–5-septate.

*Holotype*: Uzbekistan: Kurama District, on *Typha angustifolia*, Typhaceae, N. P. Golovina (lost).



**Fig. 169.** *Zasmidium smilacis-macrophyllae* (based on Chaudhary & Chaudhary 2003: 602, fig. 7). **A.** Superficial hypha. **B.** Conidiophores and superficial hyphae emerging through a stoma. **C.** Conidiophores. **D.** Conidia. Bar = 10 µm.

*Host range and distribution*: Only known from the type collection.

*Notes*: This species is insufficiently known. The original description is very meagre. Golovina (1964) cited that type material of this species was deposited at the herbarium of the Tashkent University. However, collections of TAK have been transferred to TASH, but this does not refer to fungal collections, which are lost according to Y. Gafforov, curator of TASM.

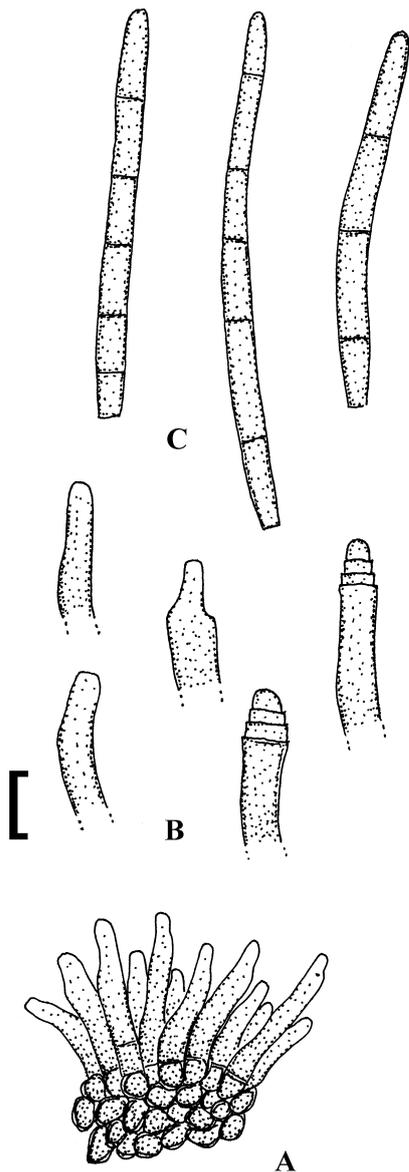


Fig. 170. *Pseudocercospora xerophytiae* (K(M) IMI 347226). A. Conidiophore fascicle. B. Conidiophores. C. Conidia. Bar = 10  $\mu$ m.

## Velloziaceae

### *Pseudocercospora*

A single species.

***Pseudocercospora xerophytiae*** B. Sutton, *Mycol. Pap.* 167: 51 (1993).  
(Fig. 170)

*Illustration:* Sutton (1993: 50–51, figs 12–13).

*Description:* *Leaf spots* at first formed as small medium brown flecks, 1 mm long, parallel to the leaf veins, later enlarging to 5  $\times$  1 mm, darker with diffuse lighter brown border, oblong elliptical to navicular, sometimes confluent. *Caespituli* amphigenous, not very conspicuous. *Mycelium* immersed, intercellular; hyphae branched, septate, 2.5–4  $\mu$ m wide, medium to dark brown, thin-walled, smooth.

*Stromata* immersed, intra- to subepidermal, often situated in deep concave interveinal depressions of the leaves, to 70  $\mu$ m diam and 30–60  $\mu$ m deep, medium to dark brown, *textura angularis*. *Conidiophores* numerous in dense to divergent sporodochial fascicles, erumpent, erect, straight, cylindrical to somewhat curved or geniculate-sinuous, unbranched, 20–45  $\times$  3–4.5  $\mu$ m, 0–2-septate, olivaceous-brown, paler towards the tip, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 10–20  $\mu$ m long, proliferation sympodial and percurrent, with to five fine annellations, conidiogenous loci truncate, 2.5–4.5  $\mu$ m wide, neither thickened nor darkened. *Conidia* solitary, cylindrical, subcylindrical or somewhat tapering towards the tip, straight to curved or slightly sinuous, about 65–90  $\times$  4.5–5  $\mu$ m, 3–5-septate, pale olivaceous-brown, thin-walled, verruculose, apex obtuse, base truncate to slightly obconically truncate, 3–4  $\mu$ m wide, hila unthickened, not darkened.

*Holotype:* Malawi: Mt Mulanje, Chambe to Lichenya track, S1580, E03540, 2200 m alt, on *Xerophyta splendens*, Velloziaceae, 16 Apr. 1991, B. C. Sutton MM156 (K(M) IMI 347226).

*Host range and distribution:* Only known from the type collection.

## Xanthorrhoeaceae

### *Cercospora*

A single species.

***Cercospora hemerocallidis*** Tehon, *Mycologia* 16: 139 (1924); as "*hemerocallis*".  
(Fig. 171)

*Literature:* Chupp (1954: 347), Saccardo (1972: 1375), Crous & Braun (2003: 215).

*Description:* *Leaf spots* amphigenous, circular to subcircular or somewhat irregular, 1–8 mm diam or even larger, at first pale greenish, later pale brownish to dingy grey in the centre with darker margin or somewhat raised marginal line, reddish to reddish brown, sometimes lower surface more or less uniformly reddish to reddish brown. *Caespituli* amphigenous, indistinct to finely punctiform, dark brown to blackish. *Mycelium* internal. *Stromata* lacking or small, substomatal, olivaceous-brown. *Conidiophores* solitary to densely fasciculate, arising from stromata, emerging through stomata, erect, straight, subcylindrical or somewhat attenuated towards the tip, somewhat geniculate-sinuous, unbranched, 10–80  $\times$  2–6  $\mu$ m, pale olivaceous-brown, yellowish brown, paler above, tip sometimes subhyaline, continuous to pluriseptate, wall thin to slightly thickened, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, conidiogenous loci distinct, thickened and darkened, about 1–2.5  $\mu$ m diam. *Conidia* solitary, acicular to narrowly obclavate, straight to somewhat curved or sinuous, 30–120

× 2–4 µm, indistinctly pluriseptate, hyaline or subhyaline, thin-walled, smooth, apex subacute, base truncate to obconically truncate, about 2–3 µm wide, hila somewhat thickened and darkened.

**Holotype: USA: Illinois:** Boomfield, on *Hemerocallis fulva*, 25 Jul. 1922, P. A. Young 2897 (ILLS 2897).

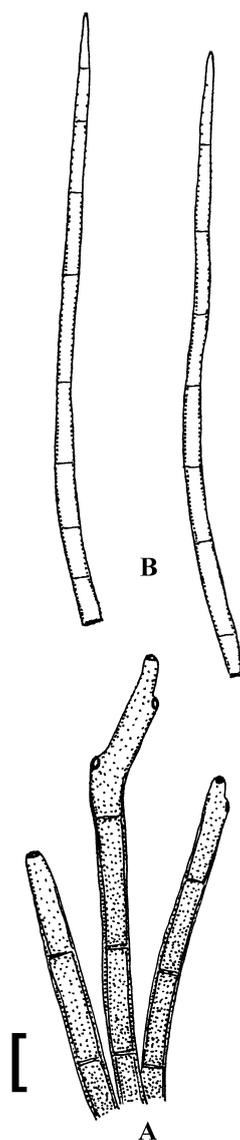
**Host range and distribution:** On *Hemerocallis* (*fulva*, *Hemerocallis* sp.), *Xanthorrhoeaceae*, North America (USA, Florida, Illinois), West Indies (Bermuda).

**Notes:** The material examined from ILLS was in poor condition, only with traces of *Cercospora*, and was dominated by *Alternaria* and *Cladosporium* species. Records from China on *Hosta plantaginea* (*Hostaceae*) are very doubtful.

## *Pseudocercospora*

### Key to *Pseudocercospora* species on *Xanthorrhoeaceae*

- 1 Mycelium internal; superficial hyphae with solitary conidiophores lacking; stromata well-developed, 25–80 µm diam; conidia (15–)20–50(–60) × 2–4 µm, 0–4-septate; on *Asphodelus* spp. .... ***P. asphodelina***
- Mycelium internal and external; superficial hyphae with solitary conidiophores present; stromata smaller, 10–40 µm diam; conidia longer and pluriseptate, (20–)30–85 × 2–4 µm, (1–)3–12-septate; on *Dianella nigra* ..... ***P. dianellae***



**Fig. 171.** *Cercospora hemerocallidis* (ILLS 2897). **A.** Conidiophore fascicle. **B.** Conidia. Bar = 10 µm.

### *Pseudocercospora* species on *Xanthorrhoeaceae*

***Pseudocercospora asphodelina*** (Sacc.) U. Braun, *Mycotaxon* **48**: 293 (1993).

(Fig. 172)

**Basionym:** *Septoria asphodelina* Sacc., *Syll. Fung.* **3**: 571 (1884).

**Synonyms:** *Septoria aphodeli* Westend., *Bull. Acad. Roy. Belg., Ser. II*, **12**: 573 (1857), non *S. aphodeli* Mont., 1849.

*Cylindrosporium asphodeli* Kuhn.-Lord. & J.P. Barry, *Bull. Trimestriel Soc. Mycol. France* **65**: 126 (1949) [**holotype:** France: Hérault, Garrigue de la Gardiole, près Fabrègues, on *Asphodelus cerasifer*, 11 May 1939, Kuhnholz-Lordat (not seen)].

**Illustration:** Braun (1993b: 295, fig. 22).

**Description:** *Leaf spots* amphigenous, subcircular to irregular, 2–15 mm diam or confluent and larger, at first yellowish, ochraceous to brownish, later greyish brown, finally greyish white, with darker margin. *Caespituli* amphigenous, punctiform, dark brown to almost black. *Mycelium* internal; hyphae septate, branched, 1–4 µm wide, subhyaline to faintly pigmented. *Stromata* well-developed, 25–80 µm diam, brown, substomatal. *Conidiophores* numerous, in dense fascicles, arising from stromata, most of the conidiophores immersed in the substomatal cavity, barely emerging through stomata, straight, subcylindrical to flexuous, unbranched, 10–25 × 2–4 µm, 0(–1)-septate, pale, subhyaline to greenish or olivaceous, thin-walled, smooth; conidiophores mostly reduced to conidiogenous cells, conidiogenous loci inconspicuous, unthickened and not darkened. *Conidia* solitary, subcylindrical-acicular, obclavate, (15–)20–50(–60) × 2–4 µm, 0–4-septate, subhyaline to greenish, thin-walled, smooth, apex subacute, base truncate to somewhat obconically truncate, 1–2 µm wide, hila neither thickened nor darkened.

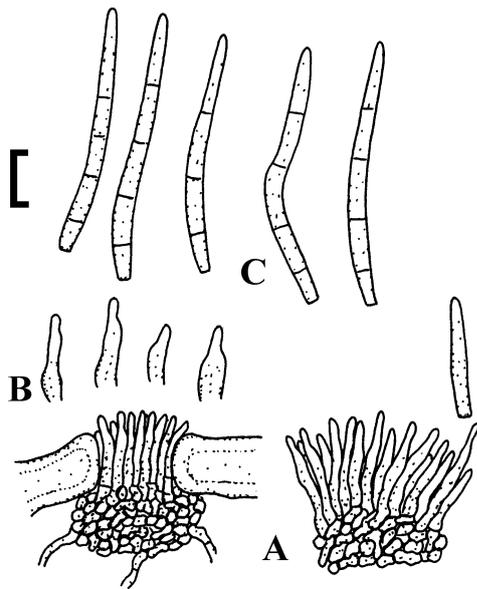


Fig. 172. *Pseudocercospora asphodelina* (BR, holotype). A. Conidiophore fascicles. B. Conidiophores. C. Conidia. Bar = 10  $\mu$ m.

**Holotype: Belgium:** on *Asphodelus albus*, without date, R. P. Cl. Dumont (BR).

**Host range and distribution:** On *Asphodelus* (*albus*, *cerasifer*, *microcarpus*), *Xanthorrhoeaceae*, Europe (Belgium, France, Spain).

**Note:** This species is rather pseudocercospora-like, but the conidiophores are not quite colourless.

***Pseudocercospora dianellae*** U. Braun & C.F. Hill, in Braun et al., *Australas. Pl. Pathol.* **32**: 89 (2003). (Fig. 173)

**Illustration:** Braun et al. (2003b: 90, fig. 3).

**Exsiccatae:** U. Braun, *Fungi Sel. Exs.* 15 (topotype material).

**Description:** Leaf spots lacking or almost so, or well-developed, amphigenous, shape and size variable, elliptical to irregular, oblong, to about 40  $\times$  10 mm, brown, sometimes reddish brown, margin indefinite, old patches becoming pale brown to greyish white, with an irregular dark border. *Caespituli* hypophyllous, punctiform, scattered, dark brown to blackish, later greyish brown. *Mycelium* internal and external; superficial hyphae sparingly branched, septate, 1.5–4  $\mu$ m wide, subhyaline to pale olivaceous-brown, thin-walled, smooth. *Stromata* lacking to well-developed, substomatal to intraepidermal, 10–40  $\mu$ m diam, olivaceous-brown. *Conidiophores* in small to moderately large fascicles, loose to moderately dense, arising from stromata, through stomata or erumpent, also solitary, arising from superficial hyphae, lateral, erect, occasionally decumbent, straight, subcylindrical-conical to strongly geniculate-sinuuous, unbranched, 5–40  $\times$  2–4  $\mu$ m, 0–3-septate, subhyaline to pale olivaceous or olivaceous-brown, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores

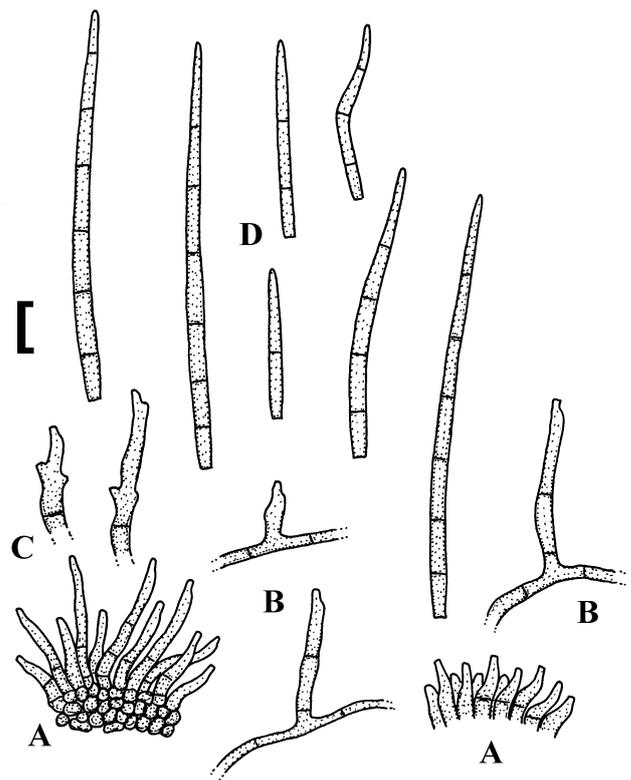


Fig. 173. *Pseudocercospora dianellae* (HAL 1729 F). A. Conidiophore fascicles. B. Solitary conidiophores arising from superficial hyphae. C. Conidiophores. D. Conidia. Bar = 10  $\mu$ m.

reduced to conidiogenous cells, 5–25  $\mu$ m long, conidiogenous loci inconspicuous. *Conidia* solitary, obclavate-cylindrical, subbacillar, (20–)30–85  $\times$  2–4  $\mu$ m, (1–)3–12-septate, subhyaline to pale olivaceous, thin-walled, smooth, apex subacute to obtuse, base truncate to obconically truncate, (1–)1.5–2.5(–3)  $\mu$ m wide, hila unthickened, not darkened.

**Holotype: New Zealand:** Auckland, Grey Lynn, Western Springs Park, on *Dianella nigra*, 31 Mar. 2001, C. F. Hill 379 (HAL 1729 F). *Isotype:* PDD 75122.

**Host range and distribution:** On *Dianella nigra*, *Xanthorrhoeaceae*, New Zealand.

## **Zasmidium**

A single species.

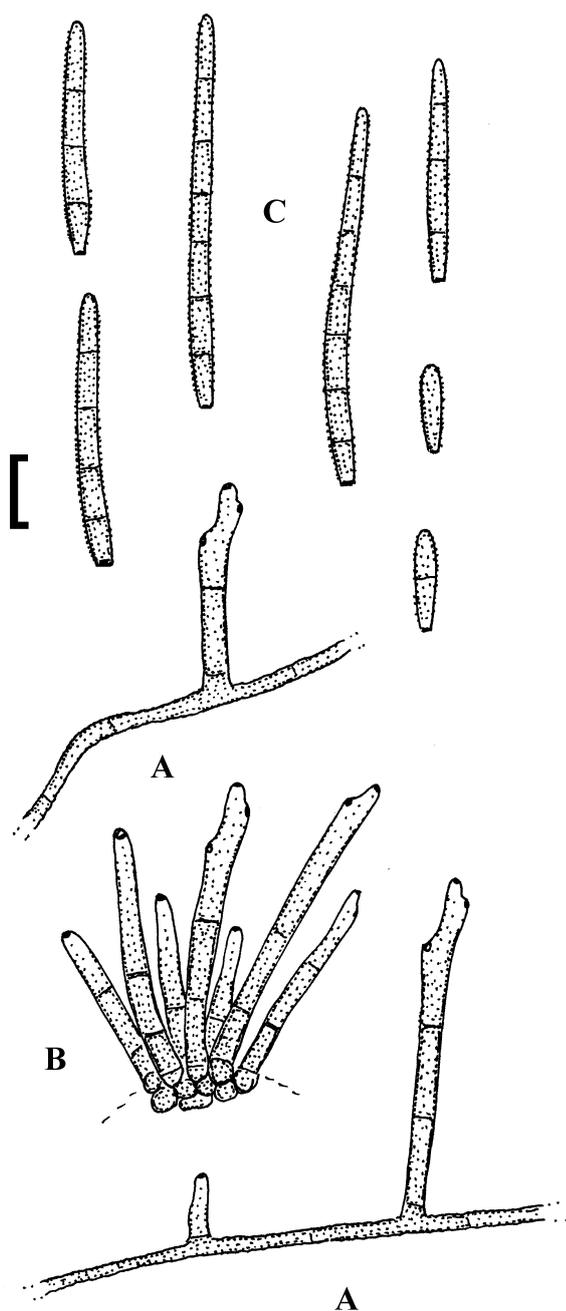
***Zasmidium dianellae*** (Sawada & Katsuki) U. Braun, *Stud. Mycol.* **72**: 336 (2012).

(Fig. 174)

**Basionym:** *Cercospora dianellae* Sawada & Katsuki, *Spec. Publ. Coll. Agric. Natl. Taiwan Univ.* **8**: 216 (1959).

**Synonyms:** *Heterosporium dianellae* Sawada, *Rep. Gov. Res. Inst. Formosa* **87**: 76 (1944), *nom. inval.* (ICN, Art. 39.1) [*holotype: Taiwan:* Taipei, on *Dianella ensifolia*, 19 Nov. 1925, K. Sawada (NTU-PPE, National Taiwan University, herb. Sawada)].

*Stenella dianellae* (Sawada & Katsuki) Goh & W.H. Hsieh, *Trans. Mycol. Soc. Republ. China* **2**: 137 (1987).



**Fig. 174.** *Zasmidium dianellae* (NTU-PPE, holotype). **A.** Solitary conidiophores arising from superficial hyphae. **B.** Conidiophore fascicle. **C.** Conidia. Bar = 10 µm.

**Literature:** David (1997: 108–110), Goh & Hsieh (1990: 209), Crous & Braun (2003: 159).

**Illustrations:** David (1997: 110, fig. 31), Goh & Hsieh (1990: 210, fig. 162).

**Description:** *Leaf spots* amphigenous, elliptical to fusiform, scattered, 0.5–6 mm long, sometimes confluent and larger, coalescing into elongated patches, at first purplish red, later dingy grey. *Caespituli* epiphyllous, punctiform-pustulate, blackish, scattered to aggregated. *Mycelium* internal and external; superficial hyphae sparingly branched, septate, very pale olivaceous to brownish, 1.5–3.5 µm wide, thin-walled, pale and narrower hyphae verruculose. *Stromata*

none to well-developed, globose, 40–125 µm diam, dark brown. *Conidiophores* in small to moderately large fascicles, to 20, loose, arising from stromata, or solitary, arising from superficial hyphae, lateral, rarely terminal, erect, straight, subcylindrical, slightly geniculate, unbranched, 20–75 × 2.5–4 µm, 0–3-septate, uniformly medium to dark reddish brown or paler towards the apex, thin-walled, smooth; conidiogenous cells integrated, terminal, conidiogenous loci thickened and darkened, about 1.5–2.5 µm diam. *Conidia* solitary, subcylindrical to obclavate-cylindrical, straight to somewhat curved, 10–60 × 3–4.5 µm, 0–6-septate, subhyaline to pale brownish, thin-walled, finely verruculose, ends bluntly rounded, hila somewhat thickened and darkened.

**Holotype:** **Taiwan:** Taipei, on *Dianella ensifolia*, 19 Nov. 1925, K. Sawada (NTU-PPE, National Taiwan University, herb. Sawada). **Isotype:** TNS-F-220610.

**Host range and distribution:** On *Dianella ensifolia*, *Xanthorrhoeaceae*, Asia (Taiwan), New Zealand.

**Notes:** Records of this species on *Phormium* sp., *Phormiaceae* (Crous & Braun 2003) are unverified.

#### **Doubtful, excluded and insufficiently known species**

*Cercospora phormii* Bolick, *nom. nud.*, fide Alfieri *et al.* (1984) and Farr *et al.* (1989: 615), on *Phormium tenax*, USA, Florida.

### **Xyridaceae**

#### **Cercospora**

#### **Doubtful, excluded and insufficiently known species**

*Cercospora xyridis* Miles, *Mycologia* **18**: 168 (1926).

**Literature:** Chupp (1954: 606), Saccardo (1972: 1388), Crous & Braun (2003: 432).

**Description:** *Leaf spots* oval, 2–4 mm diam, brown, margin purplish brown. *Caespituli* amphigenous. *Mycelium* internal. *Stromata* lacking or only small aggregations of a few swollen hyphal cells, substomatal, dark brown, wall thickened. *Conidiophores* solitary or fasciculate, 2–8, straight to slightly sinuous, rarely geniculate, unbranched, 50–150 × 4–5.5 µm, plainly pluriseptate, uniformly dark reddish brown. *Conidia* solitary, obclavate, 40–90 × 2.5–4 µm, indistinctly septate, subhyaline to very pale olivaceous, thin-walled, smooth, apex subobtuse, base obconically truncate.

**Syntypes:** **USA:** *Mississippi:* Wiggans, on *Xyris difformis* [*elata*], 15 Sep. 1920, L. E. Miles 455 (BPI 442562, CUP 41582, NY 945737).

**Host range and distribution:** On *Xyris difformis*, *Xyridaceae*, North America (USA, Mississippi).

Notes: Status unclear; type material very meagre, only dark brown substomatal stromata and conidiophore fragments found. The conidiophores seem to be cercospora-like, but

conidiogenous cells and loci as well conidia not seem. New collections are necessary to prove the generic affinity of this species.

## Zingiberaceae

### Cercospora

#### Key to *Cercospora* species on Zingiberaceae

- |       |   |                               |
|-------|---|-------------------------------|
| 1     | Conidia acicular, base truncate or at least long acicular conidia mixed with obclavate-subcylindrical conidia .....   | 2                             |
|       | Conidia obclavate-cylindrical, base short obconically truncate, acicular conidia not formed .....   | 6                             |
| 2 (1) | Conidia obclavate-cylindrical to acicular, rather broad, 40–160 × 4.5–6.5 µm; on <i>Alpinia</i> .....   | <b>P. alpinigena</b>          |
|       | Conidia narrower, 2–4 µm .....  | 3                             |
| 3 (2) | Conidia acicular; on <i>Alpinia</i> or <i>Curcuma</i> spp. ....   | 4                             |
|       | Conidia acicular, shorter conidia obclavate-cylindrical; on <i>Stahlianthus</i> or <i>Zingiber</i> spp. ....  | 5                             |
| 4 (3) | Conidiophores very long, 100–265 µm; conidia 165–335 µm long; on <i>Alpinia</i> .....   | <b>C. alpiniae-katsumadae</b> |
|       | Conidiophores shorter, 50–190 µm; conidia 40–130 µm long; on <i>Curcuma</i> .....   | <b>C. hitcheniae</b>          |
| 5 (3) | Conidiophores 20–260 µm long; on <i>Stahlianthus</i> spp. ....  | <b>C. stahlianthi</b>         |
|       | Conidiophores shorter, 15–90 µm; on <i>Zingiber</i> spp. ....   | <b>C. zingibericola</b>       |
| 6 (1) | Conidia rather broad, 40–160 × 3.5–6.5 µm, obclavate-cylindrical to acicular; on <i>Alpinia</i> spp. ....   | <b>C. alpinigena</b>          |
|       | Conidia obclavate-cylindrical, acicular conidia lacking, much narrower, 1.5–4 µm, if broader, 3.5–5 µm, pale, not quite colourless .....  | 7                             |
| 7 (6) | Stromata lacking or only with a few substomatal swollen hyphal cells; conidiophores longer, 40–100 µm; conidia broader, 25–90 × 3.5–5 µm, 3–5-septate, subhyaline; on <i>Zingiber</i> spp. .... | <b>C. zingiberi</b>           |
|       | Stromata well-developed, about 20–65 µm diam; conidia narrower, 1.5–4 µm; on other hosts .....  | 8                             |
| 8 (7) | Conidia quite colourless, 3–4 µm wide; on <i>Curcuma</i> .....  | <b>C. curcumae</b>            |
|       | Conidia subhyaline to pale olivaceous, 1.5–3.5 µm wide; on <i>Alpinia</i> .....   | <b>P. alpinicola</b>          |

#### *Cercospora* species on Zingiberaceae

***Cercospora alpiniae-katsumadae*** S.Q. Chen & P.K. Chi, *J. S. China Agric. Univ.* **11**: 58 (1990); as “*alpini-katsumadae*”.

(similar to Fig. 1)

Literature: Chi (1994: 157), Crous & Braun (2003: 52), Guo et al. (2005: 308–309).

Illustrations: Chi (1994: 24, fig. 11), Guo et al. (2005: 309, fig. 231).

Description: Leaf spots amphigenous, elliptical to irregular, greyish white with brown border. *Caespituli* epiphyllous. *Mycelium* internal. *Stromata* globose, 20–65 µm diam, olivaceous-brown to brown. *Conidiophores* in fascicles, 5–25, arising from stromata, erect, straight, cylindrical, to somewhat curved, 0–3 times geniculate above, unbranched, 100–265 × 3.5–5 µm, 3–13-septate, olivaceous-brown; conidiogenous cells integrated, terminal and intercalary, conidiogenous

loci conspicuous, thickened and darkened. *Conidia* solitary, acicular, 165–335 × 2.5–3.5 µm, 10–20-septate, hyaline, thin-walled, smooth, apex pointed, base truncate or subtruncate, hila thickened and darkened.

*Holotype*: China: Guangdong: Yunan, on *Alpinia hainanensis* [*katsumadae*] (Hb. S. China Agric. Univ., Guangzhou).

*Host range and distribution*: On *Alpinia* (*hainanensis*, *oxyphylla*), Zingiberaceae, Asia (China).

Notes: This species has strictly acicular conidia and belongs to the *C. apii* s. lat. complex.

***Cercospora alpinigena*** To-anun, Meeboon & Hidayat, **sp. nov.**

MycoBank MB809027  
(Fig. 175)

Literature: To-anun et al. (2011: 82), as *C. alpinicola*.

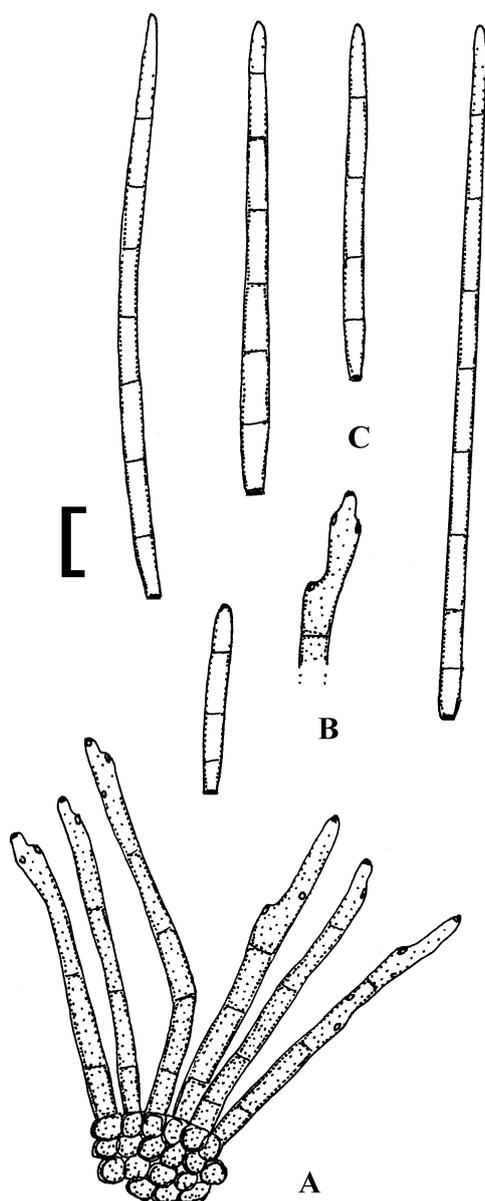


Fig. 175. *Cercospora alpinigena* (BBH 23684). A. Conidiophore fascicle. B. Conidiophore tip. C. Conidia. Bar = 10  $\mu$ m.

Illustration: To-anun *et al.* (2011: 83, fig. 66), as *C. alpinicola*.

**Diagnosis:** Morphologically resembling *Cercospora alpinicola* but conidia obclavate-cylindrical to subacicular, hyaline and much broader, 3.5–6.5  $\mu$ m,

**Description:** Leaf spots amphigenous, subcircular to angular, 2–14 mm diam, vein-limited, confluent, brown to greyish brown or centre becoming white with dark margin sometimes forming distinct discolorations around the margin. *Caespituli* amphigenous, mainly epiphyllous. *Mycelium* internal. *Stromata* small to well-developed, about 10–40  $\mu$ m, brown to dark brown, composed of globose or subglobose cells. *Conidiophores* in loose to dense fascicles, 3–8, arising from stromata, erect, straight to decumbent, subcylindrical to distinctly geniculate, unbranched, 48.5–100  $\times$  4.5–6.5  $\mu$ m, 1–3-septate, brown below, paler towards the tip, thin-walled, smooth; conidiogenous cells integrated, terminal

and intercalary, conidiogenous loci conspicuous, thickened and darkened, 1.3–2.8  $\mu$ m diam. *Conidia* solitary, obclavate-subcylindrical to subacicular, about 40–160  $\times$  3.5–6.5  $\mu$ m, 4–11-septate, hyaline, thin-walled, smooth, apex subacute or subobtuse, base short obconically truncate, 2–2.5  $\mu$ m wide, hila thickened and darkened.

**Holotype:** Thailand: Chiang Mai Province: Sanpatong District, Mae Wang Sub-district, Tambol Mae Win, Bahn Mae Sapok, Mae Sapok Royal Project, on *Alpinia purpurata*, Zingiberaceae, 8 Feb. 2008, J. Meeboon & I. Hidayat (BBH 23684).

**Host range and distribution:** Only known from the type collection.

**Notes:** The collection on *Alpinia purpurata* was previously assigned to *Cercospora alpinicola*, but differs in having colourless, much broader, obclavate-cylindrical to subacicular conidia and warrants to be considered a species of its own.

***Cercospora alpinicola*** S.Q. Chen & P.K. Chi, *J. S. China Agric. Univ.* 11: 57 (1990); as “*alpinicola*”. (Fig. 176)

**Literature:** Chi (1994: 33), Crous & Braun (2003: 53), Guo *et al.* (2005: 308).

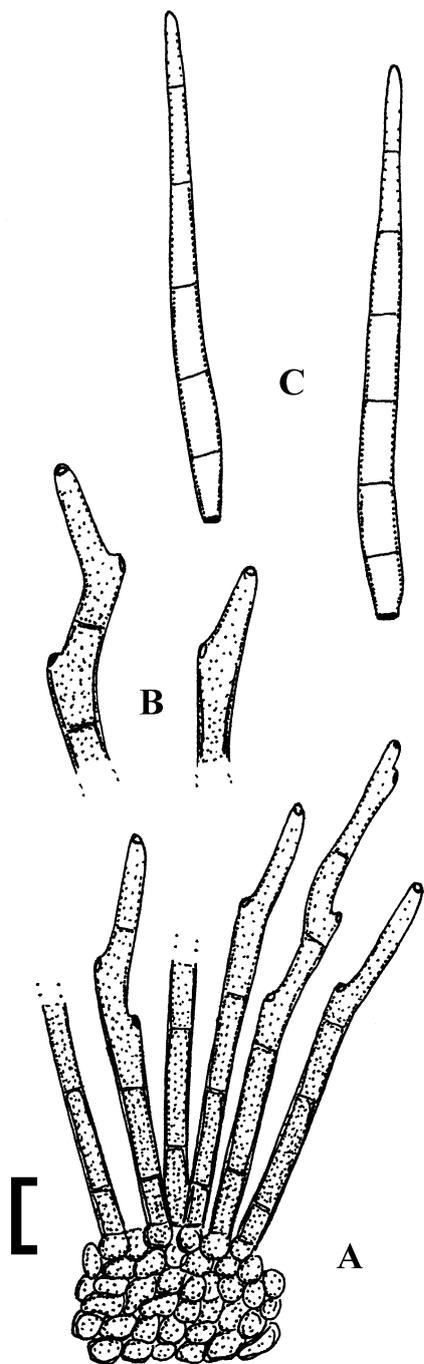
**Illustrations:** Chi (1994: 24, fig. 11), Guo *et al.* (2005: 308, fig. 230).

**Description:** Leaf spots amphigenous, elliptical, pale brown with narrow brown margin. *Caespituli* amphigenous. *Stromata* 23–67  $\mu$ m diam, olivaceous-brown. *Conidiophores* fasciculate, 10–55, arising from stromata, erect, subcylindrical, straight to geniculate, unbranched or rarely branched, 40–65  $\times$  3–3.6  $\mu$ m, 2–5-septate, olivaceous; conidiogenous cells integrated, terminal or intercalary, with conspicuous conidiogenous loci, thickened and darkened. *Conidia* solitary, obclavate, 40–80  $\times$  1.5–3.5  $\mu$ m, 3–11-septate, subhyaline to pale olivaceous, thin-walled, smooth, apex obtuse, base short obconically truncate, hila thickened and darkened.

**Holotype:** China: Guangdong: Gaoyao, on *Alpinia oxyphylla*, Zingiberaceae, Apr. 1987, S. Q. Chen 103 (Hb., S. China Agric. Univ., Guangzhou).

**Host range and distribution:** Only known from the type collection.

**Notes:** Type material could not be examined, but on account of the conspicuous conidiogenous loci and obclavate, pale olivaceous conidia, this species might rather belong to *Passalora*. To-anun *et al.* (2011: 82) recorded this species from Thailand on *Alpinia purpurata*, which differs, however, in having acicular to obclavate-cylindrical, hyaline, broader conidia and represents a distinct species of its own (see *C. alpinigena*).



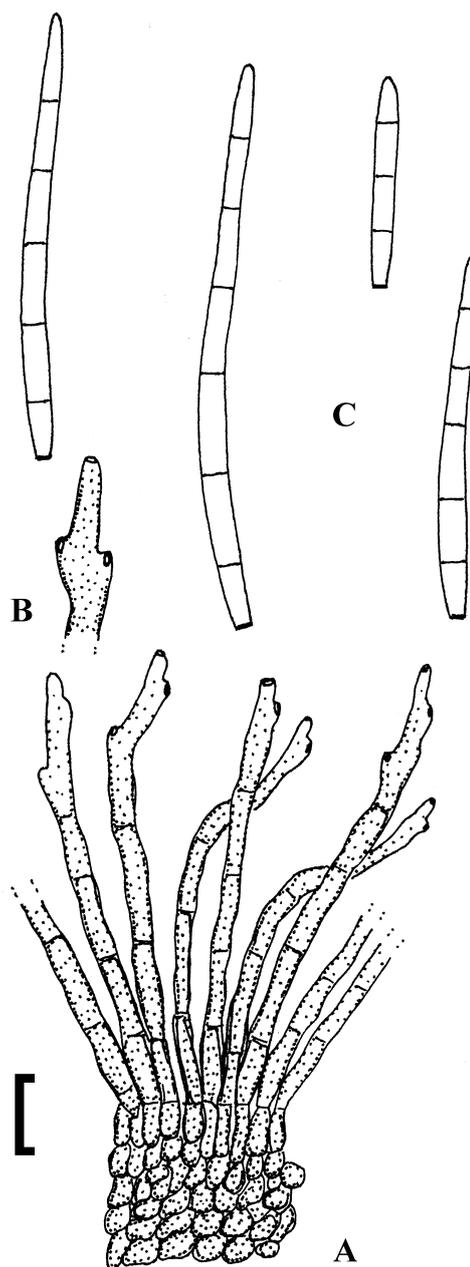
**Fig. 176.** *Cercospora alpiniicola* (based on Chi 1994: 24, fig. 11). **A.** Conidiophore fascicle. **B.** Conidiophore tips. **C.** Conidia. Bar = 10  $\mu$ m.

***Cercospora curcumae*** Govindu & Thirum., *Sydowia* 10: 275 (1956). (Fig. 177)

*Literature:* Vasudeva (1963: 94), Crous & Braun (2003: 148).

*Illustration:* Govindu & Thirumalachar (1956: plate IX, fig. 17).

*Description:* Leaf spots amphigenous, irregular, 3–5 mm diam, dark brown to almost sooty black. *Caespituli* amphigenous. *Mycelium* internal. *Stromata* globose, compact, 20–50  $\mu$ m diam, dark brown. *Conidiophores* loosely to densely fasciculate, arising



**Fig. 177.** *Cercospora curcumae* (based on Govindu & Thirumalachar 1956: plate IX, fig. 17). **A.** Conidiophore fascicle. **B.** Conidiophore tip. **C.** Conidia. Bar = 10  $\mu$ m.

from stromata, erect, straight to usually distinctly geniculate-sinuuous, unbranched or rarely 1–2 times branched, about 15–70  $\times$  3–5.5  $\mu$ m, 1–6-septate, olivaceous-brown, paler towards the apex, ultimate tips subhyaline; conidiogenous cells integrated, terminal, with conspicuous conidiogenous loci, thickened and darkened. *Conidia* solitary, obclavate-cylindrical, straight to slightly curved, about 30–70  $\times$  3–4  $\mu$ m, 1–10-septate, hyaline, thin-walled, smooth, apex pointed, base short obconically truncate, hila thickened and darkened.

*Holotype:* **India:** Karnataka: Bangalore, Hebbal, on *Curcuma longa*, 12 Apr. 1954, H. C. Govindu (probably not preserved).

*Host range and distribution:* On *Curcuma* (*aromatica*, *longa*), *Zingiberaceae*, Asia (India, Myanmar, Nepal).

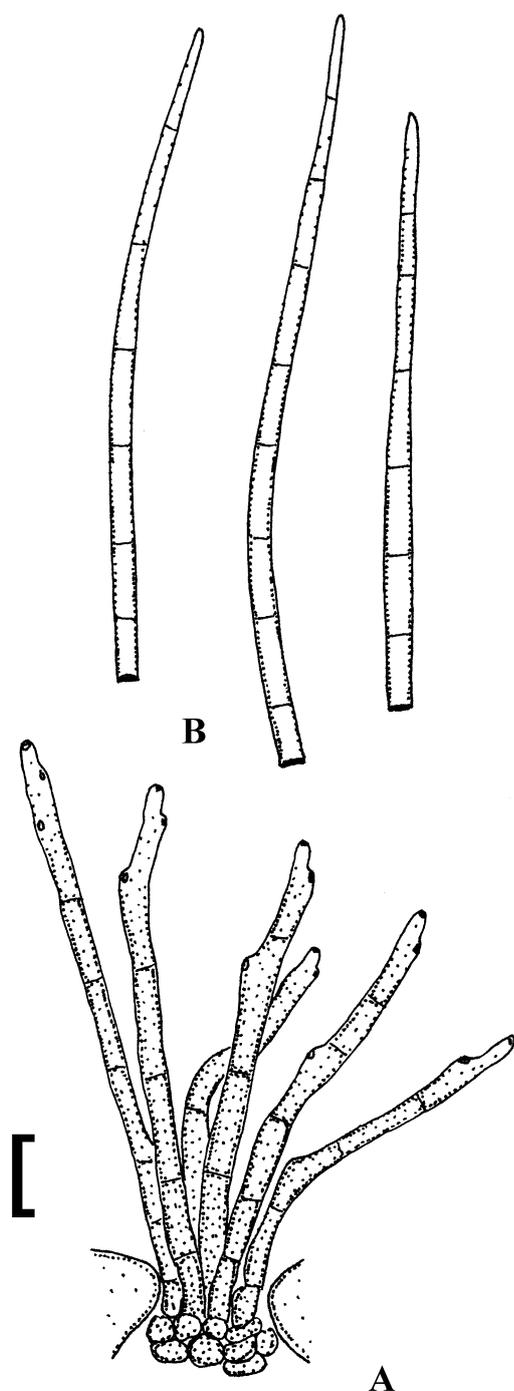


Fig. 178. *Cercospora hitcheniae* (K(M) IMI 83175). A. Conidiophore fascicle. B. Conidia. Bar = 10  $\mu$ m.

***Cercospora hitcheniae*** Chidd., *Indian Phytopathol.* **12**: 113 "1959" (1960).

(Fig. 178)

**Synonyms:** *Cercospora cucurmae-longae* Pavgi & R. Upadhyay, *Sydowia* **21**: 102 "1967" (1968) [*holotype*: **India**: Uttar Pradesh: Varanasi, on *Curcuma longa*, 3 Jan. 1964, R. Upadhyay (MSP, no. 341)].

*Cercospora curcumina* R.K. Srivast., N. Srivast. & A.K. Srivast., *Proc. Natl. Acad. Sci. India, Sect. B, Biol. Sci.* **64**: 107 (1994) [*holotype*: **India**: Madhya Pradesh: Sagar, on *Curcuma angustifolia*, Aug. 1989, R. K. Srivastava 66 (GPU 1341); *isotype*: HCIO 30881].

**Literature:** Crous & Braun (2003: 148, 218), Kamal (2010: 37, 51), Mall *et al.* (2013).

**Illustration:** Chiddarwar (1960: 117, figs 4–6), Pavgi & Upadhyay (1968: plate X, figs 4–6), Srivastava *et al.* (1994: 106, fig. 2).

**Description:** *Leaf spots* amphigenous, numerous, circular to angular-irregular, small, 2–5 mm diam, scattered, occasionally confluent, brown. *Caespituli* amphigenous. *Mycelium* internal. *Stromata* substomatal, about 15–60  $\mu$ m diam, brown to dark brown. *Conidiophores* in loose fascicles, mostly 3–10, rarely solitary, arising from stromata, emerging through stomata, erect, straight to curved, unbranched, not to distinctly geniculate, about 40–130  $\times$  3–6  $\mu$ m, 2–6-septate, olivaceous-brown to brown, wall somewhat thickened, smooth; conidiogenous cells integrated, terminal and intercalary, sympodial, conidiogenous loci conspicuous, about 2–2.5  $\mu$ m diam, thickened and darkened. *Conidia* solitary, acicular, shorter ones sometimes subcylindrical, straight to curved, 50–190  $\times$  2–4  $\mu$ m, 3–19-septate, hyaline, thin-walled, smooth, apex pointed, base truncate, about 1.5–2.5  $\mu$ m wide, hila thickened and darkened.

**Holotype:** **India**: Maharashtra: Mahabaleshwar, on *Curcuma caulina* [*Hitchenia caulina*], *Zingiberaceae*, 19 Jan. 1955, P. P. Chiddarwar (K(M) IMI 83175).

**Host range and distribution:** On *Curcuma* (*angustifolia*, *caulina*, *longa* [*domestica*]), *Zingiberaceae*, Asia (India, Madhya Pradesh, Uttar Pradesh; Nepal).

**Notes:** In the original paper, it was mentioned that portions of the type of *Cercospora cucurmae-longae* were deposited at HCIO and IMI, but it was not possible to locate any material under this name at IMI (now at K). According to the original description and illustration, this species belongs undoubtedly to the *Cercospora apii* s. lat. complex. Kamal (2010) examined type material of *C. curcumina* and stated that this species is conspecific with *C. cucurmae-longae*. On the other hand, the latter species is morphologically indistinguishable from *C. hitcheniae* described from India on *Curcuma caulina* [*Hitchenia caulina*], which is also a member of the *C. apii* s. lat. complex.

***Cercospora stahlianthi*** Z.D. Jiang & P.K. Chi, in Chi, *Fungal Diseases of Medical Plants in Guangdong Province*: 162 (1994).

(Similar to Fig. 1)

**Literature:** Crous & Braun (2003: 386), Phengsintham *et al.* (2013b: 74), Guo *et al.* (2005: 309).

**Illustrations:** Chi (1994: 162, fig. 167), Guo *et al.* (2005: 310, fig. 232), Phengsintham *et al.* (2013b: 75, figs 48–49).

**Description:** *Leaf spots* amphigenous, circular to irregular, 1–5 mm diam, pale to dark brown with yellowish to medium brown margin. *Caespituli* amphigenous, punctiform, dark brown, scattered. *Mycelium* internal; hyphae branched,

septate, with constrictions at the septa, pigmented, 2–6  $\mu\text{m}$  wide. *Stromata* substomatal, 10–70  $\mu\text{m}$  diam, brown, cells subglobose to angular-irregular in outline, 5–17  $\mu\text{m}$  diam. *Conidiophores* in small to moderately large fascicles, 2–27, loose to dense, arising from stromata, though stomata, unbranched, subcylindrical to somewhat geniculate-sinuuous, 20–260  $\times$  4–6  $\mu\text{m}$ , rarely longer, to 400  $\mu\text{m}$ , 1- to pluriseptate, brown, wall thin to somewhat thickened, smooth; conidiogenous cells integrated, terminal and intercalary, 15–65  $\mu\text{m}$  long, conidiogenous loci thickened and darkened, 2–4  $\mu\text{m}$  diam. *Conidia* solitary, acicular to somewhat obclavate-subcylindrical, 30–240  $\times$  2–4  $\mu\text{m}$ , 2–23-septate, colourless, thin-walled, apex pointed, base truncate to obconically truncate, 1.5–3  $\mu\text{m}$  wide, thickened and darkened.

**Holotype:** China: Guangdong: Gaoming, on *Stahlianthus involucrata*, Sep. 1986, Z. D. Jiang, no. 303 (SCHM [Hb. South China Agriculture University, Guangzhou]).

**Host range and distribution:** On *Stahlianthus (involucrata, thorelii)*, Zingiberaceae, Asia (China, Laos).

**Cercospora zingibericola** A.K. Kar & M. Mandal, *Trans. Brit. Mycol. Soc.* **53**: 359 (1969). (Fig. 179)

**Literature:** Crous & Braun (2003: 434), Kamal (2010: 99).

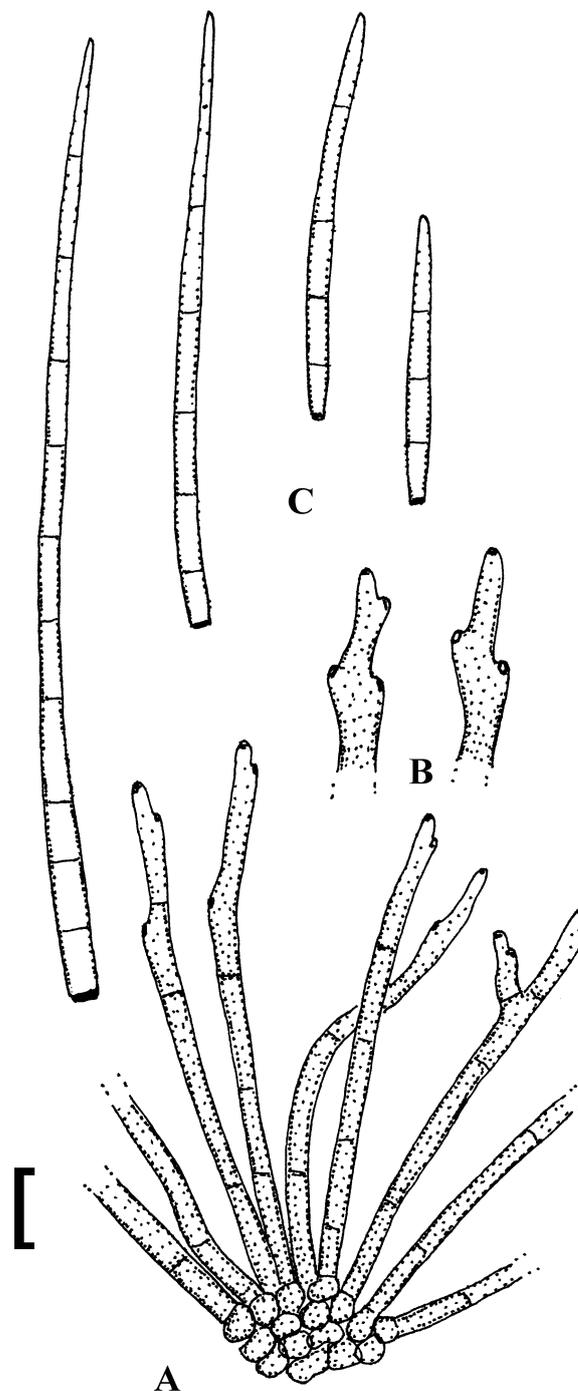
**Illustration:** Kar & Mandal (1969: 359, fig. 21).

**Description:** Leaf spots amphigenous, oblong between veins to irregular, 0.5–3 mm diam, scattered to confluent, greyish, margin indefinite. *Caespituli* amphigenous, mainly hypophyllous, dark, punctiform. *Mycelium* internal. *Stromata* small to moderately developed, 15–50  $\mu\text{m}$  diam, subglobose to irregular, pale to dark blackish brown. *Conidiophores* loosely fasciculate, 2–16(–26), arising from stromata, erect, straight, subcylindrical to geniculate-sinuuous, unbranched or rarely branched, 15–90  $\times$  3.5–5.5  $\mu\text{m}$ , 0–16-septate, subhyaline to pale brown, paler towards the tip, smooth; conidiogenous cells integrated, terminal, occasionally intercalary or conidiophores reduced to conidiogenous cells, about 10–30  $\mu\text{m}$  long, conidiogenous loci conspicuous, 1–5 per cell, about 1.5–2.5  $\mu\text{m}$  diam, thickened and darkened. *Conidia* solitary, acicular, shorter ones sometimes obclavate-cylindrical, 20–220  $\times$  2–3.5  $\mu\text{m}$ , 2–20-septate, hyaline, thin-walled, smooth, apex pointed to subobtuse, base truncate to obconically truncate in short conidia, 1.5–2.5  $\mu\text{m}$  wide, hila thickened and darkened.

**Holotype:** India: West Bengal: Murshidabad, Khargram, on *Zingiber officinale*, 1 Feb. 1967, A. K. Kar & M. Mandal (K(M) IMI 135186). **Isotype:** BPI 442646.

**Host range and distribution:** On *Zingiber (officinale, Zingiber sp.)*, Zingiberaceae, Africa (Mauritius), Asia (Borneo, China [Hong Kong], India, Myanmar).

**Note:** A true *Cercospora* s. str. belonging to the *C. apii* s. lat. complex.

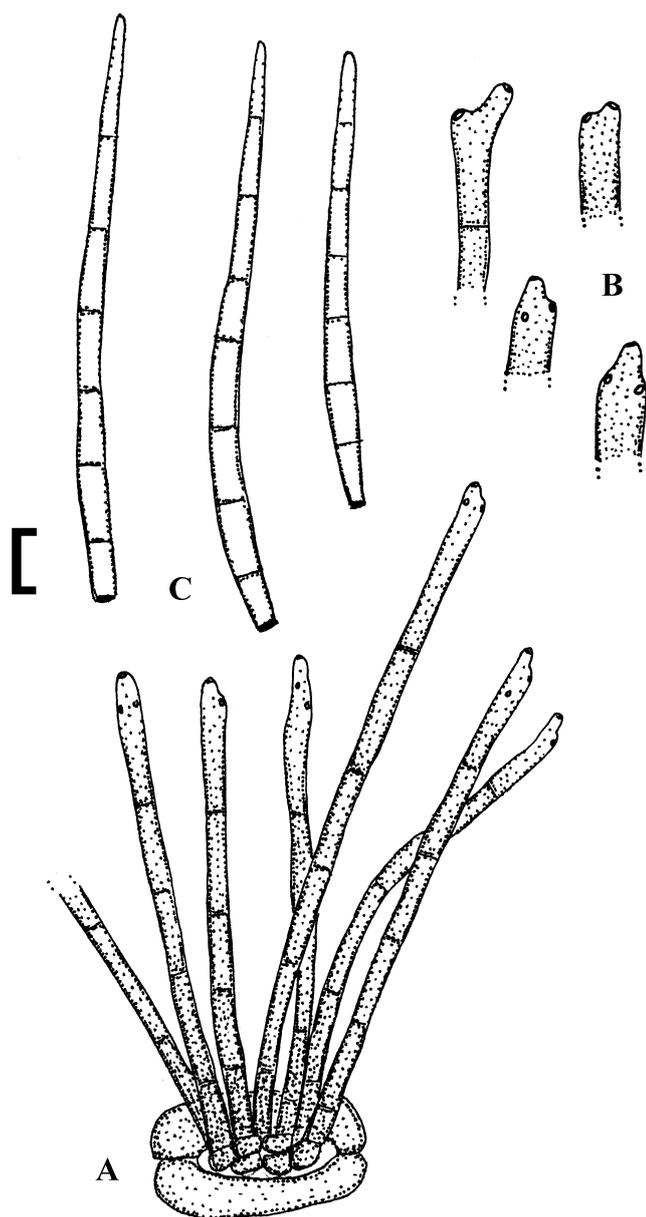


**Fig. 179.** *Cercospora zingibericola* (K(M) IMI 135186). **A.** Conidiophore fascicle. **B.** Conidiophore tips. **C.** Conidia. Bar = 10  $\mu\text{m}$ .

**Cercospora zingiberis** Togashi & Katsuki, *Bot. Mag. Tokyo* **65**: 25 (1952); as “*zingiberi*”. (Fig. 180)

**Literature:** Chupp (1954: 608), Katsuki (1965: 69), Crous & Braun (2003: 434), Kamal (2010: 99).

**Description:** Leaf spots oblong, linear, between veins, 2–20  $\times$  0.5–2 mm, occasionally confluent, pale brown to medium brown, later greyish brown, often vein-limited, margin indistinct. *Caespituli* mainly hypophyllous, punctiform, scattered, dark



**Fig. 180.** *Cercospora zingiberis* (CUP 40848). **A.** Conidiophore fascicle. **B.** Conidiophore tips. **C.** Conidia. Bar = 10  $\mu\text{m}$ .

brown to blackish. *Mycelium* internal. *Stromata* lacking or only formed as substomatal aggregations of swollen hyphal cells, to 25  $\times$  10  $\mu\text{m}$ , dark brown. *Conidiophores* in divergent to moderately dense fascicles, 4–15, effuse, erect, straight, cylindrical, unbranched, barely geniculate-sinuuous, 40–100  $\times$  3–8  $\mu\text{m}$ , 3–6-septate, pale to medium brown or olivaceous-brown, tapered and paler towards the tip, wall thin, to about 0.8  $\mu\text{m}$ , smooth; conidiogenous cells integrated, terminal, 10–30  $\mu\text{m}$  long, conidiogenous loci conspicuous, thickened and darkened, 1–5, often aggregated at the tip, not or somewhat protuberant, 1.5–2.5  $\mu\text{m}$  diam. *Conidia* solitary, obclavate-cylindrical, straight to somewhat curved, 25–90

$\times$  3.5–5  $\mu\text{m}$ , 3–7-septate, subhyaline, thin-walled, smooth, apex subacute or subobtuse, base short obconically truncate, 1.5–2  $\mu\text{m}$  wide, hila thickened and darkened.

**Holotype:** Japan: Fukuoka Pref.: Takawa, Soeda, on *Zingiber mioga*, 13 Sep. 1949, S. Katsuki (TNS-F-243831). **Isotype:** CUP 40848.

**Host range and distribution:** On *Elettaria cardamomum*, *Zingiber (mioga, officinale)*, *Zingiberaceae*, Asia (India, Karnataka; Japan), North America (USA, Florida).

**Notes:** The description of *C. zingiberis* in Nair (2011: 215) with shorter conidiophores, 17.5–56  $\times$  3.5  $\mu\text{m}$ , and much longer and narrowly linear conidia, 37–195  $\times$  1.75–2.5  $\mu\text{m}$ , is undoubtedly based on a misidentification and seems rather to refer to *C. zingibericola*.

### **Passalora**

#### **Doubtful, excluded and insufficiently known species**

*Passalora curcumae* Purkay. & Mallik, *Nova Hedwigia*, *Beih.* **63**: 132 (1979).

**Literature:** Crous & Braun (2003: 450).

**Illustration:** Purkayastha & Mallik (1979: 131, Fig. 4).

**Description:** *Leaf spots* amphigenous, circular to oval, uniformly scattered, 3–10 mm diam, greyish white with dark brown border, somewhat raised. *Caespituli* hypophyllous. *Mycelium* internal. *Stromata* lacking or almost so. *Conidiophores* in small fascicles, emerging through stomata, erect, straight, subcylindrical, unbranched, about 110–240  $\times$  4–9  $\mu\text{m}$ , 2–6-septate, brown, swollen at the very base; conidiogenous cells integrated, terminal, percurrent, conidiogenous loci conspicuous, thickened. *Conidia* solitary, obclavate-obovoid, 30–45  $\times$  5–8  $\mu\text{m}$ , (0–)1(–2)-septate, olivaceous-brown, thin-walled, smooth, apex attenuated, base obconically truncate, hila thickened.

**Holotype:** India: West Bengal: Baruipur, 24 Parganas, on *Curcuma reclinata*, *Zingiberaceae*, 15 Dec. 1975 (not preserved).

**Host range and distribution:** Only known from the type collection.

**Notes:** Identity and status of this species are unclear. Type material was said to be deposited at IMI (IMI 199984), but could not be located. In the accession book of IMI, number 199984 is listed as discarded. It is rather doubtful that *P. curcumae* represents a true *Passalora*.

**Pseudocercospora****Key to *Pseudocercospora* species on Zingiberaceae**

- 1 Conidiogenous cells rhachis-like, straight, subcylindrical, neither geniculate nor sinuous, but with numerous distinct conical denticles, dactylaria-like; on *Alpinia officinarum* ..... **P. alpinicola**, see *Doubtful, excluded and insufficiently known species*] Conidiogenous cells non-denticulate, at most subdenticulate, but then conidiogenous cells geniculate-sinuous ..... 2
- 2 (1) Stromata very large, 40–120 µm diam; conidiophores numerous, dense, in sporodochial conidiomata, very short, 8–25 µm, 0–1-septate; conidia narrowly subacicular-filiform or long and narrowly fusiform, 40–190 × 1.5–3 µm, subhyaline to pale yellowish; on *Zingiber* ..... **P. zingiberis** Stromata much smaller, 10–65 µm diam; conidiophores much longer, 10–150 µm (if uniformly short, conidia obclavate and colourless), often with several septa; conidia obclavate-cylindrical, pale olivaceous to olivaceous-brown ..... 3
- 3 (2) Conidiophores very short, 3–10 µm; conidia obclavate, colourless; on *Alpinia hainanensis* ..... **P. alpiniae-katsumadaicola** Conidiophores much longer, 10–150 µm; conidia pigmented ..... 4
- 4 (3) Mycelium *in vivo* internal and external; superficial hyphae with solitary conidiophores developed; on *Hedychium* spp. .... **P. hedychii** Mycelium *in vivo* internal; superficial hyphae and solitary conidiophores not developed; on other hosts ..... 5
- 5 (4) Conidiophores long, 65–145 µm, fertile upper part distinctly and densely raduliform and annellate; on *Alpinia* ..... **P. alpiniae** Fertile part of conidiophores neither raduliform nor annellate, proliferation only sympodial; on other hosts ..... 6
- 6 (5) Conidiophores very long, 30–150 µm, pluriseptate; on *Etilingera* ..... **P. nicolaiae** Conidiophores shorter, 10–75 µm, 0–6-septate; on other hosts ..... 7
- 7 (6) Conidiophores 10–75 × 3–5.5 µm; conidia 25–95 × 2.5–4.5 µm, 2–9-septate; on *Amomum* ..... **P. amomi** Conidiophores 12–26 × 2–3.2 µm; conidia 40–80 × 2–2.5 µm; on *Curcuma* ..... **P. curcumaticola**

***Pseudocercospora* species on Zingiberaceae**

***Pseudocercospora alpiniae*** S.Q. Chen & P.K. Chi, *J. S. China Agric. Univ.* **11**: 47 (1990). (Fig. 181)

*Literature*: Chi (1994: 48), Guo et al. (1998: 402).

*Illustrations*: Chi (1994: 159, fig. 164), Guo et al. (1998: 403, fig. 339).

*Description*: Leaf spots amphigenous, irregular, greyish white with brown border. *Caespituli* amphigenous. *Mycelium* internal. *Stromata* small, subglobose, about 15–35 µm diam, olivaceous-brown. *Conidiophores* fasciculate, 5–15, divergent to dense, arising from stromata, erect, straight, cylindrical, flexuous, unbranched, fertile apex densely raduliform or annellate, about 65–145 × 4.5–5 µm, 3–16-septate, olivaceous or pale olivaceous, thin-walled, smooth; conidiogenous cells integrated, terminal, narrowed towards the tip, sympodial and percurrent, conidiogenous loci about 1 µm wide, unthickened, not darkened. *Conidia* solitary, obclavate, straight to somewhat curved, about

40–75 × 3–3.5 µm, 5–16-septate, pale olivaceous, thin-walled, smooth, apex obtuse, base short obconically truncate, about 1 µm wide, hila unthickened, not darkened.

*Holotype*: **China**: Guangdong: Yunan, on *Alpinia officinarum*, Zingiberaceae, Oct. 1986, S. Q. Chen 105 (Hb. S. China Agric. Univ., Guangzhou).

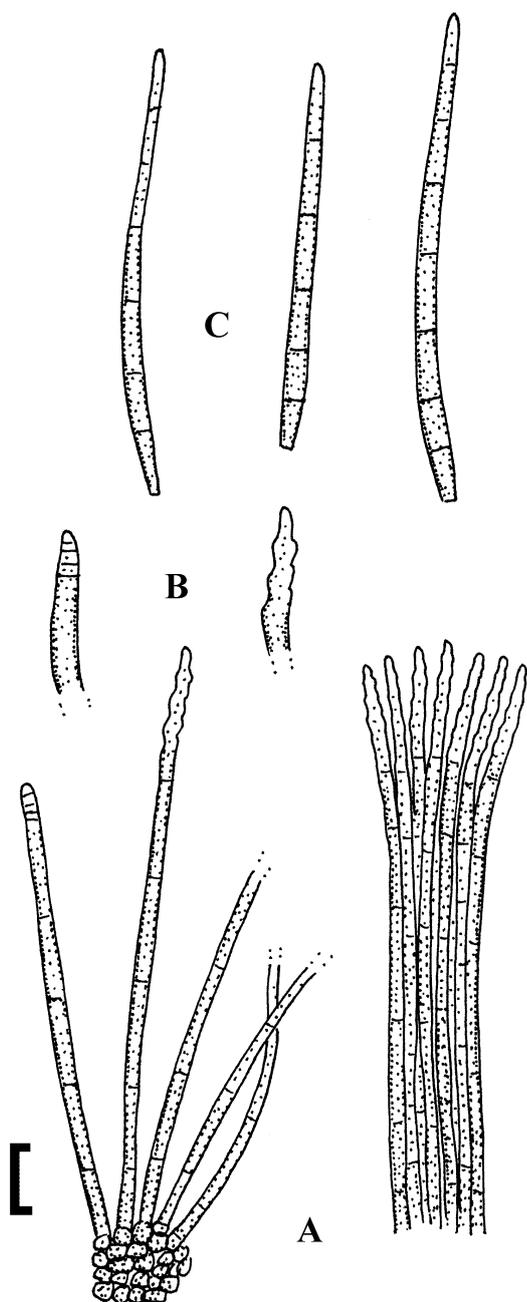
*Host range and distribution*: Only known from the type collection.

***Pseudocercospora alpiniae-katsumadaicola*** (S.Q. Chen & P.K. Chi) U. Braun & Crous, *Mycosphaerella and Anam.*: 53 (2003).

(Fig. 182)

*Basionym*: *Cercospora alpiniae-katsumadaicola* S.Q. Chen & P.K. Chi, *J. S. China Agric. Univ.* **11**: 58 (1990); as "*alpiniae-katsumadaicola*".

*Synonym*: *Pseudocercospora alpiniae-katsumadaicola* (S.Q. Chen & P.K. Chi) P.K. Chi, *Fungal Diseases of Cultivated Medical Plants in Guangdong Province*: 159 (1994), *comb. inval.* (ICN, Art. 41.5).

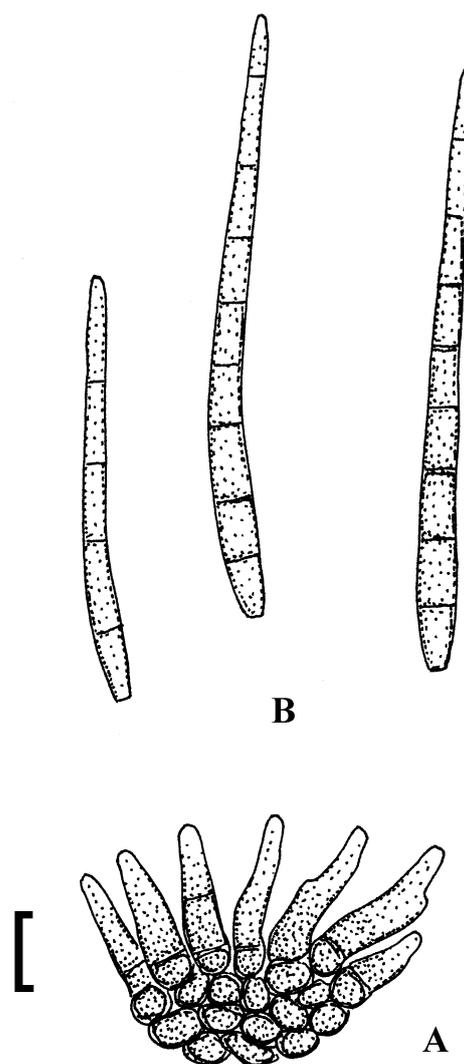


**Fig. 181.** *Pseudocercospora alpiniae* (based on Chi 1994: 48, fig. 29). **A.** Conidiophore fascicles. **B.** Conidiophore tips. **C.** Conidia. Bar = 10 µm.

*Literature:* Guo *et al.* (1998: 404).

*Illustrations:* Chi (1994: 159, fig. 164), Guo *et al.* (1998: 404, fig. 341).

*Description:* Leaf spots amphigenous, circular to elliptical, grey-brown with yellowish to brown border. *Caespituli* epiphyllous. *Mycelium* internal. *Stromata* small, globose, 20–50 µm diam, olivaceous. *Conidiophores* in small to large fascicles, 5–50, arising from stromata, erect, straight, subcylindrical to somewhat conical, 0–1-geniculate, unbranched, short, 3–10 × 2.7–3.3 µm, 0–1-septate, pale olivaceous or olivaceous, thin-walled, smooth; conidiophores usually reduced to conidiogenous cells, conidiogenous loci



**Fig. 182.** *Pseudocercospora alpiniae-katsumadaicola* (based on Chi 1994: 159, fig. 164). **A.** Conidiophore fascicle. **B.** Conidia. Bar = 10 µm.

indistinct, about 1 µm diam, unthickened, not darkened. *Conidia* solitary, narrowly obclavate, 33–77 × 2.7–3.3 µm, 4–10-septate, hyaline, thin-walled, smooth, apex obtuse, base short obconically truncate, about 1 µm wide, hila unthickened, not darkened.

*Holotype:* **China:** Guangdong: Yunan, on *Alpinia hainanensis* [*katsumadae*], *Zingiberaceae*, Oct. 1987, S. Q. Chen & P. K. Chi, no. 117 (Hb. S. China Agric. Univ., Guangzhou).

*Host range and distribution:* Only known from the type collection.

***Pseudocercospora amomi*** (A.K. Kar & M. Mandal) Deighton, *Trans. Brit. Mycol. Soc.* **88**: 388 (1987). (Fig. 183)

*Basionym:* *Cercospora amomi* A.K. Kar & M. Mandal, *Trans. Brit. Mycol. Soc.* **53**: 358 (1969).

*Literature:* Guo *et al.* (1998: 405), Crous & Braun (2003: 55), Kamal (2010: 148).

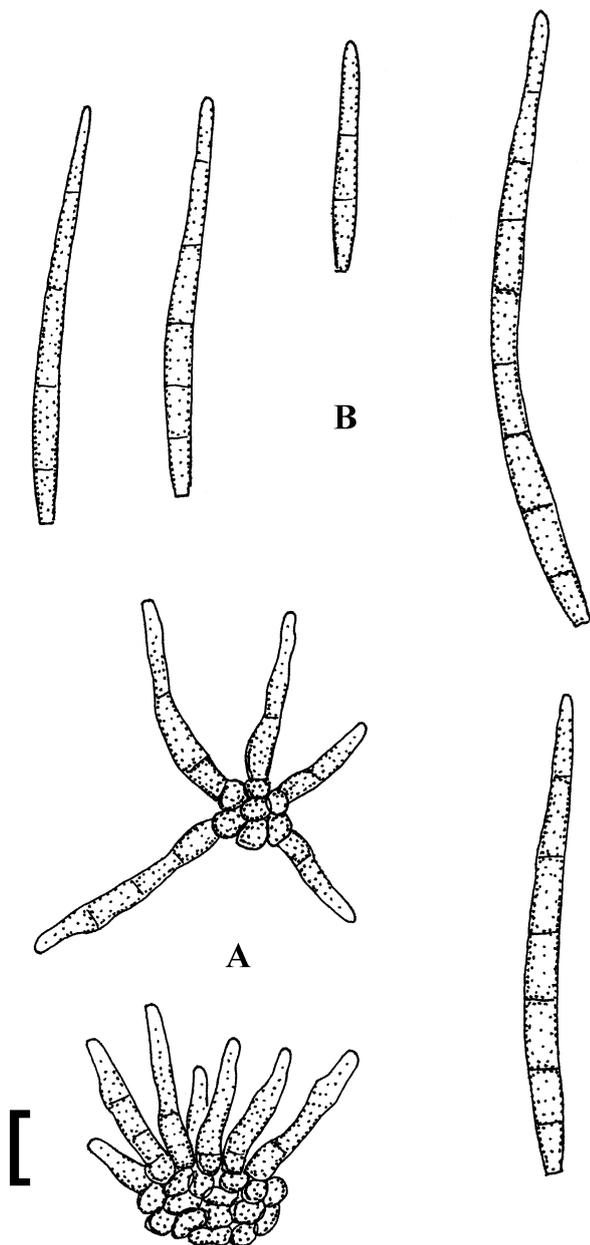


Fig. 183. *Pseudocercospora amomi* (K(M) IMI 135184). A. Conidiophore fascicles. B. Conidia. Bar = 10  $\mu$ m.

Illustrations: Kar & Mandal (1969: 358, fig. 20), Guo et al. (1998: 404, fig. 342).

**Description:** Leaf spots amphigenous, scattered to confluent, circular to irregular, at first smaller, 1–10 mm diam, later expanding, covering large leaf segments, reddish brown to greyish, margin indefinite or with darker border, purplish to deep reddish brown. Caespituli amphigenous, punctiform, dark, scattered. Mycelium internal. Stromata small to well-developed, substomatal, 10–65  $\mu$ m diam, subglobose, oblong to irregular, pale to dark olivaceous-brown. Conidiophores in small to moderately large fascicles, mostly about 2–16, arising from stromata, through stomata, erect, straight, curved to somewhat geniculate-sinuous, unbranched, 10–75  $\times$  3–5.5  $\mu$ m, 0–6-septate, pale to dark olivaceous-brown, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 10–25

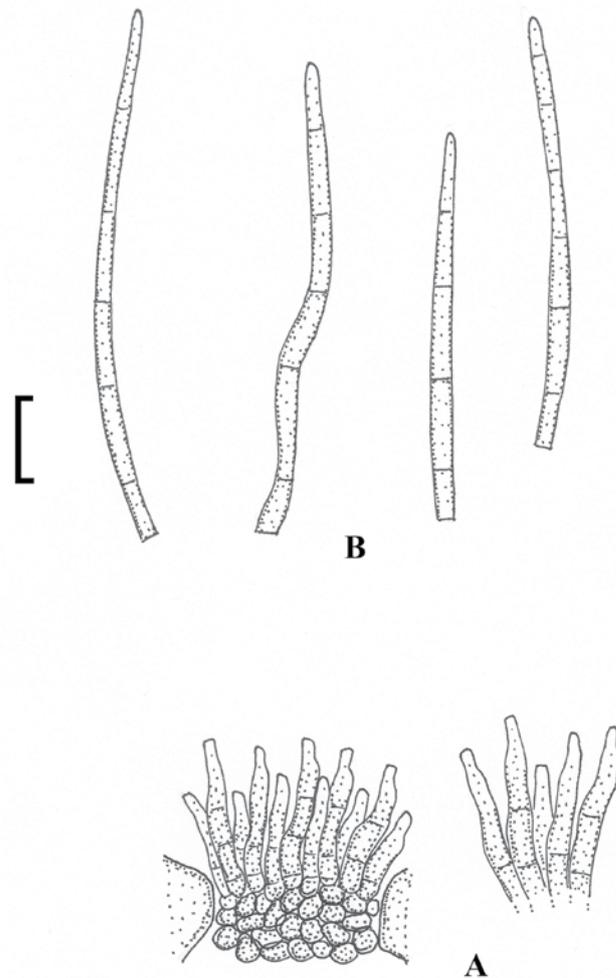


Fig. 184. *Pseudocercospora curcucicola* (TNS-F-60890). A. Conidiophore fascicle. B. Conidia. Bar = 10  $\mu$ m. U. Braun del.

$\mu$ m long, conidiogenous loci inconspicuous, unthickened, not darkened. Conidia solitary, obclavate to obclavate-cylindrical, straight to somewhat curved, 25–95  $\times$  2.5–4.5  $\mu$ m, 2–9-septate, subhyaline to pale olivaceous-brown, thin-walled, smooth, apex pointed to subobtuse, base rounded to short obconically truncate, about 1.5–2  $\mu$ m wide, hila unthickened, not darkened.

**Holotype:** India: West Bengal: Darjeeling, Tung, 1768 m alt., on *Amomum dealbatum*, 12 May 1967, A. K. Kar & M. Mandal (K(M) IMI 135184).

**Host range and distribution:** On *Amomum* (*compactum*, *dealbatum*, *villosum*), *Elettaria cardamomum* [*Amomum cardamomum*], *Zingiberaceae*, Asia (China, India, Indonesia).

***Pseudocercospora curcucicola*** A. Yoshida, I. Araki & C. Nakash., **sp. nov.**

Mycobank MB809028

(Fig. 184)

**Synonym:** *Pseudocercospora curcumae* A. Yoshida, I. Araki & C. Nakash., *Fungal Flora of Diseases on Medical Plants in Japan*: 81 [Master thesis, Mie University, Tsu] (2008), *nom. inval.* (ICN Art. 30.8).

*Leaf spots* amphigenous, indistinct or distinct, scattered, angular to irregular, small, 1–5 mm diam, later confluent, pale brown to brown. *Caespituli* amphigenous. *Stromata* small to well-developed, subglobular, substomatal to intraepidermal, olivaceous-brown to brown, 10–40  $\mu\text{m}$  diam. *Conidiophores* in small to moderately large, loosely to densely fasciculate, arising from stromata, emerging through stomata or erumpent, erect, straight to slightly curved, geniculate, subcylindrical, unbranched, pale olivaceous-brown, 12–26  $\times$  2–3.2  $\mu\text{m}$ , 1–4-septate, smooth; conidiogenous cells integrated, terminal or intercalary, proliferating sympodially or percurrently, with inconspicuous conidiogenous loci, 2–2.5  $\mu\text{m}$  diam, unthickened, not darkened. *Conidia* solitary, cylindrical to obclavate, acicular, straight to curved or sinuous, 40–80  $\times$  2–2.5  $\mu\text{m}$ , 1–6-septate, pale to pale olivaceous-brown, apex obtuse, base truncate, 2–2.5  $\mu\text{m}$  wide, hila unthickened, not darkened.

*Holotype*: **Japan**: Wakayama Pref.: Hidakagawa, on *Curcuma longa*, Zingiberaceae, 30 Oct. 2007, C. Nakashima & I. Araki (MUMH 10859). *Isotype*: TNS-F-60890. *Ex-holotype culture*: MUC 733.

*Host range and distribution*: Only known from the type collection.

*Notes*: *Pseudocercospora curcunicola* is distinguishable from other *Pseudocercospora* species on hosts of the Zingiberaceae by its moderately developed stromata, geniculate, densely fasciculate conidiophores, and pale conidia with truncate bases.

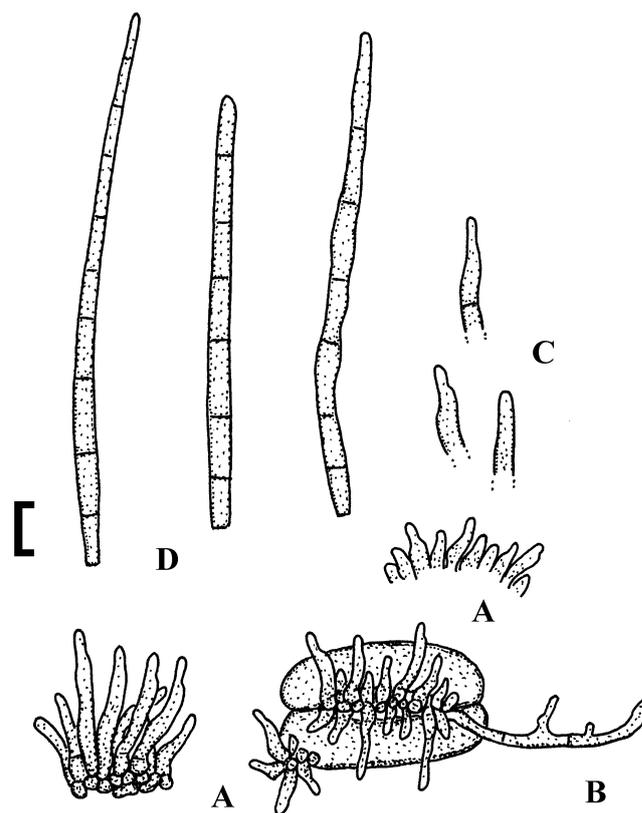
***Pseudocercospora hedychii*** (Boedijn) U. Braun, *Nova Hedwigia* 73: 424 (2001). (Fig. 185)

*Basionym*: *Cercospora hedychii* Boedijn, *Nova Hedwigia* 3: 432 (1961).

*Literature*: Thuang (1984), Crous & Braun (2003: 213), Soares & Barreto (2008).

*Illustrations*: Boedijn (1961: plate 111, fig. 18), Braun (2001a: 426, fig. 7), Soares & Barreto (2008: 89, fig. 4).

*Description*: *Leaf spots* amphigenous, often marginal and terminal, size and shape variable, oblong-elliptical, irregular, often confluent, straw-coloured, pale greyish brown, margin indefinite or narrow and brown. *Caespituli* amphigenous, punctiform to subeffuse, dark. *Mycelium* internal and external; superficial hyphae almost lacking or sparingly developed, emerging through stomata, unbranched or sparingly branched, septate, 1–4  $\mu\text{m}$  wide, subhyaline to pale olivaceous, thin-walled, smooth. *Stromata* substomatal to intraepidermal, 10–60  $\mu\text{m}$  diam, medium to dark olivaceous-brown. *Conidiophores* in small to moderately large fascicles, arising from stromata, through stomata or erumpent or solitary, arising from superficial hyphae, lateral or occasionally terminal, erect, straight, subcylindrical-conical to geniculate-sinuous, unbranched, 5–60  $\times$  2–4  $\mu\text{m}$ , 0–3-septate, subhyaline to pale olivaceous or brownish, thin-



**Fig. 185.** *Pseudocercospora hedychii* (L 53858). **A.** Conidiophore fascicles. **B.** Superficial hypha with solitary conidiophores. **C.** Conidiophores. **D.** Conidia. Bar = 10  $\mu\text{m}$ .

walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 10–35  $\mu\text{m}$  long, conidiogenous loci inconspicuous, unthickened, not darkened. *Conidia* solitary, narrowly obclavate-cylindrical, subcylindrical, subacicular, 15–80  $\times$  2–4  $\mu\text{m}$ , 1–10-septate, subhyaline to pale olivaceous or olivaceous-brown, thin-walled, smooth, apex subobtuse or subacute, base truncate to obconically truncate, 1.5–2.5(–3.5)  $\mu\text{m}$  wide, hila unthickened, not darkened.

*Holotype*: **Indonesia**: Java: Bogor, botanical garden, on *Hedychium coccineum*, 28 June 1950, K. B. Boedijn (L 53858). *Isotype*: K(M) IMI 91602.

*Host range and distribution*: On *Hedychium* (*coccineum*, *coronarum*, *spicatum*), Zingiberaceae, Asia (China [Hong Kong], Indonesia, Myanmar), South America (Brazil).

***Pseudocercospora nicolaiae*** (Boedijn) U. Braun, *Nova Hedwigia* 73: 427 (2001). (Fig. 186)

*Basionym*: *Cercospora nicolaiae* Boedijn, *Nova Hedwigia* 3: 432 (1961).

*Literature*: Crous & Braun (2003: 291).

*Illustrations*: Boedijn (1961: plate 111, fig. 19), Braun (2001a: 426, fig. 11).

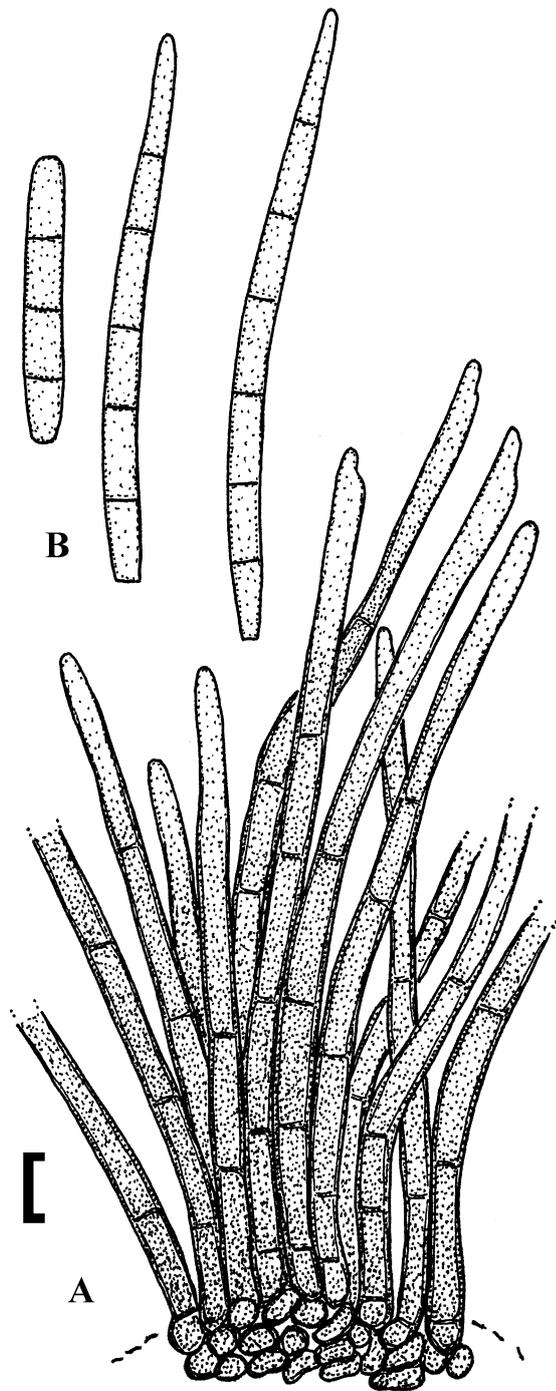


Fig. 186. *Pseudocercospora nicolaiae* (L 53870). A. Conidiophore fascicle. B. Conidia. Bar = 10  $\mu$ m.

**Description:** Leaf spots lacking, sometimes with diffuse ochraceous discolorations. *Caespituli* amphigenous, punctiform, often spreading between veins, dark brown. *Mycelium* internal. *Stromata* substomatal to immersed, variable, small to well-developed, 10–60  $\mu$ m diam, subglobose to oblong, medium to dark brown. *Conidiophores* in small to very large fascicles, loose to dense, sometimes subsynnematus, arising from stromata, through stomata or erumpent, erect, straight, subcylindrical to somewhat geniculate-sinuous, unbranched, 30–150  $\times$  2.5–5  $\mu$ m, pluriseptate throughout, wall slightly thickened, pale to medium brown, smooth; conidiogenous cells integrated,

terminal, 10–40  $\mu$ m long, conidiogenous loci inconspicuous, unthickened, not darkened. *Conidia* solitary, obclavate-cylindrical, 30–85  $\times$  2.5–5  $\mu$ m, 1–7-septate, pale olivaceous to olivaceous-brown, thin-walled, smooth, apex obtuse to subacute, base truncate to obconically truncate, 2–3  $\mu$ m wide, hila unthickened, not darkened.

**Holotype:** Indonesia: Java: Bogor, botanical garden, on *Etilingera* sp. [*Nicolaia* sp.], Zingiberaceae, Feb. 1949, K. B. Boedijn (L 53870). **Isotype:** K(M) IMI 91603.

**Host range and distribution:** Only known from the type collection.

***Pseudocercospora zingiberis* (Rathaia) Deighton,** *Mycol. Pap.* 151: 2 (1983).

(Fig. 187)

**Basionym:** *Cercoseptoria zingiberis* Rathaia, *Mycologia* 73: 774 (1981).

**Illustration:** Rathaia (1981: 775–777, figs 1–9).

**Description:** Leaf spots amphigenous, at first oblong, yellowish brown, parallel to the main veins, later oblong-fusiform, 4–9  $\times$  0.5–1.2 cm, centre becoming white with dark brown margin and yellowish halo. *Caespituli* amphigenous, punctiform, dark. *Mycelium* internal; hyphae dark brown, wall thickened. *Stromata* well-developed, immersed, originating from hyphae in the veins, brush-like, 40–120  $\mu$ m diam, dark brown. *Conidiophores* numerous in dense sporodochial fascicles, arising from stromata, erumpent, subcylindrical or somewhat wider towards the apex, straight to slightly curved or somewhat geniculate-sinuous, unbranched, 8–25  $\times$  2–3.5  $\mu$ m, 0–1-septate, pale olivaceous, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 5–20  $\mu$ m long, conidiogenous loci inconspicuous to subdentate, but always unthickened and not darkened. *Conidia* solitary, subacicular-filiform, long and narrow, fusoid, i.e. attenuated towards base and apex, 40–190  $\times$  1.5–3  $\mu$ m, 6–24-septate, subhyaline to pale yellowish, thin-walled, smooth, apex pointed, base short to long obconically truncate, about 1–1.5  $\mu$ m wide, hila unthickened and not darkened.

**Holotype:** India: Assam: Haflong, on *Zingiber officinale*, Zingiberaceae, 21 Jul. 1978, Y. Rathaia (K(M) IMI231501).

**Host range and distribution:** Only known from the type collection.

### **Doubtful, excluded and insufficiently known species**

***Pseudocercospora alpiniicola* S.Q. Chen & P.K. Chi, J. S. China Agric. Univ.** 11: 48 (1990); as "*alpiniicola*".

**Literature:** Chi (1994: 49), Guo et al. (1998: 402).

**Illustrations:** Chi (1994: 49, fig. 30), Guo et al. (1998: 403, fig. 340).

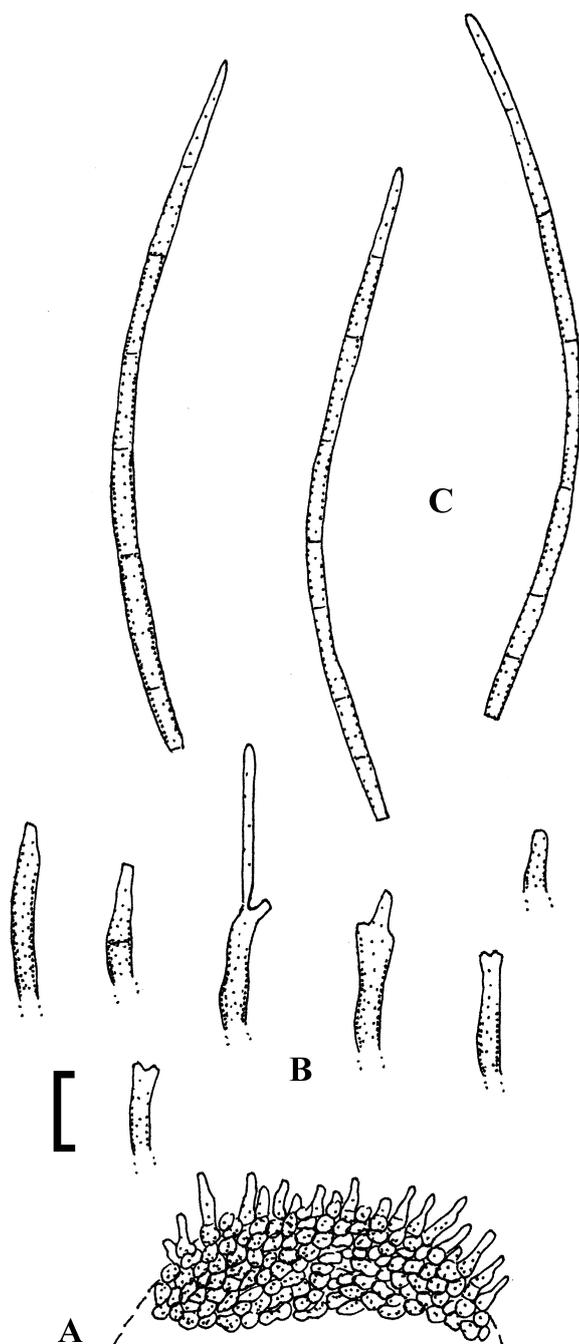


Fig. 187. *Pseudocercospora zingiberis* (K(M) IMI 231501). A. Conidiophore fascicles. B. Conidiophores. C. Conidia. Bar = 10 µm.

**Description:** Leaf spots amphigenous, irregular, greyish white with brown margin. *Caespituli* amphigenous. *Mycelium* immersed and external, with some superficial hyphae, branched, septate, 1.7–3.3 µm wide, hyaline to pale olivaceous. *Stromata* subglobose, 17–60 µm diam, olivaceous-brown. *Conidiophores* loosely fasciculate, 7–18, arising from stromata, or solitary, arising from superficial hyphae, erect to decumbent, straight, cylindrical, non-geniculate, unbranched or rarely branched, 33–133 × 4 µm, 1–7-septate, pale olivaceous to olivaceous, thin-walled, smooth; conidiogenous cells integrated, terminal, rhachis-like, straight, cylindrical, neither geniculate nor sinuous, denticulate, with numerous minute conical denticles. *Conidia* solitary, obclavate, straight to slightly curved, 50–83 × 3.3

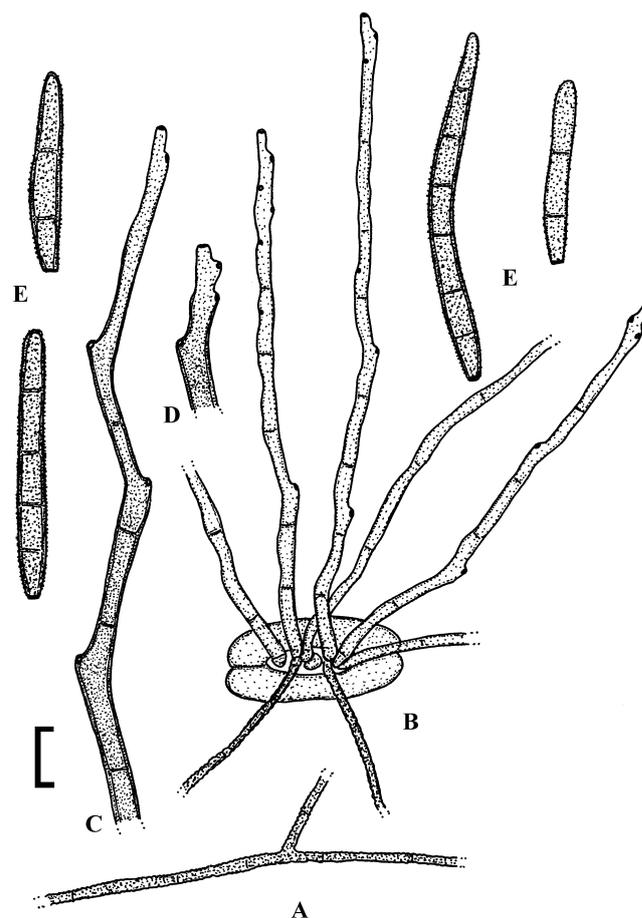


Fig. 188. *Zasmidium alpiniae* (S-F23069). A. Superficial hypha. B. Conidiophore fascicle. C. Conidiophore. D. Conidiophore tip. E. Conidia. Bar = 10 µm.

µm, 5–19-septate, pale olivaceous, thin-walled, smooth, apex obtuse to pointed, base short obconically truncate.

**Holotype:** China: Guangdong: Yunan, on *Alpinia officinarum*, Zingiberaceae, Oct. 1987, S. Q. Chen 106 (Hb. S. China Agric. Univ., Guangzhou).

**Host range and distribution:** Only known from the type collection.

**Notes:** Due to the straight rhachis with numerous conical denticles, this species is undoubtedly misplaced in *Pseudocercospora* and rather belongs to the *Dactylaria* complex, but a final conclusion and reassessment have to be based on an examination of type material.

### Zasmidium

A single species.

**Zasmidium alpiniae** (Syd. & P. Syd.) U. Braun, *Schlechtendalia* 20: 100 (2010).

(Fig. 188)

**Basionym:** *Cercospora alpiniae* Syd. & P. Syd., *Ann. Mycol.* 12: 202 (1914).

**Synonyms:** *Helminthosporium alpiniae* (Syd. & P. Syd.) Chupp, *Monograph of Cercospora*: 607 (1954).  
*Stenella alpiniae* (Syd. & P. Syd.) U. Braun, *Fungal Diversity* 8: 68 (2001).

**Literature:** Saccardo (1931: 894), Chupp (1954: 607), Katsuki (1965: 69).

**Illustration:** Braun (2001b: 67, fig. 22).

**Description:** Leaf spots lacking or only with diffuse yellowish discolorations on the upper leaf surface. *Caespituli* hypophyllous, effuse, dark olivaceous to almost sooty. *Mycelium* internal and external; superficial hyphae emerging through stomata, sparingly branched, 1–3 µm wide, septate, pale to medium olivaceous, thin-walled, verruculose. *Stromata* lacking. *Conidiophores* in small, loose fascicles, emerging through stomata (solitary conidiophores arising from superficial hyphae lacking), erect to decumbent, flexuous, strongly geniculate-sinuuous, unbranched, very long, 50–300 × (3–)4–7(–8) µm, pluriseptate throughout, pale to medium dark brown, wall thin to somewhat thickened; conidiogenous cells integrated, terminal or intercalary, 10–50 µm long, conidiogenous loci thickened and darkened, 1.5–2.5 µm diam. *Conidia* solitary, rarely in short chains, obclavate-cylindrical, 20–80 × 4–8 µm, rarely longer, (1–)2–7(–9)-septate, pale to medium dark olivaceous-brown, wall slightly thickened, verruculose, apex obtuse, base obconically truncate, about 2 µm wide, hila somewhat thickened and darkened.

[**Holotype:** **Philippines:** *Prov. Laguna:* near Los Baños, Mt Maquiling, on leaves of *Alpinia* sp., 18 Dec. 1913, C. F. Baker, no. 2221 (not preserved)]. **Neotype (designated here,** MycoBank MBT178173): **Philippines:** *Prov. Laguna:* near Los Baños, Mt Maquiling, on leaves of *Alpinia* sp., Dec. 1914, C. F. Baker, no. 213 (S-F23069). **Isonotypes:** BPI 432462, 432463, CUP-F-0213 and PC.

**Host range and distribution:** On *Alpinia* (*galanga*, *japonica*, *Alpinia* sp.), *Zingiberaceae*, Asia (Japan, Malaysia [Sarawak], Philippines).

**Notes:** The designated neotype is topotype material collected in Dec. 1914.

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