

Two new species of *Passalora* and *Periconiella* (cercosporoid hyphomycetes) from Panama

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Abstract – New species of *Passalora* on *Aphelandra scabra* (*Acanthaceae*) and of *Periconiella* on *Persea americana* (*Lauraceae*) are described from tropical lowland vegetation in Panama. The new *Passalora* species differs from congeneric species on members of *Acanthaceae* by its external hyphae giving rise to conidiophores. The new *Periconiella* species can be distinguished from other species of the genus by its conidiogenous cells being conspicuously oriented outwards from the conidiophore head and by its sizes being intermediate between those of *P. machilicola* on the one hand and of *P. longispora* and *P. rapaneae* on the other.

Anamorphic Dothideomycetes (Ascomycota) / microfungi / *Mycosphaerella* / neotropics

INTRODUCTION

Plant-associated hyphomycetes with relationships to *Mycosphaerella* and related taxa of *Dothideomycetes* (*Ascomycota*) are generally considered cercosporoid fungi with frequently changing generic concepts. Reviews and keys of the present stage of generic concepts in the cercosporoid hyphomycetes are provided by Crous & Braun (2003). Species of two genera with pigmented conidiophores and conidia with blackened conidiogenous loci and conidial hila are treated in this study, namely of *Passalora* and *Periconiella*. Species of *Periconiella* are additionally characterized by conidiophores differentiated into a stipe and head composed of branches and conidiogenous cells.

About 70 generally rarely recorded species are known in this genus, which mostly form part of a clade comprising species of *Zasmidium* and other genera (Arzanlou *et al.*, 2007; Kirschner & Chen, 2010). Some species are obvious plant pathogens with narrow host range, but certain other species appear to grow exclusively superficially on plants and have been recorded from many different host species (Ellis, 1967; Kirschner & Chen, 2010). Conidiophores in *Passalora* are not differentiated into stipe and head. The several hundred *Passalora* species are considered to have narrow host ranges within single plant families.

In our previous studies about cercosporoid fungi from Panama, we included species from two provinces and low as well as high altitudes (Kirschner & Piepenbring, 2006, 2008). The results presented in this study derived from a

botanical-mycological biodiversity inventory along a trail of 500 m in tropical lowlands in the Chiriquí Province, on the Pacific side of western Panama (Piepenbring *et al.*, 2012) and from collection in a private garden of the second author in the same village as the trail.

MATERIALS AND METHODS

Living shoots and leaves of wild plants were collected along a trail located in western Panama, Prov. Chiriquí, Corregimiento Dolega, north of David, between the village Los Algarrobos and the Majagua river at 120-150 m a.s.l. For further details about the characterization of the collection site see Piepenbring *et al.* (2012). At a short distance from the trail and still in the same village, some samples were also collected in the private garden of the second author (“Casa de la Alemana”). After identification of the host plants and the fungi, the specimens were dried and deposited at the Herbario Nacional of the Universidad de Panamá (PMA) and the Herbario de la Universidad Autónoma de Chiriquí, Panama (UCH). Microscopic characteristics were observed using fresh and dried fungal material mounted in 5-10% (w/v) aqueous KOH solution. Measurements were based on data from n replicates and are presented as mean value \pm standard deviation with extreme values given in brackets. Drawings were made freehand on scaled paper.

TAXONOMY

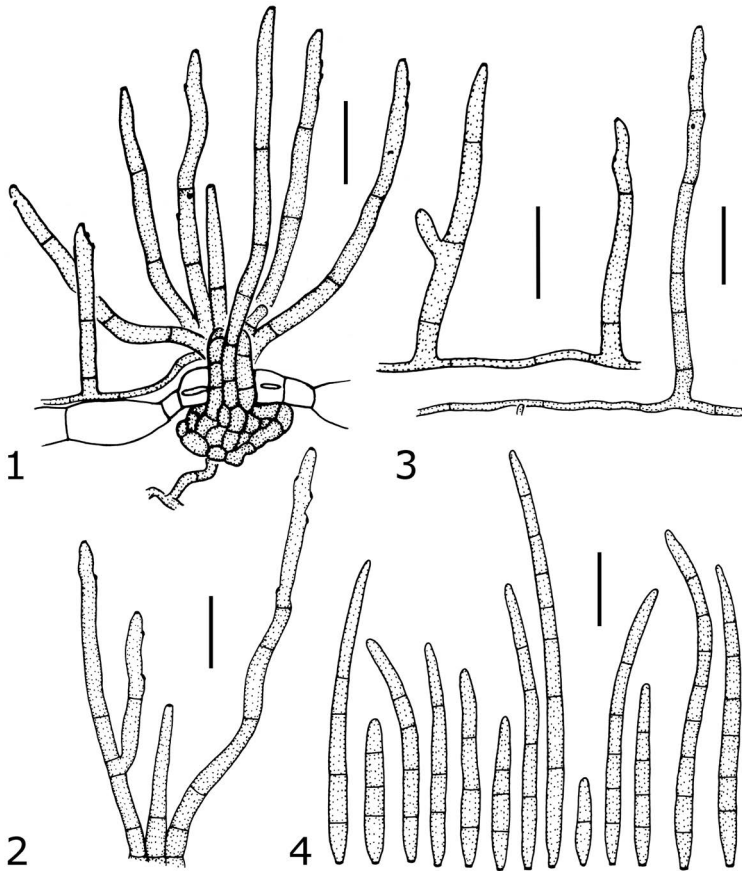
Passalora aphelandrae R. Kirschner, **sp. nov.**

Figs 1-4

Index Fungorum: IF550475

Etymology: Referring to the host genus.

Leaf spots amphigenous, yellow with dark brown centre (2-5 mm diam.) and dark brown margin (1-3 mm broad), appearing as \odot , the spot area approx. 6-10 mm diam., outside with additional diffuse yellowish margin. **Intercellular and external hyphae** pale brown, smooth, 2-3 μ m wide, connected to stromata in substomatal chambers. **Stromata** composed of few cells or up to approx. 25-35 μ m wide and 20-40 μ m high, the distal part penetrating through the stoma. Sporulation hypophyllous from conidiophores arising in fascicles of approx. 10-20 through stomata and solitarily from external hyphae. **Conidiophores** pale brown, smooth, mostly unbranched, rarely with a lateral branch, slightly curved and often becoming geniculate towards the apex, with 1-5 septa, 7-25 μ m apart, (35-)54-90(-117) \times 4-5 μ m when arising in fascicles from stomata (n=20), (35-)47-70(-83) \times 4-5 μ m when arising solitarily from external hyphae (n=20). **Conidiogenous cells** almost apical, rarely intercalary, straight or geniculate, with 1-5 conidiogenous loci, (16-)20-35(-45) \times 4-5 μ m in conidiophores arising from stomata (n=20), (12-)17-31(-35) \times (3-)3.5-4.5(-5) μ m in conidiophores arising from external hyphae (n=20), basal septum sometimes indistinct. Conidiogenous loci darkened, 1.5-2 μ m wide. **Conidia** obclavate-cylindrical, slightly narrowing towards the apex, pale brown, smooth, straight or slightly curved, 1-8-septate, most septa indistinct, (28-)33-80(-115) \times 4-5 μ m (n=30), apex broadly rounded, base narrowed to a 1.5-2 μ m wide, darkened hilum.



Figs 1-4. *Passalora aphelandrae* from abaxial leaf surface of *Aphelandra scabra* (from holotype). **1.** Stroma with a fascicle of conidiophores and an external hypha arising through a stoma in transversal leaf section. **2.** Fascicle of three conidiophores with an exceptional branched conidiophore (left). **3.** External hyphae giving rise to conidiophores. **4.** Conidia. Bars = 20 μ m.

Material examined: On living leaves of *Aphelandra scabra* (Vahl) Sm. var. *scabra* (*Acanthaceae*), Panama, Chiriquí Province, David, Los Algarrobos, way to Río Majagua, approx. 100-140 m, 4 August 2009, M. Piepenbring, A. Gockele & J. Ramos M369 (PMA, **holotype**); same locality, 6 March 2012, M. Piepenbring and students 5068 (PMA, UCH).

Notes: Several species of *Cercospora* and *Pseudocercospora* are known from species of *Acanthaceae* as hosts. Most of the species of cercosporoid fungi on members of the *Acanthaceae* appear to be specific for the host genus and have been described from Asia. Hitherto no cercosporoid fungus has been reported for *Aphelandra* species. Due to the pale brown pigmentation of the conidia and blackened conidiogenous loci and hila, the species from Panama is placed in *Passalora*. Only two species of *Passalora*, both lacking external mycelium, are hitherto known from *Acanthaceae*. *Passalora acanthicola* (Hansf.) U. Braun & Crous on *Acanthus arboreus* Forssk. from Africa additionally differs by partially

catenate conidia and conidiophores exceeding 100 μm in length (Chupp, 1954; Deighton, 1987). *Passalora barleriigena* Meeboon & Hidayat on *Barleria lupulina* Lindl. from Thailand differs by shorter conidia (25-50 μm , Meeboon *et al.*, 2007).

Among species of other cercosporoid genera than *Passalora* on members on *Acanthaceae*, *Cercospora acanthi* Pass. is described to produce similar symptoms as the species from Panama. It also causes pale leaf spots with a brown point in the centre and dark margin (Chupp, 1954). Conidia are, however, described as hyaline (Chupp, 1954), and the species is considered doubtful by Crous & Braun (2003). Additionally, the description by Chupp (1954) did not mention conidiophores arising from external hyphae and stated epiphyllous sporulation. The micromorphology of *Pseudocercospora acanthi* Deighton appears similar to that of the new species by conidium sizes and conidiophores arising in fascicles as well as from external hyphae, but in addition to the lack of blackened conidiogenous loci and hila, *Ps. acanthi* differs by its shorter conidiophores (20-40 μm , Deighton, 1987) from the new *Passalora* species (conidiophores 35-117 μm long).

***Periconiella volutifera* R. Kirschner, sp. nov.**

Figs 5-8

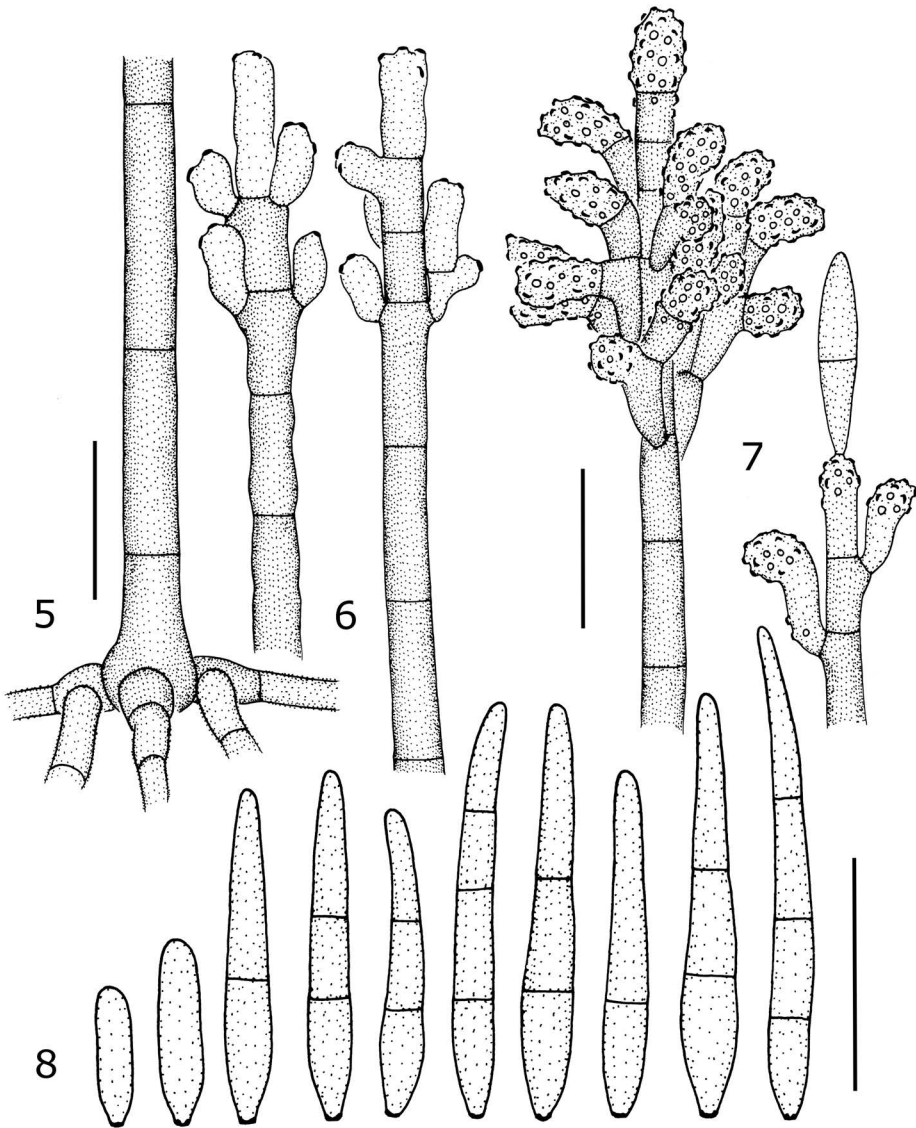
Index Fungorum: IF550476

Etymology: Composed from Latin, “bearing volutes”, referring to the conidiogenous cells conspicuously oriented outwards on the top of conidiophores, resembling ornamental elements of column capitals in architecture.

Leaf spots absent. **Mycelium** hypophyllous, external, without hyphae in the leaf or penetrating through stomata, smooth to verruculose, pale brown, 2-5 μm wide. **Conidiophores** arising solitarily from external hyphae, erect, straight, composed of a cylindrical stipe and a branched head, (295-)352-605(-725) μm long (n=30). **Stipe** smooth, dark brown, lateral wall 1 μm thick, up to 20 septa 5-45 μm apart, with basal cell horizontally extending to 10-15 μm , regular width 6-7 μm above the base, gradually narrowing to 4-5 μm below the head. **Head** irregularly branched on 2-6 levels, (30-)41-64(-65) \times (15-)18-36(-50) μm (n=30), composed of cylindrical, smooth, brown metulae, 5-20 \times 3-5 μm , and conidiogenous cells. **Conidiogenous cells** terminal and lateral when young, becoming intercalary when old, cylindrical when young, mostly becoming clavate with age, becoming strongly oriented outwards (except for the terminal cell of the central axis), pale brown to brown, smooth, 7-13(-18) \times 4-6 μm (n=30). Conidiogenous loci slightly prominent, thickened and darkened, 1-1.5 μm diam., first in terminal positions on conidiogenous cells, gradually increasing in number until covering the whole cell. **Conidia** produced singly, cylindrical when aseptate (rarely) or most commonly obclavate when 1-3-septate, almost straight, in some cases slightly curved, smooth, pale brown, (12-)23-36(-43) \times (3-)3.5-4.5(-5) μm (n=30), apex broadly rounded, base narrowing to a blackened, slightly thickened 1-1.5 μm wide hilum.

Material examined: On abaxial epidermis of living leaves of *Persea americana* Mill. (*Lauraceae*), Panama, Chiriquí Province, Corr. Dolega, north of David, Los Algarrobos, Casa de la Alemana, garden, 5 February 2012, R. Kirschner 3699 (PMA, **holotype**; UCH, **isotype**).

Notes: The new species is most similar to *P. longispora* Dorn.-Silva & Dianese (nom. illeg., non *P. longispora* Kamal, Suj. Singh & R.P. Singh), *P. machilicola* R. Kirschner, and *P. rapanae* M.B. Ellis due to solitary, obclavate, several-septate conidia produced from densely branched conidiogenous heads. It differs from *P. longispora* and *P. machilicola* by the shape of mature conidiogenous cells, which is ampulliform in the former and clavate in the latter.



Figs 5-8. *Periconiella volutifera* from abaxial leaf surface of *Persea americana* (from holotype). **5.** Base of conidiophore with radiating verruculose external hyphae. **6.** Apices of two young conidiophores with straight conidiogenous cells and branches. **7.** Apices of two mature conidiophores with conidiogenous cells oriented outside (except for the terminal cell of the main axis). **8.** Conidia. Bars = 20 μ m.

The overall dimensions of *P. machilicola* are smaller and those of *P. longispora* and *P. rapaneae* larger than in the new species (Dornelo-Silva & Dianese, 2003; Kirschner & Chen, 2010). *Periconiella rapaneae* is reported to produce multicellular plates bearing the conidiophores which are not known in the other species (Ellis, 1967). In the illustrations of *P. rapaneae* (Ellis, 1967), the terminal

branchlets appear to be long, several-septate, and loosely arranged, compared to the densely arranged, short, few-septate branches of conidiophores in the other species. The outward orientation of conidiogenous cells appears to be correlated with this dense structure as it was also illustrated for *P. santaloides* M.B. Ellis which differs by its verruculose conidia (Ellis, 1967). Other species on Lauraceae are *P. litseae* Arch. Singh, Bhalla & S.K. Singh, *P. longispora* Kamal, Suj. Singh & R.P. Singh (non *P. longispora* Dorn.-Silva & Dianese), *P. perseae* McKenzie, and *P. perseae-macranthae* Hosag. & U. Braun. Conidia of *P. longispora* have 3-20 septa (Kamal *et al.*, 1979), whereas the 0-3-septate conidia of *P. litseae*, *P. perseae*, and *P. perseae-macranthae* are not obclavate, but are clavate to ovoid in *P. litseae*, consistently aseptate in *P. perseae*, and subcylindrical in *P. perseae-macranthae*, and arise from loosely branched conidiophores (Housagoudar & Braun, 1996; Kirschner & Chen, 2010; McKenzie, 1990; Singh *et al.*, 1998).

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