

Cercosporoid fungi (*Mycosphaerellaceae*) 5. Species on dicots (*Anacardiaceae* to *Annonaceae*)

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Abstract: The present paper is a continuation of a series of comprehensive taxonomic treatments of cercosporoid fungi (formerly *Cercospora s. lat.*), belonging to *Mycosphaerellaceae* (*Ascomycota*). This fifth contribution of this series proceeds with treatments of cercosporoid fungi on dicots and comprises species occurring on hosts belonging to the families *Anacardiaceae* and *Annonaceae*, which 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. The following taxonomic novelties are introduced: *Passalora cotini* sp. nov., *P. guoana* nom. nov., *P. rhois-aromaticae* sp. nov., and *Pseudocercospora rhoicola*.

Key words:

Ascomycota
Cercospora s. lat.
hyphomycetes
taxonomy

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INTRODUCTION

One of the largest groups of fungi belonging to *Mycosphaerellaceae* (*Capnodiales*, *Ascomycota*) includes genera and species akin to the genus *Cercospora* which are commonly referred to as cercosporoid fungi (Crous & Braun 2003, Braun *et al.* 2013). The taxa concerned comprise dematiaceous, holoblastic asexual morphs and at least partly mycosphaerella-like sexual morphs. Corresponding mucedinaceous fungi within *Mycosphaerellaceae* are often classified as ramularioid fungi. *Ramularia*, the eponymous genus, is associated with sexual morphs belonging to *Mycosphaeraella s. str.* The type species of the latter genus has a phylogenetically proven asexual morph pertaining to *Ramularia* (Verkley *et al.* 2004) making *Mycosphaerella* a younger heterotypic synonym of *Ramularia*, which has been proposed as the preferred name (Crous *et al.* 2009c, Wijayawardene *et al.* 2014, Videira *et al.* 2015) and recommended for protection (Rossman *et al.* 2015).

Cercosporoid fungi represent a very large group of plant pathogenic, leaf-spotting, economically relevant species causing diseases on a wide range of hosts, including numerous cultivated plants. In the last few decades, enormous taxonomic progress has been made by increasing application of molecular methods in capnodialean fungi, including *Mycosphaerellaceae* (Crous *et al.* 2013, Groenewald *et al.* 2013, Bakhshi *et al.* 2014, Nganhom *et al.* 2015, Guatimosim *et al.* 2016, etc.). Cultures and molecular sequence analyses should be used for taxonomic purposes

in this fungal group whenever possible. On the other hand, symptoms and morphological characters exhibited *in vivo* are still important in diagnosing plant pathogenic fungi, especially for routine monitoring and identification purposes, but also in light of the ecology and taxonomy of the fungi concerned, which cause diseases on living plants. Therefore, optimal descriptions of new and already known species should cover the full range of traits ranging from characters *in vivo*, *in vitro* to phylogenetic data. Currently only a limited number of cercosporoid fungi has been cultivated and sequenced, and hundreds of taxa are only known from characters *in vivo*. However, all names have to be taken into consideration for taxonomic purposes and are subject to the rules of the *International Code of Nomenclature for algae, fungi, and plants* (ICN; McNeill *et al.* 2012), including Art. 11 dealing with the priority of names. Thus, all old names are applicable when dealing with taxonomic-nomenclatural questions, i.e. to find correct names for certain taxa in accordance with the *Code*. To facilitate this process, careful examinations of all old type collections and detailed descriptions are necessary and helpful for sound taxonomic conclusions. This is precisely the sense of this series, based on Chupp's (1954) old, seriously outdated, *Cercospora* monograph, and meant to represent an updated, supplementary treatment intended as a platform for the routine identification of cercosporoid fungi, including modern molecular examinations. We have spent decades examining thousands of old type collections and other samples of cercosporoid fungi, *inter alia* in preparation for the annotated list of *Cercospora* and *Passalora* names published by Crous & Braun (2003). Numerous previously unpublished

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results have been incorporated in already published issues of the present series. Cultures, sequence analyses and epitypifications on the basis of cultured and sequenced collections represent the next phase in order to transfer the old morphology-based names into the era of consolidated species concepts.

The growing number of DNA sequences of cercosporoid fungi allows better insights in the phylogenetic structure of this fungal group on the familial as well as the generic level. On the other hand, it has gradually been pointed out that traditionally applied phenotypic traits of the sexual as well as asexual morphs of cercosporoid fungi (*Mycosphaerellaceae*) are not in full agreement with genotypic generic circumscriptions. Species only forming mycosphaerella-like sexual morphs, i.e. without any asexual fructifications, are known in many currently recognised cercosporoid genera (e.g. Guatimosim *et al.* 2016). As a consequence, the generic affinity of mycosphaerelloid ascomycetes cannot be properly resolved without cultures, sequences, and phylogenetic analyses. On the other hand, the classical morphological characters of asexual morphs of cercosporoid fungi are no longer reliable for allocating certain species to particular genera. The analysis of fern-inhabiting cercosporoid fungi recently examined in Brazil (Guatimosim *et al.* 2016) is a striking example. The genus *Zasmidium* is known to be polyphyletic (Crous *et al.* 2009a, b, Braun *et al.* 2013). Besides genuine species of *Zasmidium* s. str., zasmidium-like asexual morphs are also known for the cercosporoid genera *Neoceratosperma* (Crous *et al.* 2014, Guatimosim *et al.* 2016) and *Paramycosphaerella* (widened to include species with zasmidium-like asexual morphs by reallocations of *Zasmidium aérohyalosporium*, *Z. dicranopteridis*, *Z. nabiacense*, and *Mycosphaerella parkii* (i.e. *Z. parkii*; Guatimosim *et al.* 2016), i.e. cercosporoid species with zasmidium-like morphology cannot be properly assigned to cercosporoid genera without data from sequence analyses. The situation in all other cercosporoid genera is comparable. Pseudocercospora-like phenotypes of cercosporoid asexual morphs are usually connected with the genus *Pseudocercospora* s. str., but there are exceptions. Several species morphologically not or barely distinguishable from true *Pseudocercospora* species do not cluster within the large *Pseudocercospora* clade and have been placed in *Pallidocercospora* and *Phaeocercospora* (Crous *et al.* 2012, 2013, Braun *et al.* 2013). *Phaeophloeospora pteridivora* is an additional species with a pseudocercosporoid asexual morph that clusters in a clade with coelomycetous morphs (Guatimosim *et al.* 2016). The cercospora-like morphology of conidiophores and conidia was believed to be a reliable character to assign species to *Cercospora* s. str., but even in this genus there are exceptions, for example the recently introduced genus *Neocercospora* (Bakhshi *et al.* 2015). However, the crux of the matter within *Cercospora* s. str. is that reliable identifications at species level are barely possible without multigene analyses, above all within the *Cercospora apii* s. lat. complex (Groenewald *et al.* 2013). *Passalora* s. lat. (*sensu* Crous & Braun 2003, Braun *et al.* 2013) is another strongly polyphyletic genus in which the

morphological characters of the asexual morphs traditionally used for the separation of genera do not reflect phylogenetic entities (i.e. genera). A corresponding detailed phylogenetic treatment of the *Passalora* complex is under preparation. All results of modern studies dealing with cercosporoid fungi in *Mycosphaerellaceae* show that proper taxonomic results and conclusions have to be based on an integrated approach including molecular sequence analyses. Conclusions just based on morphological analyses are unreliable and do not allow proper generic allocations. Therefore, we have decided to revise the focus of the present series. Efforts to reassess and reallocate cercosporoid genera and species will thus in future be based on re-examinations of types and other collections in combination with cultures and sequence analyses whenever possible. The present series will not be continued in its present form. In future, it will rather focus on the revision of type collections of old cercosporoid species, including comprehensive descriptions and illustrations, which are necessary as basis for modern examinations *in vitro* including subsequent sequence analyses.

So far four contributions have been published: part one dealing with cercosporoid fungi on other fungi (mycophylic taxa), on ferns as well as gymnosperms (Braun *et al.* 2013); part two dedicated to species on monocots, excluding true grasses (Braun *et al.* 2014); part three with a treatment of cercosporoids on hosts of *Poaceae* (Braun *et al.* 2015a); and part four as the first contribution to cercosporoids on dicots covering species occurring on hosts belonging to the families *Acanthaceae* to *Amaranthaceae* (Braun *et al.* 2015b). Part five is a continuation covering cercosporoid fungi on hosts of the dicot families *Anacardiaceae* and *Annonaceae*. Generic descriptions and keys to accepted genera are included in the first part. The structure of the present part follows the principles circumscribed in part 1 (Braun *et al.* 2013).

MATERIALS AND METHODS

The present work is a compilation based on our previous papers and unpublished data, as well as global literature. Details of methods are given in the papers cited under References. As far as new examinations are concerned, fungal structures have been studied by standard methods of light microscopy, using an Olympus BX50 microscope, with distilled water and lactic acid as mountants, but without any stain. If possible, measurements of 30 conidia and other structures have been made at a magnification of $\times 1000$. All illustrations have been prepared by UB. 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>).

TAXONOMIC TREATMENT

Cercosporoid species on dicots *s. lat.* (*Anacardiaceae* to *Annonaceae*)

Anacardiaceae

Cercospora

Key to *Cercospora* species on *Anacardiaceae*

- 1 External hyphae with solitary conidiophores present *in vivo*; conidia solitary or occasionally catenate, obclavate, base obconically truncate, to about 140 µm long and 4–7.5 µm wide; on *Rhus semialata* see **Passalora guoana**
- Mycelium consistently internal *in vivo*; solitary conidiophores not developed; conidia consistently solitary, acicular, base truncate, 2–6 µm wide 2
- 2 (1) Leaf spots finally greyish brown to dingy greyish white with brown border; on *Mangifera indica* **C. mangiferae-indicae**
- Leaf spots yellowish brown to blackish brown; on *Rhus*, *Spondias*, and *Toxicodendron* spp. **C. verniciferae**

Tabular key to *Cercospora* species on *Anacardiaceae* according to host genera

Mangifera

A single species **C. mangiferae-indicae**

Rhus

- 1 External hyphae with solitary conidiophores present *in vivo*; conidia solitary or occasionally catenate, obclavate, base obconically truncate, to about 140 µm long and 4–7.5 µm wide see **Passalora guoana**
- Mycelium consistently internal *in vivo*; solitary conidiophores not developed; conidia consistently solitary, acicular, base truncate, 2–5 µm wide **Cercospora verniciferae**

Spondias

A single species **C. verniciferae**

Toxicodendron

A single species **C. verniciferae**

Cercospora species on *Anacardiaceae*

Cercospora mangiferae-indicae Munjal, Lall & Chona, *Indian Phytopathol.* **14**: 185 (1962) ["1961"]. (Fig. 1)

Literature: Crous & Braun (2003: 266), Kakoti *et al.* (1998), Kamal (2010: 62), Todawat Nawalsing & Papdiwal (2011).

Illustration: Munjal *et al.* (1962: 187, fig. 6).

Description: Leaf spots amphigenous, subcircular to irregular, 1–25 mm diam, scattered to gregarious, pale to medium dark brown, later with greyish brown to dingy greyish white centre and brown border on the upper leaf surface, brown with darker border below. *Caespituli* amphigenous, but mainly epiphyllous, scattered, delicately punctiform, dark brown. *Mycelium* internal. *Stromata* lacking or small, 10–30 µm diam, substomatal or immersed, intraepidermal, only composed of a few swollen hyphal cells, 3–10 µm diam, brown, wall somewhat thickened. *Conidiophores* in small to moderately large fascicles, mostly

2–20, erect, straight, subcylindrical or attenuated towards the tip, unbranched, not to moderately geniculate, 15–250 × 3–8 µm, pluriseptate, pale to medium brown or olivaceous brown throughout or paler towards the tip, wall slightly thickened, smooth; conidiogenous cells integrated, terminal, sometimes intercalary, 15–40 µm long, conidiogenous loci conspicuous, thickened and darkened, 2–4 µm diam. *Conidia* solitary, acicular, straight to curved, 20–200 × 3–6 µm, 1- to pluriseptate, hyaline, thin-walled, smooth, apex subacute, base truncate, 3–4.5 µm wide, hila thickened and darkened.

Holotype: **India**: New Delhi, India Agricultural Research Institute, on *Mangifera indica*, 11 Dec. 1959, V. Prakash (HCIO 26847).

Host range and distribution: On *Mangifera indica*, *Anacardiaceae*, Asia (India, Assam, Delhi, Maharashtra, Tamil Nadu), West Indies (Dominican Republic).

Notes: This is a true *Cercospora* *s. str.*, morphologically belonging to *C. apii* *s. lat.*, but with relatively broad conidia,

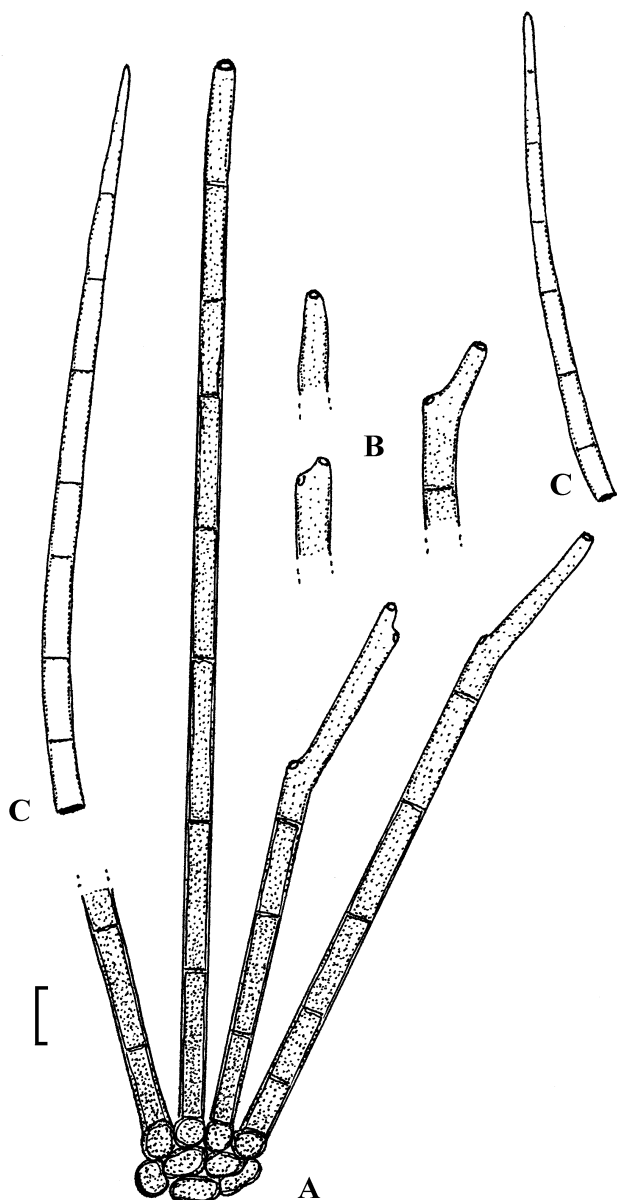


Fig. 1. *Cercospora mangiferae-indicae* (BPI 438068A). **A.** Conidiophore fascicle. **B.** Conidiophore tips. **C.** Conidia. Bar = 10 μ m.

3–6 μ m. Records from the Dominican Republic refer to collections deposited as BPI 438068A,B. Conidiophores and conidia are morphologically barely distinguishable from those of *C. verniciferae*. The phylogenetic affiliation of this species is unknown.

Cercospora verniciferae Chupp & Viégas, *Bol. Soc. Brasil. Agron.* **8**: 56 (1945).
(Fig. 2)

Literature: Chupp (1954: 44), Crous & Braun (2003: 420), Guo et al. (2005: 32–33), Phengsintham et al. (2012: 50–51; 2013: 98).

Illustration: Guo et al. (2005: 33, fig. 14), Phengsintham et al. (2012: 52, fig. 1a, 53, fig. 1b; 2013: 99, figs 44–45).

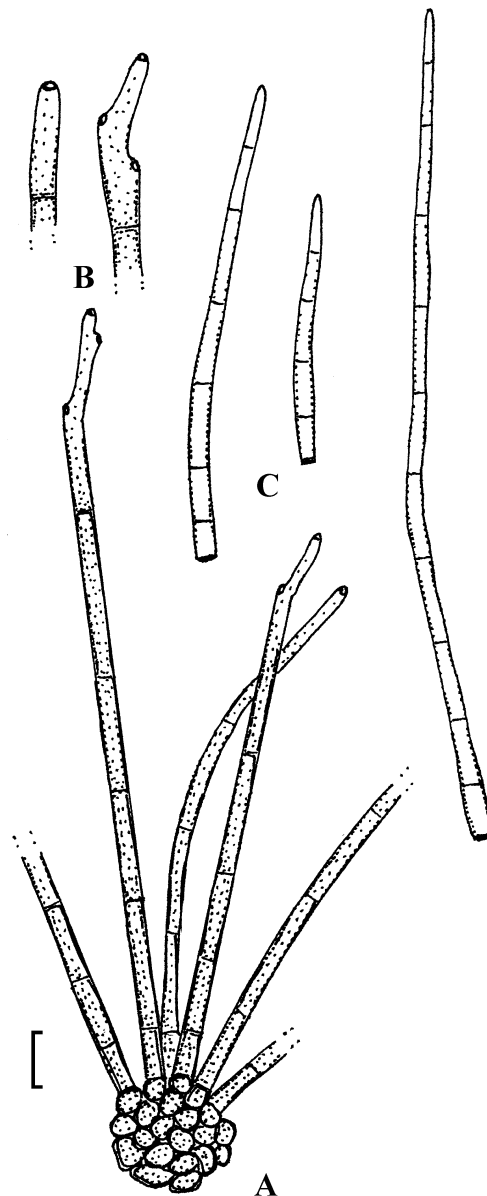


Fig. 2. *Cercospora verniciferae* (CUP 41508, lectotype). **A.** Conidiophore fascicle. **B.** Conidiophore tips. **C.** Conidia. Bar = 10 μ m.

Description: Leaf spots amphigenous, subcircular to angular-irregular, 1.5–10 mm diam, later confluent and larger, yellowish brown to blackish brown. *Caespituli* hypophyllous. *Mycelium* internal. *Stromata* absent or small, substomatal, composed of a few dark brown cells. *Conidiophores* in small to moderately large fascicles, 2–20, arising from internal hyphae or stromatic hyphal aggregations, through stomata, divergent, erect, straight, subcylindrical to somewhat geniculate, unbranched, 25–345 \times 3–5.5 μ m, pluriseptate, medium to dark brown throughout or paler towards the tip, wall thin to somewhat thickened, smooth; conidiogenous cells integrated, terminal and intercalary, conidiogenous loci conspicuous, 1.5–3 μ m diam. *Conidia* solitary, acicular, straight to curved or sinuous, 30–175 \times 2–5 μ m, 3- to pluriseptate, hyaline, thin-walled, smooth, apex subacute, base truncate, 1.5–3 μ m wide, thickened and darkened.

Lectotype (designated here, MycoBank, MBT204884):
Brazil: São Paulo: Campinas, Santa Elisa Farm, Instituto Agronomico, on *Toxicodendron verniciferum* [*Rhus vernicifera*], *Anacardiaceae*, 28 Apr. 1936, A. S. Costa 1518 (CUP 41508). *Isolectotype:* IACM 1518.

Host range and distribution: On *Rhus* (*chinensis* var. *roxbourgii*, *succedanea*), *Spondias* (*dulcis*, *pinnata*), *Toxicodendron verniciferum*, *Anacardiaceae*, Asia (Thailand), Oceania (Samoa), South America (Brazil).

Notes: This species belongs to the *Cercospora apii* s. lat. complex. The identity of morphologically barely distinguishable collections on *Spondias* species from Asia and Oceania, referred to as *C. verniciferae*, is unclear and need molecular confirmation. The phylogenetic affiliation of *C. verniciferae* and its relation to *C. mangiferae-indicae* are unknown.

Doubtful, excluded and insufficiently known species

Cercospora anacardii-occidentale Rangasw. et al., *Scheme for Collection & Identification of Fungi of South India, Final Report:* 12 (1969); *nom. inval.* (Art. 39.1).

Literature: Crous & Braun (2003: 56), Kamal (2010: 16).

Note: *Cercospora anacardii-occidentale*, described from south India on *Anacardium occidentale* is an invalid name. Type material could not be traced, and the taxonomic status of this species is unclear.

Cercospora megaspermae L.N. Bhardwaj & R.C. Sharma, *Indian Forester* **120**: 545 (1994).

Literature: Kamal (2010: 64).

Illustration: Bharadwaj & Sharma (1994: 546, fig. 1a).

Description: Leaf spots small, irregular, 1–5 mm diam. *Mycelium* internal. *Conidiophores* fasciculate, unbranched, 75–180 × 5–15 µm, septate, brown to dark brown. *Conidia* solitary, narrowly obclavate-linear, straight to curved, 60–172 × 2–4 µm, 3–8-septate, subhyaline to pale olivaceous.

Holotype: **India:** Himachal Pradesh: Solan, on *Pistacia integerrima*, *Anacardiaceae*, 15 Oct. 1989, L. N. Bharadwaj (Mycol. Herb., Dept. of Mycology & Pl. Pathol., Dr. Y.S. Pamar Univ. of Horticulture & Forestry, Solan, India, MH 515).

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

Notes: Type material of this species was not available for examination. The original description is very meagre, and the conidia were described as subhyaline to pale olivaceous, and details of the conidiogenous loci were not given. The identity of this insufficiently described species is unclear.

Cercospora toxicodendri (Ellis) U. Braun, *Monogr. Cercospora, Ramularia and Allied Genera (Phytopath. Hyphom.)* **2**: 402 (1998).

Basionym: *Cercospora toxicodendri* Ellis, *Amer. Naturalist* **16**: 811 (1882).

Synonyms: *Pseudocercospora toxicodendri* (Ellis) X.J. Liu & Y.L. Guo, *Mycosystema* **2**: 237 (1989).

Mycovellosiella toxicodendri (Ellis) U. Braun, *Mycotaxon* **55**: 224 (1995).

Cercospora californica Bonar, *Mycologia* **34**: 188 (1942) [*holotype:* **USA:** California: San Mateo County, on *Toxicodendron diversilobum*, 15 Aug. 1935, L. Bonar (UC 653836); *isotypes:* BPI 420516, FH, MICH 15390, WIS-F-11579].

Literature: Saccardo (1886: 467), Chupp (1954: 43), Guo & Hsieh (1995: 14), Braun (1995a: 68; 1998: 402).

Illustrations: Braun (1995: 69, fig. 66, as *C. californica*).

Exsiccatae: Barthol., *Fungi Columb.* 4708. Ellis & Everh., *Fungi Columb.* 691. Ellis & Everh., *N. Amer. Fungi* 1524, 1524b.

Description: Leaf spots amphigenous, scattered, subcircular to irregular, 1–6 mm diam, sometimes confluent and larger, at first pale, greyish, brownish, later dark brown to almost black, surrounded by a darker margin. *Caespituli* hypophyllous, punctiform, whitish. *Mycelium* immersed; hyphae hyaline, septate, sparingly branched, forming loose stromatic hyphal aggregations, substomatal, subhyaline, composed of swollen hyphal cells, 3–5 µm diam. *Conidiophores* few to numerous, in dense fascicles, arising from internal hyphae or stromata, through stomata, erect, straight and subcylindrical to moderately geniculate-sinuous, unbranched, 10–35 × (3–)4–7(–8.5) µm, 0–1-septate, hyaline, thin-walled, smooth, often somewhat attenuated towards the tip; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 10–25 µm long, conidiogenous loci convex, slightly thickened, refractive. *Conidia* solitary, obclavate-fusiform to subcylindrical, 40–70(–90) × 3–4 µm, (0–)2–6(–8)-septate, hyaline, thin-walled, smooth, apex subobtuse to subacute, base short obconically truncate, hila slightly thickened, refractive.

Neotype (designated by Braun 1998: 401): **USA:** New Jersey: Gloucester County, Newfield, on *Toxicodendron pubescens*, Sep. 1885, J. B. Ellis [Ellis & Everh., *N. Amer. Fungi* 1524] (NY 838637). *Iso-neotypes:* Ellis & Everh., *N. Amer. Fungi* 1524, e.g., BPI 441967, 441971, CUP 41424, NY 838639–838641, ILL 98792, OSC 35014, PAD, RMS 3281, WIS-F-9652.

Host range and distribution: On *Rhus* (*venenata*, *Rhus* sp.), *Toxicodendron* (*diversilobum* [*Rhus diversiloba*], *orientale* [*Rhus ambigua*], *pubescens* [*Rhus toxicodendron*], *radicans* subsp. *radicans*, *radicans* subsp. *rydbergii* [*Rhus rydbergii*]), *Anacardiaceae*, North America (Canada; USA, Florida, Indiana, Iowa, Massachusetts, Maryland, New Jersey, North Carolina, Texas).

Notes: The complicated nomenclature and taxonomy of this species has been discussed by Braun (1998). Type material of *C. toxicodendri*, collected in Newfield before or in 1882, is not preserved at NY and could also not be traced in any other herbaria, but topotype material collected in 1885 is preserved in many herbaria. This material, designated by Braun (1998) as neotype, contains two fungi, one with colourless conidiophores and conidia and a second with pigmented

structures, conspecific with *Cercospora bartholomei*. Ellis (1882) described colourless conidia agreeing with the colourless *Cercospora* present in the neotype material. Therefore, Braun (1998) restricted the name *C. toxicodendri* to the *Cercospora* element and neotypified this species accordingly. The correct name for *Cercospora toxicodendri* *sensu* Chupp (1954) is *Passalora bartholomei*.

Passalora (s. lat.)

Key to *Passalora* species on Anacardiaceae

- | | | |
|-------|--|----------------------------|
| 1 | Superficial hyphae with solitary conidiophores formed <i>in vivo</i> | 2 |
| | Superficial hyphae with solitary conidiophores not formed <i>in vivo</i> | 5 |
| 2 (1) | Conidia solitary, at most rarely in short chains; stromata lacking or small, 10–20 µm diam | 3 |
| | Conidia often or at least partly in chains; stromata larger, 15–90 µm diam | 4 |
| 3 (2) | Conidia subhyaline to pale olivaceous brown, 2.5–5 µm wide; on <i>Rhus</i> and <i>Toxicodendron</i> spp.,
North America | P. bartholomei |
| | Conidia hyaline, 4–6.5 µm wide; on <i>Rhus</i> sp., China | P. guoana |
| 4 (2) | Conidiophores 4–5 µm wide; conidia (0–)1–7-septate; on <i>Rhus chinensis</i> var. <i>roxburghii</i> , Asia | P. rhoina |
| | Conidiophores 2–4 µm wide; conidia 0–4(–6)-septate; on <i>Myracrodruon urundeuva</i> , South America
..... | P. myracrodruonis |
| 5 (1) | Conidia obclavate-cylindrical, 4–11.5 µm wide, consistently solitary or at most in short chains | 6 |
| | Conidia narrower, 3–5 µm, ± cylindrical and in chains or obclavate-cylindrical and consistently solitary | 7 |
| 6 (5) | Conidia 15–135 × 4–11.5 µm, 0–10-septate, solitary or in short chains; on <i>Sesaria parviflora</i> ,
India | P. pithoragarhensis |
| | Conidia 20–65 × 4–7 µm, 0–4-septate, consistently solitary; on <i>Cotinus coggygria</i> , USA | P. cotini |
| 7 (5) | Conidia formed singly, obclavate-cylindrical; on <i>Rhus aromatica</i> , USA | P. rhois-aromaticae |
| | Conidia formed in chains, ± cylindrical | 8 |
| 8 (7) | Conidia (10–)15–40(–50) µm long, 0–1(–3)-septate | P. marmorata |
| | Conidia 20–120 µm long, 0–7-septate | P. rhois |

Tabular key to *Passalora* species on Anacardiaceae according to host genera

Cotinus

- | | |
|------------------------|------------------|
| A single species | P. cotini |
|------------------------|------------------|

Myracrodruon

- | | |
|------------------------|--------------------------|
| A single species | P. myracrodruonis |
|------------------------|--------------------------|

Rhus s. lat. (incl. *Searsia* and *Toxicodendron*)

- | | | |
|-------|--|----------------------------|
| 1 | Superficial hyphae with solitary conidiophores formed <i>in vivo</i> | 2 |
| | Superficial hyphae with solitary conidiophores not formed <i>in vivo</i> | 4 |
| 2 (1) | Conidia at least partly in chains; stromata large, 15–90 µm diam | P. rhoina |
| | Conidia solitary, at most rarely in short chains; stromata lacking or small, 10–20 µm diam | 3 |
| 3 (2) | Conidia subhyaline to pale olivaceous brown, 2.5–5 µm wide; on <i>Rhus</i> and <i>Toxicodendron</i> spp.,
North America | P. bartholomei |
| | Conidia hyaline, 4–6.5 µm wide; on <i>Rhus</i> sp., China | P. guoana |
| 4 (1) | Conidia obclavate-cylindrical, 15–135 × 4–11.5 µm; on <i>Sesaria parviflora</i> , India | P. pithoragarhensis |

- Conidia narrower, 3–5 μm wide; on *Rhus* and *Searsia* spp. 5
- 5 (4) Conidia formed singly, obclavate-cylindrical; on *Rhus aromatica*, USA **P. rhois-aromaticae**
 Conidia formed in chains, \pm cylindrical 6
- 6 (5) Conidia (10–)15–40(–50) μm long, 0–1(–3)-septate **P. marmorata**
 Conidia 20–120 μm long, 0–7-septate **P. rhois**

Passalora species on Anacardiaceae

Passalora bartholomei (Ellis & Kellerm.) U. Braun & Crous, *Mycosphaerella Anam.* 1: 77 (2003).

(Fig. 3)

Basionym: *Cercospora bartholomei* Ellis & Kellerm., *J. Mycol.* 5: 144 (1889).

Synonym: *Mycovellosiella bartholomei* (Ellis & Kellerm.) U. Braun, *Monogr. Cercosporella, Ramularia Allied Genera (Phytopath. Hyphom.)* 2: 402 (1998).

Literature: Saccardo (1892: 639), Chupp (1954: 43), Braun (1995b: 224; 1998: 402).

Illustration: Braun (1995b: 229, fig. 4, as *Mycovellosiella toxicodendri*).

Exsiccatae: Barthol., *Fungi Columb.* 3206. Barthol., *N. Amer. Fungi* 2980. Ellis & Everh., *Fungi Columb.* 696. Kellerman & Swingle, *Kansas Fungi* 1290.

Description: *Leaf spots* small, 1–5 mm diam, indistinct to angular-irregular, greenish to brown. *Caespituli* hypophyllous, punctiform to effuse, brownish. *Mycelium* internal and external; superficial hyphae emerging through stomata, branched, septate, 1.5–4 μm wide, olivaceous to brown, thin-walled, smooth. *Stromata* absent or small, 10–20 μm diam, brown. *Conidiophores* in small to moderately large fascicles, loose to fairly dense, arising from internal hyphae or stromata, through stomata or erumpent, or conidiophores solitary, arising from superficial hyphae, erect, straight, subcylindrical-conical to geniculate-sinuous, unbranched, 10–50 \times 3–6 μm , 0–3-septate, olivaceous brown to brown, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 5–25 μm long, conidiogenous loci conspicuous, thickened and darkened, 1.5–2 μm diam. *Conidia* solitary, obclavate-cylindrical, straight to curved or even sigmoid, (20–)25–160(–225) \times 2.5–5 μm , 2–12-septate, subhyaline to pale olivaceous brown, thin-walled, smooth, apex obtuse to subacute, base short obconically truncate, 1.5–2 μm wide, hila slightly thickened and darkened.

Lectotype (designated here, MycoBank, MBT204885): **USA:** Kansas: Rooks County, on *Toxicodendron pubescens* [*Rhus toxicodendron*], 22 Sep. 1888, E. Bartholomew (NY 830171). *Isolectotype:* BPI 433259.

Host range and distribution: On *Rhus glabra*, *Toxicodendron* (*pubescens*, *radicans* subsp. *radicans*, *radicans* subsp. *rydbergii* [*Rhus rydbergii*]), *Anacardiaceae*, North America (Canada; USA, Indiana, Kansas, Wisconsin).

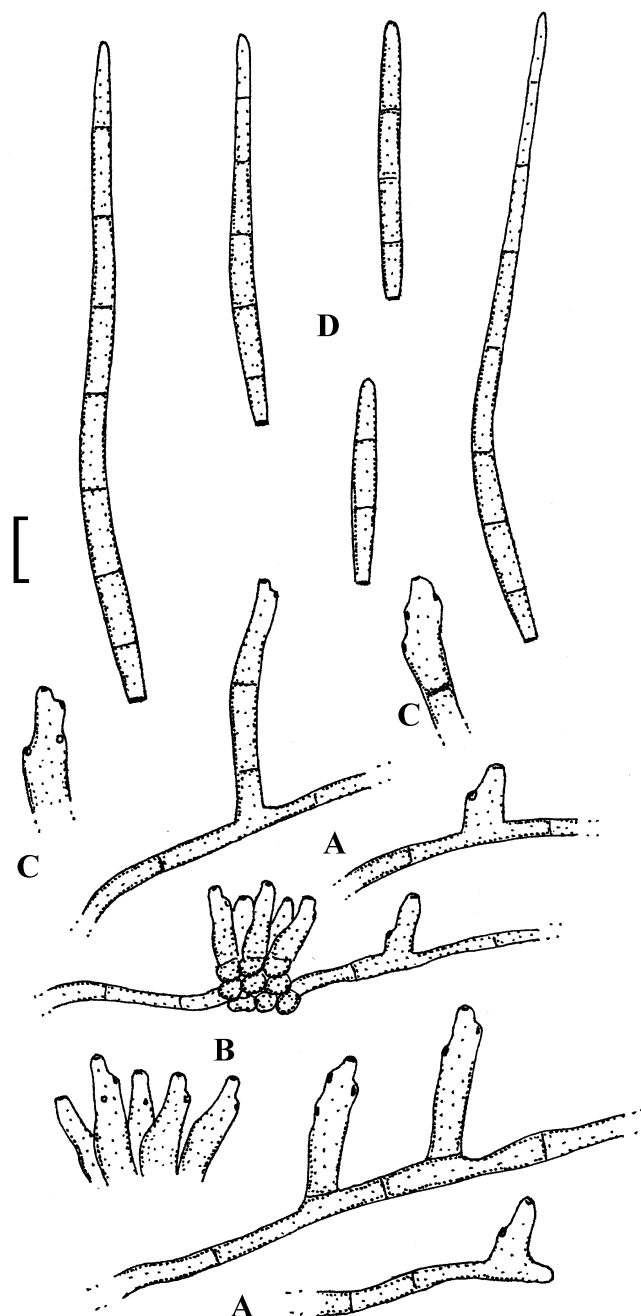


Fig. 3. *Passalora bartholomei* (NY 830171, lectotype). **A.** Solitary conidiophores arising from superficial hyphae. **B.** Conidiophore fascicles. **C.** Conidiophore tips. **D.** Conidia. Bar = 10 μm .

Note: Several names have been misapplied to this species, in particular that of *Cercospora toxicodendri* Ellis (Braun, 1998).

Passalora cotini U. Braun, sp. nov.

Mycobank MB816979

(Fig. 4)

Etymology: Named after the host genus, *Cotinus*.*Diagnosis*: Differs from *Passalora pithoragarhensis* in having shorter and narrower consistently solitary conidia, 20–65 × 4–7 µm, 0–4-septate.*Holotype*: **USA**: Alabama: Tuskegee, on *Cotinus coggygria*, Anacardiaceae, 7 Aug. 1932, G. W. Carver (BPI 440737).

Description: Leaf spots amphigenous, subcircular to angular-irregular, 1–8 mm diam, or confluent and larger, forming large patches, ochraceous, pale to medium brown, margin indefinite or centre later pale, dingy greyish brown, grey to greyish white, with darker border. *Caespituli* amphigenous, punctiform, dark brown to blackish, scattered to gregarious. *Mycelium* internal. *Stromata* lacking or only formed as small substomatal aggregation of a few swollen hyphal cells, 10–20 µm diam, medium to dark brown, in addition with larger immersed stromata, 25–80 µm diam, medium to dark brown, cells 3–8 µm diam, wall thickened, which probably represent immature ascomatal initials. *Conidiophores* in small divergent fascicles (2–8), arising from internal hyphae or small substomatal hyphal aggregations, through stomata, and in small to large fascicles (to about 20), arising from larger stromata (ascomatal initials), loose to dense, erect, straight to curved, subcylindrical, slightly attenuated towards the tip or often subclavate (width somewhat enlarged from base to top), not to slightly geniculate-sinuuous, unbranched, 20–80 × 3–8 µm, aseptate or with 1–3 thin, not very conspicuous septa, medium to medium dark brown throughout or paler towards the tip, wall somewhat thickened, above all in the lower half, to 1 µm wide, smooth; conidiogenous cells integrated, terminal, 10–40 µm long, or conidiophores aseptate, i.e. reduced to conidiogenous cells, with a single to mostly several, sometimes numerous conidiogenous loci, conspicuous, thickened and darkened, 1–2 µm diam. *Conidia* solitary, obclavate-cylindrical, straight to somewhat curved, 20–65 × 4–7 µm, (0–)1–4-septate, subhyaline to pale olivaceous or olivaceous brown, thin-walled, smooth, apex obtuse, broadly rounded to subacute, base short obconically truncate, 1.5–2 µm wide, hila somewhat thickened and darkened.

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

Notes: Type material of this species was originally deposited as *Cercospora rhoina*. Other cercosporoid collections on *Cotinus coggygria* belong to *Pseudocercospora cotini*. The new species on *Cotinus* belongs to *Passalora s. lat.*, based on the broad morphological concept of that genus outlined in Crous & Braun (2003) and Braun et al. (2013). It is a species with *Passalora s. str./Cercosporidium*-like morphology, i.e. with consistently internal mycelium *in vivo* and conidia consistently formed singly. However, *Passalora s. lat.* is polyphyletic. A phylogenetic revision of this complex is under preparation. Since phylogenetically circumscribed genera and traditionally

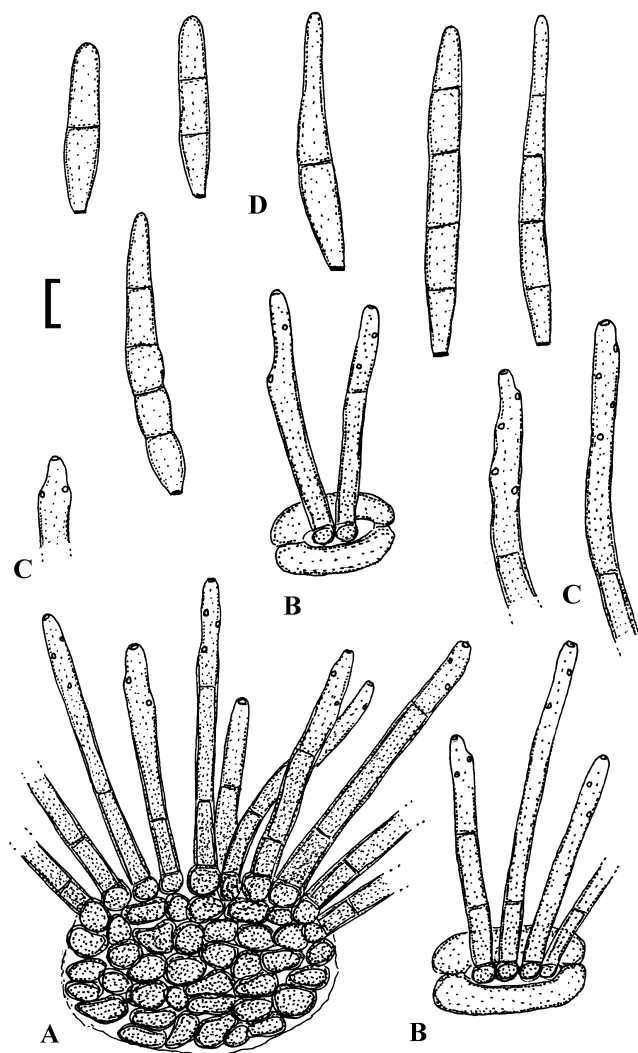


Fig. 4. *Passalora cotini* (BPI 440737, holotype). **A.** Conidiophore fascicle arising from an immature ascoma. **B.** Conidiophore fascicles. **C.** Conidiophore tips. **D.** Conidia. Bar = 10 µm.

applied morphological concepts within *Passalora s. lat.* are not in accordance with each other, phylogenetically correct reallocations of particular species are in future only possible on the base of molecular data. Hence, the new species on *Cotinus* can currently (tentatively) only be assigned to *Passalora s. lat.*

Passalora guoana U. Braun, nom. nov.

Mycobank MB816980

(Fig. 5)

Basionym: *Mycovellosiella rhois* Y.L. Guo, in Guo & Jiang, *Mycotaxon* **74**: 264 (2000); as “*rhoidis*”, nom. illegit. (Art. 53.1), non *Mycovellosiella rhois* Goh & W.H. Hsieh 1987.*Synonym*: *Passalora rhois* (Y.L. Guo) Y.L. Guo, *Mycosystema* **30**: 867 (2011); as “*rhoidis*”, nom. illegit. (Art. 53.1), non *Passalora rhois* (E. Castell.) U. Braun & Crous 2003.*Etymology*: Named after the Chinese mycologist Y.L. Guo.*Literature*: Guo et al. (2003: 12–14).

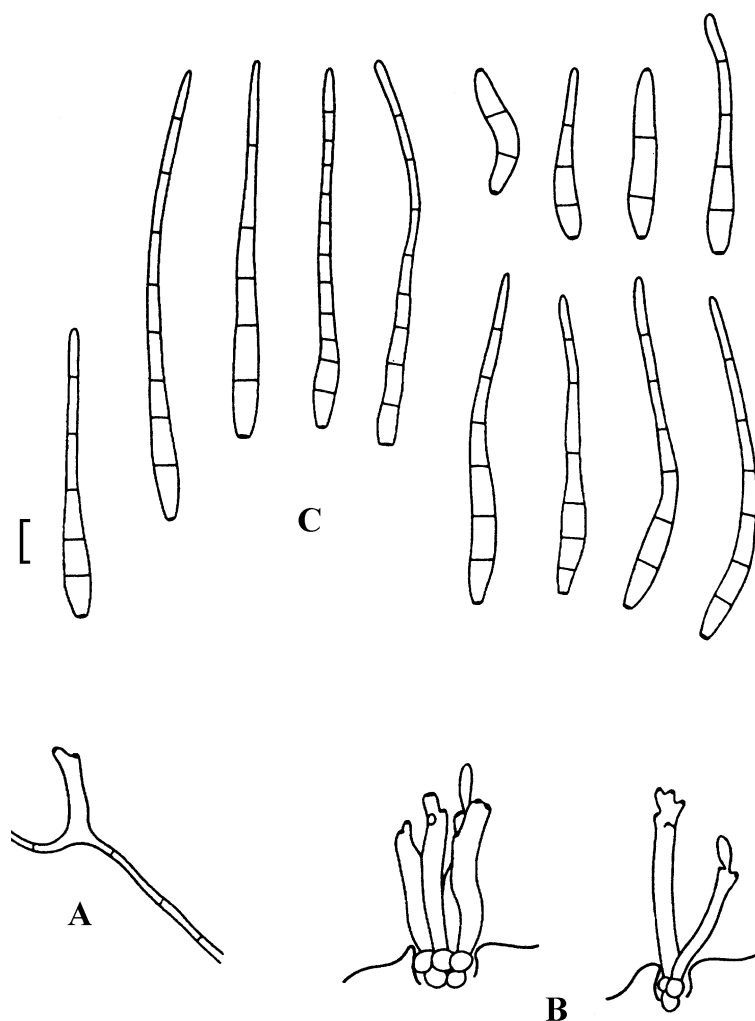


Fig. 5. *Passalora guoana* (based on Guo & Jiang 2000: 264, fig. 4). **A.** Superficial hypha with solitary conidiophore. **B.** Conidiophore fascicles. **C.** Conidia. Bar = 10 μ m.

Illustration: Guo & Jiang (2000: 264, fig. 4), Guo *et al.* (2003: 13, fig. 2).

Description: Leaf spots amphigenous, subcircular to angular-irregular, 1–4 mm diam, often confluent, centre brown to dark brown, margin blackish brown on the upper side, grey to pale greyish brown below. *Caespituli* hypophyllous. *Mycelium* internal and external; superficial hyphae emerging through stomata or arising from conidiophore tips, branched, 1.7–3.2 μ m wide, septate, subhyaline, thin-walled, smooth. *Stromata* absent. *Conidiophores* in small fascicles, 2–8, loose to dense, emerging through stomata, or solitary, arising from superficial hyphae, erect, straight to slightly curved or somewhat geniculate-sinuuous, unbranched, irregular in width, 13–65 \times 4–7.5 μ m, 0–1-septate, hyaline to very pale olivaceous, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, conidiogenous loci conspicuous, thickened and darkened, 1.7–2.2 μ m diam. *Conidia* solitary, occasionally in short chains, obclavate, straight to curved, 26–138 \times 4–6.5 μ m, 2–11-septate, hyaline, thin-walled, smooth, apex obtuse to subacute, base short obconically truncate, hila thickened and darkened.

Holotype: **China:** Hubei Province: Shennongjia, on *Rhus* sp., *Anacardiaceae*, 2 Aug. 1984, Y. L. Guo 212 (HMAS 77433).

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

Notes: The generic affinity of this species is quite unclear and not yet phylogenetically proven. Owing to colourless conidia, this species could even be allied to *Cercospora* s. str. However, *Passalora* is polyphyletic, and as long as the true generic affinity of this fungus remains unknown, we prefer to retain this species in *Passalora* s. lat. *Mycovellosiella rhois* Y.L. Guo as well as *Passalora rhois* (Y.L. Guo) Y.L. Guo are illegitimate names. Therefore, a new legitimate name is required for this species. The epithet “*rhoidis*” is undoubtedly the wrongly formed genitive of *Rhus* that must correctly be “*rhois*”, and cannot be interpreted as an arbitrarily formed name. Furthermore, “*rhoidis*” and “*rhois*” (the wrong and correct genitive of *Rhus*) would be confusable names according to Art. 53.3 that have to be treated as homonyms.

Passalora marmorata (Tranzschel ex Sacc.) U. Braun & Crous, *Mycosphaerella Anam.* **1:** 267 (2003). (Fig. 6)

Basionym: *Cercosporina marmorata* Tranzschel ex Sacc., *Syll. Fung.* **25:** 895 (1931); as “(Tranzschel) Sacc.”

Synonyms: *Cercospora marmorata* Tranzschel, in Tranzschel & Serebrianiokow, *Mycotheca Rossica*, Fasc. 5, no. 250 (1911); *nom. nud.*

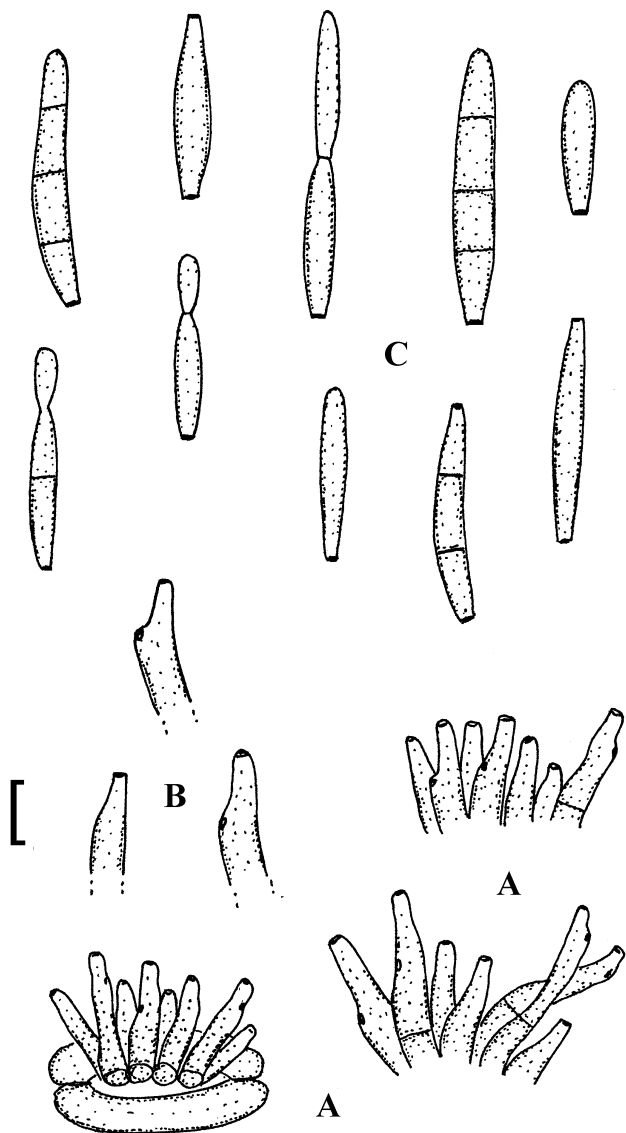


Fig. 6. *Passalora marmorata* (LE 40410, lectotype). **A.** Conidiophore fascicles. **B.** Conidiophores. **C.** Conidia. Bar = 10 μ m.

Phaeoramularia marmorata (Tranzschel ex Sacc.) Deighton, *Mycol. Pap.* **144**: 34 (1979).

Cladosporium rhois Arcang., in Thümen, *Mycoth. Univ.*, no. 1371 (1879), non *Passalora rhois* (E. Castell.) U. Braun & Crous 2003 [*lectotype (designated here, MycoBank, MBT204886)*: **Italy**: Firenze, Settignano, on *Rhus coriaria*, Nov. 1879, G. Arcangeli [Thümen, *Mycoth. Univ.* 1371] (HAL). *Isolectotypes*: Thümen, *Mycoth. Univ.* 1371 (e.g. BPI 427440, HBG, K, PAD, S), and Baglietto et al., *Erb. Crit. Ital.*, Ser. II, 849 (e.g. E, FH, G, NY).

Cercospora rhois-coriariae Kuhn.-Lord., *Ann. Épiphyt.*, ser. 2, **13**: 54 (1947) [*type: France*: Département Var, on *Rhus coriaria*, M. Kuhnholz-Lordat, not traced, probably not preserved].

Literature: Chupp (1954: 40), Ellis (1976: 316), Deighton (1979: 34), Braun & Mel'nik (1997: 72), Crous & Braun (2003: 267).

Illustrations: Ellis (1976: 316, fig. 239 A), Deighton (1979: 35, fig. 18).

Exsiccatae: Baglietto et al., *Erb. Critt. Ital.*, ser. II, 849. Roum., *Fungi. Sel. Exs.* 4990. Thüm., *Mycoth. Univ.* 1371. Tranz. & Serebr., *Mycoth. Ross.* 250.

Description: *Leaf spots* amphigenous, angular-irregular, often vein-limited, 3–6 mm diam, sometimes to 10 mm diam, pale brown to ochraceous-grey, sometimes concentrically zonate with narrow brown lines and margin. *Caespituli* amphigenous, often hypophyllous, punctiform, dark brown. *Mycelium* internal; hyphae branched, septate, 2–4 μ m wide, pale olivaceous, thin-walled, smooth. *Stromata* small, mostly substomatal, 10–30 μ m diam, olivaceous brown. *Conidiophores* in small to moderately large fascicles (to about 50), divergent to dense, arising from internal hyphae or stromata, usually through stomata, erect, straight, subcylindrical to somewhat narrowed towards the tip, somewhat geniculate-sinuuous, unbranched, 10–40 \times 3–5 μ m, 0–1-septate, pale to moderately olivaceous to yellowish brown, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores often reduced to conidiogenous cells, 10–25 μ m long, conidiogenous loci conspicuous, thickened and darkened, 1–2 μ m diam. *Conidia* in short to moderately long chains, occasionally in branched chains, cylindrical, subcylindrical, ellipsoid-fusiform, one-celled conidia sometimes obovoid, straight to curved, (10–)15–40(–50) \times (2.5–)3–5(–5.5) μ m, 0–1(–3)-septate, subhyaline to olivaceous, thin-walled, smooth, ends rounded to short obconically truncate, 1.5–2 μ m wide, hila somewhat thickened and darkened.

Lectotype (designated by Braun & Mel'nik 1997: 72): **Russia**: “prope Simeis, Tauriae” [Crimea, Simeiz], on *Rhus coriaria*, 1 June 1910, Schirajewsky [Tranzschel & Serebr., *Mycoth. Ross.* 250] (LE 40410). *Isolectotypes*: Tranzschel & Serebr., *Mycoth. Ross.* 250, e.g. BPI 438115, CUP 40252, CUP-F (M.R. 0250), E 417841, LE 40411, 40412, 158670.

Host range and distribution: On *Rhus coriaria*, *Searsia (glutinosa [Rhus glutinosa], pyroides [Rhus villosa auct., R. vulgaris])*, *Anacardiaceae*, Africa (Ethiopia), Caucasus (Armenia, Georgia), Europe (France, Portugal, Ukraine).

Notes: The name *Cercospora marmorata* was introduced by Tranzschel in the exsiccata “Tranzschel & Serebr., *Mycoth. Ross.* 250”, but without any description (*nom. nud.*). *Mycoth. Ross.*, fasc. V, no. 201–250 was listed and annotated in “Just’s Botanischer Jahresbericht 40 (Abt. 1): 371 (1912)” and “Hedwigia 53: 95 (1913)”, but in both cases without added diagnosis or description of *C. marmorata*. The first valid publication of this species dates from Saccardo’s (1931) introduction of the “combination” *Cercosporina marmorata* which was, de facto, a validation since he added a Latin description of this species.

Passalora myracrodruonis (Inácio & Dianese) U. Braun & Crous, *Mycosphaerella Anam.* **1**: 461 (2003). (Fig. 7)

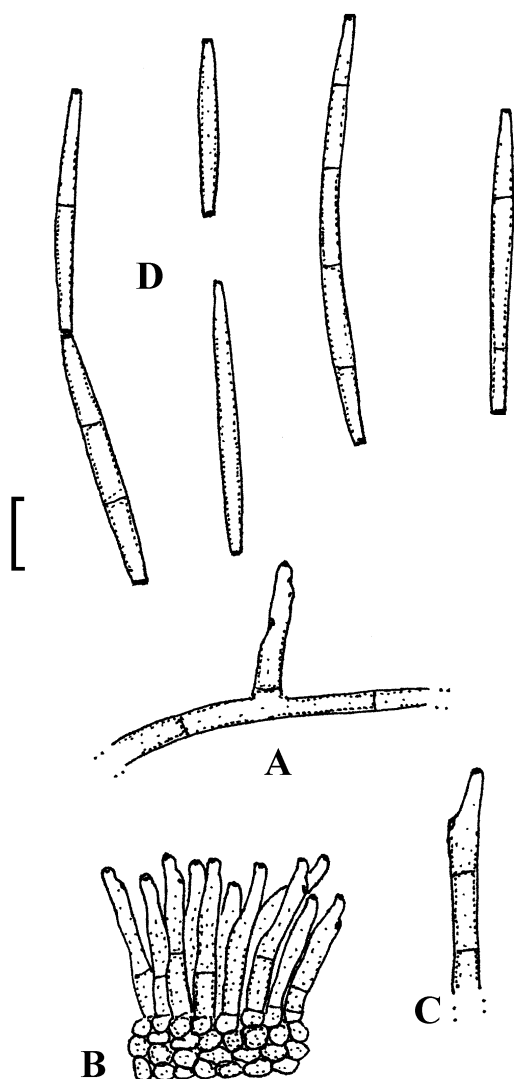


Fig. 7. *Passalora myracrodruonis* (based on Inácio & Dianese 1999: 257, figs 1–3, 258, fig. 5–8). **A.** Solitary conidiophore arising from a superficial hypha. **B.** Conidiophore fascicle. **C.** Conidiophore. **D.** Conidia. Bar = 10 µm.

Basionym: *Mycovellosiella myracrodruonis* Inácio & Dianese, *Mycotaxon* **72**: 253 (1999).

Illustration: Inácio & Dianese (1999: 257, figs 1–3, 258, fig. 5–8).

Description: *Leaf spots* amphigenous, to 15 mm diam, circular to irregular, confluent, dark brown, later necrotic with a pale greyish centre. *Mycelium* internal and external; hyphae light brown, septate, 2–4 µm wide, thin-walled, smooth, superficial hyphae mainly hypophyllous, emerging through stomata, arising from stromata, often climbing leaf hairs. *Stromata* amphigenous, about 15–65(–90) µm diam, subepidermal, erumpent, brown, cells 3–8 µm diam, *textura angularis*. *Conidiophores* in dense fascicles, arising from stromata and solitary, arising from superficial hyphae, lateral, erect, straight, subcylindrical to somewhat geniculate-sinuous, simple or occasionally branched, about 20–70 × 2–4 µm, 0–7-septate, brown, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous

cells, sympodial, with conspicuous conidiogenous loci, thickened and darkened. *Conidia* solitary or often in chains, subcylindrical, fusiform to narrowly obclavate, straight to curved, 15–85 × 2–5 µm, 0–4(–6)-septate, light olivaceous to pale brown, thin-walled, smooth, ends obtuse, attenuated to short obconically truncate, hila thickened and darkened-refractive.

Holotype: **Brazil:** Brasília, DF, Asa Norte, Novacap, Viveiro 2, on *Myracrodruon urundeuva*, 12 May 1995, C. A. Inácio 292 (UB (col. mycol.) 8767). **Paratype (topotype,** from 7 June 1995): UB (col. mycol.) 8610.

Host range and distribution: On *Myracrodruon urundeuva*, *Anacardiaceae*, South America (Brazil, Brasília, DF).

Passalora pithoragarhensis U. Braun & Crous, *Mycosphaerella Anam.* **1**: 465 (2003).

(Fig. 8)

Synonym: *Phaeoramularia pithoragarhensis* Kamal & P. Naraiyan, *Indian Phytopathol.* **39**: 198 (1986); *nom. inval.* (Art. 40.1).

Literature: Kamal (2010: 133).

Illustration: Kamal & Naraiyan (1986: 199, fig. 1).

Description: *Leaf spots* amphigenous, subcircular to angular-irregular, to 15 mm diam, brown. *Caespituli* usually hypophyllous, effuse, velvety, brown. *Mycelium* internal. *Stromata* small to well-developed, substomatal, erumpent, medium to dark olivaceous or brown. *Conidiophores* in small to large fascicles, divergent to dense, arising from stromata, through stomata, erect, subcylindrical to somewhat geniculate-sinuous, 10–75 × 3–8 µm, 0–5-septate, pale brown, thin-walled, smooth; conidiogenous cells integrated, terminal, occasionally conidiophores reduced to conidiogenous cells, conidiogenous loci conspicuous, barely to slightly thickened and darkened. *Conidia* solitary or in short chains, obclavate-cylindrical, subclavate, short conidia ellipsoid-cylindrical, 15–135 × 4–11.5 µm, 0–10-septate, pale olivaceous, thin-walled, smooth, apex obtuse to attenuated, base obconically truncate, hila barely to slightly thickened and darkened.

Holotype: **India:** *Uttar Pradesh:* Pithoragarh, on *Searsia parviflora* [*Rhus parviflora*], *Anacardiaceae*, Nov. 1983, P. Naraiyan (K(M) IMI 282665).

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

Notes: In the original publication, Kamal & Naraiyan (1986) cited two collections (GPU PH 16 and IMI 282665) but failed to designate holotype material, so that the name *Phaeoramularia pithoragarhensis* was not validly published according to Art. 40.1. Crous & Braun (2003) examined syntype material from IMI and validated this species name under *Passalora*.

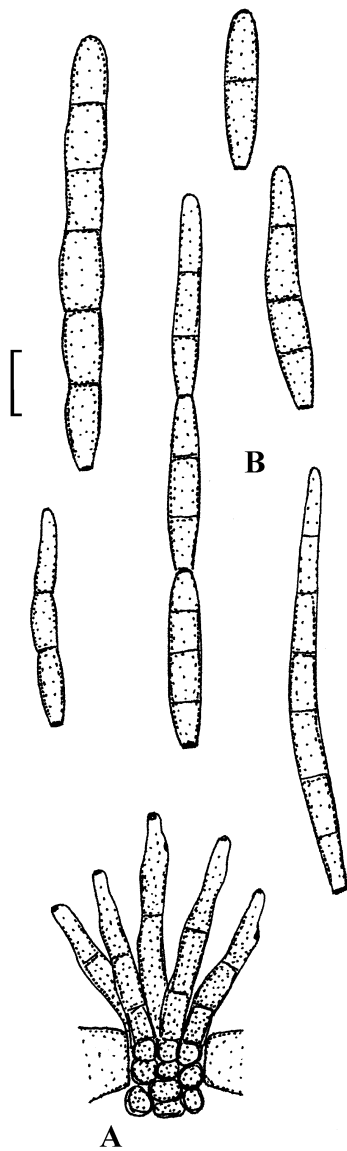


Fig. 8. *Passalora pithoragarhensis* (K(M) IMI 282665, holotype). A. Conidiophore fascicle. B. Conidia. Bar = 10 μ m.

Passalora rhoina U. Braun & Crous, *Mycosphaerella Anam.* 1: 352 (2003).

(Fig. 9)

Basionym: *Mycovellosiella rhois* Goh & W.H. Hsieh, *Trans. Mycol. Soc. Republ. China* 2: 135 (1987); as "(Sawada & Katsuki) Goh & W.H. Hsieh", *nom. nov.* (Art. 58), non *Passalora rhois* (E. Cast.) U. Braun & Crous, 2003.

Synonyms: *Cercospora rhois* Sawada & Katsuki, *Special Publ. Coll. Agric. Natl. Taiwan Univ.* 8: 225 (1958); *nom. illeg.* (Art. 53.1), non *C. rhois* E. Cast., 1942 [type: **Taiwan**: Nantou, Hsinyi, on *Rhus chinensis* var. *roxburghii*, 24 Aug. 1944, K. Sawada (NTU-PPE, hb. Sawada)].

?*Venturia rhois* Sawada, *Special Publ. Coll. Agric. Natl. Taiwan* 8: 73 (1959), *nom. inval.* (Art. 39.1) [holotype: **Taiwan**: Nantou, Hsinyi, on *Rhus chinensis* var. *roxburghii*, 23 Aug. 1944, K. Sawada (NTU-PPE, hb. Sawada); isotype: K(M) IMI 174953].

?*Mycosphaerella rhois* C.C. Chen, *Bot. Bull. Acad. Sin.* 8: 140 (1967); as "(Sawada & Katsuki) C.C. Chen", *nom. nov.* (Art. 58).

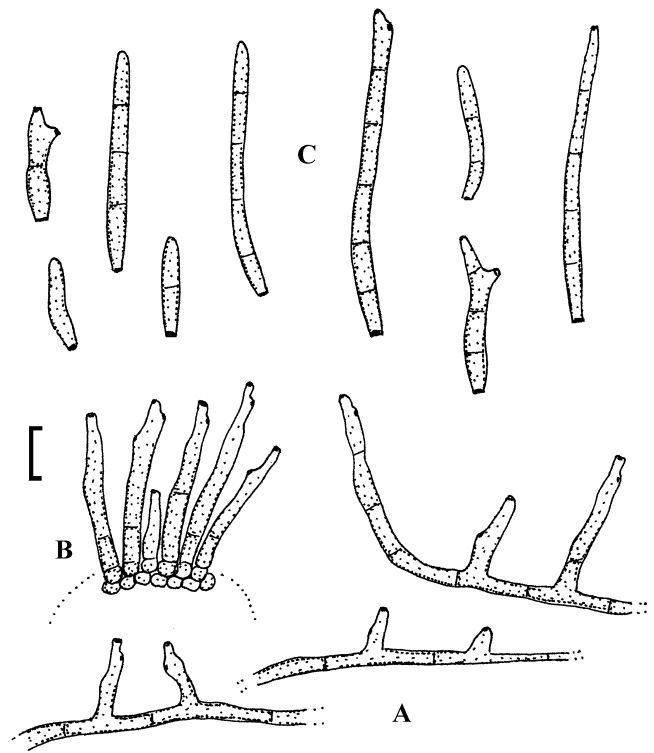


Fig. 9. *Passalora rhoina* (based on Hsieh & Goh 1990: 21, fig. 9). A. Superficial hyphae with solitary conidiophores. B. Conidiophore fascicle. C. Conidia. Bar = 10 μ m.

?*Mycosphaerella rhois* Sivan., *Biblioth. Mycol.* 59: 117 (1977); as '(Sawada) Sivan.', *nom. nov.* (Art. 58), *nom. inval.* (Art. 39.1) and *nom. illeg.* (Art. 53.1), non *M. rhois* C.C. Chen 1967.

Cercospora rhoina Sivan., *Bitun. Ascom. Anamorphs*: 192 (1984); *nom. illeg.* (Art. 53.1), non *C. rhoina* Cooke & Ellis 1878.

Literature: Hsieh & Goh (1990: 20), Sivanesan (1984: 192), Guo et al. (2003: 14–15).

Illustration: Hsieh & Goh (1990: 21, fig. 9), Guo et al. (2003: 14, fig. 3).

Description: Leaf spots amphigenous, forming indefinite pale brown discolorations on the upper leaf surface, below forming distinct greyish brown spots, angular, somewhat floccose, 2–7 mm diam. *Caespituli* amphigenous, more abundant below. *Stromata* lacking or developed on the upper side, irregularly shaped, to 65 μ m diam, dark brown. *Mycelium* internal and external; superficial hyphae branched, septate, 2.5–4 μ m wide, pale olivaceous to pale brown, thin-walled, smooth. *Conidiophores* in small to moderately large fascicles, arising from epiphyllous stromata, and solitary, arising from superficial hyphae, lateral and terminal, erect to decumbent, subcylindrical to usually geniculate-sinuous, unbranched or occasionally branched, to 70 μ m long and 4–5 μ m wide, shorter conidiophores aseptate, longer ones septate, pale olivaceous brown, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, conidiogenous loci

conspicuous, somewhat thickened and darkened. *Conidia* solitary or in chains, cylindrical or subcylindrical, short conidia ellipsoid-fusiform, straight to curved, 20–100 × 4–5 µm, (0–)1–7-septate, occasionally constricted at the septa, subhyaline to pale olivaceous brown, thin-walled, smooth, apex obtuse, base rounded to short obconically truncate, hila slightly thickened and darkened.

Holotype: Taiwan: Nantou, Hsinyi, on *Rhus chinensis* var. *roxburghii*, 24 Aug. 1944, K. Sawada (NTU-PPE, hb. Sawada).

Host range and distribution: On *Rhus chinensis* var. *roxburghii* [*semialata* var. *roxburghii*], *Anacardiaceae*, Taiwan.

Notes: The genetic connection between *Passalora rhoisa* and associated mycosphaerella-like sexual morphs is unproven, uncertain, and requires molecular and experimental confirmation. Descriptions in the literature differ and are confusing. Sivanesan (1984), based on *Mycosphaerella rhois* C.C. Chen, described the sexual morph of *P. rhoisa* as follows: *Ascomata* amphigenous, but mostly epiphyllous, mycosphaerella-like, to 160 µm diam; *asci* 45–60 × 7–9.5 µm; *ascospores* 17.5–24 × 3–4 µm, hyaline to light yellow. Aptroot (2006: 19, fig. 762; 175) examined isotype material of *Venturia rhois*, described much smaller ascospores (11–13 × 2.5–3 µm), and stressed that this species, pertaining to *Mycosphaerella* sect. *Caterva*, is morphologically indistinguishable from *M. subradians*.

Passalora rhois (E. Castell.) U. Braun & Crous, *Mycosphaerella and Anam.* 1: 353 (2003). (Fig. 10)

Basionym: *Cercospora rhois* E. Castell., *Nuovo Giorn. Bot. Ital., N.S.*, 49: 29 (1942).

Synonym: *Phaeoramularia rhois* (E. Castell.) Deighton, in Ellis, *More Dematiaceous Hyphomycetes*: 317 (1976).

Literature: Chupp (1954: 40), Ellis (1976: 316), Deighton (1979: 36), Guo *et al.* (2003: 131–132).

Illustrations: Ellis (1976: 316, fig. 239B), Deighton (1979: 36, fig. 19), Guo *et al.* (2003: 132, fig. 81).

Leaf spots amphigenous, 1–4 mm diam, subcircular to irregular, brown to dark brown, centre becoming greyish. **Caespituli** amphigenous, mostly hypophyllous, punctiform, scattered, dark brown. **Mycelium** internal. **Stromata** developed, substomatal to immersed, 10–50 µm diam, brown. **Conidiophores** in small to moderately large fascicles, arising from stromata, loose to usually dense, emerging through stomata or erumpent, erect, straight, subcylindrical to somewhat geniculate-sinuous, unbranched, 10–40(–90) × 3–6 µm, 0–2-septate, medium olivaceous to brownish, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, conidiogenous loci thickened and darkened, about 1.5–2 µm diam. **Conidia** catenate, occasionally in branched chains, cylindrical or subcylindrical, straight to curved, 20–120 × 3–5 µm, 0–7-septate, pale to medium olivaceous, olivaceous

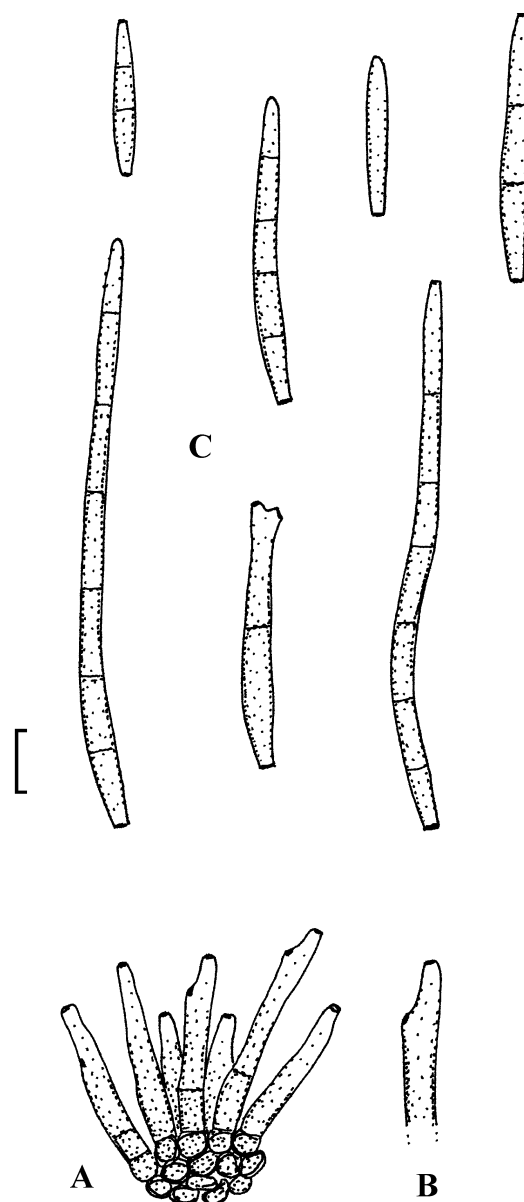


Fig. 10. *Passalora rhois* (K(M) IMI 100210, lectotype). **A.** Conidiophore fascicle. **B.** Conidiophore. **C.** Conidia. Bar = 10 µm.

brown or brownish, thin-walled, smooth, ends rounded to somewhat attenuated, hila 1.5–2 µm wide.

Lectotype (designated here, MycoBank, MBT204887): **Ethiopia:** Addis Ababa, Achachi, along river Piccolo, on *Searsia pyroides* [*Rhus vulgaris, villosa auct.*], 3 Jan. 1938, E. Castellani (K(M) IMI 100210). **Isolectotype:** BPI 440800.

Host range and distribution: On *Rhus chinensis* var. *roxburghii*, *Searsia (glutinosa subsp. abyssinica [Rhus glutinosa subsp. abyssinica, Rhus petitiana], pyroides)*, *Anacardiaceae*, Africa (Ethiopia), Asia (China).

Passalora rhois-aromaticae U. Braun, *sp. nov.* MycoBank MB816981 (Fig. 11)

Etymology: Named after the host species, *Rhus aromatica*.

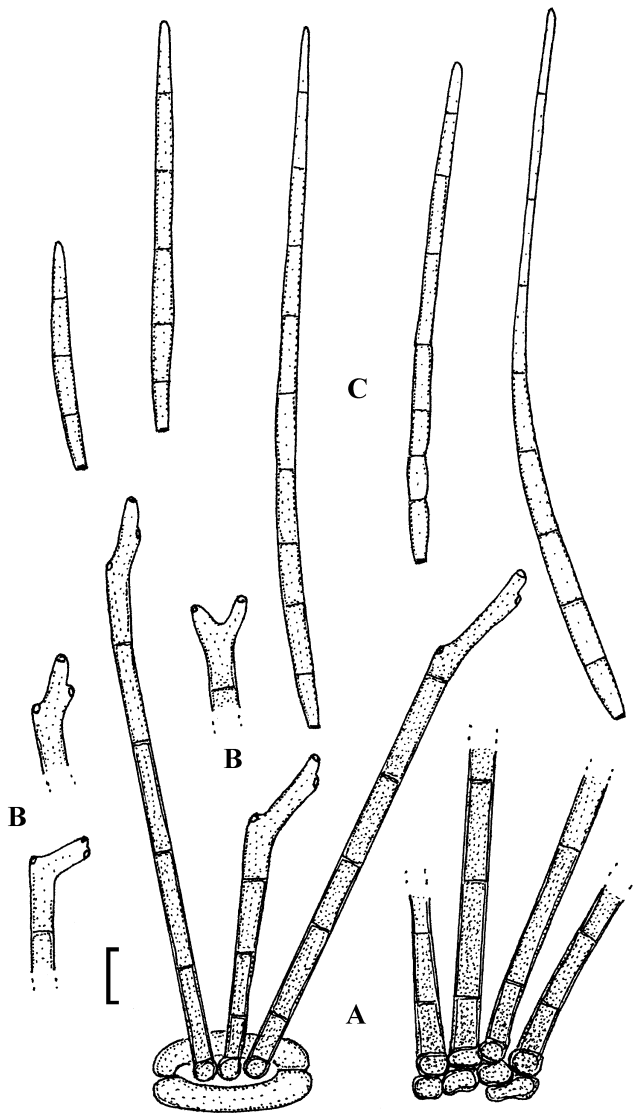


Fig. 11. *Passalora rhois-aromaticae* (BPI 440685, holotype). A. Conidiophore fascicles. B. Conidiophore tips. C. Conidia. Bar = 10 μ m.

Diagnosis: Differs from *Passalora pithoragarhensis* in having much narrower consistently solitary conidia, 20–180 \times 3–5 μ m, (0–)2–18-septate.

Description: Leaf spots amphigenous, angular-irregular, 1–10 mm diam, dark brown, margin indefinite. *Caespituli* hypophyllous, inconspicuous. *Mycelium* internal. *Stromata*

absent or only with small aggregations of a few swollen hyphal cells, 10–25 μ m diam, brown. *Conidiophores* in divergent fascicles, 2–10, arising from internal hyphae or substomatal aggregations of swollen hyphal cells, emerging through stomata, erect, straight subcylindrical to geniculate-sinuuous in the upper fertile portion, unbranched, (15–)30–100 \times 3–6 μ m, (0–)1–7-septate, pale to medium olivaceous or olivaceous brown throughout or paler towards the tip, wall thin to slightly thickened, smooth; conidiogenous cells integrated, terminal, 10–40 μ m long, conidiogenous loci conspicuous, slightly thickened, darkened-refractive. *Conidia* solitary, obclavate-cylindrical, straight to curved, 20–180 \times 3–5 μ m, (1–)2–18-septate, distance between septa 5–15 μ m, occasionally somewhat constricted at some septa, subhyaline to pale olivaceous or olivaceous brown, smooth or almost so, apex obtuse to subacute, base short to long obconically truncate, 1.5–2.5 μ m wide, hila slightly thickened, darkened-refractive.

Holotype: USA: Wisconsin, Dane County, Madison, on *Rhus aromatica*, 11 Jul. 1951, H. C. Greene (BPI 440685).

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

Notes: *Passalora rhois-aromaticae* is morphologically quite distinct from all other described cercosporoid species on hosts of the genus *Rhus* and allied genera and undoubtedly a new undescribed species. The type material of the new species was originally identified and deposited as "*Cercospora rhoina*". However, the true generic affinity of the new species on *Rhus aromatica* is unclear and can in future only be clarified on the base of molecular analyses. Following the traditional morphological concept of cercosporoid genera, the fungus on *Rhus aromatica* can currently only be placed in *Passalora* s. lat. owing to a combination of conspicuous conidiogenous loci and pigmented conidia. Based on consistently internal mycelium, fasciculate conidiophores emerging through stomata, and conidia formed singly, this species belongs to a morphological complex of cercosporoid fungi around *Passalora* s. str. and *Cercosporopidium*. *Passalora* s. lat. (sensu Crous & Braun 2003) is polyphyletic. Morphological traits traditionally used for the discrimination of genera and morphological groups within this complex are not clearly connected with phylogenetic groupings, i.e. morphology is almost meaningless and reliable allocations to genus depend in future on phylogenetic analyses.

Pseudocercospora

Key to species of *Pseudocercospora*, *Scolecostigmina* and *Stigmina* on *Anacardiaceae*

- 1 Conidiophores in large sporodochial fascicles, arising from well-developed, large stomata, 15–200 μ m diam, proliferation percurrent, with distinct annellations; conidiophores and conidia mostly distinctly verruculose (scolecostigmina/stigmina-like) 2
- Conidiophores sympodially proliferating, rarely sympodial mixed with a few percurrent proliferations, but distinct annellations not formed; conidia mostly smooth or almost so (*Pseudocercospora*) 6
- 2 (1) Conidia ellipsoid-ovoid to oblong, 18–35 \times 8–11.5 μ m, with 1–4 transverse septa and occasionally a single oblique or longitudinal septum; on *Rhus tomentosa* ***Stigmina pulviniformis***

- Conidia cylindrical, only 3.5–6 µm wide or scolecosporous, mostly obclavate-cylindrical, length exceeding 40 µm, pluriseptate 3
- 3 (2) Conidia cylindrical, (10–)15–45(–55) × 3.5–6 µm, (0–)3(–5)-septate; on *Sclerocarya birrea* subsp. *caffra* **Stigmina knoxdaviesii**
Conidia obclavate-cylindrical, longer, exceeding 50 µm, pluriseptate 4
- 4 (3) Conidia very long, 85–180 × 5.5–12 µm, strongly curved-sigmoid; on *Searsia pyroides* **Stigmina curvispora**
Conidia shorter, 20–130 µm, straight or only slightly curved 5
- 5 (4) Conidiophores short, 5–25 × 3–5 µm, 0–1(–2)-septate; conidia 20–80 × 3–6 µm; on *Mangifera indica* **Scolecostigmina mangiferae**
Conidiophores longer and broader, 30–50 × 5–8 µm, 1–2-septate; conidia longer and broader, 45–130 × 6–8 µm; on *Rhus discolor* **Stigmina rhois**
- 6 (1) Mycelium *in vivo* only internal; superficial hyphae with solitary conidiophores absent (occasionally with a few hypophyllous superficial hyphae, but without conidiophores); conidiophores strictly fasciculate or sporodochial 7
Mycelium *in vivo* internal and external; superficial hyphae with solitary conidiophores developed 14
- 7 (6) Stromata large, 20–125 µm diam; conidiophores numerous, dense, forming sporodochia; on *Cotinus* and *Rhus s. lat.* spp. **P. rhoina**
Stromata smaller, to about 50 µm diam; on other hosts 8
- 8 (7) Conidiophores 10–60 µm long, 0–3(–4)-septate, often branched, distinctly geniculate-sinuuous, often with swellings and constrictions; on *Lithraea* spp. **P. phaeochlora**
Conidiophores shorter, 5–35 µm, 0–1-septate, unbranched, not strongly geniculate-sinuuous, usually without distinct constrictions and swellings; on other hosts 9
- 9 (8) Conidia rather short, 10–50 µm, only 1–4-septate 10
Conidia longer, at least partly exceeding 50 µm, and at least partly with more than 4 septa 11
- 10 (9) Conidia 1.5–3.5 µm wide, subhyaline or only very pale olivaceous; on *Anacardium excelsum* **P. rhinocarpii**
Conidia broader, 3.5–5(–6) µm; on *Spondias mombin* **P. mombin** var. **venezuelensis**
- 11 (9) Conidia hyaline; on *Cotinus coggygria* **P. cotini**
Conidia subhyaline, pale olivaceous to olivaceous brown; on other hosts 12
- 12 (11) Stromata lacking or small; conidiophores fasciculate; conidia olivaceous brown; on *Nothopegia dalzellii* **P. nothopegiae**
Stromata well-developed, 15–55 µm diam; conidiophores in small sporodochial conidiomata; conidia subhyaline to pale olivaceous or pale olivaceous brown; on other hosts 13
- 13 (12) Caespituli epiphyllous; on *Comocladia* spp. **P. comocladiae**
Caespituli amphigenous, but mainly hypophyllous; on *Spondias* spp. **P. mombin** var. **mombin**
- 14 (6) Stromata lacking or small, 10–25 µm diam 15
Stromata well-developed, 10–90 µm diam 18
- 15 (14) Leaf spots indistinct; conidiophores 10–40 µm long; conidia ± cylindrical, 25–60 × 3.5–4.5 µm, (1–)2–4(–5)-septate; on *Schinus* spp. **P. schini**
Leaf spots distinct; conidiophores longer, exceeding 50 µm; conidia obclavate-cylindrical, longer, narrower or wider, 1–11-septate; on other hosts 16
- 16 (15) Conidia 30–70 × 3–9 µm; on *Rhus* and *Toxicodendron* **P. infuscans**
Conidia narrower, 2.5–4.5 µm; on other hosts 17
- 17 (16) Conidia 40–125 × 3–4.5 µm; on *Anacardium* spp., Central and South America **P. anacardii**
Conidia narrower, 40–80 × 2.5–3.5 µm; on *Mangifera indica*, Asia, India **P. baruipurensis**

- 18 (14) Stromata large, 50–90 µm diam; conidia 40–175 × 4–7.5 µm, 3–17(–25)-septate; on *Rhus* and *Toxicodendron* **P. rhois**
 Stromata smaller, about 10–50 µm diam; conidia narrower, 1.5–5.5 µm wide 19
- 19 (18) Conidia usually narrowly subcylindrical, 20–65 × 1.5–3 µm, hila 1–2 µm wide; on *Pistacia* spp. **P. pistaciae**
 Conidia obclavate-cylindrical, broader, 2.5–6.5 µm; on other hosts 20
- 20 (19) Conidia (2.5–)3–5.5(–6.5) µm, hila 1.5–3 µm wide; on *Rhus* and *Toxicodendron* spp. **P. rhoicola**
 Conidia narrower, 2.5–4 µm, hila 1.5–2 µm wide; on other hosts 21
- 21 (20) Leaf spots reddish brown, finally leaving shot-holes; conidia to 105 µm long, with to 12 septa;
 on *Lannaea coromandelia* **P. odinae**
 Leaf spots medium to dark brown, later paler with darker margin, without shot-hole symptoms;
 conidia to 70 µm long, with to 7 septa; on *Cotinus coggygria* **P. cotini**

Tabular key to *Pseudocercospora*, *Scolecstigmia* and *Stigmia* species on *Anacardiaceae* according to host genera

Anacardium

- 1 Mycelium internal and external; superficial hyphae with solitary conidiophores developed; fasciculate conidiophores 40–140 × 3–6 µm; conidia obclavate, 40–125 × 3–4.5 µm, 3–11-septate, pale olivaceous to olivaceous brown; on *Anacardium* spp. **P. anacardii**
 Mycelium internal, superficial hyphae with solitary conidiophores not formed; conidiophores uniformly short and narrow, 5–20 × 1.5–2.5 µm; conidia obclavate-cylindrical, shorter and narrower, 10–50 × 1.5–3.5 µm, 1–4-septate, subhyaline to pale olivaceous; on *Anacardium excelsum* **P. rhinocarpi**

Comocladia

- A single species **P. comocladiae**

Cotinus

- A single species **P. cotini**

Lithraea

- A single species **P. phaeochlora**

Lannea

- A single species **P. odinae**

Mangifera

- 1 Conidiophores in sporodochial conidiomata with well-developed stromata; conidiophores short, 5–25 µm, 0–1(–2)-septate, subcylindrical to conical or ampulliform, percurrently proliferating, with conspicuous annellations; conidia 3–6 µm wide, at least partly verruculose **Scolecstigmia mangiferae**
 Conidiophores fasciculate; stromata lacking; conidiophores much longer, 25–130 µm, pluriseptate, proliferation sympodial, annellations lacking; conidia narrower, 2.5–3.5 µm **P. baruipurensis**

Nothopegia

- A single species **P. nothopegiae**

***Rhus s. lat.* (including *Searsia* and *Toxicodendron*)**

- 1 Conidiophores in large sporodochial fascicles, arising from well-developed, large stromata, 15–200 µm diam, proliferation percurrent, with distinct annellations; conidiophores and conidia mostly distinctly verruculose (*scolecstigmia/stigmia*-like) 2
 Conidiophores sympodially proliferating, rarely sympodial mixed with few percurrent proliferations, distinct annellations not formed; conidia mostly smooth or almost so (*Pseudocercospora s. str.*) 4
- 2 (1) Conidia ellipsoid-ovoid to oblong, 18–35 × 8–11.5 µm, with 1–4 transverse septa and occasionally a single oblique or longitudinal septum; on *Rhus tomentosa* **Stigmia pulviniformis**

- Conidia scolecosporous, mostly obclavate-cylindrical, length exceeding 40 µm, pluriseptate 3
- 3 (2) Conidiophores 4–6 µm wide; conidia very long, 85–180 × 5.5–12 µm, strongly curved-sigmoid;
on *Searsia pyroides* **Stigmina curvispora**
Conidiophores 5–8 µm wide; conidia somewhat shorter and narrower, 45–130 × 6–8 µm,
straight to slightly curved; on *Rhus discolor* **Stigmina rhois**
- 4 (1) Stromata lacking or very small; conidia 30–70 × 3–9 µm **P. infuscans**
Stromata well-developed, 10–125 µm diam 5
- 5 (4) Mycelium internal, superficial hyphae with solitary conidiophores not developed
(occasionally with a few hypophyllous superficial hyphae, but without conidiophores);
stromata large, 20–125 µm diam; conidiophores in large sporodochial conidiomata;
conidia 20–90(–120) × (2–)2.5–5(–5.5) µm **P. rhoina**
Mycelium internal and external; superficial hyphae with solitary conidiophores developed;
stromata either smaller, 10–50 µm diam, or, if large, conidia 4–7.5 µm wide 6
- 6 (5) Stromata large, 50–90 µm diam; conidia 40–175 × 4–7.5 µm, 3–17(–25)-septate **P. rhois**
Stromata smaller, about 10–50 µm diam; conidia narrower, (2.5–)3–5.5(–6.5) µm wide, 2–12-septate **P. rhoicola**

Pistacia

A single species **P. pistaciae**

Schinus

A single species **P. schini**

Sclerocarya

A single species **Stigmina knoxdaviesii**

Searsia, see **Rhus**

Spondias

- 1 Conidia 20–65(–85) × (1–)1.5–3.5 µm, 2–7-septate **P. mombin** var. **mombin**
Conidia shorter and broader, 12–40 × 3.5–5 µm, with few septa, 1–3(–4)-septate **P. mombin** var. **venezuelensis**

Toxicodendron, see **Rhus**

Pseudocercospora species on Anacardiaceae

Pseudocercospora anacardii E. Castell. & Crasulli,
Rivista Agric. Subtrop. Trop. **75**: 103 (1981).

(Fig. 12)

Synonym: *Cercospora anacardii* A.S. Mull. & Chupp,
Arq. Inst. Biol. Veg. **1**: 214 (1935); *nom. inval.* (Art.
39.1) [*holotype*: **Brazil**: Minas Gerais: Ponte Nova, on
Anacardium occidentale, 15 Aug. 1930, A. S. Muller 218
(CUP-MG-000218)].

Literature: Chupp (1954: 38), Teixeira (1988), Crous & Braun
(2003: 56), O'Farrell *et al.* (2002).

Illustration: Castellani & Casulli (1981: Pl. 1)

Description: Leaf spots at first indistinct, later angular-irregular
on the upper leaf surface, 1–4 mm diam, reddish brown, on
the lower leaf surface visible by effuse fructification. *Caespituli*
hypophyllous, effuse, at first grey, greyish olivaceous,
later brown to dark brown. *Mycelium* internal and external;
superficial hyphae emerging through stomata, sparingly

branched, straight to sinuous, occasionally torulose, 1–3 µm
wide, hyaline, subhyaline to pale olivaceous, septate, thin-
walled, smooth. *Stromata* lacking or small, 10–25 µm diam,
olivaceous brown. *Conidiophores* in small to moderately
large fascicles, loose, arising from internal hyphae or
stromata, through stomata, occasionally solitary, arising from
superficial hyphae, erect, straight, subcylindrical to usually
distinctly sinuous or geniculate-sinuous, unbranched or only
rarely branched, 40–140 × 3–6 µm, pluriseptate throughout,
uniformly olivaceous brown to medium brown or tips somewhat
paler, thin-walled, smooth to faintly rough; conidiogenous
cells integrated, terminal, 10–35 µm long, conidiogenous loci
inconspicuous or subdenticulate, but wall always unthickened
and not darkened. *Conidia* solitary, obclavate, straight to
curved, 40–125 × 3–4.5 µm, 3–11-septate, pale olivaceous to
olivaceous brown, thin-walled, smooth to faintly rough, apex
obtuse to subacute, base short obconically truncate, 1.5–2
µm wide, hila neither thickened nor darkened.

Holotype: **Brazil**: Minas Gerais: Ponte Nova, on *Anacardium*
occidentale, 15 Aug. 1930, A. S. Muller 218 (CUP-
MG-000218).

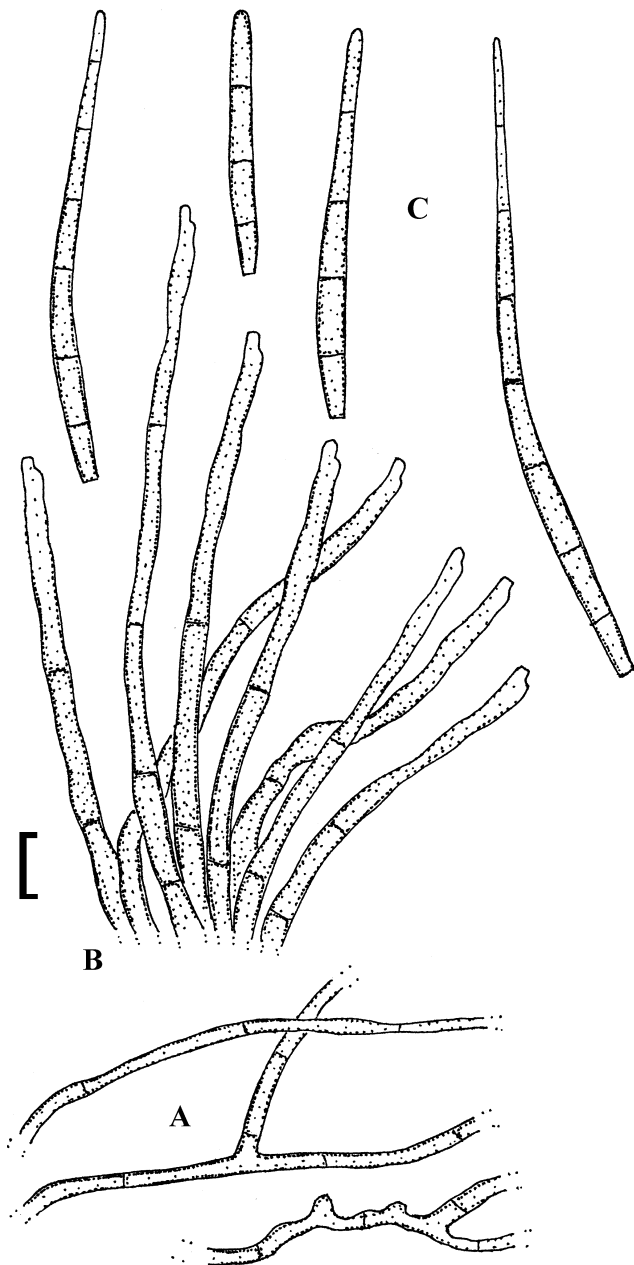


Fig. 12. *Pseudocercospora anacardii* (CUP-MG-000218, holotype). A. Superficial hyphae. B. Conidiophore fascicle. C. Conidia. Bar = 10 μ m.

Host range and distribution: On *Anacardium* (*humile*, *occidentale*), *Anacardiaceae*, Africa (Guinea-Bissau, Tanzania, Zambia), Australia, Central and South America (Brazil, Panama).

Pseudocercospora baruipurensis K.K. Sarbjana, *Indian Phytopathol.* **43**: 23 (1990). (Fig. 13)

Literature: Kamal (2010: 153).

Illustration: Sarbjana (1990: 24, fig. 2).

Description: Leaf spots amphigenous, distinct, angular-irregular, vein-limited, 2–8 mm diam, often confluent, dark

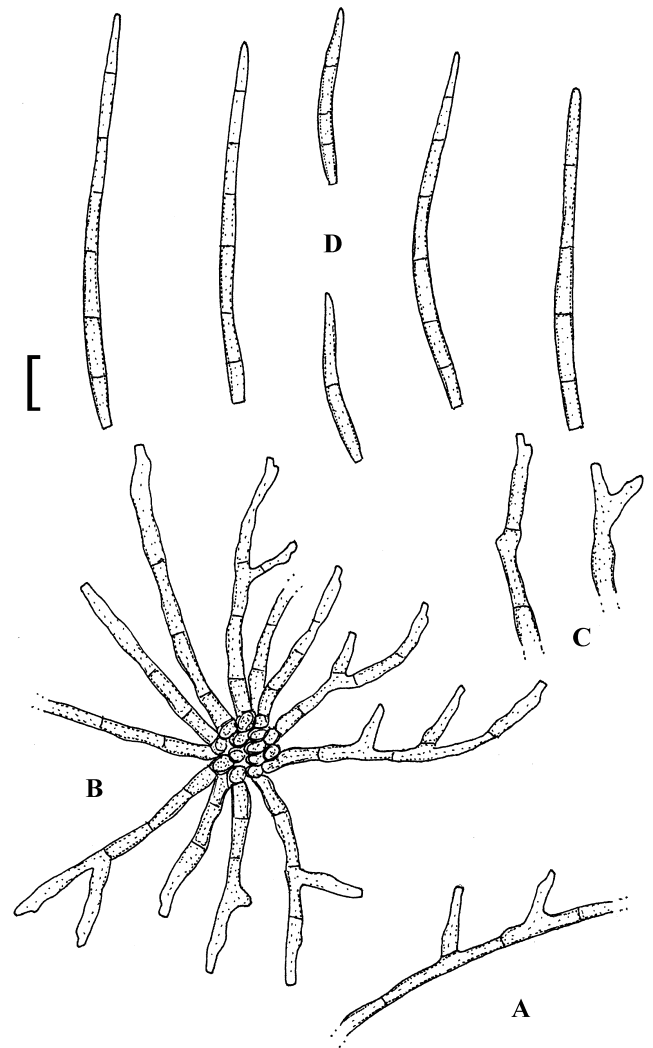


Fig. 13. *Pseudocercospora baruipurensis* (K(M) 303912, isotype). A. Superficial hypha with solitary conidiophore. B. Conidiophore fascicle. C. Conidiophores. D. Conidia. Bar = 10 μ m.

to reddish brown. *Caespituli* hypophyllous, evenly scattered, light to dark brown. *Mycelium* internal and external; internal hyphae 2–3 μ m wide, superficial hyphae hypophyllous, emerging through stomata, arising from the base of conidiophore fascicles, branched, septate, 2–4 μ m wide, pale olivaceous, smooth, thin-walled. *Stromata* absent or almost so. *Conidiophores* in loose fascicles, 3–15, arising from internal hyphae or small hyphal aggregations, through stomata, erect to decumbent, straight, subcylindrical to geniculate-sinuuous, simple or frequently branched, 25–130 \times 3–6.5 μ m, 4–10-septate, pale brown, thin-walled, smooth or conidiophores solitary, arising from superficial hyphae, lateral, sometimes terminal, shorter than fasciculate conidiophores and with fewer septa or aseptate; conidiogenous cells integrated, terminal or conidiophores sometimes reduced to conidiogenous cells, 10–25 μ m long, conidiogenous loci neither thickened nor darkened. *Conidia* solitary, obclavate-cylindrical, straight to slightly curved, 45–80 \times 2.5–3.5 μ m, 1–10-septate, pale olivaceous, thin-walled, smooth, apex subobtuse to subacute, base obconically truncate, 1–2 μ m wide, hila neither thickened nor darkened.

Holotype: India: West Bengal: Baruipur, on *Mangifera indica*, 12 Mar. 1886, K. K. Sarbajna (PPC 3811 = Presidency College Calcutta, Botany Department). **Isotype:** K(M) 303912.

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

Notes: In the introduction of the original publication, Sarbajna (1990) stated 'Holotype specimens are deposited in the herbarium, Botany Department, Presidency College, Calcutta (PPC)'. This is sufficient to conform with the provisions of Art 40.6, although the word "type or holotype" is not cited under the listed type collections of *P. baruipurensis*.

Pseudocercospora comocladiae (Petr. & Cif.) Deighton, *Mycol. Pap.* **140**: 142 (1976). (Fig. 14)

Basionym: *Cercospora comocladiae* Petr. & Cif., *Ann. Mycol.* **30**: 308 (1932).

Literature: Chupp (1954: 39), Castañeda Ruiz & Braun (1989: 51).

Illustration: Castañeda Ruiz & Braun (1989: 49, pl. 5, fig. 29).

Description: Leaf spots amphigenous, subcircular to angular-irregular, 1–5 mm diam or confluent and larger, brown with narrow darker margin on the lower leaf surface, brown, sometimes reddish brown to almost black on the upper side, later becoming pale, greyish white, with dark, border, occasionally somewhat raised. *Caespituli* epiphyllous, finely punctiform, scattered, brown. *Mycelium* internal. *Stromata* immersed, 15–50 µm diam, dark brown. *Conidiophores* in small to moderately large fascicles, arising from stromata, mostly dense, erect, straight to strongly geniculate-sinuous, unbranched, subcylindrical to somewhat conical, 5–15 × 3–4 µm, aseptate, pale to medium olivaceous brown, thin-walled, smooth; conidiophores reduced to conidiogenous cells, conidiogenous loci inconspicuous, unthickened, not darkened. *Conidia* solitary, cylindrical, obclavate-cylindrical, subacicular, straight to somewhat curved, 25–80 × 2–3.5 µm, 2–10-septate, subhyaline to olivaceous, thin-walled, smooth, apex obtuse to subacute, base short obconically truncate or rounded, 1.5–2 µm wide, hila unthickened, not darkened.

Lectotype (designated here, MycoBank, MBT204888): **Dominican Republic:** Province Santiago: Santiago, Coesta de Piedras, 200 m alt., on *Comocladia dodonaea*, 9 Dec. 1930, E. L. Ekman 3880 (W Krypt 1973-0011010). **Isolectotypes:** NY 936983, S-F21822.

Host range and distribution: On *Comocladia* (*dentata*, *dodonaea*), *Anacardiaceae*, West Indies (Cuba, Dominican Republ.).

Notes: The material deposited at NY is marked as type, but the date is given as "1. Dec. 1930". It is not quite clear if this material represents an isoelectotype or topotype material.

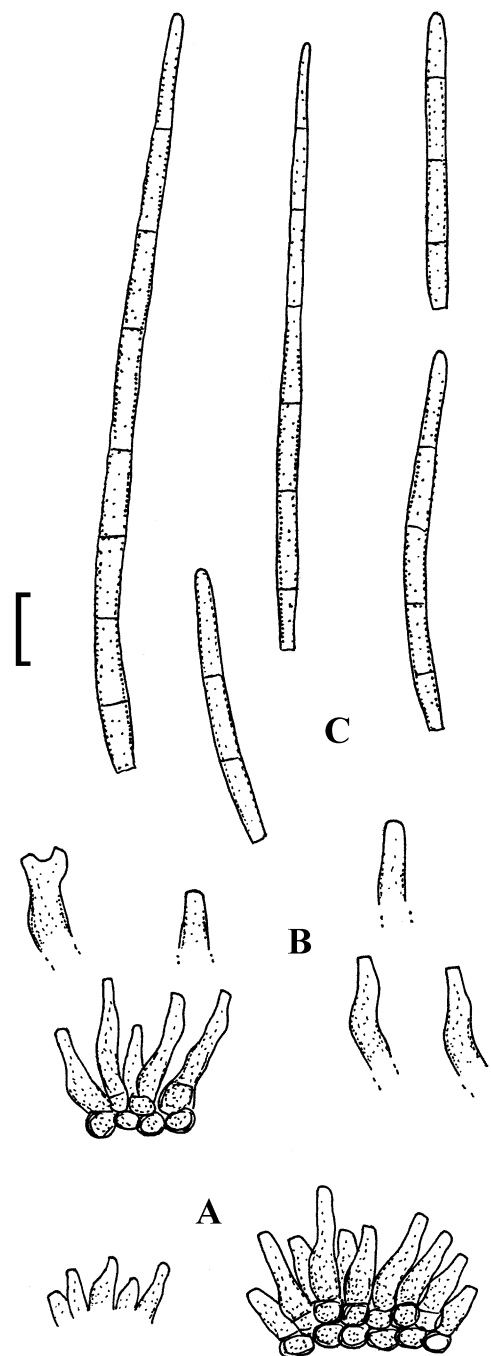


Fig. 14. *Pseudocercospora comocladiae* (W Krypt 1973-0011010, lectotype). **A.** Conidiophore fascicles. **B.** Conidiophores. **C.** Conidia. Bar = 10 µm.

Pseudocercospora cotini (Katsuki & Tak. Kobay.) Deighton, *Trans. Brit. Mycol. Soc.* **88**: 389 (1987). (Fig. 15)

Basionym: *Cercospora cotini* Katsuki & Tak. Kobay., *Trans. Mycol. Soc. Japan* **17**: 274 (1976).

Literature: Crous & Braun (2003: 141).

Illustration: Katsuki & Kobayashi (1976: 275, fig. 3)

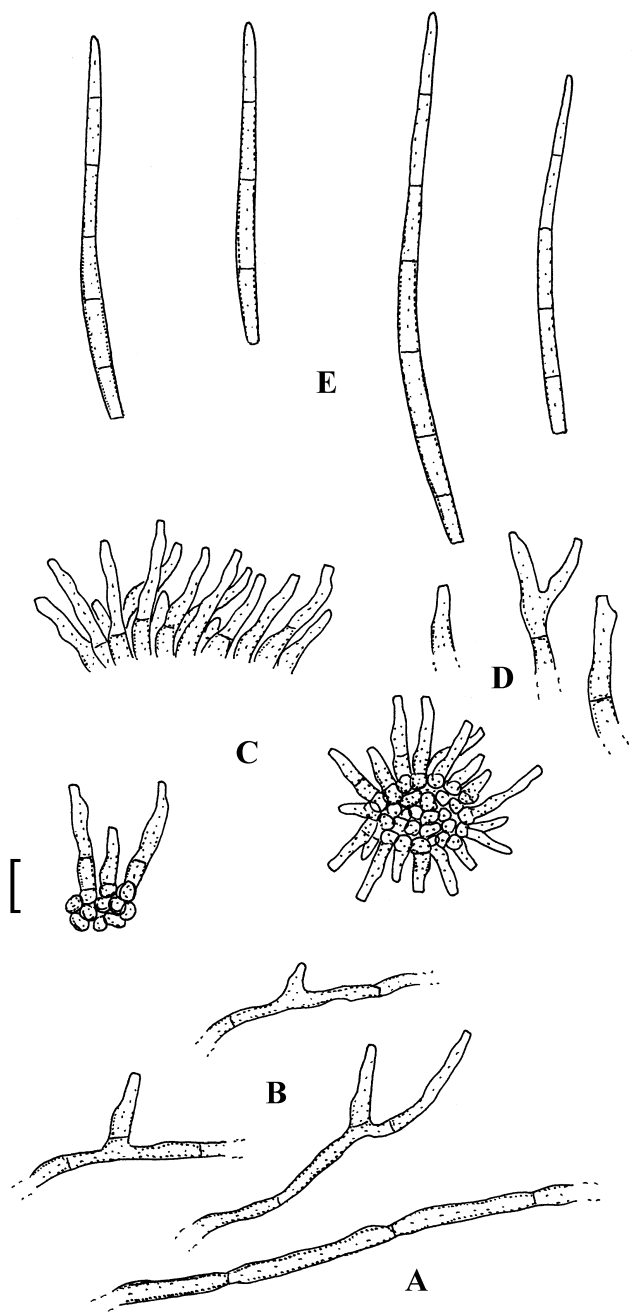


Fig. 15. *Pseudocercospora cotini* (BPI 440738). A. Superficial hypha. B. Superficial hyphae with solitary conidiophores. C. Conidiophore fascicles. D. Conidiophores. E. Conidia. Bar = 10 μ m.

Description: Lesions caulicolous and foliicolous, amphigenous, at first minute, 0.5–2 mm diam, later forming indefinite to angular-irregular spots, 3–10 mm diam, often vein-limited, on the upper side sometimes somewhat raised, medium to dark brown, later paler, with deep brown margin, along midribs and on stems elliptical to oblong, 1–5 \times 0.5–1 mm, finally confluent. *Caespituli* amphigenous, mainly epiphyllous, punctiform, effuse, dark brown. *Mycelium* internal or partly external; superficial hyphae confined to the lower leaf surface, sparingly branched, septate, 1–4 μ m wide, subhyaline to pale olivaceous or olivaceous brown, thin-walled, smooth. *Stromata* epiphyllous, immersed, intra- to subepidermal, subglobose to somewhat irregularly

shaped, 10–50 μ m diam, olivaceous brown, cells globose, subglobose to somewhat irregular, hypophyllously absent or smaller, substomatal to immersed. *Conidiophores* on the upper leaf surface in moderately large fascicles, arising from stromata, erumpent, below in smaller fascicles, arising from internal hyphae or smaller stromata, through stomata or erumpent, below also solitary, arising from superficial hyphae, erect, straight, subcylindrical or attenuated towards the tip, somewhat geniculate-sinuuous, unbranched, 5–35 \times 1.5–4 μ m, aseptate or sparingly septate, subhyaline to pale olivaceous or olivaceous brown, usually paler towards the tip, apex often subhyaline, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores often reduced to conidiogenous cells, proliferating sympodially, conidiogenous loci inconspicuous or visible as truncate tip or shoulder, but always unthickened and not darkened, 1.5–2 μ m. *Conidia* solitary, cylindrical to obclavate-cylindrical, straight to curved, 25–70 \times 2.5–4 μ m, 2–7-septate, hyaline, subhyaline to pale olivaceous or very pale olivaceous brown, thin-walled, smooth, tips subacute to subobtuse, base short to long obconically truncate, 1–2 μ m wide, hila unthickened and not darkened.

Holotype: Japan: Fukuoka Prefecture: Forest Experimental Station, on *Cotinus coggygria*, 20 Sept. 1974, S. Ogawa (TFM:FPH-4184); ex-holotype culture MAFF 410088.

Host range and distribution: On *Cotinus coggygria*, *Anacardiaceae*, Asia (Japan), North America (USA, Alabama, Florida, Texas).

Notes: North American specimens on *Cotinus coggygria*, previously referred to as *Cercospora rhoina*, belong to *Pseudocercospora cotini*. A collection from Alabama (Tuskegee, Sep. 1900, G. W. Carver, BPI 440738) has been examined and revised. Records of “*C. rhoina*” from Texas and “*Cercospora* sp.” from Florida (Alfieri et al. 1984) seem to belong to *P. cotini* as well. Another collection from Alabama on *Cotinus coggygria* proved to be a new species of *Passalora* s. lat.

Pseudocercospora infuscans (Ellis & Everh.) U. Braun, *Monograph of Cercosporiella, Ramularia and allied genera (phytopathogenic hyphomycetes)* 2: 402 (1998).

(Fig. 16)

Basionym: *Cercospora infuscans* Ellis & Everh., *Proc. Acad. Nat. Sci. Philadelphia* 43: 90 (1891).

Misapplied name: *Cercospora toxicodendri* sensu Chupp (1954: 43) p.p.

Literature: Saccardo (1892: 639), Chupp (1954: 43, p.p.), Braun (1998: 402).

Illustrations: Braun (1998: 403, fig. 656).

Description: Leaf spots amphigenous, angular-irregular, 1–6 mm diam, dull greenish or different shades of brown, margin indefinite. *Caespituli* amphigenous, usually hypophyllous, effuse, brown. *Mycelium* internal and external; superficial

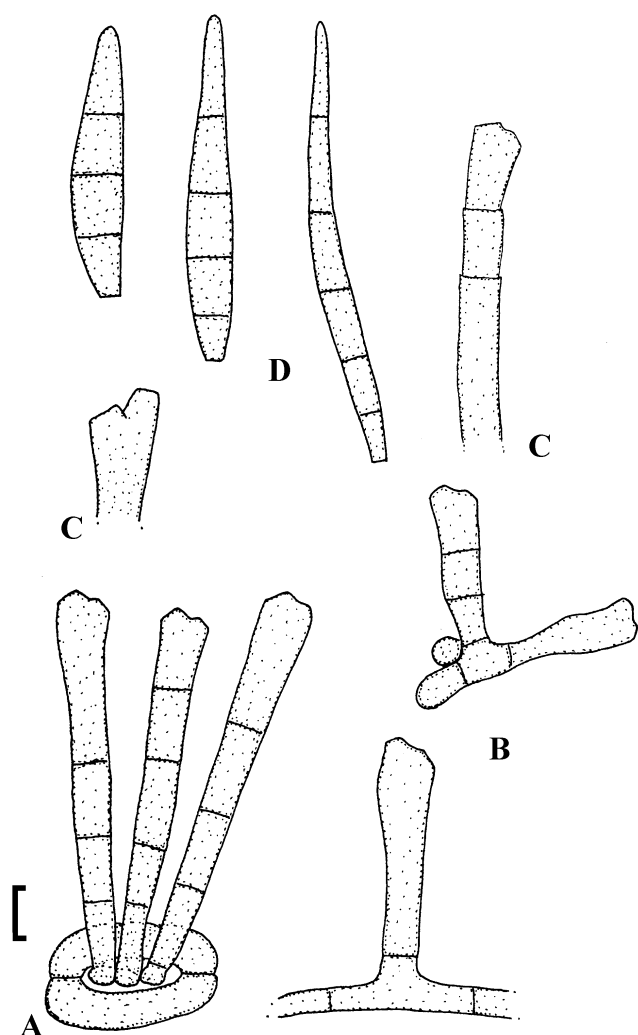


Fig. 16. *Pseudocercospora infuscans* (NY 838246, lectotype). **A.** Conidiophore fascicle. **B.** Superficial hyphae with solitary conidiophores. **C.** Conidiophore tips. **D.** Conidia. Bar = 10 μ m.

hyphae sparingly branched, septate, 2–4 μ m wide, subhyaline to pale olivaceous, thin-walled, smooth. *Stromata* absent or almost so. *Conidiophores* in small, loose fascicles, 2–4, emerging through stomata, and solitary, arising from superficial hyphae, lateral, occasionally terminal, erect to decumbent, subcylindrical to clavate, barely to slightly geniculate-sinuous, simple, rarely branched, 5–100 \times 3–8 μ m, 0–6-septate, pale olivaceous, olivaceous brown to medium brown, wall thin to somewhat thickened, smooth; conidiogenous cells integrated, terminal, sometimes conidiophores reduced to conidiogenous cells, 5–25 μ m long, proliferation sympodial, occasionally percurrent, conidiogenous loci unthickened, not darkened, often truncate, sometimes subdentate. *Conidia* solitary, obclavate-cylindrical, broadly fusiform, straight to curved, 30–70 \times 3–9 μ m, 3–7(–10)-septate, pale olivaceous to brownish, thin-walled, smooth, apex obtuse to subacute, base obconically truncate, 1.5–3.5 μ m wide, hila unthickened, not darkened.

Lectotype (designated here, MycoBank, MBT204889): USA: Delaware: Porter's Station, on *Rhus venenata*, 9 Oct. 1890, A. Commons 1621 (NY 838246). **Isolectotype:** NY 838247.

Host range and distribution: On *Rhus* (*glabra*, *venenata*, *vernix*, *Rhus* sp.), *Toxicodendron* (*pubescens*, *radicans*), *Anacardiaceae*, North America (USA, Delaware, Florida, Indiana, Iowa, Kansas, Maryland, Massachusetts, New Jersey, North Carolina, Texas, Wisconsin).

Notes: *Cercospora infuscans* is a true species of *Pseudocercospora*. Chupp (1954), who confused various cercosporoid fungi on *Rhus*, reduced this name to synonymy with *C. toxicodendri*. The complicated taxonomy and nomenclature of this species has been discussed in detail by Braun (1998).

***Pseudocercospora mombin* (Petr. & Cif.) Deighton, Mycol. Pap. 140: 148 (1976).**

var. *mombin*

(Fig. 17a)

Basionym: *Cercospora mombin* Petr. & Cif., *Ann. Mycol.* 30: 322 (1932).

Literature: Chupp (1954: 41), Braun *et al.* (1999: 102), Crous & Braun (2003: 279), Kamal (2010: 199), Phengsintham *et al.* (2013: 116–117).

Illustration: Phengsintham *et al.* (2013: 117, figs 74–75).

Description: *Leaf spots* amphigenous, subcircular to angular-irregular, 1–40 mm diam, pale to dark brown, greyish brown, finally dull grey to greyish white, margin indefinite or with narrow dark brown, sometimes somewhat raised border. *Caespituli* amphigenous, mainly hypophyllous, scattered to gregarious, punctiform, dark brown to almost blackish. *Mycelium* internal; hyphae intercellular, 2–4 μ m wide, sparingly branched, septate, subhyaline, smooth. *Stromata* 15–55 μ m diam, substomatal to immersed, subglobose to planate, brown to dark brown, cells 2–6 μ m diam. *Conidiophores* in small to moderately large fascicles (2–18), arising from stromata, through stomata or erumpent, loose to mostly dense, erect, straight to somewhat curved, unbranched, rarely branched at the base, subcylindrical to somewhat conical or ampulliform, 5–25(–30) \times 1.5–5 μ m, 0–1-septate, subhyaline to pale olivaceous brown throughout or tips paler, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 5–25 μ m long, conidiogenous loci inconspicuous or visible as truncate tip, but always unthickened and not darkened. *Conidia* solitary, cylindrical to obclavate-cylindrical, straight to curved, 20–65(–85) \times (1–)1.5–3.5 μ m, 2–7-septate, subhyaline to pale olivaceous or olivaceous brown, thin-walled, smooth, apex subobtuse to subacute, base truncate to short obconically truncate, 0.5–2 μ m wide, hila unthickened, not darkened.

Lectotype (designated here, MycoBank, MBT204890): Dominican Republic: Province Santiago: Valle de Ciboá, Hato del Yaque, on *Spondias mombin*, 1 May 1931, R. Ciferri. 4018 (W Krypt 1973-0010017). **Isolectotype:** PAV. **Topotypes** (1 Jan 1931): BPI 438565A–B.

Host range and distribution: On *Spondias* (*dulcis* [*cytherea*], *mombin*, *purpurea*), *Anacardiaceae*, Central and South

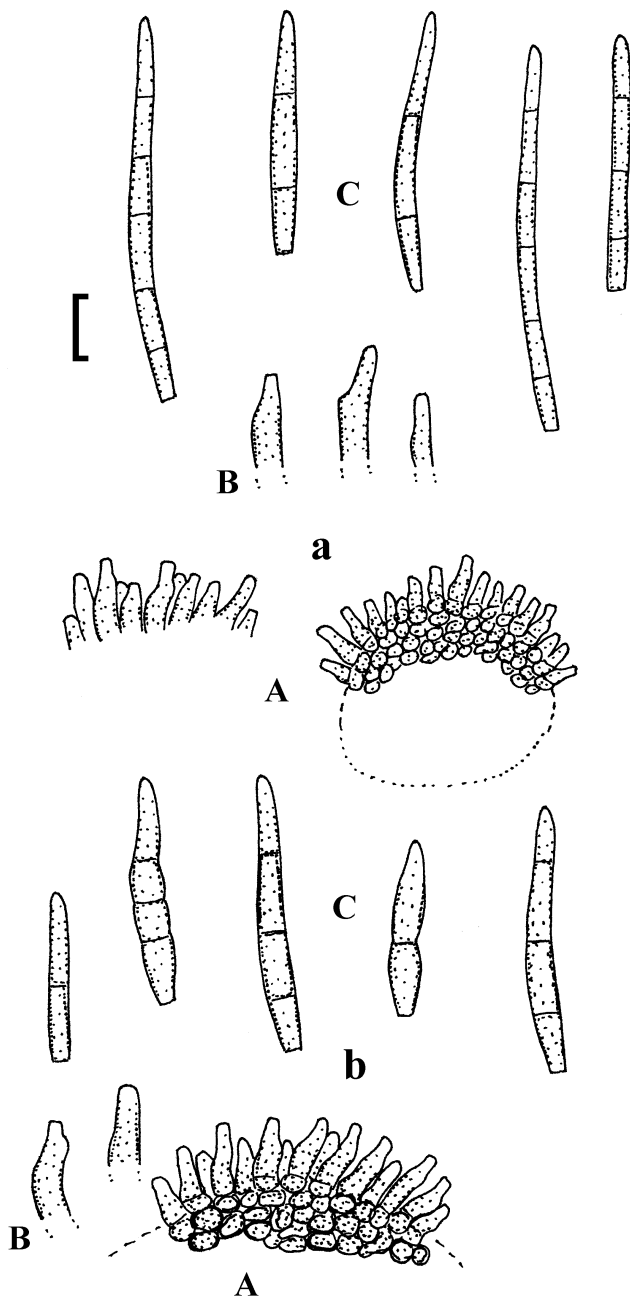


Fig. 17a. *Pseudocercospora mombin* var. *mombin* (W Krypt 1973-0010017, lectotype). **A.** Conidiophore fascicles. **B.** Conidiophores. **C.** Conidia. **17b.** *P. mombin* var. *venezuelensis* (HAL 2157 F, holotype). **A.** Conidiophore fascicle. **B.** Conidiophores. **C.** Conidia. Bar = 10 μ m.

America (Brazil, Panama, Venezuela), Asia (Philippines, Thailand), North America (Mexico), Oceania (Samoa), West Indies (Cuba, Dominican Republic).

Notes: The record from Mexico (on *S. purpurea*) refers to a collection deposited as BPI 438566, and the record from Samoa is included in Dingley *et al.* (1981).

var. **venezuelensis** U. Braun & Uruga, *Feddes Repert.* **119**: 494 (2008).
(Fig. 17b)

Illustration: Braun & Uruga (2008: 495, fig. 7).

Description: Differs from *P. mombin* var. *mombin* in having broader, 1–3(–4)-septate conidia, 12–40 \times 3–5(–6) μ m.

Holotype: **Venezuela:** Lara State: Barquisimeto, on *Spondias mombin*, Anacardiaceae, Jan. 2007, R. Uruga (HAL 2157 F).

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

Pseudocercospora nothopegiae (Ramakr. *et al.*) Deighton, *Mycol. Pap.* **140**: 149 (1976).
(Fig. 18)

Basionym: *Cercospora nothopegiae* Ramakr. *et al.*, *Proc. Indian Acad. Sci., Sect. B*, **37**: 94 (1953).

Literature: Vasudeva (1963: 152), Crous & Braun (2003: 292), Kamal (2010: 203).

Exsiccatae: Herb. Crypt. Ind. Orient Exs. III. Indian Cercosporae, Fasc. 1, no. 31.

Description: Leaf spots amphigenous, subcircular to angular-irregular, 0.5–5 mm diam, gregarious, at first olivaceous brown, later darker, dingy blackish brown, finally paler, greyish brown to dingy grey, margin indefinite or narrow and darker. *Caespituli* hypophyllous, inconspicuous to punctiform, dark brown. *Mycelium* internal and external; superficial hyphae sparingly branched, 1.5–4 μ m wide, septate, subhyaline, pale olivaceous to olivaceous brown, thin, walled, smooth. *Stromata* immersed to somewhat erumpent, small to medium in size, 10–40 μ m diam, sometimes confluent and larger, olivaceous brown, cells 2–6 μ m diam. *Conidiophores* in small to moderately large fascicles, loose to moderately dense, arising from stromata, or solitary arising from superficial hyphae, lateral, erect, straight to somewhat flexuous and geniculate-sinuous, subcylindrical or attenuated towards the apex, unbranched, 5–35 \times 2–4.5 μ m, 0–2-septate, pale olivaceous to olivaceous brown, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 5–25 μ m long, conidiogenous loci mostly truncate, but neither thickened nor darkened. *Conidia* solitary, subcylindrical, obclavate-cylindrical, subacicular, straight to curved, (15–)30–100 \times 2–4.5 μ m, (1–)3–9-septate, subhyaline, pale olivaceous to medium olivaceous brown, thin-walled, smooth, apex obtuse to subacute, base truncate to somewhat obconically truncate, (1.5–)2–2.5(–3) μ m wide, hila unthickened, not darkened.

Lectotype (designated here, MycoBank, MBT204891): **India:** Tamil Nadu: Chennai (Madras), Naduvattam, on *Nothopegia dalzellii*, Anacardiaceae, 24 Feb. 1952, T. S. Ramakrishnan & K. V. Srinivasan [Herb. Crypt. Ind. Orient Exs. III. Indian Cercosporae, Fasc. 1, no. 31] (K(M) IMI 62837). **Isolectotypes:** Herb. Crypt. Ind. Orient Exs. III. Indian Cercosporae, Fasc. 1, no. 31 (e.g. HClO).

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

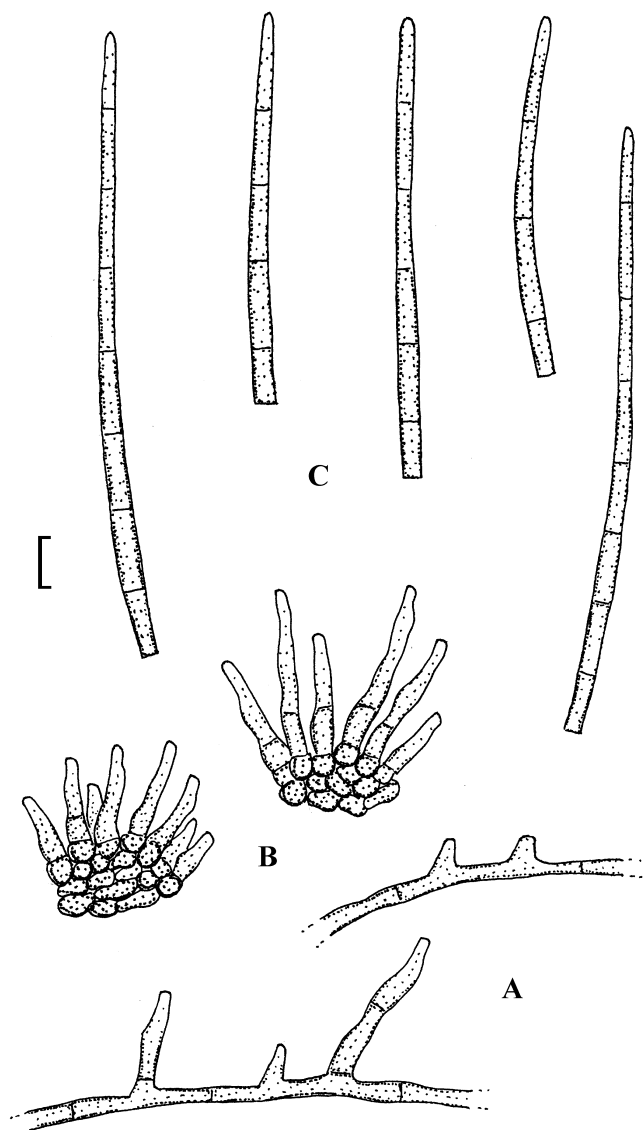


Fig. 18. *Pseudocercospora nothopegiae* (K(M) IMI 62837, lectotype). **A.** Superficial hyphae with solitary conidiophores. **B.** Conidiophore fascicles. **C.** Conidia. Bar = 10 µm.

Pseudocercospora odinae K.K. Sarbajna, *Indian Phytopathol.* **43:** 21 (1990).

(Fig. 19)

Illustration: Sarbajna (1990: 21, fig. 1).

Description: Leaf spots amphigenous, circular or subcircular, vein-limited, 3–8 mm diam, reddish brown, finally leaving shot-holes. *Caespituli* hypophyllous, evenly scattered, light brown. *Mycelium* internal and external; internal hyphae branched, septate, 2–2.5 µm wide, hyaline; superficial hyphae arising from the base of conidiophore fascicles, branched, septate, pale olivaceous, thin-walled, smooth. *Stromata* developed, substomatal, globose or subglobose, compact, dark brown, composed of swollen, brownish hyphal cells. *Conidiophores* in small to large fascicles, 5–45, arising from stromata, divergent or conidiophores solitary, arising from superficial hyphae, erect, straight to curved, usually unbranched, 6.5–30.5 × 2.5–3.5 µm, 0–3-septate, pale olivaceous, wall somewhat thickened, smooth;

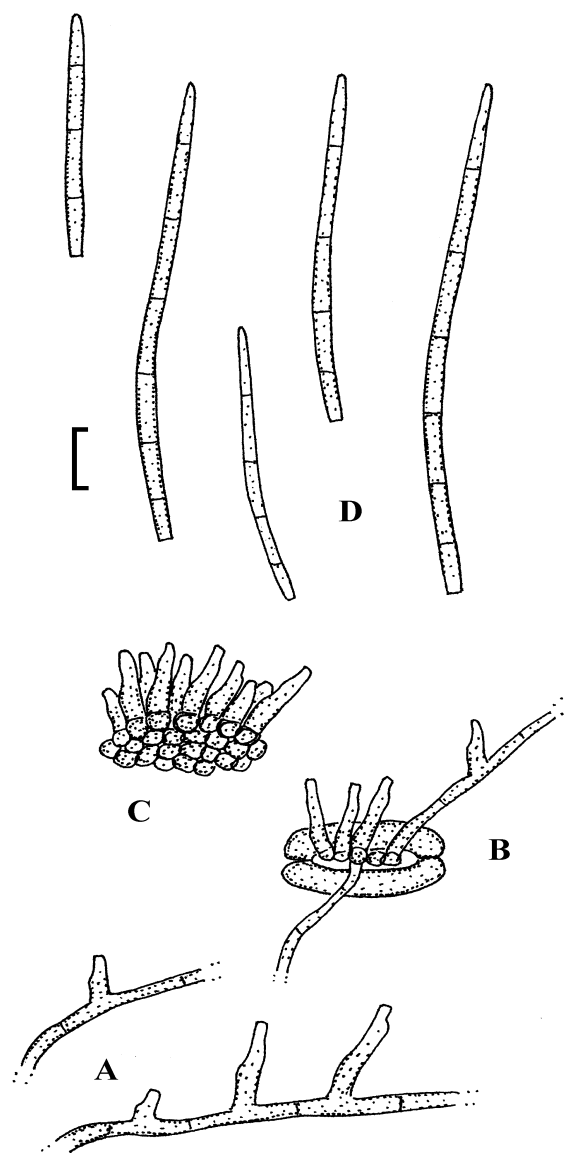


Fig. 19. *Pseudocercospora odinae* (K(M) IMI 309962, isotype). **A.** Superficial hyphae with solitary conidiophores. **B.** Conidiophores and hyphae emerging through a stoma. **C.** Conidiophore fascicle. **D.** Conidia. Bar = 10 µm.

conidiogenous cells integrated, terminal or conidiophores sometimes reduced to conidiogenous cells, subdentate, but conidiogenous loci unthickened, not darkened. *Conidia* solitary, obclavate-cylindrical, straight to curved, 30–105 × 3.5–4 µm, 3–12-septate, pale olivaceous, thin-walled, smooth, apex subotuse or subacute, base obconically truncate, about 1.5–2 µm wide, hila unthickened, not darkened

Holotype: India: West Bengal: 24 Parganas (South), Amtala, on *Lannea coromandelica* [*Odina woodier*], 11 Aug. 1986, K. K. Sarbajna (PCC 3251 = Presidency College Calcutta, Botany Department). **Isotype:** K(M) IMI 309962.

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

Note: See nomenclatural comment under *Pseudocercospora baruipurensis*.

Pseudocercospora phaeochlora (Speg.) U. Braun et al., *Fungal Diversity* 6: 31 (2001).

(Fig. 20)

Basionym: *Cercospora? phaeochlora* Speg., *Anales Mus. Nac. Hist. Nat. Buenos Aires* 20: 441 (1910).

Literature: Saccardo (1913: 1414), Chupp (1954: 41), Braun (2000: 68), Crous & Braun (2003: 319).

Illustration: Braun et al. (2001: 29, fig. 10).

Description: Leaf spots absent to angular-irregular, 1–7 mm diam, or oblong, to 10 mm, sometimes confluent and larger, on the upper leaf surface visible as pale yellowish ochraceous discolorations, on the lower leaf surface reddish to dark brown, finally sooty due to abundant fungal colonies, margin indefinite, sometimes vein-limited. *Caespituli* hypophyllous, effuse, loose to dense, olivaceous to sooty. *Mycelium* internal. *Stromata* small to fairly large, occasionally confluent, substomatal to intraepidermal, immersed to erumpent, about 10–50 μm diam, olivaceous brown. *Conidiophores* in small to moderately large fascicles, divergent to dense, arising from stromata, through stomata or erumpent, erect, flexuous,

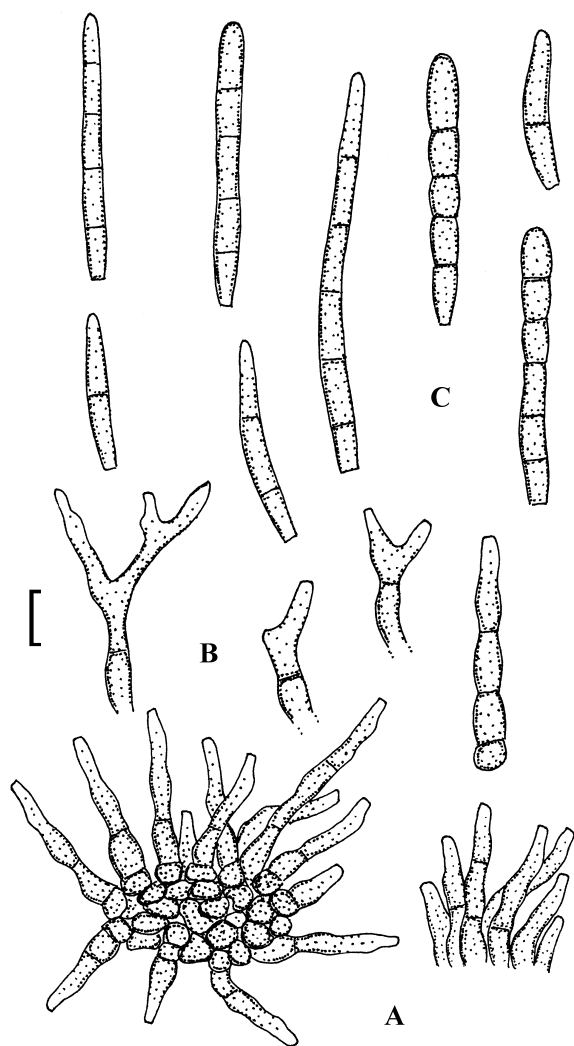


Fig. 20. *Pseudocercospora phaeochlora* (LPS 947, holotype). **A.** Conidiophore fascicles. **B.** Conidiophores. **C.** Conidia. Bar = 10 μm .

geniculate-sinuous, often branched, 10–60 \times 2–5 μm , width irregular, often with constrictions and swellings, continuous to 1–3(–4)-septate, pale yellowish brown to olivaceous or medium brown, smooth, thin-walled; conidiogenous cells integrated, terminal or conidiophores occasionally reduced to conidiogenous cells, 10–25 μm long, conidiogenous loci inconspicuous. *Conidia* solitary, cylindrical to obclavate, straight to curved, (15–)30–80(–90) \times (2–)3–5(–5.5) μm (according to Chupp l.c., to 150 μm long), 1–7-septate, sometimes constricted at the septa, pale to medium olivaceous brown or yellowish brown, thin-walled, smooth, apex obtuse, often broadly rounded, base rounded, truncate to obconically truncate, 2–2.5 μm wide, hila unthickened, not darkened.

Holotype: **Argentina:** Buenos Aires, Jardín Botánico, on *Lithraea brasiliensis*, 28 Apr. 1906, C. Spegazzini (LPS 947).

Host range and distribution: On *Lithraea (brasiliensis, molleoides, venenosa [caustica])*, *Anacardiaceae*, South America (Argentina, Chile).

Pseudocercospora pistaciae (Chupp) Crous & U. Braun, *Mycotaxon* 78: 338 (2001).

(Fig. 21)

Basionym: *Cercospora pistaciae* Chupp, *Monograph of Cercospora*: 41 (1954).

Synonym: *Cercospora pistaciae* Sawada ("*pistaceae*"), *Special Publ. Coll. Agric. Natl. Taiwan Univ.* 8: 224 (1959), *nom. nud.* (Art. 38.1).

Literature: Chupp (1954: 41), Hsieh & Goh (1990: 20), Crous & Braun (2003: 326).

Illustrations: Crous & Braun (2001: 335, fig. 6).

Description: Leaf spots at first inconspicuous, later amphigenous, irregularly shaped, 0.5–3 mm diam, sometimes confluent and larger, brown to greyish brown, margin distinct, dark brown. *Caespituli* amphigenous, punctiform, brown. *Mycelium* internal and external; superficial hyphae branched, 3–4 μm wide, light brown, thin-walled, smooth. *Stromata* 10–60 μm diam, substomatal to immersed, brown. *Conidiophores* in small to moderately large fascicles, usually dense, arising from stromata, through stomata or erumpent, or solitary, arising from superficial hyphae, lateral, erect, straight to somewhat curved, subcylindrical-conical, unbranched, 5–15 \times 2–3.5 μm , aseptate, subhyaline, pale olivaceous to light brown, thin-walled, smooth; conidiophores reduced to conidiogenous cells, conidiogenous loci inconspicuous. *Conidia* solitary, narrowly subcylindrical to somewhat obclavate-cylindrical, straight to curved, 20–65 \times 1.5–3 μm , 3–5-septate, subhyaline to pale olivaceous, thin-walled, smooth, apex subobtuse to subacute, base obconically truncate, 1–2 μm wide, hila unthickened, not darkened.

Lectotype (designated here, MycoBank, MBT204892): **USA:** Texas: Bexar County, San Antonio, on *Pistacia vera*, Sep. 1931, G. T. Ratliffe (CUP 40569). *Isolectotype:* BPI 439746.

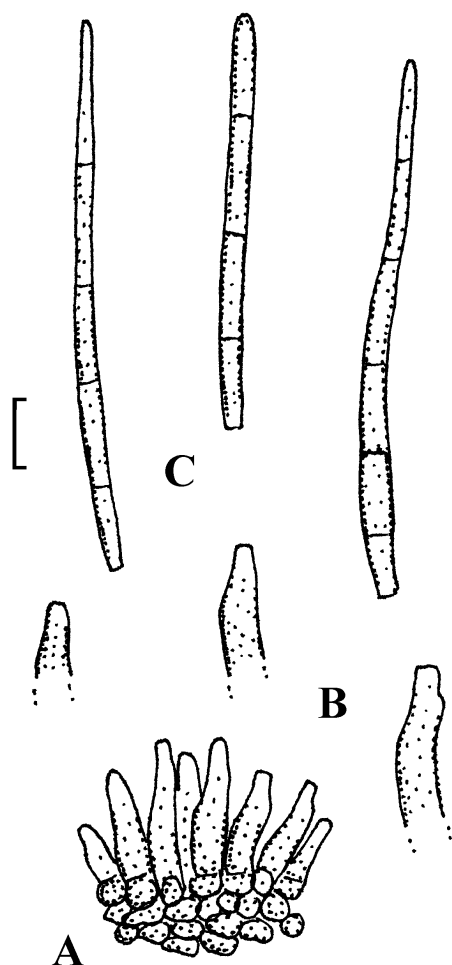


Fig. 21. *Pseudocercospora pistaciae* (CUP 40569, lectotype). A. Conidiophore fascicle. B. Conidiophores. C. Conidia. Bar = 10 μ m.

Host range and distribution: On *Pistacia* (*atlantica* [*mutica*], *?chinensis*, *vera*), *Anacardiaceae*, ?Asia (China, Taiwan), North America (USA, Maryland, Texas).

Notes: Hsieh & Goh (1990) examined original material of *C. pistaciae* Sawada deposited at NTU-PPE (Taiwan: Hsinchu, 4 Dec. 1928, K. Sawada), but did not find any sporophores on the leaves. Collections on *Pistacia atlantica* from Texas and material found in Maryland, USA, are deposited at BPI.

Pseudocercospora rhinocarpi U. Braun & Crous, in Crous & Braun, *Mycosphaerella Anam.* 1: 351 (2003).

(Fig. 22)

Synonym: *Cercospora rhinocarpi* Chupp & A.S. Mull., *Bol. Soc. Venez. Ci. Nat.* 8: 54 (1942); *nom. inval.* (Art. 39.1).

Literature: Chupp (1954: 42), Braun & Urtiaga (2013: 201).

Illustration: Crous & Braun (2003: 352, fig. 21).

Leaf spots amphigenous, irregular, 2–8 mm diam, brown to greyish brown, margin indistinct or with a narrow, somewhat raised border. *Caespituli* amphigenous, delicately punctiform, scattered to aggregated, dark brown. *Mycelium* immersed.

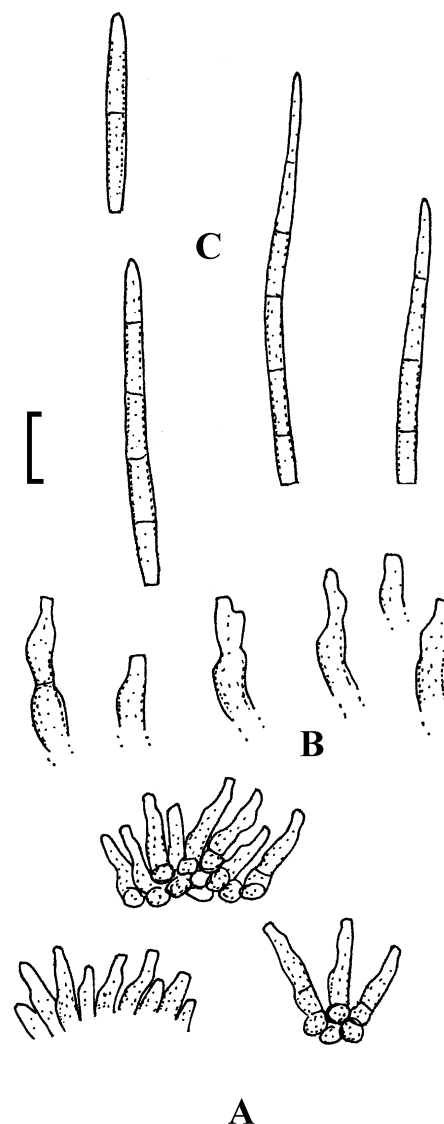


Fig. 22. *Pseudocercospora rhinocarpi* (CUP-VZ 2047, holotype). A. Conidiophore fascicles. B. Conidiophores. C. Conidia. Bar = 10 μ m.

Stromata substomatal or intraepidermal, 10–30 μ m diam, yellowish to olivaceous brown, substomatal to intraepidermal. *Conidiophores* loosely to densely fasciculate, arising from stromata, through stomata or erumpent, erect, flexuous, subcylindrical to geniculate-sinuuous, unbranched, 5–20 \times 1.5–2.5 μ m, 0–1-septate, subhyaline to very pale olivaceous, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 5–15 μ m long, conidiogenous loci inconspicuous. *Conidia* solitary, narrowly obclavate-subcylindrical, subacicular, 10–50 \times 1.5–3.5 μ m, 1–4-septate, subhyaline to pale olivaceous, smooth, apex subacute to subobtuse, base truncate to

obconically truncate, 1–1.5 µm wide, hila unthickened, not darkened.

Holotype: Venezuela: Aragua: Maracay, on *Anacardium excelsum*, 26 Nov. 1937, A. S. Muller (CUP-VZ 2047).

Host range and distribution: On *Anacardium excelsum* [*rhinocarpus*], *Anacardiaceae*, South America (Venezuela).

Notes: This is a typical *Pseudocercospora* with inconspicuous conidiogenous loci. *Cercospora rhinocarpi* is an invalid name published without Latin description. An English description was published by Chupp (1954), but the validation of this name dates from Crous & Braun (2003).

***Pseudocercospora rhoicola* U. Braun & C. Nakash., sp. nov.**

Mycobank MB816982

(Fig. 23)

Misapplied names: *Cercospora toxicodendri* sensu Katsuki (1965: 10), *Pseudocercospora toxicodendri* sensu Guo & Hsieh (1995: 14) and Guo *et al.* (1998: 25–26), *P. rhoina* sensu Sarbajna & Chattopadhyay (1991: 47), *P. infuscans* p.p. in Crous & Braun (2003: 226).

Etymology: Named after the host genus, *Rhus* (dweller of *Rhus*).

Diagnosis: Morphologically comparable to the North American *Pseudocercospora infuscans*, but stromata developed, 10–50 µm diam, above all on the upper leaf surface, conidia longer and narrower, 30–120 × (2.5–)3–5.5(–6.5) µm.

Holotype: Japan: Tokyo, Murayama reservoir, on *Rhus* sp., 12 Oct. 1952, E. Kurosawa (CUP 40763).

Literature: Sarbajna & Chattopadhyay (1991: 47, as "*P. rhoina*"), Guo & Hsieh (1995: 14, as "*P. toxicodendri*"), Braun (1998: 402), Guo *et al.* (1998: 25–26, "*P. toxicodendri*"), Kamal (2010: 215, as "*P. rhoina*").

Illustrations: Sarbajna & Chattopadhyay (1991: 48, fig. 3, as "*P. rhoina*"), Guo & Hsieh (1995: 15, fig. 14, as "*P. toxicodendri*"), Braun (1998: 403, fig. 656), Guo *et al.* (1998: 26, fig. 14, as "*P. toxicodendri*").

Description: Leaf spots amphigenous, subcircular to usually angular-irregular, sometimes vein-limited, 1–10 mm diam, reddish brown, dark brown to blackish brown, later sometimes greyish brown to greyish white, above all on the upper surface, often paler and less distinct below, margin indefinite. *Caespituli* amphigenous, subeffuse below, punctiform above, brown to blackish brown. *Mycelium* internal and external; superficial hyphae on the lower leaf surface, emerging through stomata, arising from stomata or the base of conidiophore fascicles, sparingly branched, septate, 1.5–3(–5) µm wide, subhyaline to pale olivaceous, thin-walled, smooth. *Stromata* absent, above all on the lower leaf surface, to developed, above all on the upper leaf surface, 10–50 µm diam, medium to dark olivaceous brown, composed of swollen hyphal cells, circular

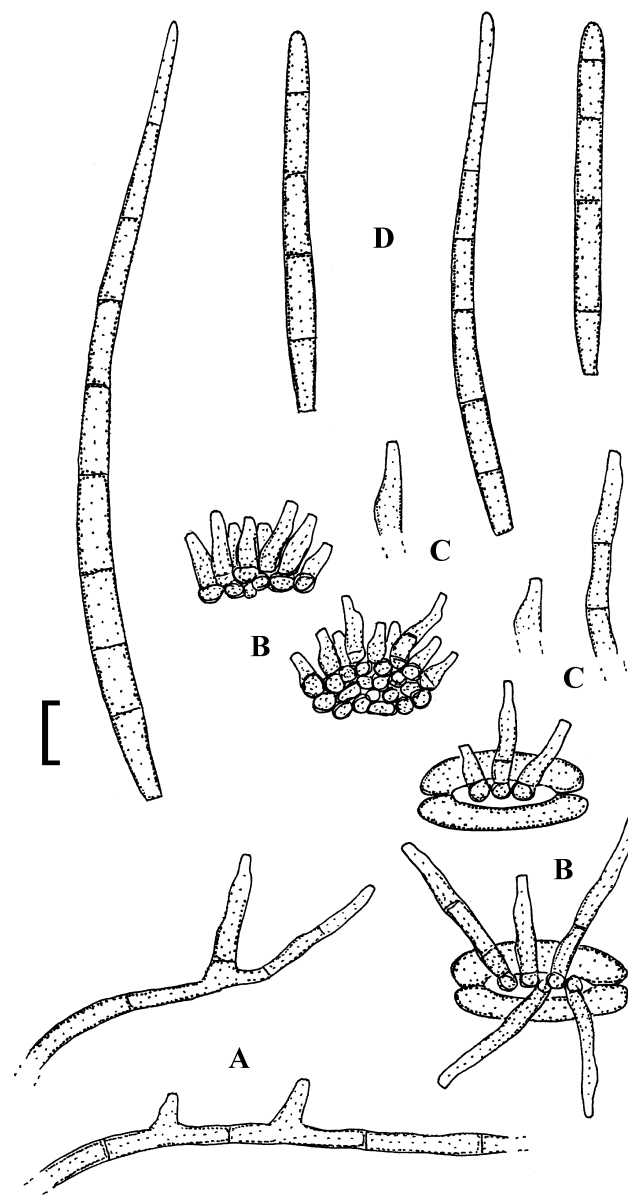


Fig. 23. *Pseudocercospora rhoicola* (CUP 40763, holotype). **A.** Solitary conidiophores arising from superficial hyphae. **B.** Conidiophore fascicles. **C.** Conidiophores. **D.** Conidia. Bar = 10 µm.

to somewhat irregular in outline, 2–6 µm diam. *Conidiophores* on the lower leaf surface in small, loose fascicles, about 2–5, emerging through stomata, and solitary, arising from superficial hyphae, lateral, occasionally terminal, on the upper leaf surface in small to moderately large fascicles, arising from stomata, through stomata or erumpent, erect to decumbent, straight, subcylindrical or somewhat narrowed towards the tip, barely to distinctly geniculate-sinuuous, simple, rarely branched, 5–65 × 3–6(–7) µm, 0–3(–7)-septate, pale to medium olivaceous or olivaceous brown, wall thin, smooth; conidiogenous cells integrated, terminal, sometimes conidiophores reduced to conidiogenous cells, 5–25 µm long, proliferation sympodial, conidiogenous loci unthickened, not darkened, often truncate, sometimes subdentate. *Conidia* solitary, obclavate-cylindrical, straight to curved, 20–120 × (2.5–)3–5.5(–6.5) µm, 2–12-septate, pale brown or pale olivaceous to olivaceous brown, thin-walled, smooth, apex obtuse to subacute, base

obconically truncate, 1.5–3 µm wide, hila unthickened, not darkened.

Host range and distribution: On *Rhus* (*aromatica*, *chinensis*, *javanica*, *Rhus* sp.), *Toxicodendron orientale* [*Rhus ambigua*], *Anacardiaceae*, Asia (China; India, West Bengal; Japan).

Notes: *Pseudocercospora* species on *Rhus* were notoriously confused and misinterpreted. Above all, the name *Cercospora toxicodendri* has been used for different cercosporoid fungi (Braun 1998). The North American *P. infuscans* is morphologically comparable to and possibly confusable with the present new Asian species, but differs in having shorter and wider conidia, 30–70 × 3–9 µm, and lacking stromata. The conidiophores are often subclavate and may proliferate percurrently. Additional Japanese material has been examined: Yamagata, Kamabuchi, on *R. javanica*, 15 Oct. 1950, T. Kobayashi (TFM:FPH-528).

Pseudocercospora rhoina (Cooke & Ellis) Deighton, *Mycol. Pap.* **140**: 152 (1976); as "*rhoina*". (Fig. 24)

Basionym: *Cercospora rhoina* Cooke & Ellis, *Grevillea* **6**: 89 (1878).

Synonym: *Cercospora copallina* Cooke, *Grevillea* **12**: 31 (1883) [**holotype**: USA: South Carolina: Aiken, on *Rhus copallina*, H. W. Ravenel 586 (K(M) 202807)].

Cercospora rhoina var. *nigromaculans* Peck, *Rep. (Annual) New York State Mus. Nat. Hist.* **42**: 129 (1889) [**holotype**: USA: New York: Manor, Long Island, on *Rhus copallina*, Aug., C. H. Peck (NYS)].

Literature: Saccardo (1886: 467–468), Chupp (1954: 42), Katsuki (1965: 10, as *C. toxicodendri*), Sarbajna & Chattopadhyay (1991: 47), Guo & Hsieh (1995: 13), Guo *et al.* (1998: 24), Shin & Kim (2001: 218), Crous & Braun (2003: 353).

Illustrations: Sarbajna & Chattopadhyay (1991: 48, fig. 3), Guo & Hsieh (1995: 14, fig. 13), Guo *et al.* (1998: 25, fig. 13), Shin & Kim (2001: 219, fig. 100).

Exsiccatae: Barthol., *Fungi Columb.* 2613, 2809, 4613. Ellis, *Fungi Columb.* 794. Ellis & Everh., *N. Amer. Fungi* 1252, 1505. Rabenh., *Fungi Eur. Exs.* 3682. Ravenel, *Fungi Amer. Exs.* 586. Szym. & Earle, *Econ. Fungi* 119. Sydow, *Fungi Exot. Exs.* 447.

Description: *Leaf spots* amphigenous, subcircular to angular-irregular, 1–8 mm diam, sometimes vein-limited, brown, reddish brown or even blackish, later centre greyish brown to greyish white, above all on the upper leaf surface, margin at first yellowish, later brown to reddish brown, sometimes with yellowish halo or slightly zonate, finally sometimes thin, dropping out, causing shot-hole symptoms. *Caespituli* amphigenous, punctiform to pustulate on the upper leaf surface, dark brown to blackish, on the lower leaf surface not pustulate, more delicate, punctiform, scattered. *Mycelium* internal, occasionally with some superficial hyphae, mainly on the lower leaf surface, emerging through stomata, sparingly branched, septate, thin-walled, smooth, pale olivaceous to brownish, 1.5–4 µm

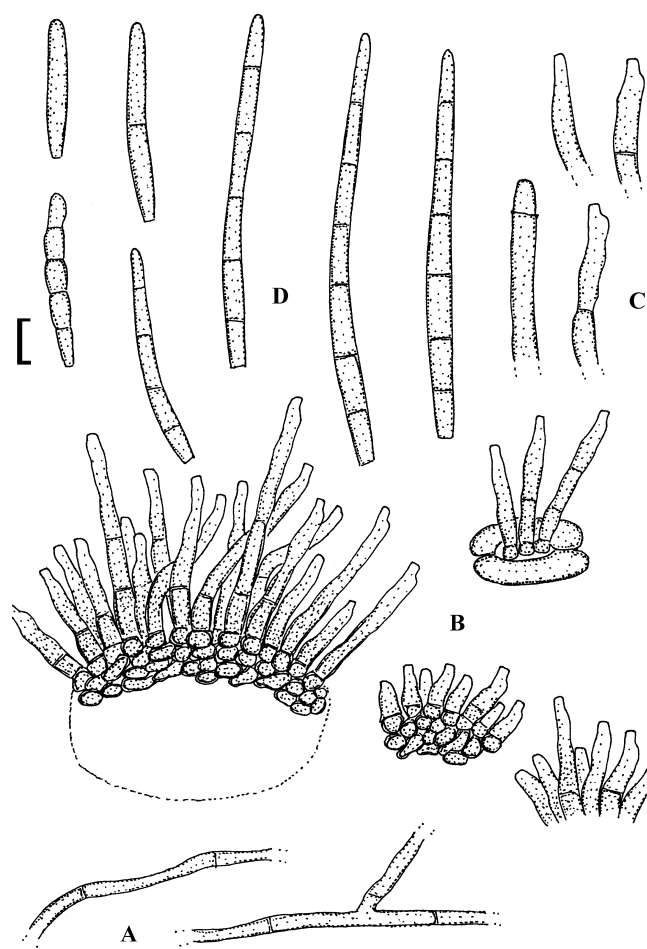


Fig. 24. *Pseudocercospora rhoina* (K(M) 202815, lectotype). **A.** Superficial hyphae. **B.** Conidiophore fascicles. **C.** Conidiophores. **D.** Conidia. Bar = 10 µm.

wide. *Stromata* small to well-developed, large, substomatal to immersed, erumpent, 20–125 µm diam, subglobose to somewhat irregularly shaped or oblong, lacking or smaller on the lower leaf surface, 10–55 µm diam, larger on the upper leaf surface, usually > 50 µm diam, brown to blackish brown, cells 2–7 µm diam, circular to somewhat angular-irregular in outline, wall slightly thickened. *Conidiophores* on the upper side in well-developed, mostly large and dense fascicles, 10–40, arising from stromata, on the lower side in smaller fascicles, through stomata or erumpent, erect, straight to somewhat curved, subcylindrical or somewhat attenuated towards the tip, to geniculate-sinuuous, unbranched, 5–70(–85) × (1.5–)2–6 µm, 0–3-septate, uniformly pale to medium olivaceous brown or brown, thin-walled, smooth, occasionally somewhat rough-walled with age; conidiogenous cells, integrated, terminal or conidiophores reduced to conidiogenous cells, mostly 5–40 µm long, proliferation sympodial, rarely percurrent, conidiogenous loci inconspicuous or visible as truncate tip, neither thickened nor darkened. *Conidia* solitary, obclavate-cylindrical, straight to curved, 20–120(–140) × (2–)2.5–5.5(–6) µm, 2–10(–12)-septate, subhyaline to pale olivaceous or olivaceous brown, thin-walled, smooth, apex obtuse to subacute, base subtruncate to short obconically truncate, 1.5–2.5(–3) µm wide, hila unthickened, not darkened.

Lectotype (designated here, MycoBank, MBT204893): USA: New Jersey: Newfield, on *Rhus glabra*, 7 June 1877, J. B. Ellis 2656 (K(M) 202815). **Isolectotypes:** K(M) 202817–202819.

Host range and distribution: On *Rhus* (*aromatica*, *canadensis*, *chinensis*, *copallinum*, *coriaria*, *glabra*, *lanceolata*, *michauxii* [*pumila*], *potaninii*, *taitensis*, *trilobata*, *typhina*, *vernix*, *Rhus* sp.), *Searsia natalensis* [*Rhus natalensis*], *Toxicodendron* [*orientale* [*Rhus ambigua*], *sempervirens*, *vernifluum*], *Anacardiaceae*, Africa (Kenya, Malawi), Asia (China, ?India, Japan, Korea, Taiwan), Europe (Ukraine), North America (Canada; USA, Alabama, Arkansas, California, Connecticut, Delaware, Florida, Illinois, Indiana, Iowa, Louisiana, Maryland, Massachusetts, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Jersey, New York, North Carolina, Oklahoma, Pennsylvania, South Carolina, Tennessee, Texas, West Virginia, Wisconsin).

Notes: *Pseudocercospora rhoina* undoubtedly represents a complex of races or even cryptic species which needs to be split on the base of cultures and results of molecular sequence analyses. This widespread species has a broad host range amongst species of *Rhus* and allied genera and is morphologically rather variable. Collections on *Toxicodendron orientale* [*Rhus ambigua*] in Japan are, for instance, characterized by having relatively narrow conidia at the lower limit of the variation. It is doubtful that all collections from Africa and Asia are conspecific with North American collections. Sarbajna & Chattopadhyay (1991) described and illustrated *P. rhoina* from India (West Bengal) on *Rhus* sp. The collection concerned was misidentified and belongs to *P. rhoicola*. Kamal (2010) listed *Rhus aromatica* as additional Indian host of *P. rhoina*. Source and identity of the latter record are unclear and unproven. North American records of *P. rhoina* on *Cotinus coggygria* are based on confusions with *P. cotini* (see notes under *P. cotini*).

***Pseudocercospora rhois* Y.L. Guo & X.J. Liu, *Acta Mycol. Sin., Suppl. 1*: 345 (1986); as “*rhoidis*”.** (Fig. 25)

Literature: Guo & Hsieh (1995: 12), Guo et al. (1998: 23).

Illustrations: Guo (1986: 346, fig. 2), Guo & Hsieh (1995: 13, fig. 12), Guo et al. (1998: 24, fig. 12).

Description: Leaf spots amphigenous, subcircular, 0.5–2 mm diam, often confluent, centre whitish, greyish white to pale brown, margin conspicuous on the upper leaf surface, narrow, dark brown, spots paler below. *Caespituli* amphigenous, mainly epiphyllous, punctiform, dark. *Mycelium* internal and partly external; superficial hyphae septate, 2–2.5 µm wide, pale olivaceous. *Stromata* epiphyllous, immersed, subepidermal, located along the margin of leaf spots, subglobose, 50–90 µm diam, dark brown. *Conidiophores* in small fascicles emerging through stomata to numerous, in dense fascicles arising from stromata or solitary, arising from superficial hyphae, lateral, erect, straight, subcylindrical, attenuated towards the tip, not or only very slightly geniculate-

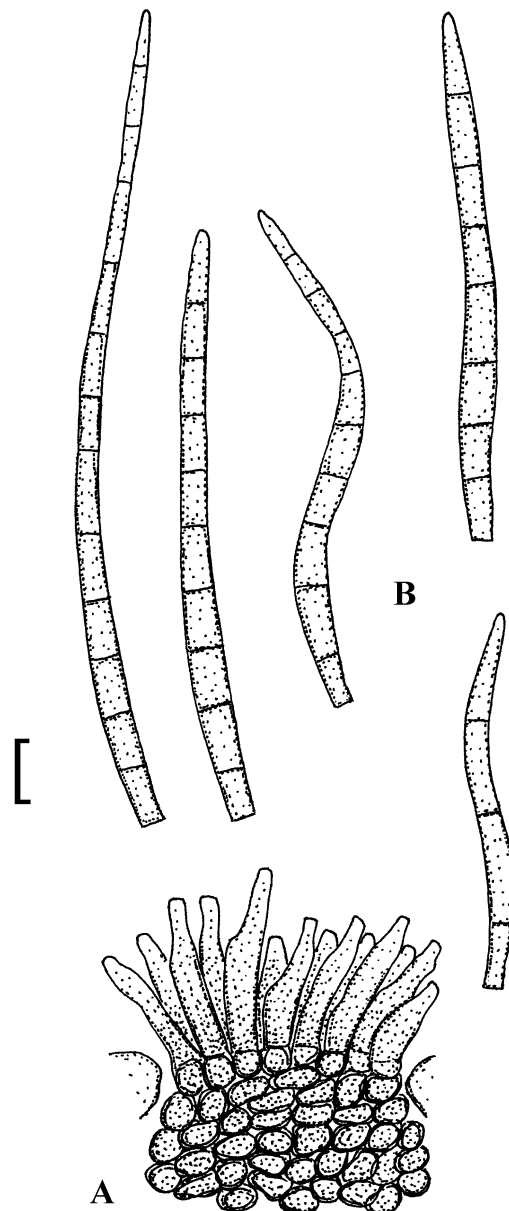


Fig. 25. *Pseudocercospora rhois* (based on Guo & Hsieh 1995: 13, fig. 12). **A.** Conidiophore fascicle, **B.** Conidia. Bar = 10 µm.

sinuous, unbranched, 9–37 × 3–5 µm, aseptate, pale brown to brown, thin-walled, smooth; conidiophores reduced to conidiogenous cells, conidiogenous loci inconspicuous. *Conidia* solitary, obclavate-cylindrical, straight, curved to somewhat sigmoid, 40–175 × 4–7.5 µm, 3–17(–25)-septate, pale to medium brown, thin-walled, smooth, apex obtuse to subacute, base obconically truncate, hila unthickened, not darkened.

Holotype: China: Hubei Province: Shennongjia, Xiaoping, on *Toxicodendron sylvestre*, 10 Aug. 1984, Y. L. Guo 312 (HMAS 47834).

Host range and distribution: On *Rhus hypoleuca*, *Toxicodendron sylvestre* [*Rhus sylvestris*], *Anacardiaceae*, Asia (China, Hubei, Sichuan).

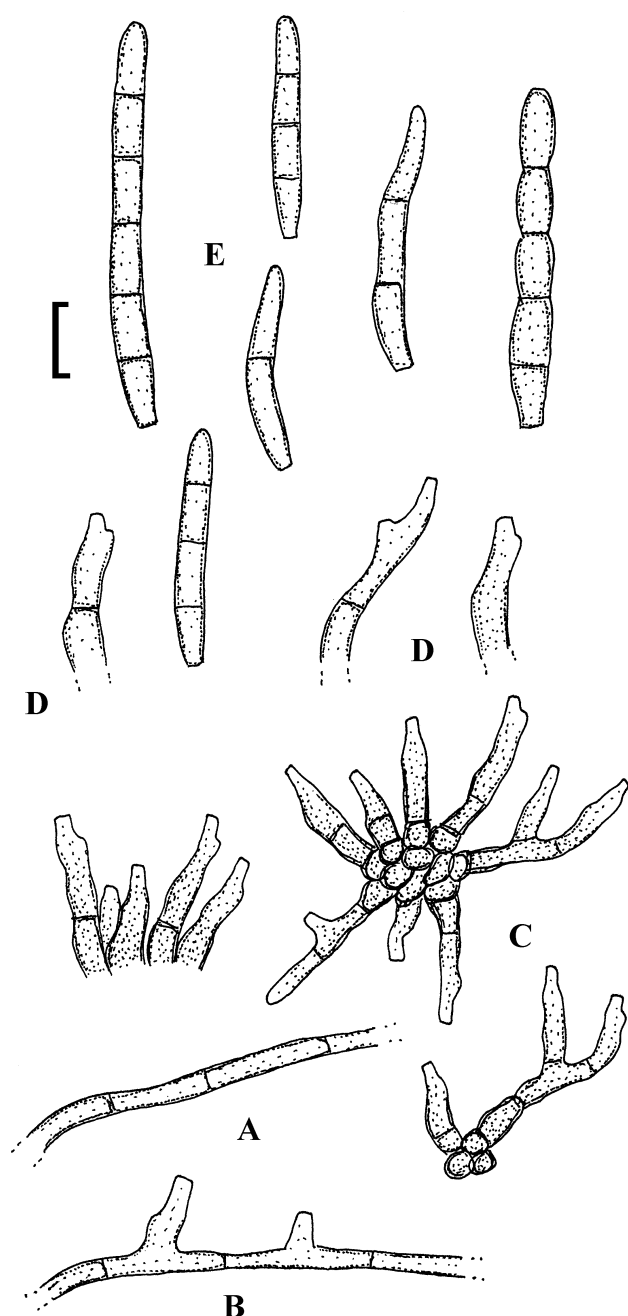


Fig. 26. *Pseudocercospora schini* (CUP 41175, isotype). A. Superficial hypha. B. Superficial hypha with solitary conidiophores. C. Conidiophore fascicles. D. Conidiophores. E. Conidia. Bar = 10 μ m.

Pseudocercospora schini (Syd. & P. Syd.) U. Braun & Crous, in Crous & Braun, *Mycosphaerella Anam.* 1: 368 (2003).

(Fig. 26)

Basionym: *Cercospora schini* Syd. & P. Syd., *Mem. Herb. Boissier* 8(4): 2 (1900).

Literature: Saccardo (1902: 1068), Chupp (1954: 43), Alfieri *et al.* (1984).

Description: Leaf spots indistinct, forming yellowish discolorations on the upper leaf surface. *Caespituli*

hypophyllous, finely punctiform to effuse, olivaceous. *Mycelium* internal or partly external, with a few superficial hyphae, septate, sparingly branched, 2–5 μ m wide, pale. *Stromata* lacking or only formed as small aggregations of a few swollen hyphal cells, olivaceous, substomatal. *Conidiophores* in small to moderately large fascicles, arising from internal hyphae or swollen hyphal cells, through stomata, or conidiophores solitary, arising from superficial hyphae, lateral, occasionally terminal, erect to decumbent, straight, subcylindrical or attenuated towards the tip, moderately geniculate-sinuuous, unbranched or occasionally branched, 10–40 \times 3–7 μ m, 0–3-septate, olivaceous, olivaceous brown or yellowish brown, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 10–25 μ m long, conidiogenous loci inconspicuous, occasionally visible as truncate tip or denticle-like lateral shoulder caused by sympodial proliferation, but always unthickened and not darkened. *Conidia* solitary, cylindrical or subcylindrical, straight to curved, 25–60 \times 3.5–4.5 μ m, (1–)2–4(–5)-septate, occasionally somewhat constricted at the septa, yellowish to olivaceous brown, thin-walled, smooth, apex obtuse, base short obconically truncate, about 2 μ m wide, hila unthickened, not darkened.

Holotype: **Argentina:** Province Córdoba: Córdoba, on *Schinus polygama*, Apr. 1899, T. Stuckert 6805 (S-F20495). *Isotype:* CUP 41175.

Host range and distribution: On *Schinus (polygama [dependens], terebinthifolia)*, *Anacardiaceae*, North America (USA, Florida), South America (Argentina, Córdoba).

Doubtful, excluded and insufficiently known species

Phaeoisariopsis pulgaonvensis Dharkar & Subhedar, *Geobios* 33: 206 (2006).

Illustration: Dharkar & Subhedar (2006: 206, fig. 1).

Description: Infection spots orbicular. Colonies dark brown to black. *Mycelium* immersed, subhyaline to light brown. *Stromata* partly immersed, prosenchymatous, brown, to 76.5 μ m diam. *Conidiophores* synnematos along the basal portion and almost mononematous towards the apex, unbranched, septate, olivaceous brown to brown, smooth, thin-walled, geniculate, 60.8–323 μ m long and 1.9–3.8 μ m thick at the base. *Conidia* solitary, acropleurogenous, 15.2–41.8 \times 11.4–15.2 μ m, 1–4-septate, smooth [conidial shape and colour not described, but based on the original illustration obviously broadly ellipsoid-ovoid, pigmented, base and apex rounded].

Holotype: **India:** Maharashtra: Pulgaon, Wardha District, on *Mangifera indica*, 25 Aug. 2003, N. S. Dharkar (AMH 8873).

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

Notes: Based on the morphology and phylogenetic position

of its type species, the genus *Phaeoisariopsis* has been reduced to synonymy with *Pseudocercospora* (Crous et al. 2006, Braun et al. 2013). However, *Phaeoisariopsis pulgaonvensis* is a saprobic, non-cercosporoid hyphomycete growing on dead stems of *Mangifera indica*, at first glance resembling the saprobic, synnematos genus *Podosporium*, but the genuine generic affinity of *P. pulgaonvensis* requires a re-examination of type material, which was not available.

Stigmia curvispora Crous & U. Braun, *Sydowia* **46**: 220 (1994).
(Fig. 27)

Illustration: Crous & Braun (1994: 221, fig. 10).

Description: Leaf spots amphigenous, scattered, subcircular to irregular, 2–10 mm diam, dark brown. *Caespituli* epiphyllous, punctiform, dark. *Mycelium* internal; composed of dark brown, smooth hyphae. *Stromata* substomatal, 60–80 µm wide and 10–20 µm high, composed of swollen hyphal cells, brown, pseudoparenchymatous. *Conidiophores* numerous, arising from stromata, forming well-developed, brown sporodochia, 70–90 × 30–50 µm, emerging through stomata, erect, straight to slightly curved or sinuous, unbranched, subcylindrical, doliiform, 10–60 × 4–6 µm,

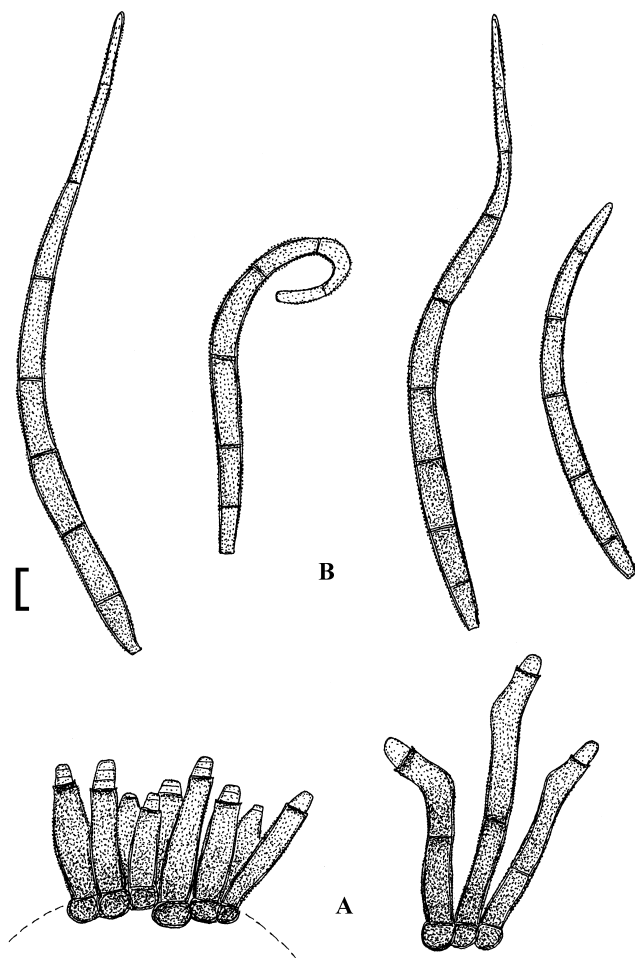


Fig. 27. *Stigmia curvispora* (PREM 51105, holotype). **A.** Parts of sporodochia with conidiophores. **B.** Conidia. Bar = 10 µm.

0–3-septate, brown, thin-walled, verruculose; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, about 10–30 µm long, proliferation percurrent, with conspicuous annellations. *Conidia* solitary, obclavate, usually strongly curved-sinuous, 85–180 × 5.5–12 µm, 4–9-septate, pale brown, thin-walled, verruculose, apex obtuse to subacute, base obconically truncate, occasionally with minute frill, hila unthickened, not darkened.

Holotype: South Africa: Mpumalanga (Eastern Transvaal): Roodeplaat, Vegetable & Ornamental Plant Research Institute, experimental farm, on *Searsia pyroides* [*Rhus pyroides*], *Anacardiaceae*, Mar. 1988, E. J. van der Linde (PREM 51105).

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

Notes: This species is scolecostigmia-like. Based on its type species, *Scolecostigmia* turned out to be a phylogenetically separate genus clustering apart of *Pseudocercospora* (Crous et al. 2013), but other species previously assigned to *Scolecostigmia* belong in *Pseudocercospora*. Therefore, the verification of the proper generic affinity of *S. curvispora* needs phylogenetic data. Thus, we prefer to keep this species tentatively in *Stigmia*.

Stigmia knoxdavesii Crous & U. Braun, *Mycotaxon* **57**: 279 (1996).
(Fig. 28)

Replaced name: *Cercospora caffra* Syd. & P. Syd., *Ann. Mycol.* **12**: 267 (1914), non *Stigmia caffra* (Wakef.) M.B. Ellis 1959.

Literature: Saccardo (1931: 868), Chupp (1954: 38), Crous & Braun (1996: 279), Crous & Braun (2003: 238).

Illustration: Crous & Braun (1996: 271, fig. 6).

Description: Leaf spots amphigenous, subcircular, 1–6 mm diam, brown, reddish brown to finally almost blackish, margin indefinite. *Caespituli* amphigenous, mainly hypophyllous, punctiform-pustulate, greyish brown, dark brown to blackish brown. *Mycelium* internal; hyphae sparingly branched, septate, brown, thin-walled, smooth. *Stromata* substomatal to immersed, large, subglobose to somewhat applanate, 50–85 µm wide and 20–30 µm high, pseudoparenchymatous, brown. *Conidiophores* numerous, in dense sporodochial fascicles, arising from stromata, through stomata or erumpent, erect, subcylindrical-conical, doliiform-ampulliform, unbranched, straight to slightly curved, aseptate, i.e. reduced to a single conidiogenous cell, 8–25 × 3–5 µm, pale olivaceous to brown, darker in mass, tips sometimes subhyaline, wall thin to slightly thickened, verruculose, proliferation percurrent, leaving 1–4 irregular annellations, terminal conidiogenous locus planate, unthickened, not darkened. *Conidia* solitary, cylindrical, subcylindrical to somewhat obclavate, straight to usually curved, (10–)15–45(–55) × 3.5–6 µm, (0–)3(–6)-septate, brown, wall thin to slightly thickened, verruculose, apex

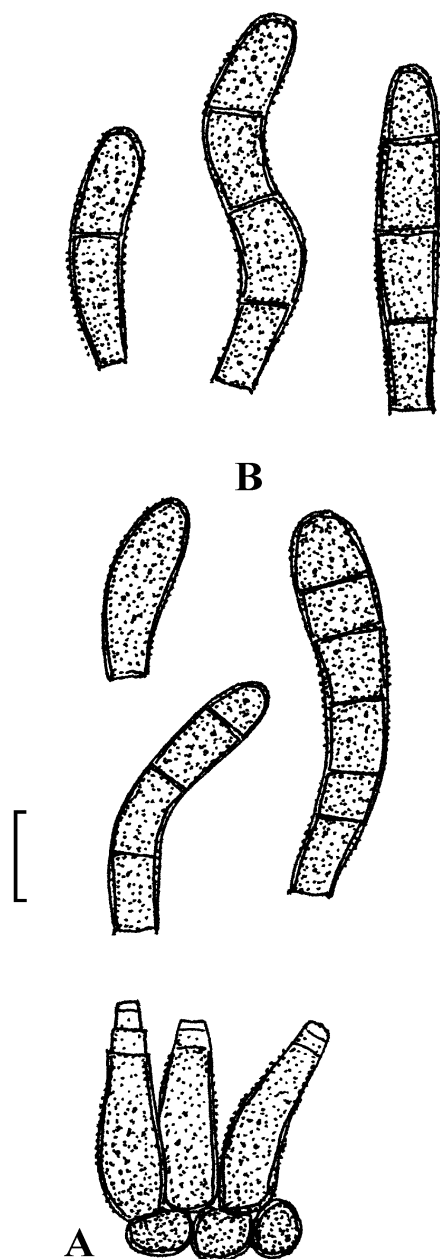


Fig. 28. *Stigmata knoxdavesii* (PREM 6618, lectotype). A. Part of a sporodochium. B. Conidia. Bar = 10 μ m.

obtuse, base truncate to short obconically truncate, planate, hila unthickened and not darkened, occasionally with a minute frill.

Lectotype (designated here, MycoBank, MBT204894):

South Africa: Transvaal: Nelspruit, Barberton, on *Sclerocarya birrea* subsp. *caffra*, May 1913, S. Hall (PREM 6618). *Isolectotypes:* CUP 39256, S-F23405.

Host range and distribution: On *Sclerocarya birrea* subsp. *caffra* [*caffra*], Anacardiaceae, South Africa (Transvaal).

Notes: This species is tentatively maintained in *Stigmata* s. lat. The latter genus has been reduced to synonymy with *Pseudocercospora* since the type species of *Stigmata*, *S. platani* (Fuckel) Sacc. (conidia distoseptate), clusters within the big *Pseudocercospora* clade (Crous *et al.* 2006), and

Pseudocercospora has been conserved against the older name *Stigmata* (Braun & Crous 2006). However, the genuine generic affinity of *S. knoxdavesii* is still unknown and not yet proven by means of sequence analyses. The shape and structure of the conidiophores, conidiogenous cells as well as euseptate conidia are reminiscent of *Scolecostigmata*, a genus segregated from *Stigmata* due to pluriseptate, scolecosporeous conidia. The type species of the latter genus clusters distantly from the *Pseudocercospora* clade, but other species previously assigned to *Scolecostigmata* belong to *Pseudocercospora* (Crous *et al.* 2013). Therefore, a final conclusion about the generic affinity of *S. knoxdavesii* requires phylogenetic data. The material deposited at PREM, which is in better condition than the meagre type collection in S, is designated as lectotype.

***Stigmata pulviniformis* (Syd.) S. Hughes, Mycol. Pap. 49: 24 (1952).**

(Fig. 29)

Basionym: *Brachysporium pulviniforme* Syd., *Ann. Mycol.* 12: 267 (1914).

Synonym: *Sciniatosporium pulviniforme* (Syd.) Morgan-Jones, *Canad. J. Bot.* 49: 1003 (1971).

Literature: Ellis (1976: 116), Crous & Braun (1996: 303).

Illustration: Ellis (1976: 115, fig. 82 C).

Description: Leaf spots lacking, indistinct. *Caespituli* hypophyllous, punctiform, in small groups, later confluent, forming continuous dark brown patches, pulvinate. *Mycelium* internal. *Stromata* large, immersed to somewhat erumpent, to 200 μ m diam, brown. *Conidiophores* numerous, in large sporodochial conidiomata, arising from stromata, erumpent, subcylindrical to somewhat ampulliform, unbranched, apex more or less truncate, 10–35 \times 5–9 μ m, aseptate, with 0–4 conspicuous annellations. *Conidia* solitary, ellipsoid-ovoid to oblong, short subcylindrical, straight, rarely slightly curved, 18–35 \times 8–11.5 μ m, with 1–4 transverse septa and occasionally a single longitudinal or oblique septum, brown, wall somewhat thickened, smooth, apex rounded, base short obconically truncate, hila not thicker and not darker than the lateral wall.

Lectotype (designated here, MycoBank, MBT204895):

South Africa: Cape Province: Cape Town, St James, on *Rhus tomentosa*, 22 Dec. 1912, G. B. Pole Evans 5575 (S-F21930). *Isolectotypes:* K(M) IMI 37988, PREM 5575.

Notes: Owing to the phylogenetic position of its type species, the genus *Stigmata* has been reduced to synonymy with *Pseudocercospora*. However, the phylogenetic affinity of *S. pulviniformis* is still unknown and this species is morphologically not scolecostigmata-like. On the other hand, it resembles the type species of *Stigmata* which proved to cluster within the *Pseudocercospora* clade. *Stigmata pulviniformis* needs to be sequenced and reassessed. Therefore, we prefer to maintain this species in *Stigmata*, at least tentatively until its phylogenetic affinity is clarified.

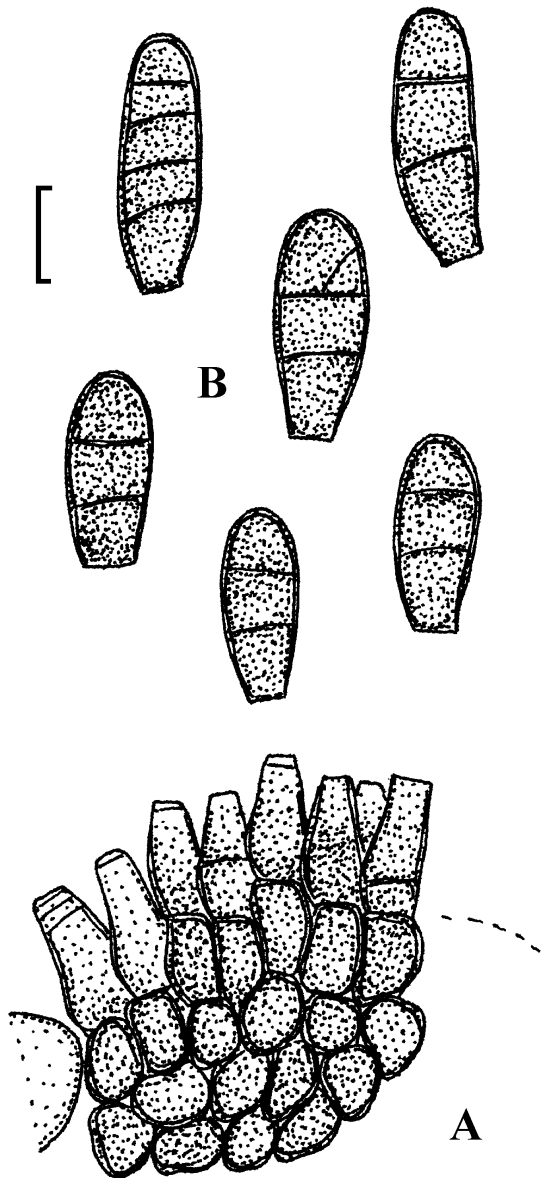


Fig. 29. *Stigmata pulviniformis* (K(M) IMI 37988, isoelectotype). A. Sporodochium. B. Conidia. Bar = 10 μ m.

Stigmata rhois Crous & U. Braun, *Sydowia* **46**: 221 (1994). (Fig. 30)

Illustration: Crous & Braun (1994: 222, fig. 11).

Description: *Leaf spots* epiphyllous, scattered, circular to irregular, 4–20 mm diam, dark brown. *Caespituli* epiphyllous, punctiform-pustulate, brown. *Mycelium* internal, composed of branched, septate, medium brown hyphae. *Stromata* well-developed, large, brown. *Conidiophores* numerous, in dense fascicles, arising from stromata, forming large sporodochia, 55–100 wide and 35–70 μ m high, centered over stomata, dark brown, erect, straight, subcylindrical, somewhat geniculate-sinuuous, unbranched, 30–50 \times 5–8 μ m, 1–2-septate, brown, thin-walled, verruculose; conidiogenous cells integrated, terminal, subcylindrical-ampulliform, proliferation percurrent, with to five distinct annellations. *Conidia* solitary, obclavate-subcylindrical, straight to curved,

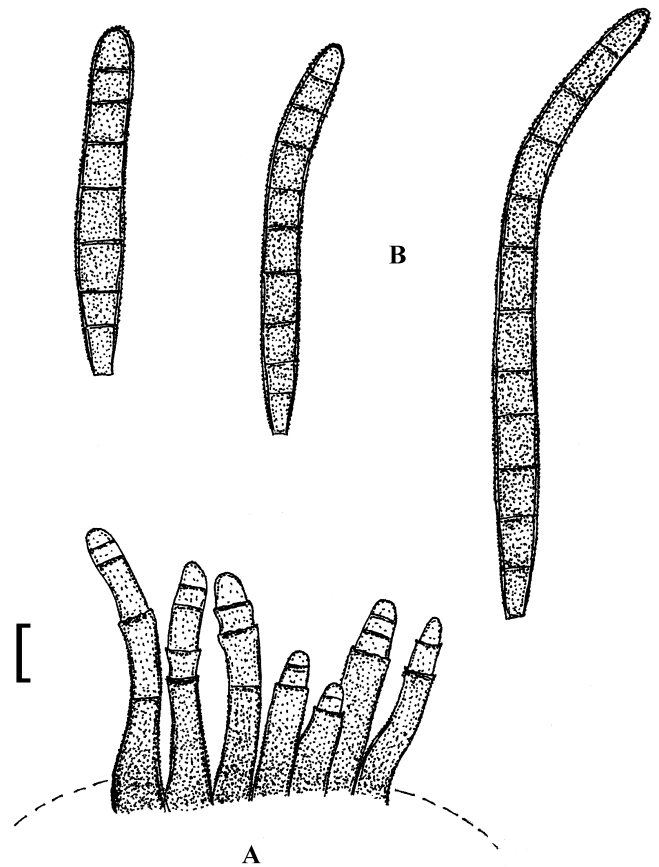


Fig. 30. *Stigmata rhois* (PREM 51132, holotype). A. Part of a sporodochium with conidiophores. B. Conidia. Bar = 10 μ m.

45–130 \times 6–8 μ m, 3–19-septate, medium brown, thin-walled, verruculose, apex obtuse, rounded, base short obconically truncate, occasionally with a minute frill, hila unthickened, not darkened.

Holotype: **South Africa**: *Natal*: Mahai George, Royal Natal National Park, on *Rhus discolor*, *Anacardiaceae*, May 1988, R. Y. Anelich (PREM 51132).

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

Note: See notes under *Stigmata curvispora*.

Scolecostigmata

A single species.

Scolecostigmata mangiferae (Koord.) U. Braun & Mouch., *New Zealand J. Bot.* **37**: 323 (1999). (Fig. 31)

Basionym: *Cercospora mangiferae* Koord., *Verh. Kon. Ned. Akad. Wetensch., Afd. Natuurk., Tweede Sect.* **13**: 236 (1907).

Synonyms: *Stigmata mangiferae* (Koord.) M.B. Ellis, *Mycol. Pap.* **72**: 49 (1959).

Sciniatosporium mangiferae (Koord.) Morgan-Jones, *Canad. J. Bot.* **49**: 999 (1971).

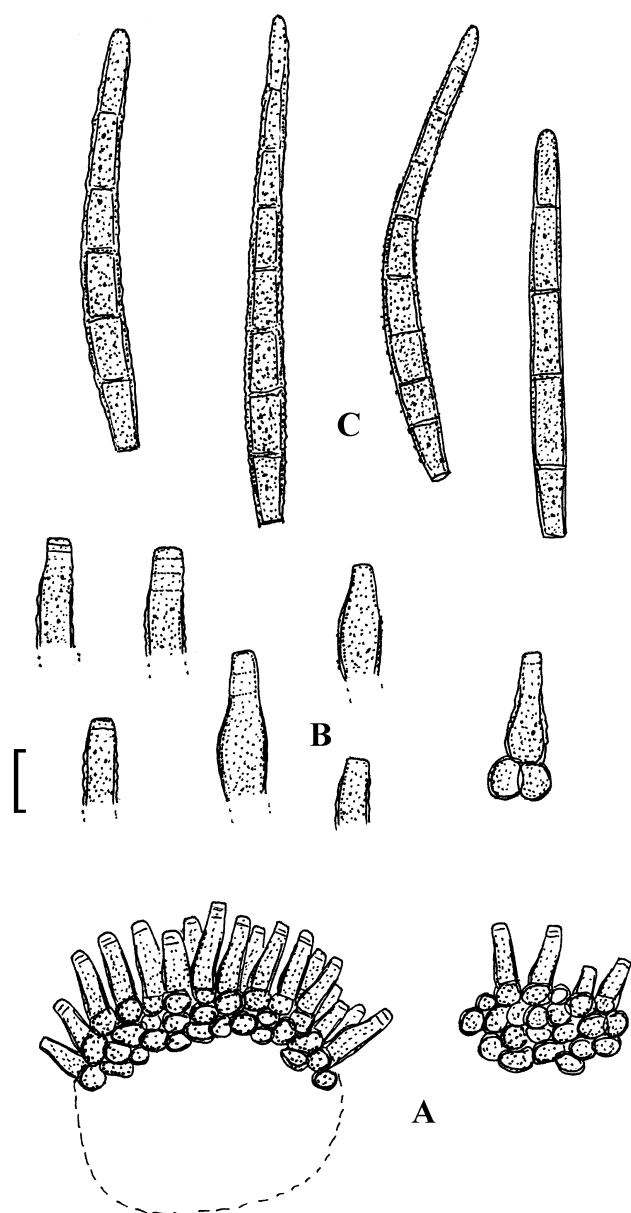


Fig. 31. *Scolectostigmia mangiferae* (PC, Bugnicourt, NC 59.061a,b). **A.** Sporodochial conidiomata. **B.** Conidiophores. **C.** Conidia. Bar = 10 μm .

Literature: Saccardo (1913: 1414), Chupp (1954: 39–40), Ellis (1971: 146), Hsieh & Goh (1990: 21), Hyde (1992), Braun & Freire (2003: 325), Crous & Braun (2003: 265–266), Kamal (2010: 260), Phengsintham *et al.* (2013: 151–152), Crous *et al.* (2013: 74).

Illustrations: Ellis (1971: 145, fig. 97 C), Hyde (1992: 1, fig., unnumbered), Braun *et al.* (1999: 322, fig. 26), Phengsintham *et al.* (2013: 152, fig. 172, 153, fig. 173), Crous *et al.* (2013: 75, fig. 18).

Exsiccatae: Petr., Mycoth. Gen. 1210. Syd., Fungi Exot. Exs. 916.

Description: Leaf spots amphigenous, shape and size variable, subcircular to angular-irregular, 0.5–6 mm diam, occasionally

larger, to 13 mm diam, dark brown to blackish, with yellowish, greenish to reddish brown margin or halo. *Caespituli* hypophyllous, punctiform, scattered, dark olivaceous brown to blackish. *Mycelium* internal. *Stromata* small to usually well-developed, (10–)15–70 μm diam, substomatal to immersed, often erumpent, dark brown, composed of swollen hyphal cells, circular to somewhat angular-irregular in outline, 3–7 μm diam. *Conidiophores* in small to usually large fascicles arising from stromata, dense, mostly sporodochial, emerging through stomata or erumpent, erect, straight or only slightly curved, subcylindrical to conical, ampulliform, unbranched, short, 5–25 \times 3–5 μm , 0–1(–2)-septate, often aseptate, olivaceous brown to dark fuliginous, paler towards the tip, wall 0.5–1 μm wide, smooth or almost so to distinctly verruculose, apex truncate; conidiogenous cells integrated, terminal or often reduced to conidiogenous cells, 5–20 μm long, with a truncate tip, unilocular, about 2–3 μm wide, unthickened, not darkened, proliferation percurrent, with 1–7 conspicuous, dense annellations. *Conidia* solitary, obclavate, obclavate-cylindrical or broadly fusoid, straight to curved, 20–80 \times 3–6 μm , 2–10-septate, usually euseptate, but occasionally mixed with few distosepta, dark olivaceous to medium dark brown, sometimes with a reddish tinge, wall slightly thickened, 0.3–0.8 μm , smooth to rugose-verruculose, apex obtuse, base short obconically truncate, occasionally long obconically truncate, 2–4 μm wide, hila neither thicker nor darker compared to the lateral walls, sometimes with minute frill.

Holotype: **Indonesia:** Java: Kedu, Purworedjo, on *Mangifera indica*, 21 Sep. 1905, S. H. Koorders 6 ser. 5 (type material not traced, probably not preserved).

Host range and distribution: On *Mangifera* (*foetida*, *indica*), *Anacardiaceae*, Africa (Angola, Congo, Gabon, Ghana, Malawi, Mozambique, Nigeria, São Tomé e Príncipe, Sierra Leone, Somalia, Sudan, Tanzania, Uganda, Zambia), Asia (Brunei, China, India, Indonesia, Japan, Laos, Malaysia, Nepal, Papua New Guinea, Philippines, Sri Lanka, Taiwan, Thailand), Australia, North America (Mexico; USA, Florida), Central and South America (Argentina, Brazil, Colombia, Honduras, Panama, Suriname, Venezuela), Oceania (Cook Islands, Fiji, New Caledonia, Samoa, Solomon Islands, Tonga, Vanuatu), West Indies (Cuba, Dominican Republ., Haiti, Jamaica, Puerto Rico, Trinidad and Tobago, Virgin Islands).

Notes: Braun *et al.* (1999) introduced the genus *Scolectostigmia* with *Cercospora mangiferae* as type species. This genus is morphologically close to *Pseudocercospora*, above all to species with percurrently proliferating conidiogenous cells, previously assigned to *Cercostigmia*, which is now a synonym of *Pseudocercospora*, but distinguished by having conidiogenous cells with coarse annellations, usually verruculose, and thick-walled conidia. The morphological differentiation from *Pseudocercospora* spp. is not sharp and rather gradual, but molecular analyses recently carried out by Crous *et al.* (2013) unequivocally confirmed *Scolectostigmia* as a genus of its own. Type material could not be traced. Suitable material for a

neotypification from Java was also not available. Therefore, the typification of this species has been postponed and should be done in connection with fresh collections, cultures and sequence analyses.

***Zasmidium s. lat.* (zasmidium-like asexual morph)**

A single species.

***Cercospora chandleri* Hansf., *Proc. Linn. Soc. London* 155: 55 (1943).**

(Fig. 32)

Synonym: Stenella chandleri (Hansf.) Suj. Singh & Kamal, *Indian Phytopathol.* 31: 316 (1979) ["1978"].

Literature: Chupp (1954: 39), Crous & Braun (2003: 118).

Description: Leaf spots lacking, fructification mixed with leaf hairs and mycelium of *Asterina* sp. *Caespituli* hypophyllous, effuse, olivaceous. *Mycelium* internal and external; superficial hyphae emerging through stomata, branched, mostly at right angles, straight to somewhat flexuous, sinuous, 1–3 µm wide, subhyaline, pale olivaceous to olivaceous brown, pale, thin-walled, verruculose, hyphae around conidiophores often somewhat darker, wider, to 4.5 µm, with slightly thickened walls. *Stromata* lacking. *Conidiophores* solitary, arising from superficial hyphae, on top of mother cells, erect, straight, cylindrical to filiform-setiform, rarely branched, only fertile upper part geniculate-sinuous or slightly nodulose, 100–300 × 3–5 µm, pluriseptate throughout, pale to medium dark brown throughout or somewhat paler towards the tip, wall slightly thickened, smooth to somewhat rough; conidiogenous cells integrated, terminal or intercalary, 10–25 µm long, conidiogenous loci conspicuous, somewhat thickened and darkened, 1.5–2 µm diam. *Conidia* solitary, cylindrical to slightly cylindrical-obclavate, straight to slightly curved, 20–120(–200) × 3–6 µm, 1–11-septate, pale brown or olivaceous brown, thin-walled, verruculose, apex obtuse, base truncate or slightly obconically truncate, 2–2.5 µm wide, hila somewhat thickened and darkened.

Holotype: **Uganda:** Kampala, on *Pseudospondias microcarpa*, *Anacardiaceae*, Oct. 1938, *Hansford* 2532 (K(M) IMI 8594).

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

Notes: This is a species with typically zasmidium-like morphology. The combination of this species into *Stenella* by Singh & Kamal (1979) was based on Indian material on *Cassia fistula*, which is, however, not conspecific and belongs to *Stenella cassiae* Abbasi & D.N. Shukla. *Cercospora chandleri* does not cause any lesions, but forms mixed infections with *Asterina* sp., but the two species are not

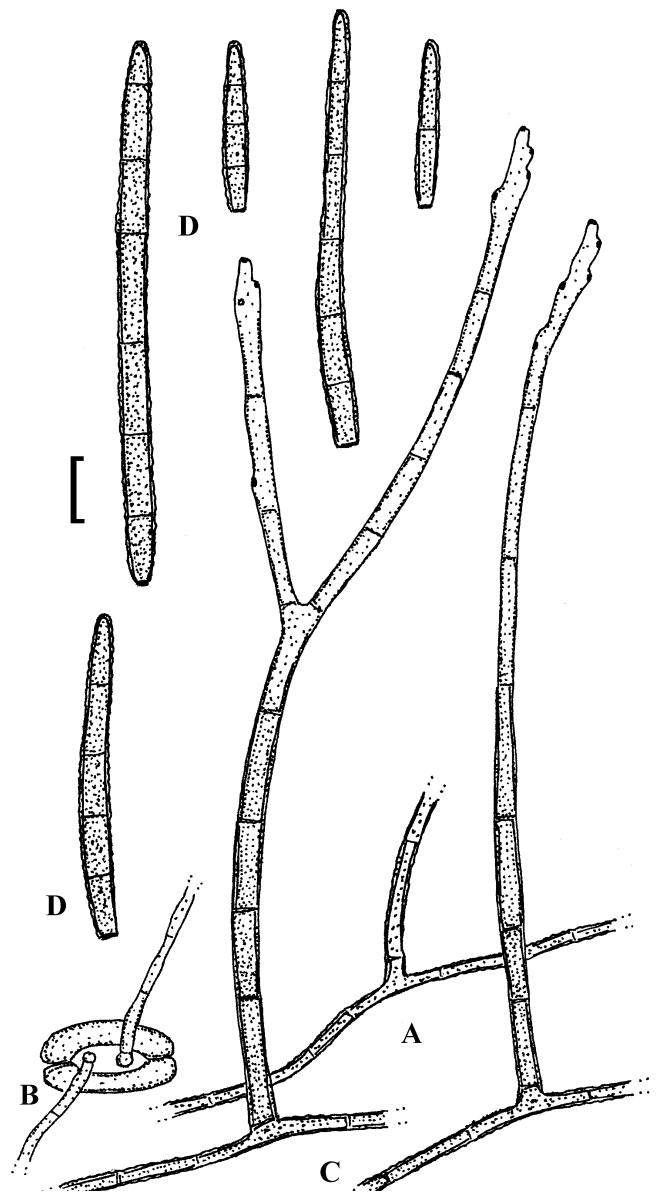


Fig. 32. *Cercospora chandleri* (K(M) IMI 8594, holotype). **A.** Superficial hypha. **B.** Superficial hyphae emerging through a stoma. **C.** Solitary conidiophores arising from superficial hyphae. **D.** Conidia. Bar = 10 µm.

associated, i.e., *C. chandleri* is not fungicolous. The mycelium of this species is only associated with green leaf tissue, so that *C. chandleri* has to be considered a plant parasite. However, a proper reassessment of the generic affinity of this species is not possible and must be based on cultures and sequence data. The zasmidium-like morphology is not sufficient and unreliable for a reallocation since zasmidium-like asexual morphs are associated with cercosporoid species belonging to various mainly phylogenetically circumscribed genera (see introduction). Therefore, we prefer to keep this species in *Cercospora*, at least tentatively until corresponding sequence analyses are available.

Annonaceae**Cercospora**

A single species.

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

Notes: *Cercospora* collections morphologically indistinguishable from *C. apii s. lat.* are known from *Annona squamosa*

and *Cananga odorata* (Crous & Braun 2003: 61, 99, as "*C. canescens*"). The identity of the collections concerned is unclear. *C. apii s. lat.* is a complicated complex of plurivorous and specialised taxa (Groenewald *et al.* 2013). Reliable identifications of such collections have to be based on cultures and molecular sequence analyses.

Passalora**Key to *Passalora* species on Annonaceae**

- 1 Mycelium internal; conidiophores fasciculate, long and broad, 50–110 × 5–9 µm; conidia formed singly, 35–130 × 7–9 µm, 1–4-septate; on *Miliusa* sp. **P. annonacerarum**
 Mycelium internal and external, with solitary conidiophores or, if mycelium only internal, conidiophores much narrower, 2–5 µm wide; conidia formed in chains, only 2–4.5 µm wide 2
- 2 (1) Superficial hyphae with solitary conidiophores present (mycovellosiella-like) 3
 Superficial hyphae and solitary conidiophores lacking; conidiophores fasciculate (phaeoramularia-like species) 4
- 3 (2) Stromata 10–30 µm diam; conidiophores in fascicles as well as solitary; conidia 25–80 µm long, 3–8-septate; on *Annona* sp. **P. annonigena**
 Stromata lacking; conidiophores consistently solitary, fascicles not formed; conidia 15–50 µm long, 2–4-septate; on *Miliusa* sp. **P. miliusae**
- 4 (2) Stromata poorly developed; conidiophores 100–200(–250) µm long; conidia subhyaline to pale brownish; on *Isolona cauliflora* **P. isolonae**
 Stromata 10–30 µm diam; conidiophores 30–150 µm long; conidia hyaline or subhyaline; on *Annona* and *Xylopia* **P. xylopieae**

Tabular key to *Passalora* species on Annonaceae according to host genera**Annona**

- 1 Mycelium internal and external; superficial hyphae with solitary conidiophores developed; conidiophores 10–60 µm long; conidia solitary, 25–80 × 3–6 µm, 3–8-septate, subhyaline, pale olivaceous to olivaceous brown **P. annonigena**
 Mycelium internal; superficial hyphae with solitary conidiophores not developed; conidiophores much longer, 30–150 µm; conidia at least partly in chains, 25–50(–65) × 2–4.5 µm, hyaline or subhyaline **P. xylopieae**

Isolona

- A single species **P. isolonae**

Miliusa

- 1 Stromata lacking; mycelium internal and external; conidiophores solitary, arising from superficial hyphae, short, about 10–25 µm long; conidia 15–50 µm long and about 5 µm wide **P. miliusae**
 Stromata developed, 10–30 µm diam; superficial hyphae and solitary conidiophores absent; conidiophores fasciculate, much longer, 50–110 µm; conidia 35–130 µm long and 7–9 µm wide **P. annonacerarum**

Xylopia

- A single species **P. xylopieae**

Passalora species on Annonaceae

Passalora annonacearum A.N. Rai & Kamal, *Kavaka* 14: 33 (1987) [“1986”]; as “*annonacearum*”. (Fig. 33)

Literature: Crous & Braun (2003: 438), Kamal (2010: 103).

Illustrations: Rai & Kamal (1987: 34, fig. 2)

Description: *Leaf spots* hypophyllous, greyish brown, confluent, covering large leaf segments. *Caespituli* hypophyllous, effuse, greyish brown, velvety. *Mycelium* internal; hyphae branched, septate, pigmented, thin-walled, smooth. *Stromata* relatively small, immersed, substomatal, subcircular to irregular in outline, 10–30 µm diam, medium to dark olivaceous brown. *Conidiophores* solitary or in small fascicles, divergent, erect, subcylindrical to distinctly geniculate-sinuous, unbranched, 50–110 × 5–9 µm, pluriseptate, pale to medium olivaceous or

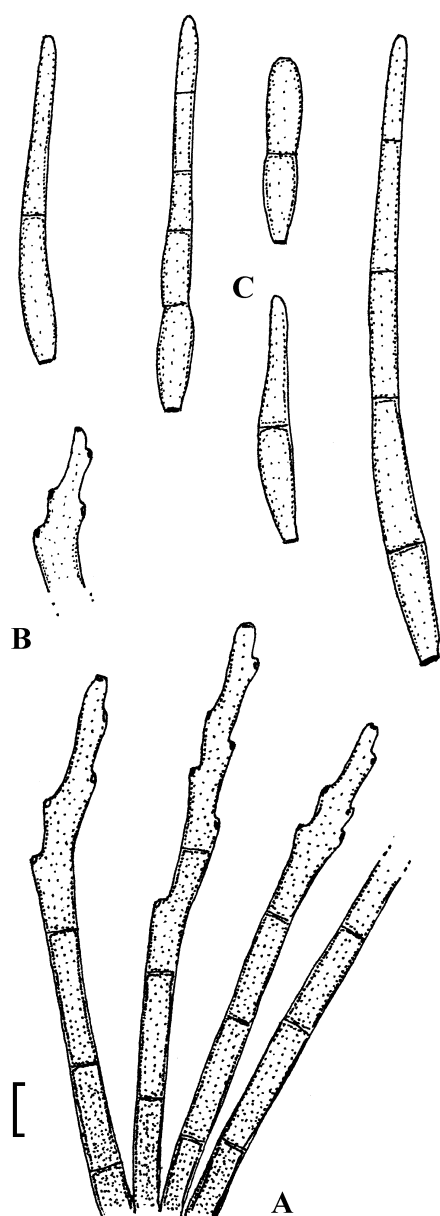


Fig. 33. *Passalora annonacearum* (K(M) IMI 247367, holotype). **A.** Conidiophore fascicle. **B.** Conidiophore tip. **C.** Conidia. Bar = 10 µm.

olivaceous brown, thin-walled, smooth; conidiogenous cells integrated, terminal, proliferation sympodial, with conspicuous conidiogenous loci, slightly thickened and darkened. *Conidia* solitary, cylindrical, subcylindrical to obclavate-cylindrical, straight to somewhat curved, 35–130 × 7–9 µm, 1–4-septate, subhyaline to pale olivaceous, thin-walled, smooth, apex subacute to obtuse, base obconically truncate, hila slightly thickened and darkened.

Holotype: **India**: *Uttar Pradesh*: West Baharaich Forest Division, Katarniaghat, on *Miliusa* sp., *Annonaceae*, Dec. 1979, A. N. Rai KR 399 (K(M) IMI 247367).

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

Passalora annonigena U. Braun & F. Freire, *Cryptog., Mycol.* 23: 297 (2003) [“2002”]. (Fig. 34)

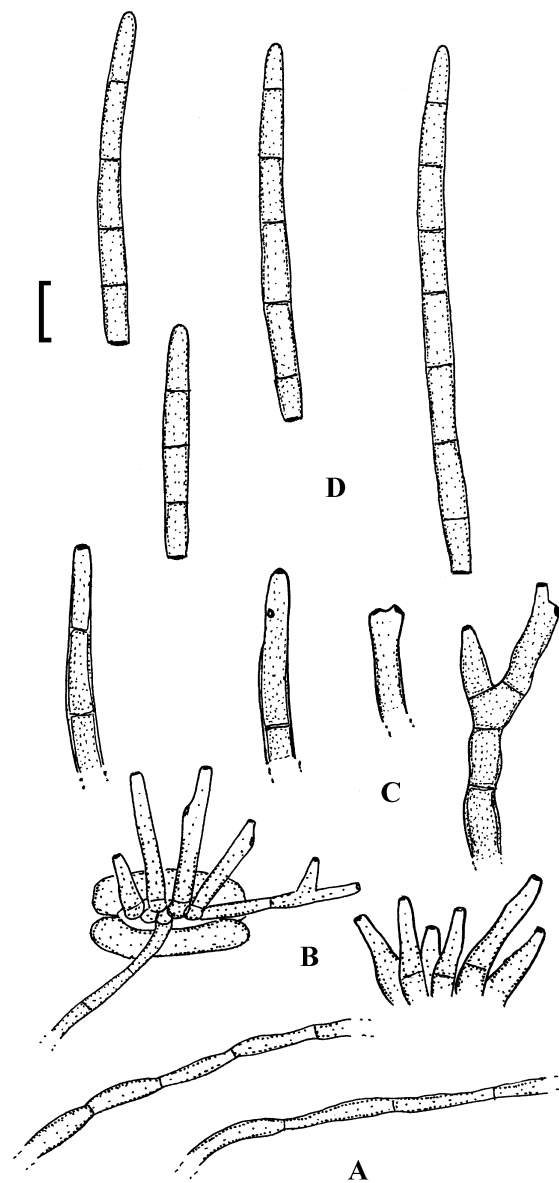


Fig. 34. *Passalora annonigena* (HAL 1701 F, holotype). **A.** Superficial hyphae. **B.** Conidiophore fascicles. **C.** Conidiophores. **D.** Conidia. Bar = 10 µm.

Literature: Crous & Braun (2003: 438), Braun & Crous (2008).

Illustrations: Braun & Freire (2003: 298, fig. 2).

Description: Leaf spots amphigenous, angular-irregular, 2–20 mm diam, dark brown to blackish, later dingy greyish brown, margin indefinite or with a narrow darker border or marginal line, sometimes with a pale yellowish to ochraceous halo. *Caespituli* hypophyllous, punctiform, blackish brown. *Mycelium* internal and external; superficial hyphae sparingly branched, septate, 1.5–4 μm wide, pale olivaceous, smooth or almost so. *Stromata* substomatal, 10–30 μm diam, brown. *Conidiophores* in small to moderately large fascicles, loose to moderately dense, arising from stromata, through stomata, occasionally arising from superficial hyphae, lateral and occasionally terminal, erect, straight, subcylindrical to slightly geniculate-sinuuous, unbranched or only rarely branched, 10–60 \times 3–5 μm , continuous to pluriseptate throughout, pale olivaceous to reddish brown, tips paler, thin-walled to somewhat thickened, smooth; conidiogenous cells integrated, terminal, 10–20 μm long, conidiogenous loci conspicuous, somewhat thickened and darkened, 1.5–2 μm diam. *Conidia* solitary, cylindrical to cylindrical-obclavate, more or less straight, 25–80 \times 3–6 μm , 3–8-septate, occasionally constricted at the septa, subhyaline, pale olivaceous to olivaceous brown, thin-walled, smooth, apex obtuse, base short obconically truncate, 1.5–2.5 μm diam, hila slightly thickened and darkened.

Holotype: **Brazil:** State of Ceará: Cascavel county, Preaoca district, on *Annona* sp., *Annonaceae*, 5 Sep. 1999, F. C. O. Freire (HAL 1701 F).

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

Passalora isolonae (G. Siboe *et al.*) U. Braun & Crous, *Mycosphaerella Anam.* 1: 457 (2003). (Fig. 35)

Basionym: *Phaeoramularia isolonae* G. Siboe *et al.*, *Sydowia* 52: 299 (2000).

Illustrations: Siboe *et al.* (2000: 300, fig. 6)

Description: Leaf spots more or less circular, poorly differentiated, dark brown to greyish. *Caespituli* amphigenous, effuse, greyish to olivaceous brown. *Stromata* poorly developed. *Hyphae* internal. *Conidiophores* in fascicles, loose to rather dense, erect, subcylindrical-filiform, geniculate-sinuuous, simple or branched, 100–200(–250) \times 2.5–4 μm , 2–5-septate, brown, thin-walled, smooth to faintly verruculose; conidiogenous cells integrated, terminal, 15–60 μm long, proliferation sympodial, conidiogenous loci conspicuous, thickened and darkened, about 1.5–2 μm wide. *Conidia* solitary and in short chains, cylindrical or subcylindrical, straight to somewhat curved, 30–70 \times 3–4 μm , 2–7-septate, subhyaline to pale brownish, thin-walled,

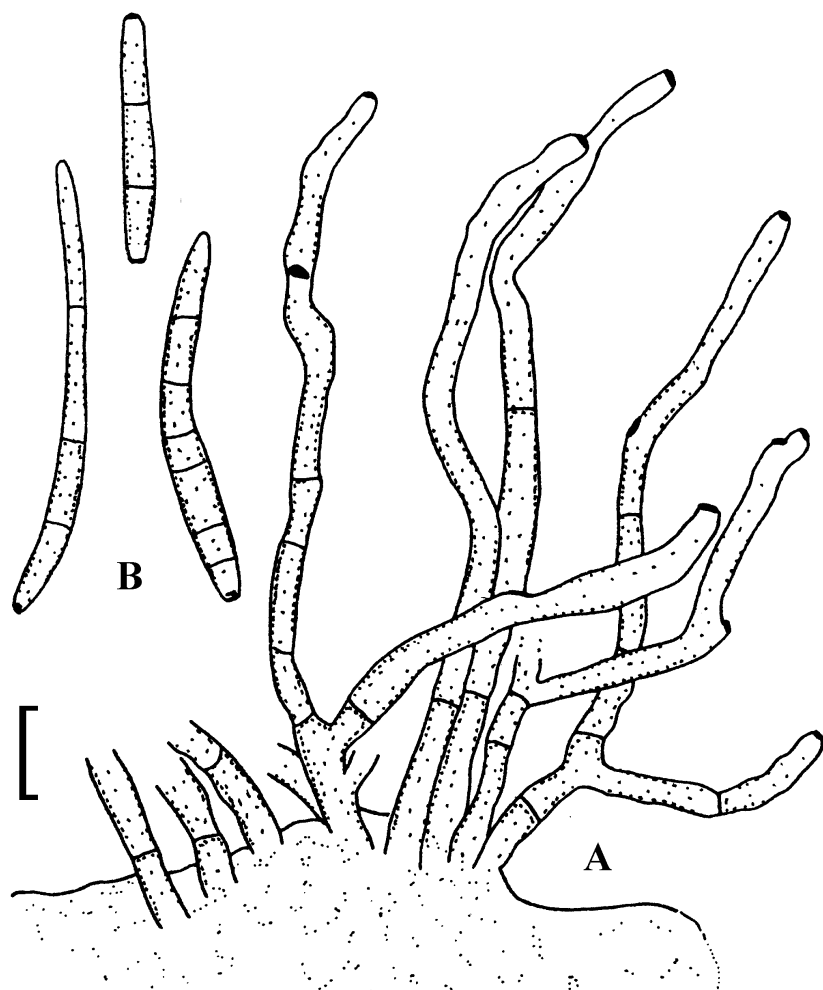


Fig. 35. *Passalora isolonae* (based on Siboe *et al.* 2000: 300, fig. 6). **A.** Loose conidiophore fascicle. **B.** Conidia. Bar = 10 μm .

smooth, apex obtuse to truncate in catenate conidia, base short obconically truncate, about 1.5–2 µm wide, hila slightly thickened and darkened.

Holotype: Kenya: Kwale, Shimba Hills National Park, Makadara Forest, on *Isolona cauliflora*, Annonaceae, 21 Sep. 1999, G. M. Siboe (NAI (M) 4384).

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

Passalora miliusae U. Braun & Crous, *Mycosphaerella Anam.* 1: 460 (2003).
(Fig. 36)

Basionym: *Mycovellosiella indica* P. Kumar & Kamal, *Curr. Sci.* 51: 846 (1982), non *Passalora indica* Kamal & P. Kumar 1981.

Literature: Kamal (2010: 129)

Illustrations: Kumar & Kamal (1982: 846, figs 1–2).

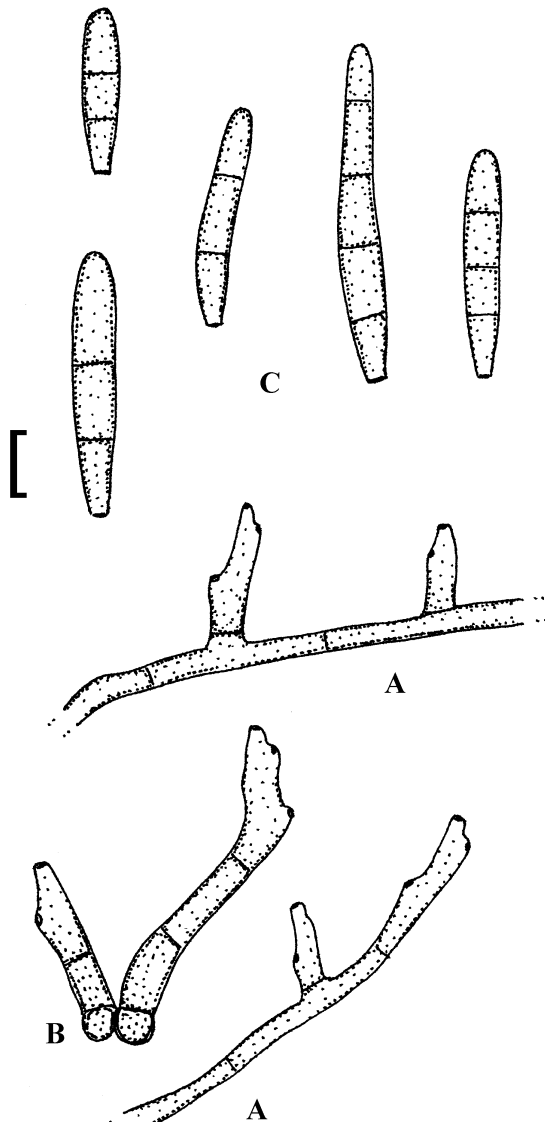


Fig. 36. *Passalora miliusae* (K(M) IMI 228205, holotype). **A.** Solitary conidiophores arising from superficial hyphae. **B.** Small conidiophore fascicle. **C.** Conidia. Bar = 10 µm.

Description: Leaf spots indistinct. Colonies hypophyllous, effuse. Mycelium internal and external; superficial hyphae emerging through stomata, branched, septate, to 3 µm wide, subhyaline, thin-walled, smooth. Stromata absent. Conidiophores solitary, arising from superficial hyphae, lateral and terminal, erect, straight, subcylindrical to distinctly geniculate-sinuous, simple or branched, about 10–25 µm long and 3–4 µm wide, 0–2-septate; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, sympodial, with conspicuous conidiogenous loci, thickened and darkened. Conidia solitary, cylindrical, subcylindrical to somewhat clavate, more or less straight, 15–50 µm long, about 5 µm wide, 2–4-septate, subhyaline, apex rounded, base obconically truncate, about 2 µm wide, hila somewhat thickened and darkened.

Holotype: India: Uttar Pradesh: Gorakhpur, on *Miliusa tomentosa*, Annonaceae, Feb. 1978, P. Kumar 262 (K(M) IMI 228205).

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

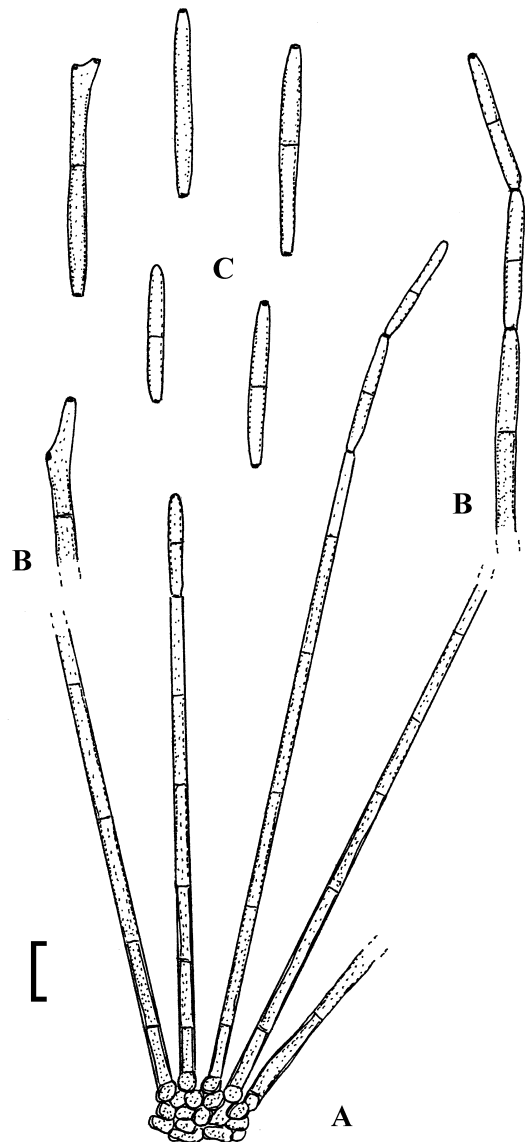


Fig. 37. *Passalora xylopiiae* (CUP 41581, lectotype). **A.** Conidiophore fascicle. **B.** Conidiophore tips. **C.** Conidia. Bar = 10 µm.

Passalora xylopieae (Viégas & Chupp) U. Braun & Crous, *Mycosphaerella Anam.* 1: 432 (2003). (Fig. 37)

Basionym: *Cercospora xylopieae* Viégas & Chupp, *Bol. Soc. Brasil. Agron.* 8: 58 (1945).

Literature: Chupp (1954: 46).

Description: Leaf spots amphigenous, subcircular to angular-irregular, 2–8 mm diam, sometimes oblong between veins, dark brown, later greyish brown, with a narrow darker border. *Caespituli* amphigenous, finely punctiform to subeffuse. *Mycelium* internal. *Stromata* small, about 10–30 µm diam, brown, substomatal to immersed. *Conidiophores* in loose fascicles, about 2–15, arising from stromata, through stomata or erumpent, erect, straight, subcylindrical-filiform, not or barely geniculate, unbranched, 30–150 × 2–5 µm, pluriseptate throughout, subhyaline to pale olivaceous or olivaceous brown below, paler towards the apex, tips hyaline or subhyaline, thin-walled, smooth; conidiogenous cells integrated, terminal, 10–25 µm long, conidiogenous loci conspicuous, (1–)1.5–2 µm wide, slightly thickened and darkened. *Conidia* in simple, occasionally branched chains,

cylindrical or subcylindrical, more or less straight, 20–50(–65) × 2–4.5 µm, 0–5-septate, hyaline or subhyaline, thin-walled, smooth, apex obtuse to truncate, base truncate to short obconically truncate, 1.5–2 µm wide, hila slightly thickened and darkened.

Lectotype (**designated here**, MycoBank MBT204896): **Brazil:** São Paulo, Ribeirão Preto, Experiment Station, on *Xylopia aromatica*, 30 May 1935, A. S. Costa & H. P. Krug 690 (CUP 41581). *Isolectotype:* IACM 690.

Host range and distribution: On *Annona* (*dioica*, *muricata*), *Xylopia aromatica* [*grandiflora*], *Annonaceae*, South America (Brazil, Dominican Republic).

Notes: The conidiophores are filiform with mostly unilocular conidiogenous cells and conspicuous conidiogenous loci. The conidia are catenate, occasionally in branched chains, i.e. this species is morphologically phaeoramularioid. Detached conidiophores or conidiophore fragments might be confused with longer conidia. The record from the Dominican Republic on *Annona muricata* refers to a collection deposited as BPI 442561.

Key to *Pseudocercospora* species on *Annonaceae*

- 1 Conidiophores in synnematosous conidiomata; on *Annona squamosa* **P. annonarium**
Conidiophores solitary or fasciculate, at most in sporodochial conidiomata, but not synnematosous 2
- 2 (1) Superficial mycelium *in vivo* present; conidiophores solitary as well as fasciculate, sometimes even in sporodochial conidiomata 3
Superficial mycelium *in vivo* not developed, mycelium consistently internal 8
- 3 (2) Conidia very broad, 20–80 × 4–12 µm, with 1–9 transverse and occasionally 1(–2) oblique or longitudinal septa; on *Asimina* spp. **P. asiminae**
Conidia much narrower, to 7 µm, only with transverse septa 4
- 4 (3) Conidiophores consistently solitary, arising from superficial hyphae, distinct fascicles not formed, 12–70 × 3.5–5 µm; conidia narrowly obclavate-cylindrical, 40–156 × 2.5–3.5 µm, 3–13-septate; on *Polyalthia suberosa*, India **P. polyalthiae**
Conidiophores solitary as well as fasciculate 5
- 5 (4) Conidia very long and wide, 50–150 × 5–7 µm, densely pluriseptate (6–18), hila 2.5–3.5 µm wide; conidiophores usually fasciculate, occasionally solitary, arising from superficial hyphae; on *Annona* spp., Asia, Central and South America, West Indies **P. annonae**
Conidia narrower, 1.5–6(–7) µm wide, with to 10 septa, hila narrower, 1–2.5 µm 6
- 6 (5) Conidia 25–150 × 3–6(–7) µm, very pale, mostly subhyaline; on *Asimina* spp., North America **P. asiminae-pygmaeae**
Conidia narrower, 1.5–4 µm, subhyaline to pale brown; on *Annona* and *Rollinia* spp. 7
- 7 (6) Superficial mycelium with solitary conidiophores abundant, fascicles of conidiophores variable, small and loose to large and dense, occasionally in almost sporodochial conidiomata; apex of conidia obtuse in cylindrical conidia to subacute in obclavate conidia; on *Annona* spp. and *Rollinia mucosa*, Asia, West Indies, Central and South America **P. annonae-squamosae**
Mycelium internal and external, but conidiophores in dense fascicles, solitary conidiophores not formed; apex of conidia obtuse; on *Annona purpurea*, Brazil **P. xenoannonicola**
- 8 (2) Conidiophores in sporodochial conidiomata; conidiogenous cells monoblastic, percurrent, with distinct annellations; conidia rough-walled 9

- Conidiogenous cells monoblastic to usually polyblastic, sympodial, annellations lacking;
conidia smooth or almost so 10
- 9 (8) Conidiophores 30–50 µm long, verruculose; conidia 40–120 × 4.5–8 µm, obclavate-cylindrical;
on *Annona senegalensis*, South Africa **P. oblecta**
- Conidiophores 5–20(–30) µm long, smooth; conidia narrower, 20–220 × 3.5–5 µm,
cylindrical-verniform; on *Annona crassifolia*, Brazil **P. annonifolii**
- 10 (8) Conidia broad, 5–8 µm; conidiophores in small, more or less loose fascicles 11
- Conidia narrower, 2–6 µm; conidiophores usually numerous, in more or less dense,
often sporodochial fascicles or, if not sporodochial, conidia very narrow, only 2–3 µm wide 12
- 11 (10) Conidiophores fasciculate, 60–220 µm long; conidia obclavate, 50–110 µm long,
base obconically truncate; on *Annona senegalensis* and *Annona* sp., Africa, Asia **P. scitula**
- Conidiophores much shorter, to 100 µm long, fasciculate, occasionally solitary,
arising from superficial hyphae; conidia broadly acicular-obclavate,
base truncate to slightly obconically truncate; on *Annona* spp. and *Rollinia* spp. **P. annonae**
- 12 (10) Conidia subcylindrical-filiform to subacicular, 50–115 × 3.5–6 µm, hyaline to pale olivaceous;
on *Miliusa* sp., India **P. annonacea**
- Conidia obclavate-cylindrical, narrower, 2–3 µm wide, pale olivaceous to olivaceous brown 13
- 13 (12) Conidia (30–)50–80(–100) µm long; mycelium internal and external; on *Annona montana*, Brazil
..... **P. xenoannonicola**
- Conidia shorter, 20–65 µm; mycelium consistently internal 14
- 14 (13) Leaf spots to 1 mm diam, brown, later greyish with brown margin; stromata small, 10–25 µm diam;
conidiophores very pale olivaceous; conidia 3–7-septate; on *Xylopiya aethiopica*, Africa **P. aethiopicae**
- Leaf spots 1–21 mm diam; brown to blackish; stromata larger, 15–40 µm diam;
conidiophores light brown; conidia 0–4-septate; on *Miliusa tomentosa*, Asia (India) **P. miliusae-tomentosae**

Tabular key to *Pseudocercospora* species on Annonaceae according to host genera

Annona

- 1 Conidiophores in synnematosus conidiomata; on *Annona squamosa* **P. annonarum**
- Conidiophores solitary or fasciculate, at most in sporodochial conidiomata, but not synnematosus 2
- 2 (1) Superficial mycelium *in vivo* developed; conidiophores solitary as well as fasciculate,
sometimes even in sporodochial conidiomata 3
- Superficial mycelium *in vivo* not developed, mycelium consistently internal 5
- 3 (2) Conidia very long and wide, 50–150 × 5–7 µm, densely pluriseptate (6–18), hila 2.5–3.5 µm wide;
conidiophores usually fasciculate, occasionally solitary, arising from superficial hyphae;
on *Annona* spp., Asia, Central and South America, West Indies **P. annonae**
- Conidia narrower, 1.5–4 µm wide, with to 8 septa, hila narrower, 1–2 µm 4
- 4 (3) Superficial mycelium with solitary conidiophores abundant, fascicles of conidiophores variable,
small and loose to large and dense, occasionally in almost sporodochial conidiomata;
apex of conidia obtuse in cylindrical conidia to subacute in obclavate conidia; on *Annona* spp.
and *Rollinia mucosa*, Asia, West Indies, Central and South America **P. annonae-squamosae**
- Mycelium internal and external, but conidiophores in dense fascicles, solitary conidiophores not formed;
apex of conidia obtuse; on *Annona purpurea*, Brazil **P. xenoannonicola**
- 5 (2) Conidiophores in sporodochial conidiomata; conidiogenous cells monoblastic, percurrent,
with distinct annellations; conidia rough-walled 6
- Conidiogenous cells monoblastic to usually polyblastic, sympodial, annellations lacking;
conidia smooth or almost so 7
- 6 (5) Conidiophores 30–50 µm long, verruculose; conidia 40–120 × 4.5–8 µm, obclavate-cylindrical;
on *Annona senegalensis*, South Africa **P. oblecta**

- Conidiophores 5–20(–30) μm long, smooth; conidia narrower, 20–220 \times 3.5–5 μm , cylindrical-vermiform; on *Annona crassifolia*, Brazil **P. annonifolii**
- 7 (5) Conidia (30–)50–80(–100) \times 2–3 μm ; mycelium internal and external, but without solitary conidiophores; on *Annona montana*, Brazil **P. xenoannonicola**
Conidia much broader, 5–8 μm ; mycelium consistently internal 8
- 8 (7) Conidiophores fasciculate, very long, 60–220 μm ; conidia obclavate, 50–110 μm long, base obconically truncate; on *Annona senegalensis* and *Annona* sp., Africa, Asia **P. scitula**
Conidiophores much shorter, to 100 μm long, fasciculate, occasionally solitary, arising from superficial hyphae; conidia broadly acicular-obclavate, base truncate to slightly obconically truncate; on *Annona* spp. and *Rollinia* spp. **P. annonae**
- Asimina**
- 1 Conidia 25–150 \times 3–6(–7) μm , transversely septate **P. asiminae-pygmaeae**
Conidia very broad, 20–80 \times 4–12 μm , with 1–9 transverse and occasionally 1(–2) oblique or longitudinal septa **P. asiminae**
- Miliusa**
- 1 Stromata 30–75 μm diam; conidiophores pale olivaceous; conidia subcylindrical-filliform or only slightly obclavate-cylindrical, 50–115 \times 3.5–6 μm , 4–17-septate, hyaline to pale olivaceous **P. annonacea**
Stromata smaller, 15–40 μm diam; conidiophores light brown; conidia much shorter and narrower, 20–60 \times 2–3 μm , 0–4-septate, pale brown **P. miliusae-tomentosae**
- Polyanthia**
- A single species **P. polyalthiae**
- Rollinia**
- 1 Conidia 50–150 \times 5–7 μm , 6–18-septate **P. annonae**
Conidia (15–)20–75(–80) \times (1.5–)2–4(–5) μm , (1–)2–6(–8)-septate **P. annonae-squamosae**
- Xylopi**
- A single species **P. aethiopicae**

***Pseudocercospora* species on Annonaceae**

Pseudocercospora aethiopicae Deighton, *Mycol. Pap.* **140**: 13 (1976).
(Fig. 38)

Literature: Braun & Crous (2008).

Illustration: Deighton (1976: 14, fig. 3).

Description: Leaf spots at first brown, more or less angular, to 1 mm diam, later greyish with a brown margin, irregularly angular, to 5 mm diam, often confluent. *Caespituli* mostly hypophyllous, minutely punctiform, pale olivaceous. *Mycelium* internal; hyphae branched, septate, almost colourless, 1–2 μm wide. *Stromata* substomatal, about 25 μm diam and 10 μm high, olivaceous brown. *Conidiophores* in small to moderately large fascicles, mostly relatively dense, straight, subcylindrical to somewhat geniculate-sinuous, unbranched, 10–40 \times 2.5–4 μm , 0–2-septate, very pale olivaceous, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 10–25 μm long, conidiogenous loci inconspicuous or subdenticulate, 1–1.5 μm diam, but always unthickened and not darkened.

Conidia solitary, obclavate-cylindrical, straight to curved, occasionally sigmoid, 30–65 \times 2.5–3 μm , 3–7-septate, very pale olivaceous, thin-walled, smooth, apex obtuse, base short obconically truncate, 1–2 μm wide, hila unthickened and not darkened.

Holotype: **Sierra Leone**: Njala (Kori), on *Xylopi aethiopicae*, 28 Jan. 1934, F. C. Deighton (K(M) IMI 7717).

Host range and distribution: On *Xylopi aethiopicae*, *Annonaceae*, Africa (Sierra Leone).

Pseudocercospora annonacea (Kamal *et al.*) U. Braun, *Nova Hedwigia* **58**: 209 (1994).

(Fig. 39)

Basionym: *Cercoseptoria annonacea* Kamal *et al.*, *Indian Phytopathol.* **39**: 455 “1986” (1987); as “*anonacea*”.

Synonyms: *Pseudocercospora miliusae* M.D. Mehrotra & R.K. Verma, *Mycol. Res.* **95**: 1168 (1991) [*holotype*: **India**: *Uttarakhand*: Dehra Dun, Lacchiwala, on *Miliusa velutina*, without date, M. D. Mehrotra (FRIDD-36)].

Literature: Braun & Crous (2008: 218), Kamal (2010: 149).

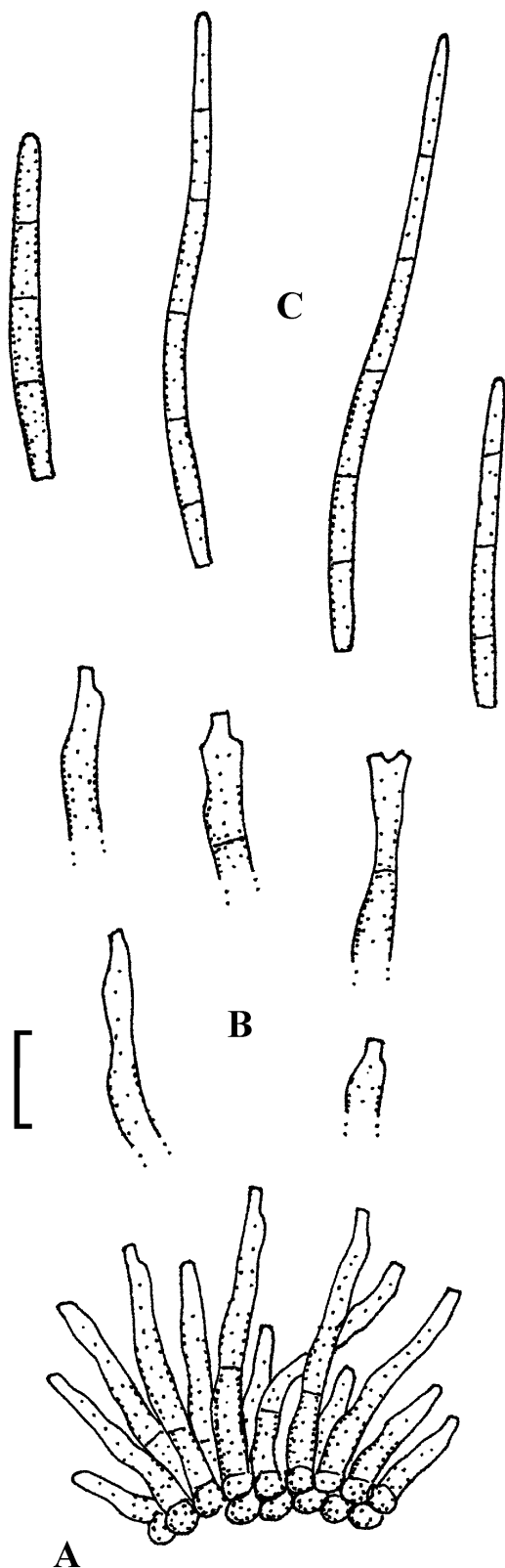


Fig. 38. *Pseudocercospora aethiopicae* (K(M) IMI 7717, holotype).
A. Conidiophore fascicle. B. Conidiophores. C. Conidia. Bar = 10 μ m.

Illustrations: Kamal et al. (1987: 455, fig. 2), Mehrotra & Verma (1991: 1168, fig. 27).

Description: Leaf spots amphigenous, subcircular to angular-irregular, 3–10 mm diam, sometimes confluent

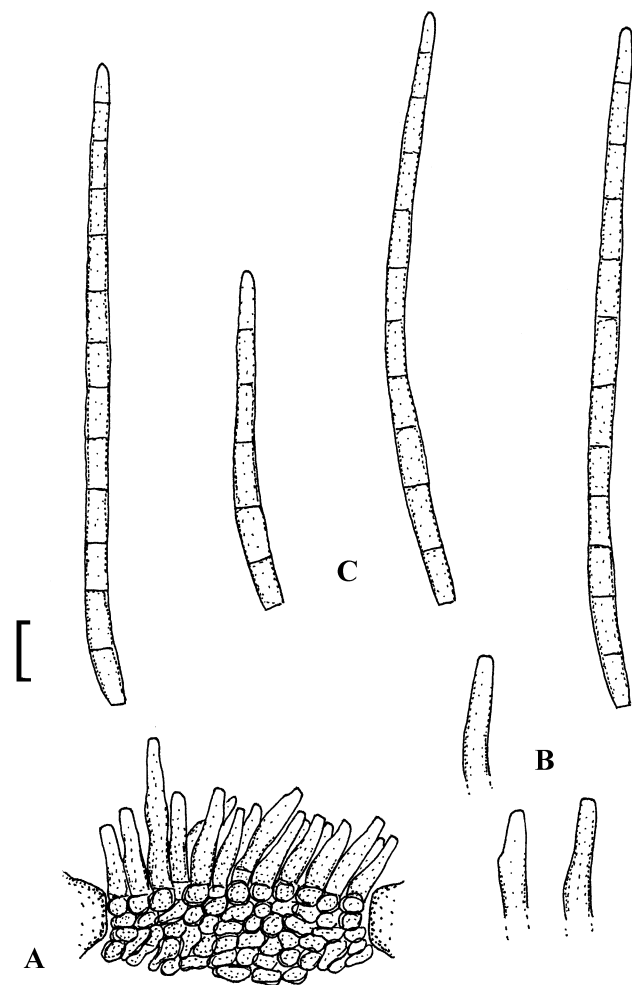


Fig. 39. *Pseudocercospora annonacea* (K(M) IMI 283994, isotype).
A. Conidiophore fascicle. B. Conidiophores. C. Conidia. Bar = 10 μ m.

and larger, greyish to dark brown, margin yellowish brown. *Caespituli* amphigenous, punctiform, scattered, floccose, dark brown. *Mycelium* internal. *Stromata* large, 30–75 μ m diam and 10–15 μ m high, substomatal to immersed, olivaceous brown. *Conidiophores* numerous, in large, dense, sporodochial fascicles, arising from stromata, through stomata or erumpent, erect, straight, subcylindrical or somewhat attenuated towards the tip, slightly geniculate-sinuuous, unbranched, 10–50 \times 2.5–4.5 μ m, 0–2-septate, pale olivaceous, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores mostly reduced to conidiogenous cells, 10–30 μ m long, conidiogenous loci inconspicuous. *Conidia* solitary, subcylindrical-ellipsoid to slightly obclavate-cylindrical, straight to curved, 50–115 \times 3.5–6 μ m, 4–17-septate, hyaline to pale olivaceous, thin-walled, smooth, apex obtuse, base short obconically truncate, hila unthickened, not darkened.

Holotype: India: Uttar Pradesh: North Gonda Forest Division, on *Miliusa velutina*, Jan. 1984, P. Narayana (GPU 94).
Isotype: K(M) IMI 283994.

Host range and distribution: On *Miliusa velutina*, *Annonaceae*, Asia (India, Uttarakhand, Uttar Pradesh).

Pseudocercospora annonae U. Braun & Crous,
Feddes Repert. **113**: 117 (2002).

(Fig. 40)

Synonym: *Cercospora annonae* A.S. Mull. & Chupp, *Arq. Inst. Biol. Veg., Rio de Janeiro* **1**: 214 (1935); as "*annonae*", *nom. inval.* (Art. 39.1) [*holotype:* **Brazil:** Minas Gerais: Viçosa-Escola, on *Annona squamosa*, 7 Apr. 1932, A. S. Muller 335 (CUP-MG-000335)].

Literature: Chupp (1945: 45), Vasudeva (1963: 39), Crous & Braun (2003: 59), Braun & Crous (2008: 218), Kamal (2010: 149).

Illustrations: Braun *et al.* (2002: 115, fig. 5).

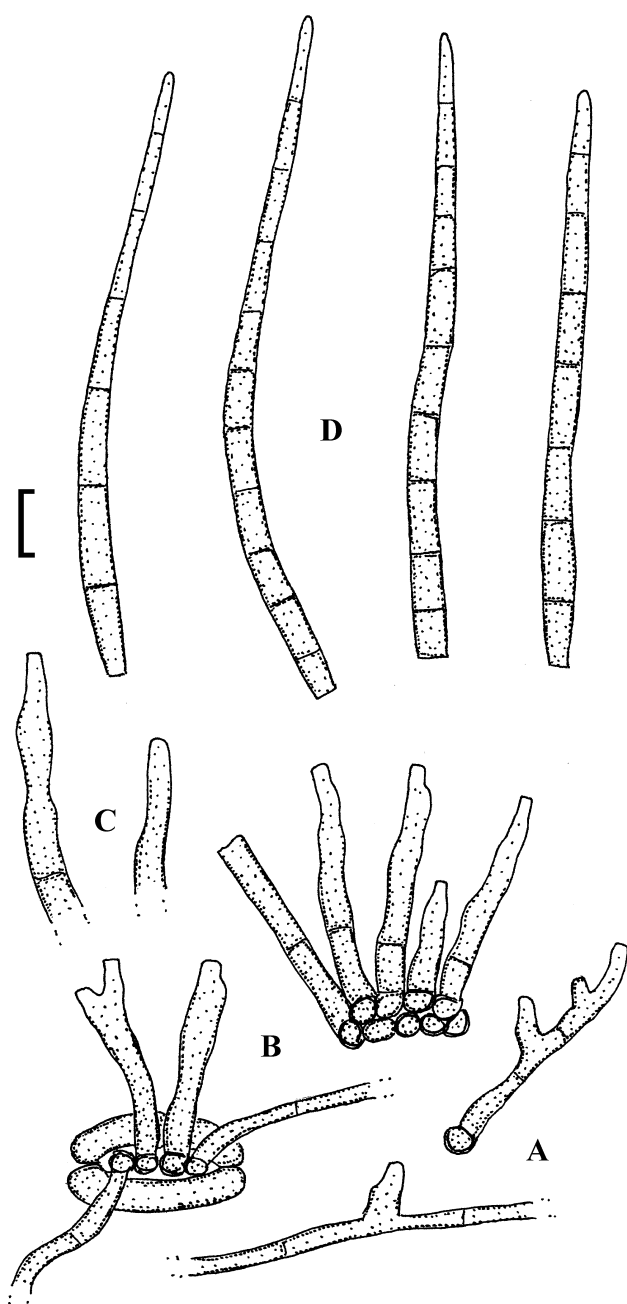


Fig. 40. *Pseudocercospora annonae* (CUP-MG-000335, holotype). **A.** Solitary conidiophores arising from superficial hyphae. **B.** Conidiophore fascicle. **C.** Conidiophore tips. **D.** Conidia. Bar = 10 μ m.

Description: Leaf spots amphigenous, angular-irregular, 0.5–5 mm diam, often vein-limited, blackish, margin indefinite. *Caespituli* amphigenous, punctiform to subeffuse, brown. *Mycelium* internal and external; superficial hyphae lacking to well-developed, emerging through stomata, sparingly branched, septate, 1.5–4 μ m wide, subhyaline to pale olivaceous, thin-walled, smooth. *Stromata* lacking or small, composed of a few swollen hyphal cells, substomatal, brown. *Conidiophores* in small to moderately large fascicles, loose to dense, arising from internal hyphae or stromatic hyphal aggregations or arising from superficial hyphae, lateral and occasionally terminal, erect, straight, subcylindrical, flexuous, simple or rarely branched, barely geniculate-sinuuous, 10–110 \times 3–5 μ m, 0–2-septate, pale olivaceous, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 10–30 μ m long, conidiogenous loci inconspicuous. *Conidia* solitary, obclavate-cylindrical, broadly subacicular, 50–150 \times 5–7 μ m, densely pluriseptate, usually 6–18-septate, distance between septa 4–15 μ m, subhyaline to medium olivaceous, thin-walled, smooth, apex subobtuse to subacute, base truncate to somewhat obconically truncate, 2.5–3.5 μ m wide, hila unthickened, not darkened.

Holotype: **Brazil:** Minas Gerais: Viçosa-Escola, on *Annona squamosa*, 7 Apr. 1932, A. S. Muller 335 (CUP-MG-000335).

Host range and distribution: On *Annona* (*cherimolia*, *muricata*, *reticulata*, *squamosa*, *Annona* sp.), *Rollinia sylvatica*, *Annonaceae*, Asia (India, Andhra Pradesh; Philippines), Central and South America (Brazil, Guatemala, Panama, Venezuela), West Indies (Cuba).

Notes: This species is common on *Annona* spp. The single record on *Rollinia sylvatica* refers to a collection deposited as CUP-MG-000779 (Brazil, Minas Gerais, Viçosa-Escola, 29 Apr. 1934, A.S. Muller 779).

Pseudocercospora annonae-squamosae U. Braun & R.F. Castañeda, *Cryptog. Bot.* **1**: 50 (1989).

(Fig. 41)

Synonyms: *Cercospora caracasensis* Chupp & A.S. Mull., *Bol. Soc. Venez. Ci. Nat.* **8**: 39 (1942), *nom. inval.* (Art. 39.1) [*holotype:* **Venezuela:** Caracas, on *Annona purpurea*, 1 Mar. 1938, A. S. Muller (CUP-VZ 2111); *isotype:* VIA 2111].

Pseudocercospora annonicola Goh & W.H. Hsieh, *Cercospora and similar fungi from Taiwan*: 22 (1999) [*holotype:* **Taiwan:** Taitung, on *Annona squamosa*, 24 Mar. 1987, T. K. Goh (NCHUPP-152d)].

Literature: Chupp (1954: 45), Vasudeva (1963: 67), Guo & Hsieh (1995: 16), Guo *et al.* (1998: 27–28), Nakashima *et al.* (2002: 96), Crous & Braun (2003: 59), Braun & Freire (2004: 226), Braun & Crous (2008: 218–220), Kamal (2010: 149).

Illustrations: Castañeda Ruiz & Braun (1989: 48, plate 19, fig. 4), Hsieh & Goh (1990: 22, fig. 10), Guo & Hsieh (1995: 16), fig. 15), Guo *et al.* (1998: 28, fig. 16), Nakashima *et al.* (2002: 98, fig. 3), Braun & Crous (2008: 219, fig. 4).

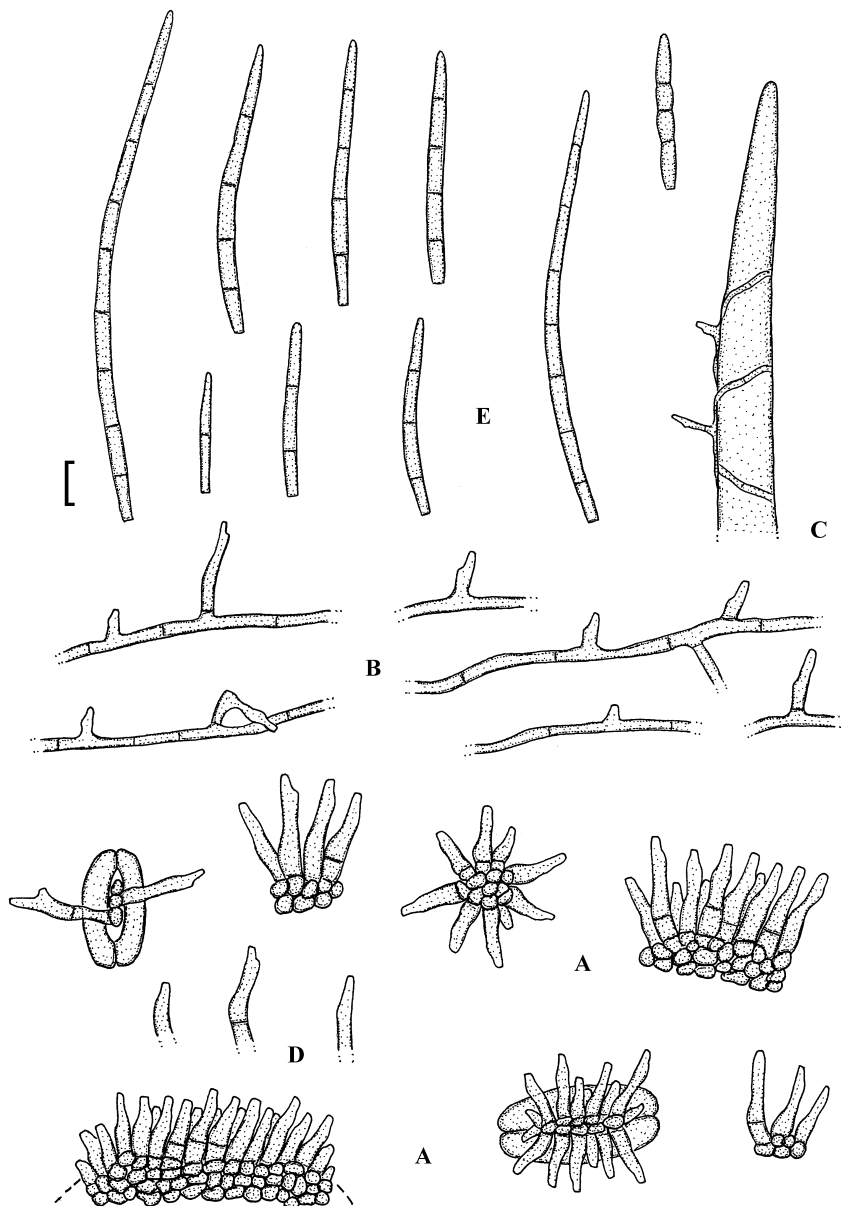


Fig. 41. *Pseudocercospora annonae-squamosae* (HAL 1650 F, holotype). **A.** Conidiophore fascicles. **B.** Solitary conidiophores arising from superficial hyphae. **C.** Superficial hyphae climbing a leaf hair. **D.** Conidiophores. **E.** Conidia. Bar = 10 μ m.

Exsiccatae: U. Braun, Fungi Sel. Exs. 9.

Description: Leaf spots amphigenous, subcircular to angular-irregular, 1–30 mm diam, occasionally confluent, reddish brown, medium to dark brown or sometimes even blackish brown, later often greyish brown to dingy grey, finally greyish white, often vein-limited, margin indefinite or with darker narrow margin or marginal line, brown. *Caespituli* amphigenous, on the upper side conspicuous, punctiform, scattered, dark brown to blackish, but soon turning greyish by abundant conidial formation, on the lower leaf surface slightly effuse and less conspicuous, dingy greyish olivaceous to olivaceous brown. *Mycelium* internal and external, superficial hyphae variable, ranging from almost lacking to well-developed, usually hypophyllous, emerging through stomata, occasionally climbing leaf hairs, branched, septate, 1–3.5 μ m wide, pale olivaceous to olivaceous brown, thin-walled, smooth. *Stromata* almost absent to well-developed, above all on the upper side, 10–80 μ m diam, substomatal to intraepidermal, olivaceous brown.

Conidiophores in small, loose to large, dense fascicles, often almost sporodochial on the upper side, arising from internal hyphae or from stromata and solitary, arising from superficial hyphae (if present, and mainly on the lower side), lateral, rarely terminal, erect, straight, subcylindrical, conical to distinctly geniculate-sinuuous, usually unbranched, 5–30(–45) \times 2–4(–5) μ m, 0–1(–2)-septate, subhyaline to pale olivaceous or olivaceous brown, medium olivaceous brown in mass, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 5–20 μ m long, conidiogenous loci inconspicuous to subconspicuous by being truncate or subdenticulate, but always unthickened and not darkened. *Conidia* solitary, obclavate-cylindrical, (15–)20–75(–80) \times (1.5–)2–4(–5) μ m, (1–)2–6(–8)-septate, occasionally slightly constricted at a few septa, subhyaline to pale olivaceous, thin-walled, smooth, apex obtuse in cylindrical conidia to subacute in above all obclavate conidia, base short obconically truncate, 1–2 μ m wide, hila unthickened, not darkened.

Holotype: Cuba: Santiago de las Vegas, on *Annona squamosa*, 29 Dec. 1987, R. F. Castañeda Ruiz (HAL 1650 F). **Isotype:** INIFAT, C87/376.

Host range and distribution: On *Annona* (**atemoya* [*cherimola* × *squamosa*], *muricata*, *purpurea*, *reticulata*, *squamosa*, *Annona* sp.), *Rollinia mucosa*, *Annonaceae*, Asia (India, Karnataka; Japan, Taiwan), Central and South America (Brazil, Panama, Venezuela), West Indies (Cuba).

Note: Records of the present species on *Asimina pygmaea* [*Annona pygmaea*] probably refer to *Pseudocercospora asiminae-pygmaeae*.

Pseudocercospora annonarum (Petr. & Cif.) U. Braun & Crous, *Mycotaxon* **105**: 212 (2008). (Fig. 42)

Basionym: *Isariopsis annonarum* Petr. & Cif., *Ann. Mycol.* **30**: 345 (1932); as "*anonarum*".

Synonyms: *Phaeoisariopsis annonarum* (Petr. & Cif.) U. Braun, *Nova Hedwigia* **50**: 511 (1990).

Passalora annonarum (Petr. & Cif.) U. Braun & Crous, *Mycosphaerella and Anam.* **1**: 438 (2003).

Illustrations: Braun (1990: 510, fig. 4e), Braun & Crous (2008: 213, fig. 3).

Description: Leaf spots amphigenous, subcircular to angular-irregular, 1–10 mm diam, occasionally confluent and larger, pale to dark brown, later greyish brown to dingy grey, on the lower leaf surface usually much paler, margin conspicuous, dark brown to blackish, narrow. *Conidiomata* synnematos, hypophyllous, scattered, rather inconspicuous to punctiform, brown to dark brown. *Mycelium* internal. *Stromata* immersed, 20–60 µm diam, brown. *Synnemata* 80–250 × 20–50 µm, brown, composed of a mostly firm subcylindrical stipe of numerous densely appressed parallel conidiophores and a more or less loose apical capitulum, stipe often somewhat wider at the very base, occasionally with conidiophores in dense fascicles, i.e. not distinctly synnematos, individual conidiophores 40–120 × 2–5 µm, terminal cells (conidiogenous cells) to 7 µm wide, olivaceous to medium brown, pluriseptate throughout, thin-walled, smooth; conidiogenous cells integrated, terminal, rarely intercalary or pleurogenous, 10–25(–30) µm long, conidiogenous loci inconspicuous to subconspicuous by being subdentate or by having an unthickened, but slightly darkened-refractive rim (paracercosporoid), visible in front view as minute circle, 1–2 µm diam. *Conidia* solitary, obclavate-cylindrical, occasionally subclavate, short conidia sometimes ellipsoid-ovoid, straight to curved, (1.5–)2.5–7.0(–8.0) × (3.5–)4–8(–9) µm, (0–)1–7(–10)-septate, occasionally constricted at the septa, pale to medium olivaceous or olivaceous brown, thin-walled (ca. 0.5 µm), smooth, apex obtuse, base obconically truncate to somewhat convex, (1.5–)2–2.5(–3) µm wide, hila unthickened, not darkened, at most somewhat refractive.

Lectotype (designated here, MycoBank, MBT204897): **Dominican Republic:** Santiago Province: Valle del Ciboa, on *Annona squamosa*, 22 Dec. 1930, E. L. Ekman (W Krypt.

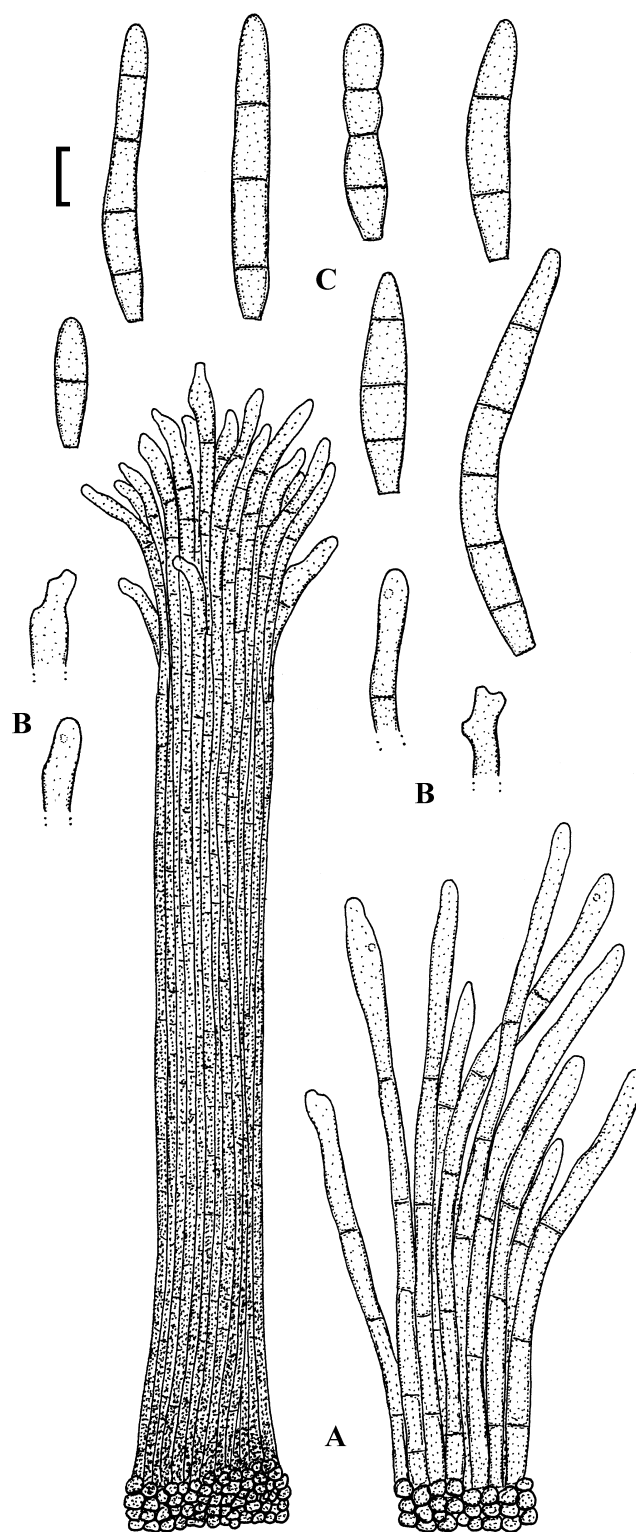


Fig. 42. *Pseudocercospora annonarum* W Krypt. 1973-0010913, lectotype). **A.** Synnemata. **B.** Conidiophore tips. **C.** Conidia. Bar = 10 µm.

1973-0010913). **Isolectotype:** S-F40467. **Topotypes** (1 Dec. 1930): NY 936880, 936881.

Host range and distribution: On *Annona* (*cherimola*, *squamosa*), *Annonaceae*, South America (Bolivia, Venezuela), West Indies (Dominican Republic).

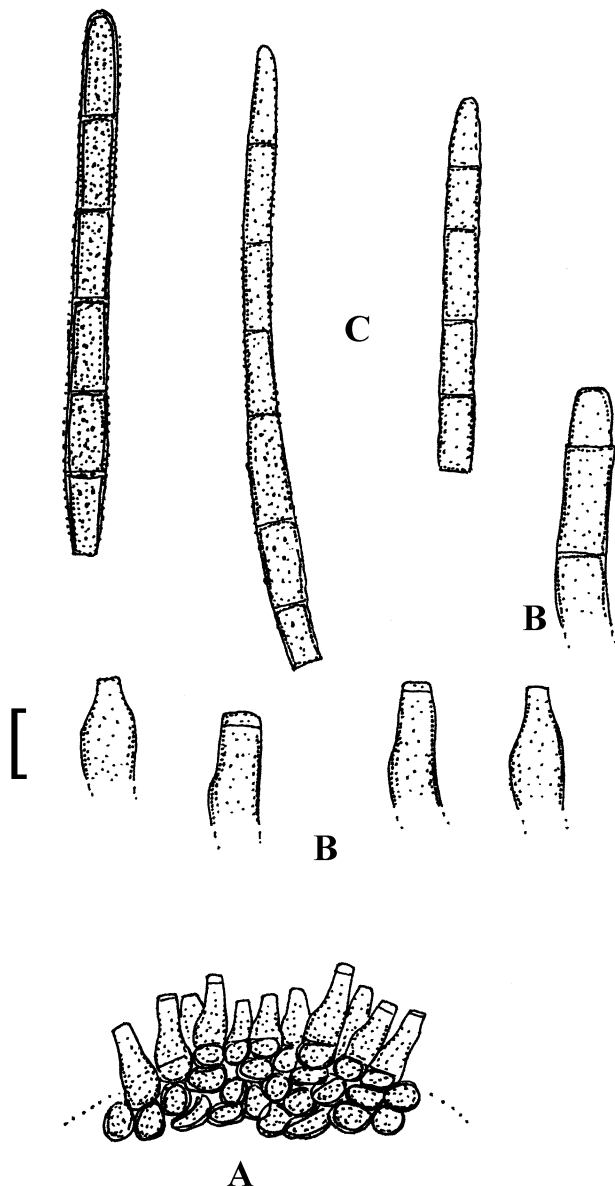


Fig. 43. *Pseudocercospora annonifolii* (IMUR 21780, holotype). **A.** Sporodochial conidiophore fascicle. **B.** Conidiophores. **C.** Conidia. Bar = 10 μ m.

Pseudocercospora annonifolii (Bat. & Peres) U. Braun & F. Freire, *Bibl. Lichenol.* **86**: 82 (2003).

(Fig. 43)

Basionym: *Cercospora annonifolii* Bat. & Peres, *Brotéria*, Ser. Ci. Nat., **31**: 372 (1962) [also in *Anais do XIII Congresso da Sociedade Botânica do Brasil* (Janeiro – 1962): 374 (1964)].

Literature: Crous & Braun (2003: 59), Braun & Crous (2008: 221).

Illustrations: Batista & Peres (1964: 375, fig. 96), Braun (2003: 93, fig. 4).

Description: Leaf spots amphigenous, subcircular, 2.5–5.5 mm diam, brown, surrounded by a narrow blackish brown marginal line. *Caespituli* (conidiomata) punctiform to

almost pustulate, dark brown, scattered. *Mycelium* internal. *Stromata* immersed, sometimes erumpent, oblong in outline, 55–90 μ m diam, brown. *Conidiophores* very numerous, in dense fascicles, arising from stromata, forming sporodochial conidiomata, erect, straight, subcylindrical-conical, ampulliform, 5–20(–30) \times 3–8 μ m, aseptate, olivaceous brown, thin-walled, smooth; conidiophores reduced to conidiogenous cells, unilocal, determinate or percurrently proliferating with 1(–2) fine annellations, conidiogenous loci 2–3.5 μ m wide, unthickened, not darkened. *Conidia* solitary, cylindrical-ovoid (-obclavate), 20–240 \times 3.5–5 μ m, pluriseptate (with to 30 septa), olivaceous, thin-walled, verruculose, apex obtuse, rounded, base rounded to truncate, 2–3 μ m wide, hila unthickened, not darkened.

Holotype: **Brazil:** Minas Gerais: Paraopeba, on *Annona crassifolia*, *Annonaceae*, 15 Aug. 1960, E. P. Heringer (IMUR 21780).

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

Notes: This species belongs morphologically to a group of *Pseudocercospora* spp. previously assigned to *Cercostigmia*. Species of this group are characterised by having sporodochial conidiomata and consistently unilocal, percurrent conidiogenous cells.

Pseudocercospora asiminae (Ellis & Morgan) U. Braun & Crous, *Mycotaxon* **105**: 221 (2008).

(Fig. 44).

Basionym: *Phloeospora asiminae* Ellis & Morgan, *J. Mycol.* **3**: 88 (1887).

Synonyms: *Rhopaloconidium asiminae* (Ellis & Morgan) Petr., *Sydowia* **6**: 301 (1952).

Cercospora asiminae Ellis & Kellerm., *J. Mycol.* **3**: 103 (1887) [holotype: **USA:** Kansas: Mound City, on *Asimina triloba*, Jul. 1887, W. A. Kellerman (NY 985441)].

Centrospora asiminae (Ellis & Kellerm.) Deighton, *Mycol. Pap.* **124**: 5 (1971).

Mycocentrospora asiminae (Ellis & Kellerm.) Deighton, *Taxon* **21**: 716 (1972).

Miuraea asiminae (Ellis & Morgan) Arx & O. Constant., *Proc. Kon. Ned. Akad. Wetensch.*, C **86**: 39 (1983).

Literature: Saccardo (1892: 638), Chupp (1954: 45), Deighton (1971: 5), Braun (1995: 223), Crous & Braun (2003: 68).

Illustration: Braun (1995: 222, fig. 211a).

Exsiccatae: Barthol., *Fungi Columb.* 3244. Seym. & Earle, *Econ. Fungi* 102.

Description: Leaf spots amphigenous, angular-irregular, often vein-limited, 1–5 mm diam, at first pale brown, later often dull purplish violet to reddish brown or dark brown, margin indefinite, spots later sometimes confluent and larger. *Caespituli* hypophyllous, punctiform to subeffuse, whitish, loose to fairly dense, sometimes coalescent. *Mycelium* internal and external; internal hyphae branched, 1–4 μ m wide, colourless, septate,

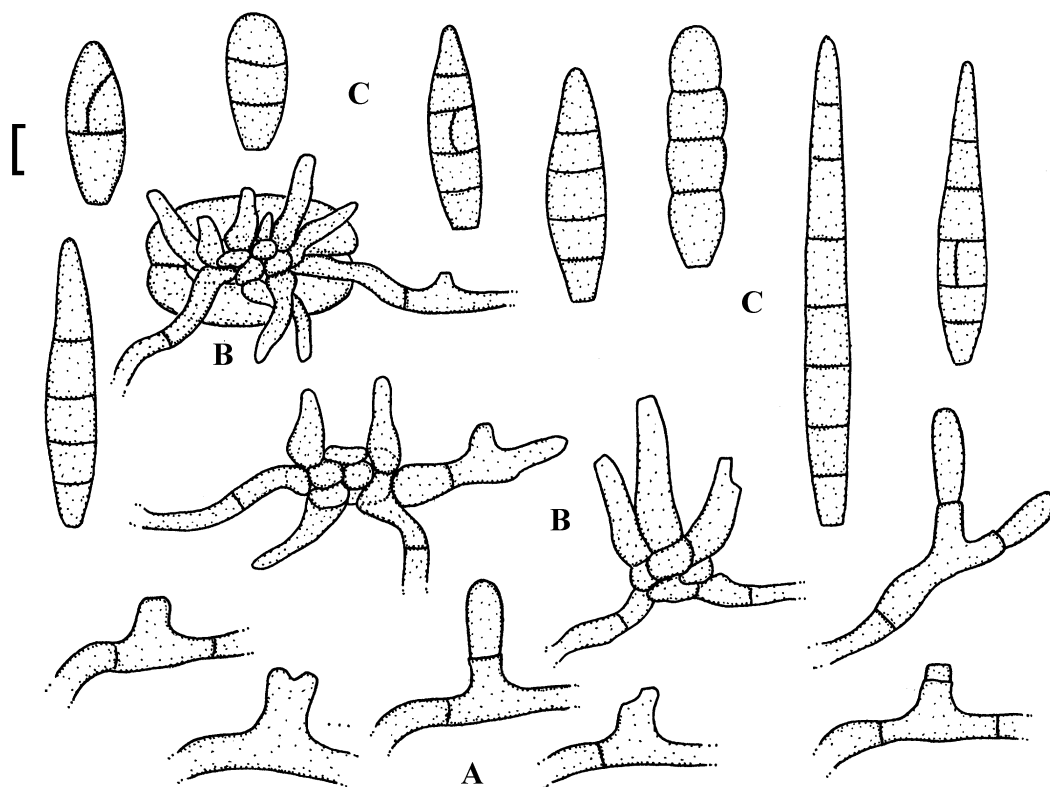


Fig. 44. *Pseudocercospora asiminae* (NY 1097272, holotype). **A.** Solitary conidiophores arising from superficial hyphae. **B.** Conidiophore fascicles. **C.** Conidia. Bar = 10 μ m.

sometimes forming loose stromatic hyphal aggregations, to 50 μ m diam, substomatal to erumpent, almost superficial, hyaline to faintly pigmented; superficial hyphae arising from internal hyphae or substomatal to superficial hyphal aggregations, branched, septate, 2–5 μ m wide, thin-walled, smooth, hyaline, subhyaline to pale yellowish, brownish or olivaceous. *Conidiophores* in small, loose fascicles, arising from substomatal to erumpent stromatic hyphal aggregations or solitary, arising from superficial hyphae, lateral, occasionally terminal, erect, straight, subcylindrical to slightly geniculate-sinuous, solitary conidiophores short, 6–20 \times 4–10 μ m, fasciculate conidiophores often somewhat longer, to 35 μ m, aseptate, rarely with a single septum, hyaline to faintly pigmented, pale yellowish green, olivaceous or even brownish, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores usually reduced to conidiogenous cells, monoblastic, determinate to polyblastic, usually percurrently proliferating, occasionally sympodial, conidiogenous loci more or less truncate, unthickened, not darkened. *Conidia* solitary, straight to curved, shape variable, ellipsoid-ovoid, fusiform, obclavate, 20–80 \times 4–12 μ m, with 1–9 transverse septa and occasionally 1(–2) longitudinal or oblique septa, sometimes constricted at the septa, hyaline to faintly pigmented, pale yellowish, greenish, thin-walled, smooth, apex obtuse, base rounded to truncate, with broad hilum, unthickened, not darkened.

Holotype: USA: Ohio: Preston, on *Asimina triloba*, without date, A. P. Morgan 463 (NY 1097272).

Host range and distribution: On ?*Annona squamosa*, *Asimina (parviflora, obovata, triloba, Asimina sp.)*, *Annonaceae*, North America (USA, Alabama, Florida, Illinois, Indiana, Iowa,

Kansas, Maryland, Mississippi, Missouri, Ohio, Texas, West Virginia), ?Oceania (Niue).

Note: The record of this species on *Annona squamosa* from Niue (Dingley *et al.* 1981) is doubtful and needs verification.

Pseudocercospora asiminae-pygmaeae U. Braun, *Monogr. Cercosporiella, Ramularia Allied Genera (Phytopath. Hyphom.)* 1: 223 (1995).

(Fig. 45).

Illustration: Braun (1995: 222, fig. 211b).

Description: *Leaf spots* at first fairly inconspicuous, angular, vein-limited, 1–4 mm diam, dull greyish green, later dull brown, greyish to dark brown, subcircular to angular-irregular, to 8 mm diam. *Caespituli* hypophyllous, greyish white, sometimes darker, punctiform to subeffuse. *Mycelium* internal and external; internal hyphae branched, septate, thin-walled, smooth, forming small substomatal stromatic hyphal aggregations, yellowish brown, often erumpent; superficial hyphae sparingly to well-developed, arising from substomatal hyphal aggregations or through stomata, branched, septate, 2–5 μ m wide, subhyaline to pale olivaceous, thin-walled, smooth. *Conidiophores* in small, loose fascicles, about 2–8, arising from internal hyphae or stromatic hyphal aggregations, through stomata or erumpent, or solitary, arising from superficial hyphae, erect, straight, subcylindrical or somewhat attenuated towards the tip to moderately geniculate-sinuous, unbranched, 10–40 \times 3–6 μ m, mostly aseptate, occasionally 1-septate, subhyaline to pale yellowish brown or olivaceous, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 10–30 μ m

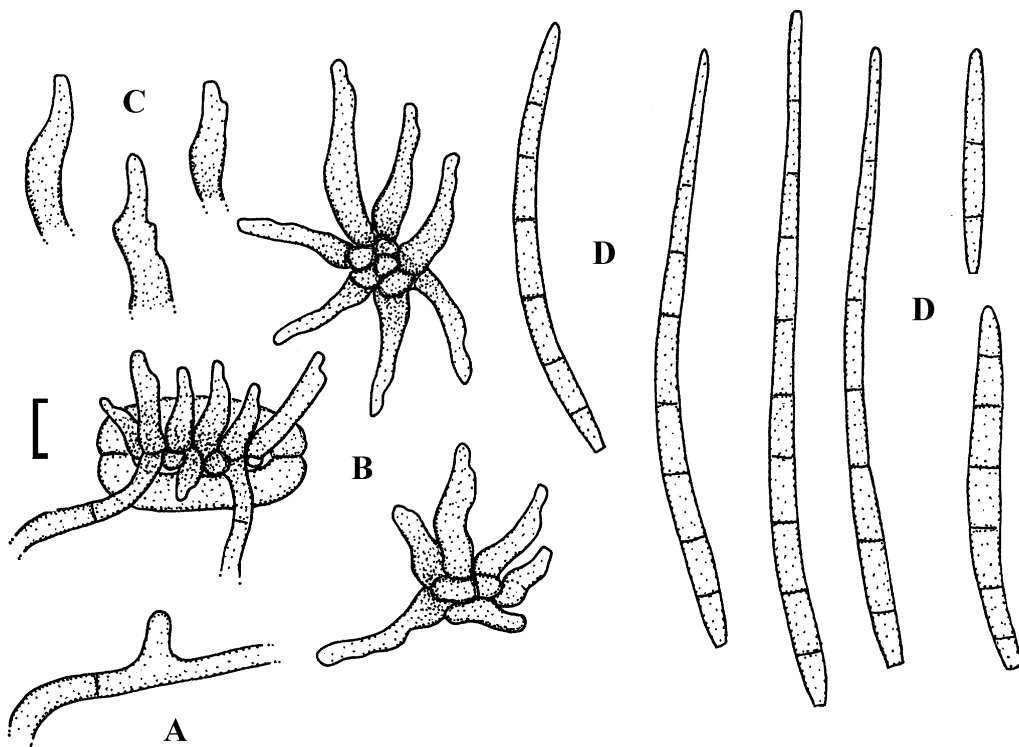


Fig. 45. *Pseudocercospora asiminae-pygmaeae* (NY 985488, holotype). **A.** Superficial hypha with a solitary conidiophore. **B.** Conidiophore fascicles. **C.** Conidiophores. **D.** Conidia. Bar = 10 μ m.

long, proliferation sympodial, conidiogenous loci unthickened, not darkened. *Conidia* solitary, obclavate-subcylindrical, rarely fusiform or subacicular, straight to curved, 25–140 \times 3–6(–7) μ m, 2–10-septate, subhyaline to very pale greenish or olivaceous, thin-walled, smooth, apex subacute, base truncate to obconically truncate, 2–2.5 μ m wide, hila unthickened, not darkened.

Holotype: USA: Florida: Alachua County, La Crosse, on *Asimina pygmaea*, 17 Jul. 1936, G. F. Weber 11475 (NY 985488).

Host range and distribution: On *Asimina* (*angustifolia*, *canescens*, *pygmaea*), *Annonaceae*, North America (USA, Florida).

Pseudocercospora miliusae-tomentosae Kamal, *Cercosporoid Fungi India*: 197 (2010).

(Fig. 46).

Synonym: *Pseudocercospora miliusae* Raghv. Singh et al., *Mycotaxon* 117: 140 (2011) [**holotype:** India: Uttar Pradesh: Gorakhpur, Vindhyavashini Park, on *Miliusa tomentosa*, Jan. 2008, R. Singh (HCIO 48786)].

Illustration: Kamal (2010: 197, fig. 27), Singh et al. (2011: 141, fig. 2).

Description: Leaf spots amphigenous, subcircular to angular-irregular, vein-limited, 1–21 mm diam, sometimes confluent, brown to blackish. *Caespituli* hypophyllous, effuse, brown. *Mycelium* internal. *Stromata* subepidermal, erumpent, about 15–40 μ m diam, pseudoparenchymatous, brown. *Conidiophores* solitary or in small to moderately large fascicles, 2–50, arising from stromata, loose to dense, erumpent, erect to decumbent, straight, subcylindrical to

usually geniculate-sinuuous, unbranched or branched, 10–70 \times 2–5 μ m, 1–2-septate, light brown, wall somewhat thickened, smooth; conidiogenous cells integrated, terminal, 10–40 μ m long, conidiogenous loci inconspicuous to subdentate, unthickened, not darkened. *Conidia* solitary, cylindrical-obclavate, straight to curved, 20–60 \times 2–3 μ m, 0–4-septate, pale brown, thin-walled, smooth, apex acute to subobtuse, base short obconically truncate, sometimes rounded, 1–1.5 μ m wide, hila unthickened, not darkened.

Holotype: India: Uttar Pradesh: Gorakhpur, Vindhyavashini Park, on *Miliusa tomentosa*, *Annonaceae*, Jan. 2008, R. Singh (HCIO 48786).

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

Pseudocercospora oblecta (Syd.) Crous & U. Braun, *Mycotaxon* 105: 222 (2008).

(Fig. 47)

Basionym: *Cercospora oblecta* Syd., *Ann. Mycol.* 33: 235 (1935).

Synonym: *Stigmia oblecta* (Syd.) Crous & U. Braun, *Mycotaxon* 57: 285 (1996).

Literature: Chupp (1954: 45), Crous & Braun (1996: 285), Crous & Braun (2003: 294).

Illustration: Crous & Braun (1996: 286, fig. 8).

Description: Leaf spots amphigenous, irregular, 2–6 mm diam, brown, grey-brown with age. *Caespituli* epiphyllous, punctiform-pustulate, dark. *Mycelium* internal. *Stromata* epiphyllous, well-developed, 40–90 μ m diam, immersed, blackish brown to almost black. *Conidiophores* numerous, in

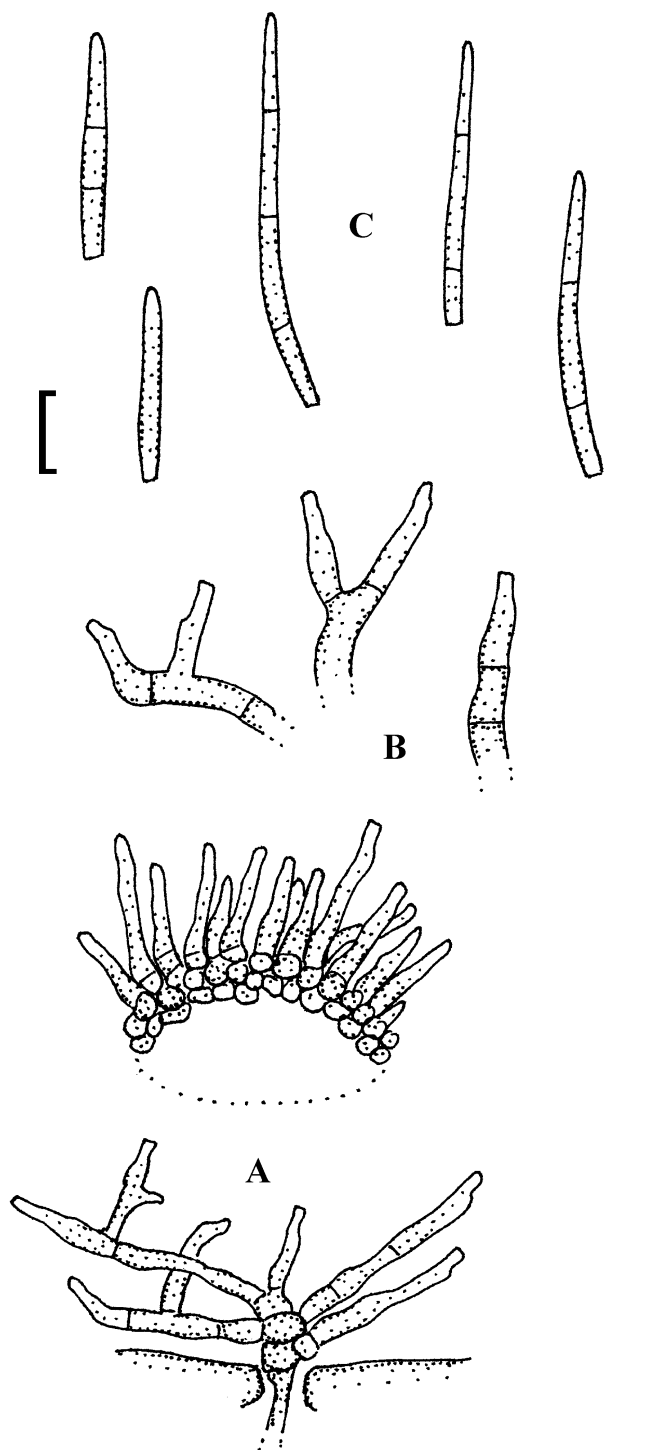


Fig. 46. *Pseudocercospora miliusae-tomentosae* (based on Kamal 2010: 197, fig. 27). **A.** Conidiophore fascicles. **B.** Conidiophores. **C.** Conidia. Bar = 10 µm.

dense fascicles, arising from stromata, forming sporodochial conidiomata, to 90 µm wide and 60 µm high, erumpent, erect, straight, cylindrical to somewhat irregularly shaped, unbranched, (10–)30–50(–60) × 3–7 µm, 0–2-septate, pale to medium olivaceous or brown, thin-walled, verruculose; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, subcylindrical or tapering towards a rounded to truncate tip, unilocal, proliferation percurrent, with 1–4 conspicuous annellations, conidiogenous

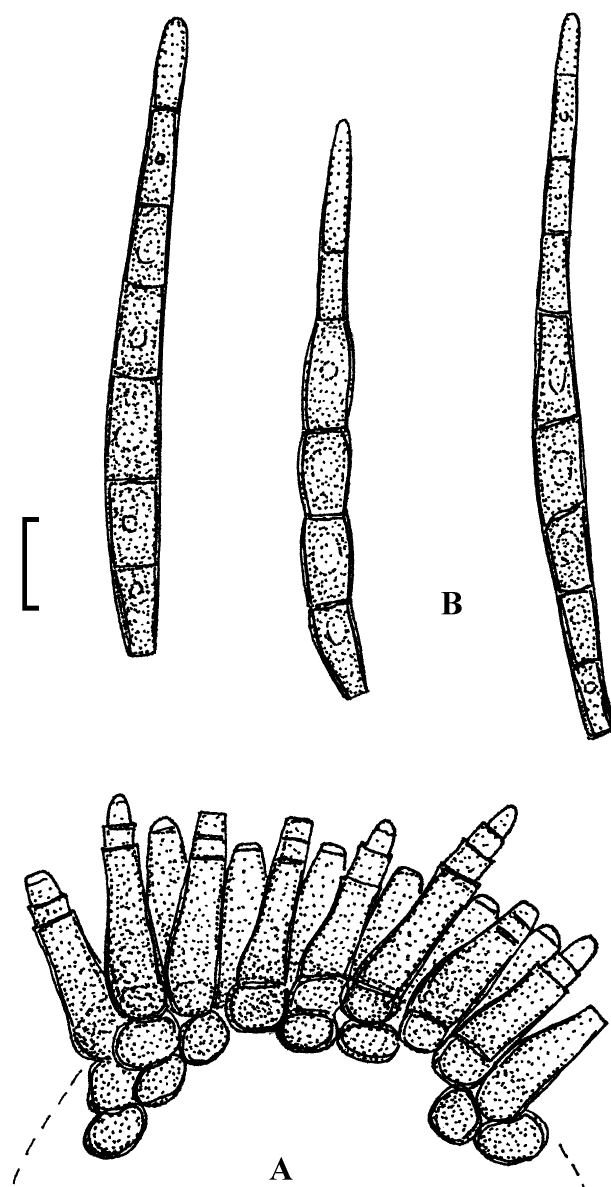


Fig. 47. *Pseudocercospora oblecta* (CUP 40404, isolectotype). **A.** Sporodochial conidioma. **B.** Conidia. Bar = 10 µm.

loci unthickened and not darkened. *Conidia* solitary, obclavate to cylindrical, straight to curved, 40–120 × 4–8 µm, 1–15-septate, brown, olivaceous towards the apex, wall thin, verruculose, apex rounded, base obconically truncate or subtruncate, hila neither thickened nor darkened.

Lectotype (**designated here**, MycoBank, MBT204898): **South Africa:** Mpumalanga: Barberton, on *Annona senegalensis*, Apr. 1931, L. C. C. Liebenberg 26043 (PREM 26043). **Isolectotypes:** CUP 40404, 40405; K(M) IMI 37998.

Host range and distribution: On *Annona* (*senegalensis*, *Annona* sp.), *Annonaceae*, South Africa (Transvaal), South America (Brazil).

Notes: This species has been recorded from Brazil on *Annona* sp. (Mendes *et al.* 1998). Material was not available for confirmation of the correct identification.

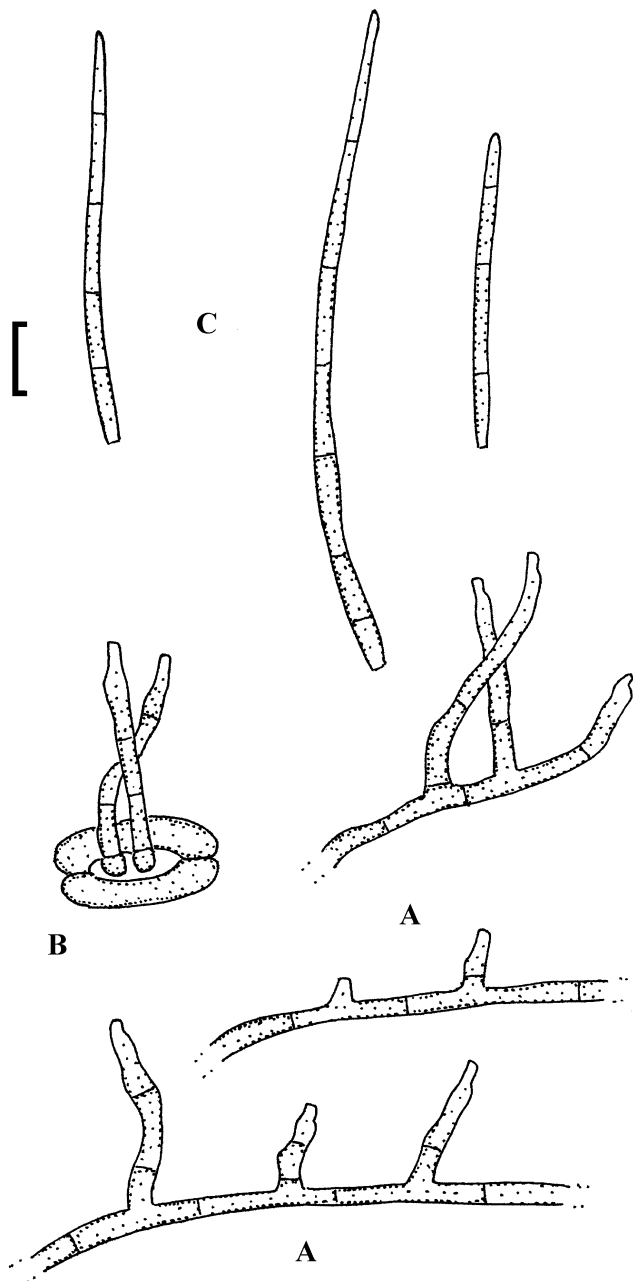


Fig. 48. *Pseudocercospora polyalthiae* (based on Yen *et al.* 1982: 44, fig. 4 E–G). **A.** Solitary conidiophores arising from superficial hyphae. **B.** Conidiophores emerging through a stoma. **C.** Conidia. Bar = 10 μ m.

Pseudocercospora polyalthiae J.M. Yen *et al.*,
Mycotaxon **16**: 43 (1982).
(Fig. 48)

Literature: Braun & Crous (2008), Kamal (2010: 210).

Illustration: Yen *et al.* (1982: 44, fig. 4 E–G).

Description: Leaf spots indistinct or lacking. *Caespituli* hypophyllous, rather indistinct. *Mycelium* internal and external; superficial hyphae branched, septate, 1.5–3 μ m wide, very pale olivaceous, thin-walled, smooth. *Stromata* not developed. *Conidiophores* solitary, arising from

superficial hyphae, lateral, occasionally with a single or few conidiophores emerging through stomata, erect, straight, subcylindrical-conical to geniculate-sinuuous, unbranched or only occasionally branched, 12–70 \times 3.5–5 μ m, 0–8-septate, pale olivaceous brown, paler towards the tip, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, conidiogenous loci inconspicuous, unthickened, not darkened. *Conidia* solitary, narrowly obclavate-cylindrical, straight to curved, 40–155 \times 2.5–3.5 μ m, 3–13-septate, pale olivaceous brown, thin-walled, smooth, apex obtuse to subacute, base short obconically truncate, about 1–2 μ m wide, hila neither thickened nor darkened.

Holotype: **India:** West Bengal: 24-Parganas, Garia, on *Polyanthia suberosa*, Annonaceae, 15 Dec. 1979, B. K. Das, Pcc4095 = Yen # 10585 (UC).

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

Pseudocercospora scitula (Syd.) Deighton, *Mycol. Pap.* **140**: 152 (1976).
(Fig. 49)
Basionym: *Cercospora scitula* Syd., *Ann. Mycol.* **33**: 236 (1935).

Literature: Chupp (1954: 46), Crous & Braun (1996: 308), Crous & Braun (2003: 369), Kamal (2010: 218).

Leaf spots formed as yellowish, ochraceous to dark brown blotches, to 50 mm diam, shape and size variable, margin indefinite. *Caespituli* hypophyllous, punctiform, medium dark brown to dark brown or formed as effuse, sooty colonies. *Mycelium* internal. *Stromata* lacking or almost so, only formed as aggregations of a few swollen hyphal cells. *Conidiophores* in small to moderately large fascicles, mostly 5–18, divergent to dense, sometimes almost coremioid, arising from internal hyphae or hyphal aggregations, through stomata, erect, straight, subcylindrical to distinctly geniculate-sinuuous, above all in the upper half, often wider near the tip, unbranched or occasionally branched, 50–220 μ m long, 3–6 μ m wide below and 4–8 μ m wide above, pluriseptate throughout, distance between septa 15–45 μ m, pale to medium dark olivaceous brown or brown throughout or paler towards the tip, wall slightly thickened, to 1 μ m, above all in the lower half, smooth; conidiogenous cells integrated, terminal, 20–50 μ m long, proliferation sympodial, conidiogenous loci inconspicuous, visible as truncate tips or subdenticulate, 2–2.5 μ m wide, but unthickened and not darkened. *Conidia* solitary, obclavate-cylindrical, occasionally subclavate, straight to curved or sometimes sigmoid, 25–110 \times 5–8 μ m, 3–9-septate, pale to medium dark olivaceous or olivaceous brown, wall thin (< 1 μ m), smooth, apex obtuse or conidia partly almost rostrate, base short to long obconically truncate, 2–2.5(–3) μ m wide, hila unthickened, not darkened.

Lectotype (designated here, MycoBank, MBT204899): **South Africa:** Mpumalanga: Barberton, Nelspruit Research Station, on *Annona senegalensis*, Apr. 1931, L. C. C.

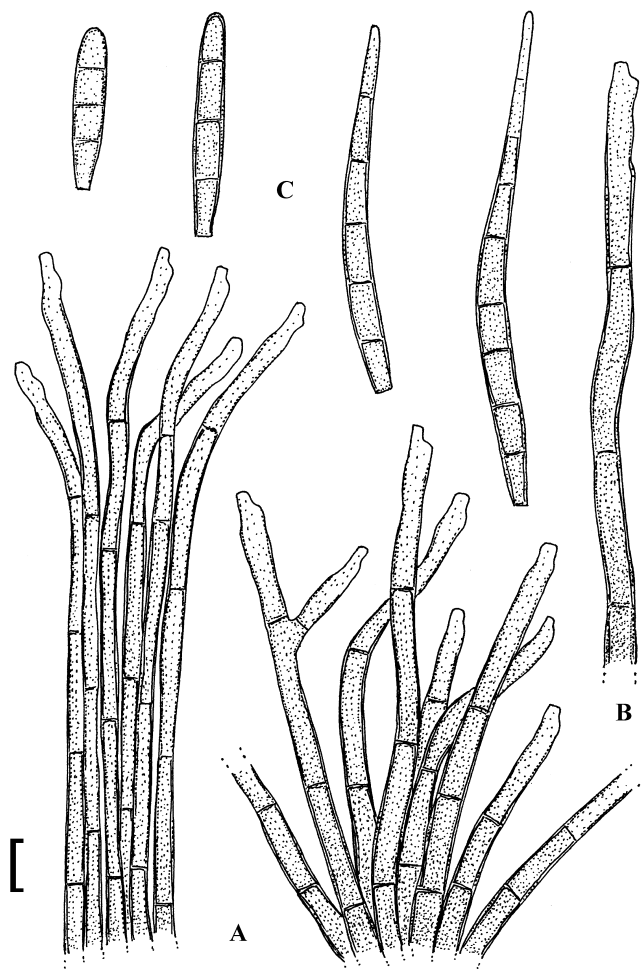


Fig. 49. *Pseudocercospora scitula* (CUP 41178, isoelectotype). **A.** Conidiophore fascicles (on the left synnematous). **B.** Conidiophore tip. **C.** Conidia. Bar = 10 µm.

Liebenberg 26027 (PREM 26027). *Isoelectotype*: CUP 41178.

Host range and distribution: On *Annona* (*senegalensis*, *Annona* sp.), *Annonaceae*, Asia (India), Africa (Ghana, South Africa).

Pseudocercospora xenoannonicola Crous & Bench.,
Sydowia **52**: 88 (2001).
(Fig. 50)

Illustration: Crous *et al.* (2001: 87, fig. 10).

Description: *Leaf spots* amphigenous, subcircular to irregular, 7–40 mm diam, initially formed as chlorotic yellowish discolorations, centre later grey to pale brown, surrounded by a dark brown outer region. *Caespituli* mainly hypophyllous, grey to medium brown, punctiform. *Mycelium* internal and external; superficial hyphae branched, septate, 2–3 µm wide, pale brown, thin-walled, smooth. *Stromata* to 30 µm diam, brown. *Conidiophores* in dense fascicles, to 60 µm wide and 35 µm high, straight, subcylindrical to geniculate-sinuous,

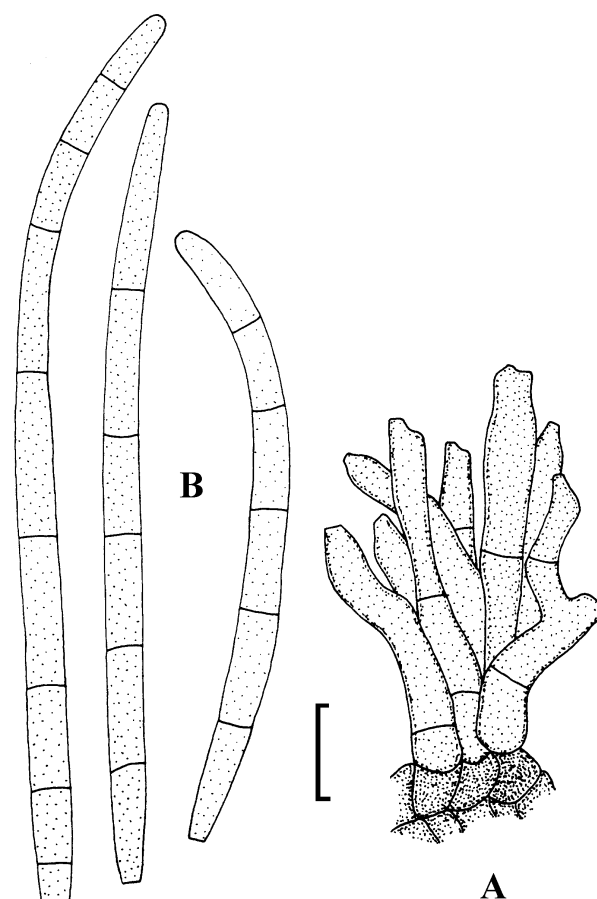


Fig. 50. *Pseudocercospora xenoannonicola* (PREM 56555, holotype). **A.** Conidiophore fascicle. **B.** Conidia. Bar = 10 µm.

unbranched, 10–30 × 3–4 µm, 0–2-septate, medium brown, paler towards the tip, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 7–20 µm long, conidiogenous loci inconspicuous or visible as truncate tips, but always unthickened and not darkened. *Conidia* solitary, narrowly obclavate to subcylindrical, straight to curved, (30–)50–80(–100) × 2–3 µm, 5–7-septate, pale brown, thin-walled, smooth, apex obtuse to subacute, base short obconically truncate, 1–1.5 µm wide, hila unthickened, not darkened.

In vitro (MEA, CLA): *Colonies* olivaceous-grey, reverse olivaceous-black, sectoring, with uneven, smooth margins and sparse aerial mycelium, reaching 18–20 mm diam after 14 d at 25°C in the dark.

Holotype: **Brazil**: *Pará*: Belém, on *Annona montana*, Mar. 1998, R. L. Benchimol & F. C. Albuquerque (PREM 56555).

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

Zasmidium

Key to *Zasmidium* species on Annonaceae

- 1 Stromata 10–40 µm diam; conidiophores 20–150 µm long, pluriseptate; conidia subcylindrical-filiform, acicular to narrowly obclavate, pale olivaceous, yellowish brown to brown; on *Annona* spp. and an unknown host of the *Annonaceae*, Brazil **Z. annonaceae**
- Stromata lacking; conidiophores shorter, 17–75.5 µm, only 1–4-septate; conidia narrowly obclavate-cylindrical, pale olivaceous; on *Polyalthia suberosa*, India **Z. polyalthiae**

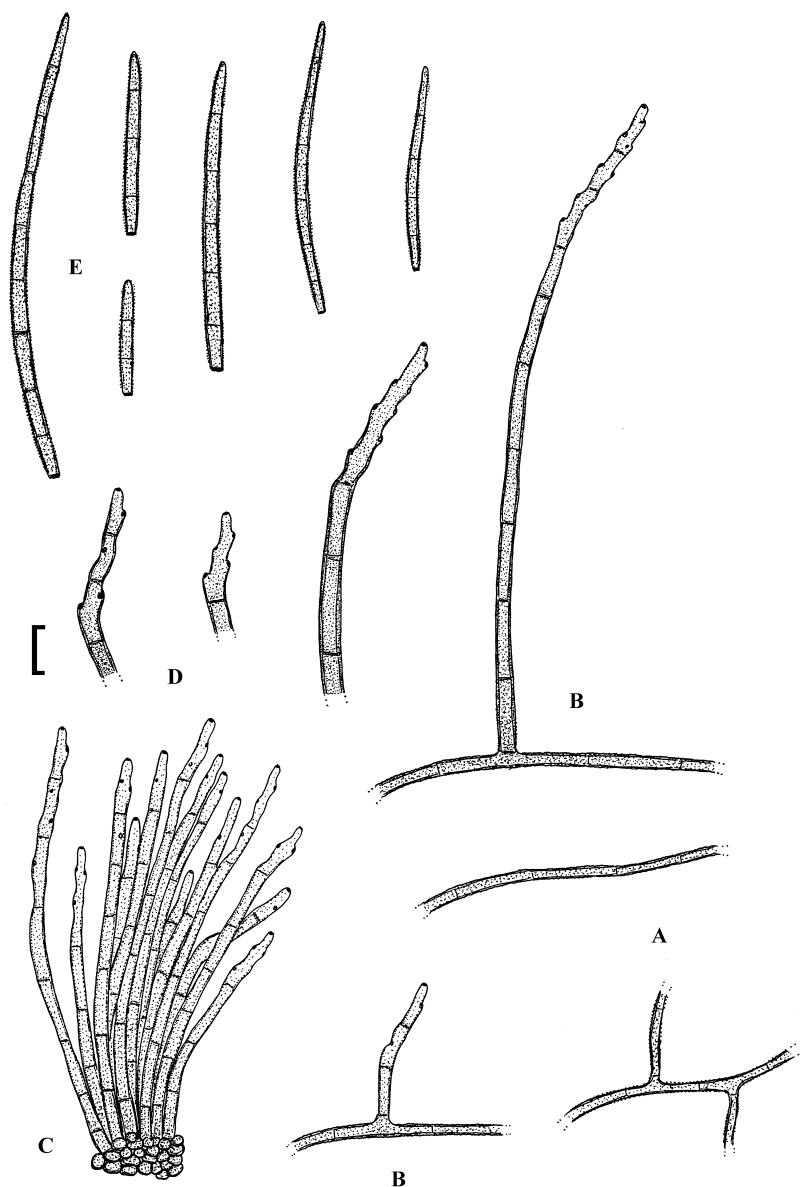


Fig. 51. *Zasmidium annonaceae* (LEP, lectotype). **A.** Superficial hyphae. **B.** Solitary conidiophores arising from superficial hyphae. **C.** Conidiophore fascicle. **D.** Conidiophore tips. **E.** Conidia. Bar = 10 µm.

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

(Fig. 51)

Basionym: *Cercospora annonaceae* Henn., *Hedwigia* **48**: 18 (1909); “*anonaceae*”.

Synonym: *Stenella annonaceae* (Henn.) U. Braun, *Mikol. Fitopatol.* **30**: 3 (1996).

Literature: Saccardo (1931: 868), Chupp (1954: 44), Crous & Braun (2003: 59), Braun & Crous (2008: 208).

Illustration: Braun & Mel'nik (1996: 2, fig. 2), Braun & Crous (2008: 210, fig. 1)

Description: *Leaf spots* amphigenous, subcircular to angular irregular, 1–25 mm diam, sometimes confluent, pale to dull dark brown, later greyish to dingy greyish white, margin indefinite or with a narrow darker border or marginal line. *Colonies* amphigenous, mainly hypophyllous, inconspicuous, effuse to punctiform, brown to greyish brown. *Mycelium* internal and external; superficial hyphae emerging through stomata, 1.5–3 µm wide, branched, septate, subhyaline, pale to medium olivaceous, olivaceous brown or yellowish brown, thin-walled,

verruculose. *Stromata* absent or small, not very conspicuous, 10–40 μm diam, immersed, brown. *Conidiophores* solitary, arising from superficial hyphae, lateral, or in small to moderately large fascicles, loose to rather dense, sometimes almost coremioid, arising from internal hyphae or stromata, erect, unbranched, subcylindrical-filiform, straight to somewhat flexuous-sinuuous, upper fertile part usually geniculate-sinuuous, sometimes strongly so, 20–150 \times (2.5–)3–4(–4.5) μm , pluriseptate throughout, pale to dark brown, yellowish brown or olivaceous brown, smooth, wall thin to slightly thickened (< 1 μm); conidiogenous cells integrated, terminal and intercalary, 5–20 μm long, occasionally longer, with several conspicuous conidiogenous loci, 1–1.5 μm diam, slightly thickened and darkened. *Conidia* solitary, subcylindrical-filiform, acicular, narrowly obclavate, straight to curved, 20–100 \times 2.5–4.5 μm , 2–8-septate, pale olivaceous, yellowish brown to brown, verruculose, wall thin (about 0.5 μm), apex obtuse to subacute, base truncate to usually obconically truncate, 1–1.5(–2) μm wide, hila slightly thickened and darkened.

Lectotype (designated by Braun & Crous 2008): **Brazil:** São Paulo: Ague Branca, on an unidentified annonaceous host (probably *Annona* sp.), May 1903, Puttemans 738 (LEP).

Host range and distribution: On *Annona* (*cherimola*, *reticulata*, *squamosa*, *Annona* sp.), *Annonaceae*; North America (Mexico), South America (Brazil, Colombia, Ecuador, Venezuela), West Indies (Cuba).

Notes: “Pará, May 1903, Puttemans” is written on the original label of the corresponding sample deposited at LEP. This is undoubtedly type material since date and collector agree with the data given in the protologue. “Pará” is, however, incorrect since the material concerned had been collected in the São Paulo region as all other specimens that Hennings obtained from Puttemans. Additional material from Brazil on *A. reticulata* has been examined (Fungos de Minas Geræa, Viçosa-Escola, 23 Mar 1930, A. S. Muller, CUP-MG 157). Syntype material is not preserved at B.

Zasmidium polyalthiae (S. Chaudhary *et al.*) Kamal, *Cercosporoid Fungi India*: 246 (2010); as “*polyalthiae*”.

(Fig. 52)

Basionym: *Stenella polyalthiae* S. Chaudhary *et al.*, *Indian Phytopathol.* **55**: 58 (2002).

Illustration: Chaudhary *et al.* (2002: 58, fig. 2).

Description: *Leaf spots* hypophyllous, circular to subcircular, blackish, scattered. *Colonies* hypophyllous, punctiform. *Mycelium* internal and external; superficial hyphae branched, septate, 1.5–3 μm wide, subhyaline, faintly verruculose, thin-walled. *Stromata* absent. *Conidiophores* solitary, arising from superficial hyphae, lateral or terminal, erect, straight, subcylindrical to flexuous, geniculate-sinuuous, unbranched or branched, 17–77.5 \times 2.5–4 μm , 1–4-septate, brown, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores sometimes reduced to conidiogenous cells, conidiogenous loci conspicuous, somewhat thickened

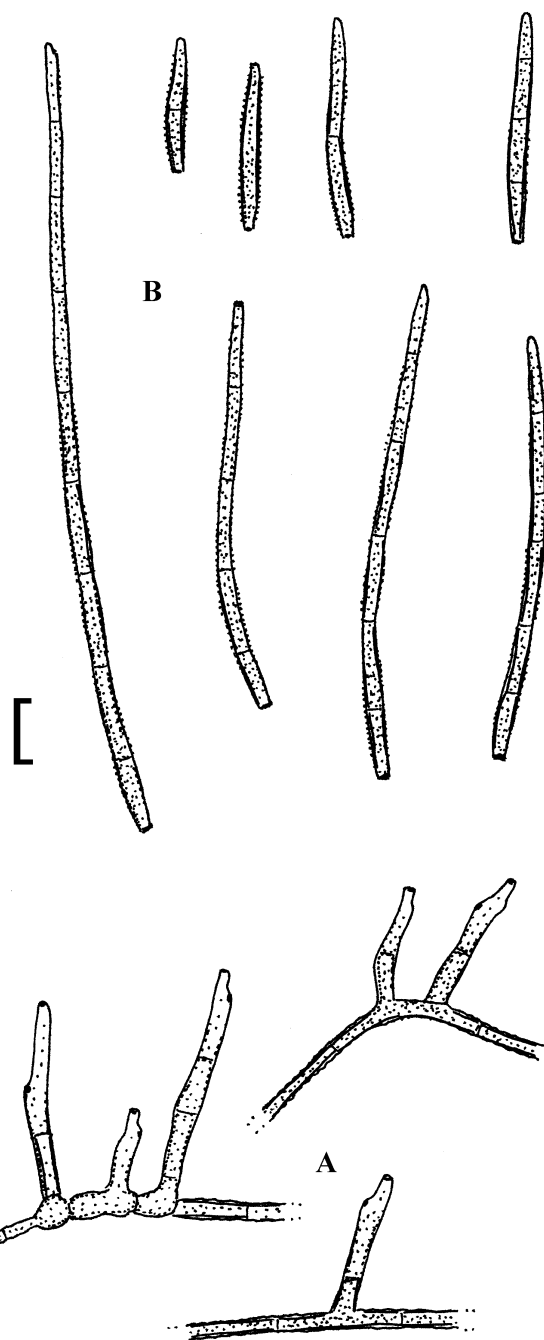


Fig. 52. *Zasmidium polyalthiae* (based on Chaudhary *et al.* 2002: 58, fig. 2). **A.** Solitary conidiophores arising from superficial hyphae. **B.** Conidia. Bar = 10 μm .

and darkened. *Conidia* solitary, rarely catenate, narrowly obclavate-cylindrical, straight to curved, 20–157 \times 2–3.5 μm , 0–8-septate, pale olivaceous, thin-walled, verruculose, apex obtuse, rounded, base obconically truncate, hila somewhat thickened and darkened.

Holotype: **India:** Uttar Pradesh: Maharajganj, Nichaul Forest, on *Polyalthia suberosa*, *Annonaceae*, Mar. 1990, S. Chaudhary (HCIO 43694). *Isotype:* GPU 9016.

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

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