

# Cercosporoid fungi (*Mycosphaerellaceae*) 1. Species on other fungi, *Pteridophyta* and *Gymnospermae*\*

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**Abstract:** Cercosporoid fungi (former *Cercospora* s. lat.) represent one of the largest groups of hyphomycetes belonging to the *Mycosphaerellaceae* (*Ascomycota*). They include asexual morphs, asexual holomorphs or species with mycosphaerella-like sexual morphs. Most of them are leaf-spotting plant pathogens with special phytopathological relevance. The only monograph of *Cercospora* s. lat., published by Chupp (1954), is badly in need of revision. However, the treatment of this huge group of fungi can only be accomplished stepwise on the basis of treatments of cercosporoid fungi on particular host plant families. The present first part of this series comprises an introduction, a survey on currently recognised cercosporoid genera, a key to the genera concerned, a discussion of taxonomically relevant characters, and descriptions and illustrations of cercosporoid species on other fungi (mycophylic taxa), *Pteridophyta* and *Gymnospermae*, arranged in alphabetical order under the particular cercosporoid genera, which are supplemented by keys to the species concerned. The following taxonomic novelties are introduced: *Passalora austroplenkiae* comb. nov., *P. backmanii* comb. nov., *P. condensata* comb. nov., *P. gymnocladi* comb. nov., *P. thalictri* comb. nov., *Pseudocercospora davalliicola* sp. nov., *P. chamaecyparidis* comb. nov., *P. cratevicola* nom. nov., *P. gleicheniae* comb. nov., *P. lygodiicola* sp. nov., *P. lygodiigena* nom. nov., *P. nephrolepidigena* sp. nov., *P. paraexosporioides* sp. nov., *P. pini-densiflorae* var. *montantiana* comb. et stat. nov., *P. pteridigena* sp. nov., *P. ptisanae* sp. nov., *P. sciadopytos* sp. nov., *P. subramanianii* nom. nov., *P. thujina* comb. nov., and *Zasmidium australiense* comb. nov.

**Key words:**

*Ascomycota*  
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## INTRODUCTION

Cercospora-like fungi are one of the largest groups of mostly plant pathogenic, leaf-spotting hyphomycetes, comprising more than 2000 names (Crous & Braun 2003). Numerous economically relevant plant diseases are involved, as for instance angular leaf spot of bean (*Pseudocercospora griseola*), black leaf streak of banana (*Pseudocercospora fijiensis*), fruit and leaf spot disease of citrus (*Pseudocercospora angolensis*), leaf spot disease of celery (*Cercospora apii*), sugarbeet (*Cercospora beticola*), etc. Cercosporoid fungi are known from all parts of the world, but they are especially abundant and diverse in tropical and subtropical areas of Africa, Asia, Australia and Central to South America (e.g. Beilharz *et al.* 2002, Braun & Freire 2004, Hernández-Gutiérrez & Dianese 2008, 2009). They are dematiaceous hyphomycetes characterised by having macronematous conidiophores, formed singly, in fascicles, sporodochia or synnemata, with integrated, terminal to intercalary conidiogenous cells, holoblastic (mono- to polyblastic) conidiogenesis, percurrent to sympodial proliferation, forming amero- to scolecosporous conidia,

solitary or in acropetal chains. Cercosporoid hyphomycetes are asexual fungi with relation to mycosphaerella-like sexual morphs as far as meiotic states are formed at all. Many or probably most species are asexual holomorphs, i.e. they have lost the ability to form sexual morphs. *Mycosphaerella* sexual morphs within this complex are morphologically rather uniform and provide few characters to support a further splitting into smaller generic units, whereas the asexual morphs are morphologically strongly differentiated, which is reflected in numerous asexual genera introduced for particular morphological groups in this complex. Furthermore, the genus *Mycosphaerella* proved to be polyphyletic (Crous *et al.* 2007). Based on comprehensive phylogenetic examinations using analyses of DNA sequence data, the *Mycosphaerella* complex has been separated into several families and monophyletic genera (Crous *et al.* 2007, 2009b, c, 2013, Groenewald *et al.* 2013). Due to the changes of the International Code of Nomenclature for

\*In memoriam Charles D. Chupp (1886–1967), the author of the first monograph of *Cercospora*.

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Algae, Fungi and Plants (ICN) accepted during the Botanical Congress in Sydney 2011, above all the abolishment of the previous Article 59 dealing with pleomorphic fungi, asexual morph-typified genera are now nomenclaturally equivalent to sexual morph-typified ones (Hawksworth 2011, Norvell 2011, Braun 2012). Hence, several asexual morph genera within the *Mycosphaerella* complex can be used as generic holomorph names for particular groups segregated from this complex based on morphology and molecular sequence analyses. *Mycosphaerella punctiformis*, the type species of *Mycosphaerella*, has *Ramularia endophylla* as asexual morph (Verkley *et al.* 2004). The genus *Mycosphaerella* is however a facultative synonym of *Ramularia*, since the latter genus is older and has priority.

Fries (1849) introduced *Passalora*, the first generic name within the complex of cercosporoid hyphomycetes, followed by *Cercospora* introduced by Fresenius (in Fuckel 1863). Authors of the first half of the 19<sup>th</sup> century usually applied broad generic concepts of *Cercospora* (e.g. Viégas 1945). Chupp (1954) published the first and only monograph of cercosporoid hyphomycetes in which he followed a very broad generic concept. He referred most cercosporoid fungi to *Cercospora*, reduced several genera to synonymy with the latter genus, e.g. *Ragnhildiana* and *Cercoseptoria*, but maintained *Passalora* as separate genus (with *Cercosporidium* as synonym) for species with (0–)1(–3)-septate conidia. His general understanding of “genera confused with *Cercospora*”, reflected in his key (Chupp 1954: 17–20) in which he recognised genera like *Cercodeuterosporium*, *Vellosiella* and *Pseudocercospora*, is, however, vague and confusing. Soon after Chupp’s (1954) treatment of this fungal group, the erosion of his broad generic concept set in. Above all Deighton’s numerous treatments of cercosporoid fungi (Deighton 1967, 1971, 1973, 1974, 1976, 1979, 1983, 1987, 1990) strongly influenced the further taxonomy of this fungal group at generic and species rank. The strong proliferation and splitting of cercosporoid genera was later questioned due to numerous morphologically intermediate taxa and a continuum in several previously applied generic characters as well as the first phylogenetic results based on DNA sequence data (Crous *et al.* 2000, Crous & Braun 2003), which again lead to a reduction of recognised cercosporoid genera. Most of these changes in generic circumscriptions have recently been confirmed during the course of various molecular DNA studies, although a few newly segregated cercosporoid genera have been introduced to reflect monophyletic, morphologically separated clades, e.g. *Phaeocercospora* (Crous *et al.* 2012), *Pallidocercospora* and *Phaeomyocentrospora* (Crous *et al.* 2013). Other genera, previously sometimes considered to be synonyms, have been confirmed as separate genera, e.g. *Pantospora* (Minnis *et al.* 2011), *Paracercospora s. str.* and *Scolecostigmia s. str.* (Crous *et al.* 2013).

The history and the evolution of concepts of cercosporoid genera was comprehensively discussed in Deighton (1976), Braun (1995a) and Crous & Braun (2003) as well as recently in Crous *et al.* (2013) and Groenewald *et al.* (2013) with special emphasis on *Pseudocercospora* and *Cercospora*, respectively. These treatments may be consulted for further details.

Beside numerous, partly controversial treatments of cercosporoid hyphomycetes at generic level, a very large

number of additional species have been described since Chupp’s (1954) monograph, and numerous comprehensive taxonomic treatments and works dealing with particular areas, including large countries, have been published, e.g. Viégas (1945, Brazil), Muntañola (1960), Deighton (1967, 1971, 1974, 1976, 1979, 1983, 1987, 1990), Katsuki (1965, Japan), Yen & Lim (1980, Singapore and the Malay Peninsula), Hsieh & Goh (1990, Taiwan), Guo & Hsieh (1995, China, *Pseudocercospora*), Crous & Braun (1996, South Africa), Braun & Mel’nik (1997, Russia and adjacent countries), Shin & Kim (2001, Korea), Guo *et al.* (2005, China, *Cercospora*), Guo *et al.* (2003, China, *Passalora s. lat.*), Kamal (2010, India) and Phengsintham *et al.* (2013a, b, Laos, Thailand). Hence, Chupp’s (1954) monograph is badly out of date. There is no modern comprehensive treatment of cercosporoid species, and taxonomic work on this fungal group is complicated and time-consuming due to the large number of species involved, and descriptions scattered throughout the mycological and phytopathological literature. Therefore, a new “Chupp” summarising all taxa of and data on cercosporoid hyphomycetes is urgently required. To accomplish a comprehensive treatment of all taxa concerned in a monograph as in Chupp (1954), we have decided to treat the cercosporoids occurring on particular host families, i.e., in principle following Chupp’s (1954) concept, but supplemented by keys to the species and illustrations for most taxa. In the present first contribution, hyperparasitic cercosporoid species and taxa on hosts belonging to *Pteridophyta* and *Gymnospermae* are treated. After comprehensive treatments of cercosporoids of all host families, it will be possible to supplement the individual publications and compile a monograph.

## MATERIAL AND METHODS

The present work is a compilation based on papers and unpublished data of the authors as well as global literature. Details on methods are to be found in the papers cited. As far as new examinations are concerned, fungal structures have been examined on the base of standard methods of light microscopy, using an Olympus BX50 microscope, with distilled water and lactic acid as media, but without any staining. If possible, measurements of 30 conidia and other structures have been made at a magnification of  $\times 1000$ . 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/>).

## Taxonomically relevant characters

Basic characters at generic rank (for the discrimination of genera) are mainly confined to colour of conidiophores (hyaline or pigmented) and the structure of the conidiogenous loci and conidial hila (conspicuous by being thickened and darkened versus inconspicuous, neither thickened nor darkened, or at least unthickened). Other features previously used to distinguish

smaller generic units (segregated genera) proved to be of little relevance at generic level, e.g. absence or formation of external mycelium *in vivo*, arrangement and formation of conidiophores *in vivo* (formed singly on superficial hyphae, fasciculate, in sporodochia or synnemata). However, these characters are useful at species rank, i.e. for the differentiation of allied, morphologically similar species. The following additional characters are useful and applicable for the characterisation of species and their discrimination from allied taxa: shape and size, septation, pigmentation (pale to dark brown), wall thickness and surface structure (smooth to verrucose) of conidiophores; shape, size, integration and proliferation mode of conidiogenous cells; location, size (diameter) and shape of conidiogenous loci (scars) (e.g. inconspicuous, on shoulders caused by sympodial proliferation, denticle-like, etc.); formation of conidia (solitary or in simple or branched chains), shape, size, septation (eu- or distoseptate, transversely or longitudinally to obliquely septate, amero- to scolecosporous), colourless or pigmented, wall smooth or sculptured; shape and size, number and location of hila.

## SEXUAL MORPHS AND CURRENTLY RECOGNISED CERCOSPOROID GENERA

### *Mycosphaerella* and mycosphaerella-like sexual morphs

Sexual morphs of various cercosporoid hyphomycetes were traditionally referred to as *Mycosphaerella*. Ascospores of the latter genus are morphologically rather uniform and provide few characters to support further splitting. The associated asexual morphs are, in contrast, morphologically strongly differentiated and better reflect genotypic variation. The type species of *Mycosphaerella*, *M. punctiformis*, has an asexual morph described as *Ramularia endophylla* and clusters together with other *Ramularia* species in a monophyletic *Ramularia* clade within the *Mycosphaerellaceae* (Verkley *et al.* 2004, Crous *et al.* 2007), so that *Mycosphaerella s. str.* becomes a facultative synonym of *Ramularia* according to the new rules of the ICN (Art. 59). The older name *Ramularia* has priority and should be applied as holomorph name for this monophyletic unit composed of asexual or sexual morphs, or *Ramularia* species with *Mycosphaerella* sexual morphs in their life cycles. The further splitting of ascomycetes with mycosphaerella-like sexual morphs is closely connected with and based on assemblages of certain species with particular asexual morphs for which asexual morph-typified generic names are available. *Ramularia* (*Mycosphaerella*) as mucedinaceous genus, characterised by having colourless conidiophores and conidia, does not belong to the complex of cercosporoid genera, and is hence not treated in this series. *Ramularia* and allied mucedinaceous genera have been monographed by Braun (1995a, 1998), and a detailed molecular phylogeny will be published elsewhere (Videira *et al.*, in prep.).

### CERCOSPORA S. STR.

The genus *Cercospora* was introduced by Fresenius (in Fuckel 1863) for passalora-like species with pluriseptate conidia.

The typification of a genus is essential for further taxonomic treatments, i.e. for changed generic circumscriptions *s. str.* or *s. lat.* However, the typification of *Cercospora* was previously controversially handled and discussed. *Cercospora apii* was usually considered as type species (or lectotype species) of *Cercospora* (Solheim 1930, Clements & Shear 1931, Ellis 1971, etc.), based on the assumption that the first description of this genus dates back to Fresenius (1863). This typification was accepted by most subsequent authors, including Sutton & Pons (1988), but proved to be wrong, which was pointed out by Braun (1995a) who showed that the first valid description of *Cercospora* was published somewhat earlier in Fuckel (1863) and simultaneously in Fuckel, *Fungi Rhen. Exs., Fasc. II, No. 117, 1863* with *Cercospora penicillata* (*C. depazeoides*) as only and hence type species. Fuckel (1863) only added a new forma (*f. apii*), which is, however, irrelevant for the typification. Early circumscriptions of *Cercospora* comprised *Cercospora ferruginea*, a species with thickened, darkened conidiogenous loci and pigmented conidia, which was later reallocated to *Mycovellosiella* and belongs now to *Passalora* emend. During the course of the following 100 years, the application of *Cercospora* had been continuously widened (Saccardo 1880, Solheim 1930, etc.). All kinds of superficially similar species, with or without conspicuous conidiogenous loci, with hyaline or pigmented conidia, formed singly or in chains, were assigned to this genus. This broad generic concept was used and applied by Chupp (1954) in his monograph of *Cercospora s. lat.*, in which he treated 1 419 species. The number of species assigned to *Cercospora* increased rapidly in the following decades. Pollack (1987) listed more than 3 000 names. Several early attempts to split *Cercospora s. lat.* into smaller generic units had been made, e.g. by Earle (1901) (*Cercosporidium*), Ferraris (1909) (*Phaeoisariopsis*), Spegazzini (1910) (*Cercosporina*, *Pseudocercospora*), Maublanc (1913a, b) (*Asperisporium*), Rangel (1917) (*Mycovellosiella*), Miura (1928) (*Cercosporiopsis*), Sydow (1930) (*Stenella*), Petrak (1951) (emendation of *Chaetotrichum* to include some cercosporoid taxa), Muntañola (1960) (*Phaeoramularia*), etc. However, the genera concerned did not gain wide acceptance and application until Deighton's (1967, 1971, 1974, 1976, 1979, 1983, 1987, 1990) comprehensive studies on cercosporoid hyphomycetes, and his new generic concepts and splitting of *Cercospora s. lat.* Ellis (1971, 1976) followed Deighton's concepts and accepted *Cercosporidium*, *Mycovellosiella*, *Phaeoramularia* and other cercosporoid genera segregated from *Cercospora*. Deighton (1976) re-introduced *Pseudocercospora* and widened its circumscription to all kinds of cercosporoid hyphomycetes with inconspicuous (unthickened, not darkened) conidiogenous loci, i.e. he finished the gradual reduction of the application of the genus *Cercospora* and confined it (*s. str.*) to species resembling *C. apii*, i.e. to taxa with pigmented conidiophores, thickened and darkened conidiogenous loci (scars) and colourless, pluriseptate, scolecosporous conidia formed singly, a concept accepted up to now and confirmed by molecular sequence analyses in which *Cercospora s. str.* proved to represent a monophyletic clade (Crous *et al.* 2000, Groenewald *et al.* 2013). Numerous molecular examinations of *Cercospora* species have been carried out, based on rDNA ITS data as well as multilocal approaches (Stewart *et al.* 1999, Crous *et al.* 2000, 2004a, 2009a, b, Goodwin *et al.*



2001, Tessmann *et al.* 2001, Pretorius *et al.* 2003, Groenewald *et al.* 2005, 2006a, b, 2010, 2013, Montenegro-Calderón *et al.* 2011). Crous & Braun (2003) published an annotated list of *Cercospora* and *Passalora emend.* names, including 659 recognised species of *Cercospora s. str.* and further 281 species names reduced to synonymy with *C. apii s. lat.* since they were morphologically not or barely distinguishable from *C. apii s. str.* on celery. This concept was influenced by assumptions as well as proven results suggesting that *C. apii s. lat.* comprises specialised as well as plurivorous races (Ellis 1971). Crous & Braun (2003) provided a morphological circumscription of *Cercospora apii s. lat.* and recommended to assign new collections on hosts of new families or genera to *C. apii s. lat.* if morphologically indistinguishable and if not proven by means of molecular sequence analyses and/or inoculation experiments that distinct species are involved. However, the speciation within *Cercospora s. str.*, above all with regard to *C. apii s. lat.*, is more complicated than previously assumed and far from being comprehensively perceived. Detailed molecular examination of *Cercospora s. str.* based on a multilocus DNA approach (ITS, actin, calmodulin, histone H3, and translation elongation factor 1- $\alpha$  genes) has recently been carried out by Groenewald *et al.* (2013). The monophyly of *Cercospora s. str.* was verified, but the speciation within this genus proved to be very complicated. *Cercospora apii s. lat.* as plurivorous monophyletic species could not be confirmed. *Cercospora apii s. lat.* is rather a complicated complex composed of specialised as well as numerous species with wide host range, often with overlapping host ranges between particular taxa. The problem is that most of the taxa involved, including various plurivorous ones, are morphologically barely distinguishable. Certain hosts or host ranges are also not reliable for taxonomic purposes within *C. apii s. lat.* *Cercospora* collections on certain hosts with agreeing morphology found in different geographical regions do often not belong to a single species, i.e. it is usually not possible to simply apply old names of *Cercospora* species described from Europe or North America to taxa in Africa, Asia, Australia or South America and *vice versa*. Therefore, descriptions of new species on new hosts morphologically indistinguishable from *C. apii s. lat.* should be avoided without support by molecular sequence analyses. The collections concerned should be simply referred to as *C. apii s. lat.* (*C. apii* complex) as recommended by Crous & Braun (2003).

Attempts to separate *Cercospora* into several subgeneric units have been made by Penzes (1927) (three sections: *Brachycercosporae*, *Macroercosporae* and *Mediocercosporae*) and Solheim (1930) (21 sections based on mycelium internal/external, conidiophores simple/branched, stroma and conidium shape), which are, however, barely practicable and not useful since these classifications were derived from a wide range of species of *Cercospora s. lat.* that now belong to different genera. Therefore, it is not surprising that these subgeneric concepts have never been applied by other authors.

A special problem concerns *Cercospora* species with colourless but *passalora*-like conidia, i.e. broadly ellipsoid-ovoid to obclavate-cylindrical, only with few septa, e.g. *Cercospora chenopodii* (*Passalora dubia*) and *C. sojina* (*P. sojina*). In this case, the generic relevance of the conidial shape versus conidial colour was unclear and differently

evaluated. However, this problem has recently been clearly solved on the basis of molecular sequence analyses (Groenewald *et al.* 2012), which showed that species with hyaline conidia, independent of the conidial shape, cluster within the *Cercospora* clade. Other *Cercospora* species are characterised by having colourless or very pale conidiophores. They are superficially similar to *Cercosporella* species, but species of the latter genus have quite distinct conidiogenous loci (Braun 1995a). Braun (1993) introduced *Cercospora* subgen. *Hyalocercospora* for such species. Molecular data for *Cercospora cercosporelloides*, the type species of this subgenus, or any other species assigned to it in Braun (1995a) are not yet available, i.e. it is still unproven if they cluster in the monophyletic *Cercospora* clade.

The following description circumscribes *Cercospora* as currently perceived and phylogenetically confirmed as monophyletic genus:

***Cercospora*** Fresen., in Fuckel, *Hedwigia* 2: 133 (1863) [and in Fuckel, *Fungi Rhen. Exs.*, Fasc. II, No. 117, 1863].

*Type species: Cercospora penicillata* (Ces.) Fresen. 1863 (*C. depazeoides* (Desm.) Sacc. 1876).

*Synonyms: Virgasporium* Cooke, *Grevillea* 3: 182 (1875) [type species: *V. maculatum* Cooke 1875].

*Cercosporina* Speg., *Anales Mus. Nac. Buenos Aires* 20: 424 (1910) [type species: *C. asparagicola* Speg. 1910].

*Literature:* Chupp (1954), Vasudeva (1963), Katsuki (1965), Ellis (1976: 244), Yen & Lim (1980: 152–166), Hsieh & Goh (1990), Braun (1995a: 40), Shin & Kim (2001: 20), Guo *et al.* (2005), Kamal (2010: 11), Seifert *et al.* (2011: 128–130).

*Description* [emend. Crous & Braun (2003: 16)]: Hyphomycetes (asexual morphs, asexual holomorphs) or *Cercospora* with mycosphaerella-like sexual morphs; *Mycosphaerellaceae*. Saprobiic, secondary invaders or mostly plant pathogenic, symptomless or usually causing distinct lesions (leaf-spotting fungi). Mycelium internal, rarely external; hyphae branched, septate, colourless or almost so to usually pigmented, thin-walled, smooth, rarely faintly rough-walled. *Stromata* lacking to well-developed, substomatal, intaeperidermal to deeply immersed, mostly pigmented, composed of *textura angulata* or *globosa*. *Conidiophores* mononematous, macronematous, solitary or fasciculate, in small to large fascicles, rarely in sporodochial conidiomata, emerging through stomata or erumpent, very rarely arising from superficial hyphae, erect, continuous to pluriseptate, hyaline or almost so (subgen. *Hyalocercospora*) to mostly pigmented, pale olivaceous to dark brown (subgen. *Cercospora*), wall smooth to somewhat rough, thin to moderately thick; conidiogenous cells integrated, terminal or intercalary, sometimes conidiophores aseptate, i.e. reduced to conidiogenous cells, monoblastic, determinate to usually polyblastic, proliferation sympodial, rarely percurrent, conidiogenous loci (scars) conspicuous, thickened and darkened-refractive, planate with minute central pore. *Conidia* solitary, rarely in short chains (mainly under high humidity), mostly scolecosporous, obclavate-cylindrical, acicular, filiform and pluriseptate, rarely amero- to phragmosporous, broadly ellipsoid-ovoid to broadly

obclavate-cylindrical, but always hyaline or subhyaline (with a pale greenish tinge), thin-walled, smooth or almost so, hila thickened and darkened, conidial secession schizolytic.

## DISTOCERCOSPORA

The genus *Distocercospora* is passalora-like (thickened and darkened loci and hila and pigmented conidia), but differs in having distoseptate conidia. The meaning of distoseptation as character on generic level within the complex of cercosporoid genera is, however, unclear. Distosepta may occasionally occur intermixed between genuine septa in some *Passalora* species (Crous & Braun 2003) as well as in *Pseudocercospora cryptomericola* (Nakashima *et al.* 2007). It is possible that distosepta mixed with eusepta are more common in cercosporoid fungi than hitherto known as it is often rather difficult to discern such septa in taxa with thin walls. However, cultures and molecular data based on Japanese material of the type species of *Distocercospora*, *D. pachyderma*, and *D. livistonae* have recently been examined by C. Nakashima (unpubl. data), which showed that these species cluster within the *Mycosphaerellaceae* clade in a more basal and separate position. These results indicate that *Distocercospora* has to be maintained as separate genus, distinguished from *Passalora* by having consistently distoseptate conidia.

**Distocercospora** Pons & B. Sutton, *Mycol. Pap.* **160**: 60 (1988).

*Type species: Distocercospora pachyderma* (Syd. & P. Syd.) Pons & B. Sutton 1988.

*Literature:* Braun (1995a: 40), Braun & Mel'nik (1997: 15), Crous & Braun (2003: 26), Seifert *et al.* (2011: 187).

*Description:* *Foliicolous*, plant pathogenic, leaf spotting hyphomycetes (asexual morphs), sexual morphs unknown. *Mycelium in vivo* internal; hyphae branched, septate, subhyaline to pigmented, thin-walled, smooth. *Stromata* lacking to well-developed, pigmented, *textura angulata* to *globosa*. *Conidiophores* macronematous, mononematous, simple to branched, often strongly branched, septate, pigmented, thin-walled, smooth to rough-walled; conidiogenous cells integrated, terminal, occasionally intercalary, proliferation sympodial, conidiogenous loci conspicuous, somewhat thickened and darkened. *Conidia* formed singly, rarely in short chains, scolecosporous, mostly obclavate to cylindrical, with a single to several transverse distosepta, subhyaline to pigmented, wall smooth to rough, hila somewhat thickened and darkened, conidial secession schizolytic.

## PASSALORA EMEND. CROUS & BRAUN (2003)

*Passalora*, described by Fries (1849), was the first genus introduced for cercosporoid hyphomycetes. Fresenius (in Fuckel 1863) introduced *Cercospora* for passalora-like species with pluriseptate conidia. Later the concept of

*Cercospora* was considerably widened, and culminated in Chupp's (1954) monograph of *Cercospora s. lat.* with very broad generic concept. Several attempts to segregate smaller generic units from *Cercospora s. lat.* for cercosporoids with thickened and darkened conidiogenous loci were made in the 20<sup>th</sup> century, but attracted little attention and were barely used, e.g. *Cercosporidium* (Earle 1901), *Mycovellosiella* (Rangel 1917), *Ragnhildiana* (Solheim 1930), *Cercodeuterospora* (Curzi 1932), *Berteromyces* (Ciferri 1954), *Fulvia* and *Oreophylla* (Ciferri 1954), *Phaeoramularia* (Muntañola 1960), *Tandonella* (Prasad & Verma 1970).

Deighton (1967) reintroduced *Cercosporidium* for cercospora-like hyphomycetes with internal mycelium, usually well-developed stromata, fasciculate conidiophores and solitary, non-scolecosporous, mostly pale conidia and maintained *Passalora*, although very similar, as separate genus based on "lacking" stromata and pale brown conidia. For similar species characterised by conidia formed in chains, Ellis (1971, 1976) and Deighton (1979) accepted and used *Phaeoramularia*, and for those with solitary conidiophores arising from superficial mycelium the old name *Mycovellosiella* was reintroduced (Deighton 1974, 1979, 1983; Ellis 1971, 1976). This splitting of the *Passalora* complex had been the generally recognised genus concept in the following about 25 years, recognised by most subsequent authors (e.g., von Arx 1983, Pons & Sutton 1988, Hsieh & Goh 1990, Braun 1995a, Braun & Mel'nik 1997, Shin & Kim 2001, Guo *et al.* 2003, etc.).

First doubts with regard to the acceptance and rationality of the differentiation between *Passalora* and *Cercosporidium*, as made in Deighton (1967), were expressed in Deighton's (1990) reassessment of the synnematous genus *Phaeoisariopsis* in which he confined the latter genus to a few species around *P. griseola*, the type species, characterised by having subconspicuous, non-protuberant conidiogenous loci on non-geniculate conidiogenous cells. Other former *Phaeoisariopsis* species with inconspicuous (unthickened, not darkened) loci were assigned to *Pseudocercospora*, and the remaining species with thickened, darkened loci on distinctly geniculate conidiogenous cells were proposed to be candidates for *Passalora*. Braun (1995b) reassessed the *Passalora* complex and proposed to reduce *Cercosporidium*, *Mycovellosiella* and *Phaeoramularia* to synonymy with *Passalora*. Crous & Braun (2003) discussed this generic complex in detail and came to the conclusion that these genera and various additional ones should better be merged under the oldest name *Passalora*. There is a continuum of all relevant morphological characters between species of the genera involved. Numerous examples of intermediate species were cited and discussed in Crous & Braun (2003). Neither the conidial formation, solitary or in chains, nor the presence or absence of superficial mycelium represent reliable features on generic rank. With regard to morphological features reliably applicable for the discrimination on generic level, *Passalora* is comparable with other cercosporoid and ramularioid genera like *Pseudocercospora*, *Pseudocercosporella*, *Ramularia* and *Zasmidium*. Thus, the new emended circumscription of *Passalora* (according to Crous & Braun 2003) encompassed cercosporoid species with internal and external or only internal mycelium, solitary, fasciculate to synnematous conidiophores

and conidia formed singly or in chains, but in all cases with conspicuous (thickened and darkened) conidiogenous loci (scars) and mostly non-scolecosporous, pigmented conidia. This new concept was also supported by first molecular sequence analyses (Crous et al. 2000, 2001). Hernández-Gutiérrez & Dianese (2009) divided *Passalora* in sections, viz. sect. *Passalora*, *Mycovellosiella*, *Phaeoramularia*, and *Pseudophaeoisariopsis*, which can be seen as morphological, non-monophyletic groups, which are, however, connected by numerous morphologically intermediate species. Sequences of *Passalora fulva* (*Cladosporium fulvum*, *Fulvia fulva*), type species of the genus *Fulvia*, with a special habit of conidiophores, are close to those of some other *Passalora* species in the *Mycosphaerellaceae* clade (Thomma et al. 2005), which supported the reduction of *Fulvia* to synonym with *Passalora* as proposed in Crous & Braun (2003). In this wide concept of *Passalora*, some species with hyaline passalora-like conidia (non-scolecosporous, broad, only with few septa) were included, as for instance *Passalora dubia* and *P. jansseana*. However, in molecular sequence analyses, such species clustered within the *Cercospora* clade (Groenewald et al. 2012), i.e. the colour of the conidia (absence or presence of pigmentation) is more important than the conidial shape, although most *Passalora* species are characterised by having non-scolecosporous conidia and most *Cercospora* species by scolecosporous ones.

The currently applied wide concept of *Passalora* introduced by Braun (1995b) and Crous & Braun (2003) is not generally accepted and was questioned by some authors. For instance, Guo et al. (2003) treated Chinese species of the *Passalora s. lat.* complex and recognised three genera, namely *Mycovellosiella*, *Passalora* (including *Cercosporidium*) and *Phaeoramularia*. Baker et al. (2000) discussed the intricately, controversial history of *Passalora* and *Cercosporium* in detail, admitted a morphological continuum between the two genera, but considered the merging of these genera as undesirable. They discussed morphological differences between these genera, and considered them to be sufficiently distinct to be maintained until more profound examinations will be available. With the increasing application of molecular methods in the *Cercospora* complex, more profound approaches are now given, but corresponding analyses of sequence data do not support a clear separation of *Cercosporidium*, *Passalora* and other genera involved.

The phylogenetic structure of *Passalora* is, however, complicated and causes severe problems. Numerous available phylogenetic examinations based on rDNA ITS data and other markers indicate that *Passalora s. lat.* is not monophyletic (Crous et al. 2000, 2001, 2009b, c, 2013; Thomma et al. 2005). Taxa within the *Mycosphaerellaceae* are at least paraphyletic, if not polyphyletic. Comprehensive phylogenetic analyses based on a much broader sampling, including the type species of *Passalora* and its synonymised genera, are necessary for a better understanding of the generic structure of *Passalora s. lat.* However, a severe problem is that clades or subclades spread within the *Mycosphaerellaceae* are not clearly connected with morphological groups within *Passalora*, i.e. mycovellosiella-like, phaeoramularia-like groups of species and other morphological types are not reflected in phylogenetic assemblages. Hence, a comprehensive phylogenetic

reassessment and further splitting of *Passalora* is currently not possible based on available data, and it has to be accepted as a para- or polyphyletic genus, at least for the present.

**Passalora** Fr., *Summa Veg. Scand.* **2**: 500 (1849).

*Type species: Passalora bacilligera* (Mont. & Fr.) Mont. & Fr. 1849.

*Synonyms: Cercosporidium* E. Earle, *Muhlenbergia* **1**: 16 (1901) [type species: *C. helleri* E. Earle 1901].

*Velloosiella* Rangel, *Bol. Agric. (São Paulo), Ser.* **16 A**, 2: 151 (1915), *nom. illeg.* (Art. 53.1).

*Mycovellosiella* Rangel, *Arch. Jard. Bot. Rio de Janeiro* **2**: 71 (1917) [type species: *M. cajani* (Henn.) Rangel ex Trotter 1931].

*Passalora* sect. *Mycovellosiella* (Rangel) A. Hern.-Gut. & Dianese, *Mycotaxon* **108**: 3 (2009).

*Ormathodium* Syd., *Ann. Mycol.* **26**: 138 (1928) [type species: *O. styracis* Syd. 1928], *fide* Muntañola (1960).

*Ragnhildiana* Solheim, *Mycologia* **23**: 365 (1931) [type species: *R. agerati* (F. Stevens) F. Stevens & Solheim 1931].

*Cercodeuterospora* Curzi, *Boll. Staz. Patol. Veg. Roma, Ser.* **2**, **12**: 149 (1932) [type species: *C. trichophila* Curzi 1932].

*Fulvia* Cif., *Atti Ist. Bot. Univ. Lab. Critt. Pavia, Ser.* **5**, **10**: 246 (1954) [type species: *F. fulva* (Cooke) Cif. 1954].

*Mycovellosiella* subgen. *Fulvia* (Cif.) U. Braun, *Monogr. Cercosporella, Ramularia* **1**: 39 (1995).

*Berteromyces* Cif., *Sydowia* **8**: 267 (1954) [type species: *B. aeneus* Cif. 1954].

*Oreophyllum* Cif., *Sydowia* **8**: 253 (1954) [type species: *O. angelaemariae* Cif. 1954].

*Phaeoramularia* Munt.-Cvetk., *Lilloa* **30**: 182 (1960) [type species: *P. gomphrenicola* (Speg.) Munt.-Cvetk. 1960].

*Passalora* sect. *Phaeoramularia* (Munt.-Cvetk.) A. Hern.-Gut. & Dianese, *Mycotaxon* **108**: 3 (2009).

*Tandonella* S.S. Prasad & R.A.B. Verma, *Indian Phytopathol.* **23**: 111 (1970) [type species: *T. ziziphi* S.S. Prasad & R.A.B. Verma 1970].

*Walkeromyces* Thuang, *Trans. Brit. Mycol. Soc.* **66**: 213 (1976) [type species: *W. grewiae* Thuang 1976].

*Passalora* sect. *Pseudophaeoisariopsis* U. Braun, Dianese & A. Hern.-Gut., *Mycotaxon* **108**: 3 (2009).

*Literature:* Deighton (1967), Ellis (1971, 1976, as *Cercosporidium*), Hsieh & Goh (1990), Braun (1995a: 41), Braun & Mel'nik (1997: 16–17), Shin & Kim (2001: 135), Crous & Braun (2003: 21), Guo et al. (2003: 65), Kamal (2010: 101), Seifert et al. (2011: 331–332).

*Description* [emend. Crous & Braun (2003: 21)]: *Hyphomycetes* (asexual morphs or asexual holomorphs) or *Passalora* species with mycosphaerella-like sexual morphs; *Mycosphaerellaceae*. *Follicolous*, occasionally also *caulicolous* or on fruits, usually phytopathogenic, causing leaf-spots or other lesions, occasionally symptomless, rarely hyperparasitic or saprobic. *Mycelium in vivo* internal and external, superficial; hyphae branched, septate, colourless or almost so to pigmented, thin-walled, smooth or almost so. *Stromata* absent to well-developed, substomatal, intraepidermal to deeply immersed, applanate to subglobose,



subhyaline to usually pigmented. *Conidiophores in vivo* solitary, arising from superficial hyphae, lateral, occasionally terminal, or loosely to densely fasciculate, arising from internal hyphae or stromata, sometimes in sporodochia or synnemata, macronematous, cylindrical, filiform to strongly geniculate-sinuuous, unbranched or sometimes branched, pale to distinctly pigmented, olivaceous to medium dark brown, continuous to pluriseptate, wall thin to somewhat thickened, smooth, occasionally somewhat rough; conidiogenous cells integrated, terminal, occasionally intercalary or pleurogenous, or conidiophores aseptate, i.e. conidiophores reduced to conidiogenous cells, mono- to mostly polyblastic, proliferation sympodial, rarely percurrent, with a single to numerous conspicuous conidiogenous loci, non-protuberant to distinctly so, somewhat thickened and darkened-refractive, more or less cercosporoid, i.e. planate. *Conidia* solitary or catenate, in simple or branched acropetal chains, amero- to scolecosporous, aseptate to pluriseptate, rarely with additional distosepta, pale olivaceous to distinctly pigmented, wall thin to slightly thickened, smooth to finely rough, hila conspicuous, somewhat thickened and darkened-refractive, conidial secession schizolytic.

### **PSEUDOCERCOSPORA EMEND. CROUS ET AL. (2013), PALLIDOCERCOSPORA AND PHAEOCERCOSPORA**

The genus *Pseudocercospora* was introduced by Spegazzini (1910) in order to accommodate *Septonema vitis* (*Cercospora vitis*). This genus name was little used until Deighton (1976) reintroduced it in the course of his splitting of *Cercospora s. lat.* into smaller generic units. He used *Pseudocercospora* for cercosporoid hyphomycetes with unthickened "conidial scars" (i.e. conidiogenous loci), widened its circumscription and added a large number of species. Unthickened conidiogenous loci are characterised by having locus walls not thicker than the walls of the surrounding conidiogenous cells. Such loci are often inconspicuous, but may be more rigid and conspicuous in other species by being more or less denticle-like. The unthickened nature of the conidiogenous loci is, indeed, the fundamental character of *Pseudocercospora*, although in almost all species of this genus the loci are in addition not darkened-refractive, i.e. not darker than the surrounding wall of the conidiogenous cells (the darker pigmentation of conidiogenous loci, which is diagnostic for species of other cercosporoid genera like *Cercospora*, *Passalora* and *Zasmidium*, is generally caused by a combination of darker pigmentation and sometimes structural differences that may cause altered refraction of the light). The basic importance of unthickened conidiogenous loci as generic character for *Pseudocercospora* is supported by several "abnormal" species with more conspicuous loci which are unthickened but darker by being somewhat refractive or even slightly darkened (Crous & Braun 2003). Nevertheless such species belong in *Pseudocercospora*, which has been confirmed in several studies based on molecular sequence analyses (e.g., Crous *et al.* 2001, 2012).

Another problem concerns conidial formation. In almost all *Pseudocercospora* species, the conidia are consistently formed singly, but conidial catenation may occasionally

occur, e.g. in *Pseudocercospora nyctanthis*, *P. milletiae* and *P. noveboracensis* (Hsieh & Goh 1990, Braun 1995a, Braun & Mel'nik 1997, Crous & Braun 2003, Crous *et al.* 2013). Some other pseudocercospora-like species, characterised by subconspicuous conidiogenous loci (unthickened or almost so, but somewhat refractive or darkened-refractive) giving rise to short conidial chains or disarticulating conidia, were considered to be intermediate between *Passalora* and *Pseudocercospora* and assigned to the new genus *Pseudophaeoramularia* (Braun & Mel'nik 1997). However, the phylogenetic position of species with *Pseudophaeoramularia* morphology within the *Pseudocercospora* (*s. str.*) clade revealed that catenate conidia and somewhat darkened-refractive loci and hila are acceptable variation within *Pseudocercospora*.

*Prathigada* is another example for a misinterpreted and confused genus. Due to at least partly conspicuous conidiogenous loci, it has previously been interpreted as close to *Passalora*, but distinct by having obclavate, relatively thick-walled, often apically rostrate conidia. Beside type material, a collection on *Crateva formosensis*, collected in Japan, has been examined and compared. The Japanese material agrees perfectly with the type material. The conidia do not exceed 50 µm in length and three septa in both specimens. Results of molecular sequence analyses based on the Japanese material (C. Nakashima, unpubl. data) showed that *Prathigada crataevae*, the type species of *Prathigada*, clusters within the *Pseudocercospora s. str.* clade near to *P. fijiensis*, i.e. *Prathigada* has to be reduced to synonym with *Pseudocercospora*. The molecular data are supported by morphological characters of *P. crataevae*. The conidiogenous loci and conidial hila are somewhat intermediate between the *Passalora* and *Pseudocercospora* type by ranging from inconspicuous to conspicuous by being denticle- or peg-like or by being somewhat refractive to slightly darkened-refractive, but on the other hand they are always unthickened and thus not in conflict with the current concept of *Pseudocercospora s. str.* (Crous *et al.* 2013). Unthickened conidiogenous loci which are more conspicuous by being somewhat darkened-refractive are known in other proven *Pseudocercospora* species, e.g. in *Pseudophaeoramularia*, which has been reduced to synonymy with the latter genus (Crous *et al.* 2013). Due to the discussed results, *Prathigada crataevae* has to be reallocated to *Pseudocercospora*. The following redescription is based on the re-examination of type material and an additional Japanese sample:

#### ***Pseudocercospora crataevae* C. Nakash. & U. Braun, nom. nov.**

Mycobank MB805517

(Fig. 1)

*Basionym:* *Napicladium crataevae* Syd. & P. Syd. ("*crataevae*"), *Ann. Mycol.* **11**: 329 (1913), non *Pseudocercospora crataevae* Phengsintham *et al.* (2013).

*Synonyms:* *Macraea crataevae* (Syd. & P. Syd.) Subram. ("*crataevae*"), *Proc. Indian Acad. Sci., B, Biol. Sci.*, **36**(4): 164 "1952" (1953).

*Prathigada crataevae* (Syd. & P. Syd.) Subram. ("*crataevae*"), in Subramanian & Ramakrishnan, *J. Madras Univ., B*, **26**: 367 (1956).

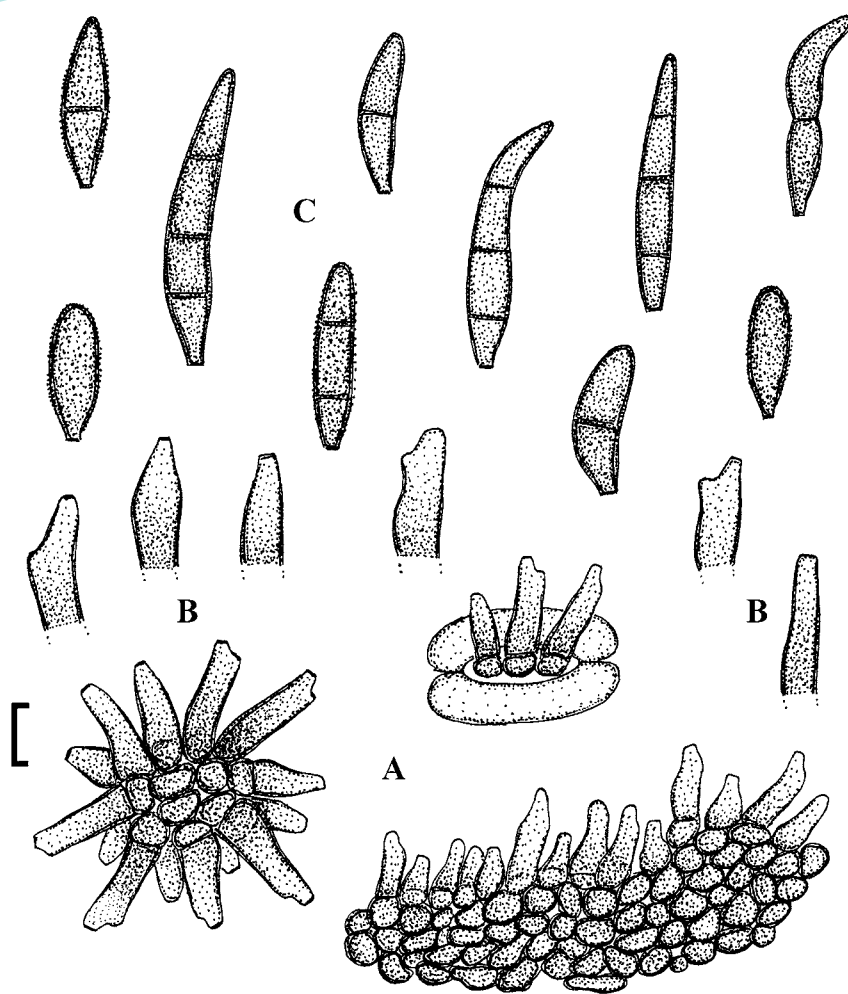


Fig. 1. *Pseudocercospora cratevicola* (S, F42112). A. Conidiophore fascicles. B. Conidiophores. C. Conidia. Bar = 10 µm.

**Description:** Leaf spots almost lacking to well-developed, amphigenous, subcircular to angular-irregular, 1–10 mm diam or confluent and larger, yellowish, ochraceous, pale to medium brown, later dark brown by abundant fructification, lesions uniform or with a paler centre, finally sometimes greyish white, surrounded by a darker border, often with a diffuse yellowish to ochraceous halo. *Caespituli* amphigenous, scattered, punctiform, sometimes pustulate, later confluent and dense, forming larger layers, dark brown. *Mycelium* internal. *Stromata* lacking or almost so to well-developed, substomatal to intraepidermal or deeply immersed, subcircular in outline, 10–80 µm diam, or oblong, up to 150 × 50 µm, olivaceous-brown, yellowish brown to medium brown, composed of swollen hyphal cells, subcircular to angular-irregular in outline, 3–8 µm diam, wall somewhat thickened. Arrangement of *conidiophores* variable, ranging from small fascicles arising from internal hyphae or small stromata, rarely even solitary, to well-developed, large, dense fascicles, forming sporodochial conidiomata, emerging through stomata or erumpent, erect, straight to somewhat curved, subcylindrical to mostly attenuated towards the tip, conical or somewhat irregularly shaped, unbranched, 10–35 × 5–10 µm, 0–1-septate, pale olivaceous to olivaceous-brown or light brown, wall thin, about 0.5–0.75 µm, smooth or almost so to verruculose; conidiophores mostly reduced to conidiogenous cells, occasionally integrated, terminal, 10–30 µm long, proliferation sympodial, rarely percurrent, with a single or few

conidiogenous loci, inconspicuous to conspicuous by being denticle-like (peg-like) or by being somewhat refractive or slightly darkened-refractive, but always unthickened, 1.5–3 µm diam. *Conidia* solitary, 15–50 × 5–9 µm, 0–3-septate, young small conidia ellipsoid-ovoid, obovoid or subcylindrical, 0–1-septate, thin-walled, subhyaline or pale, uniformly pigmented, mostly verruculose, fully developed older conidia obclavate, straight to often curved, above all at the apex, 2–3-septate, pale olivaceous to medium dark brown, above all in the lower part, uniformly pigmented or often distinctly paler towards the tip, wall thickened, up to 1.5 µm, smooth or almost so to verruculose, apex obtuse to somewhat pointed, base short obconically truncate, sometimes abruptly attenuated, peg-like, 1.5–3 µm diam, hila neither thickened nor darkened, at most somewhat refractive.

**Material examined:** **India:** Madras: Coimbatore, Government Farm, on *Crateva religiosa* (Capparaceae), 5 Feb. 1912, W. McRae, No. 9 (S, F42112, holotype). – **Japan:** Shizuoka, Ito, on *Crateva formosensis*, 29 Sep. 1999, T. Kobayashi & C. Nakashima (CNS 797 and HAL 2597 F).

**Notes:** Subramanian (1953) introduced *Micaraea* for *Napicladium cratevae* as type species and added the new species *M. punjabensis* distinguished from the latter species by having longer conidia, about 30–70 µm, with mostly 3–6 septa. Later he assigned the two species to *Prathigada*



introduced as replacement name since *Micraea* proved to be a younger homonym. The source for the description and illustration of *Prathigada cratevae* in Ellis (1971) is unclear, but undoubtedly covers *P. cratevae* as well as *P. punjabensis*, although the latter name is not cited as synonym. The re-examination of type material of *Napicladium cratevae* (S, F42112) showed that this collection perfectly coincides with Subramanian's (1953) description and illustration. Mature, fully developed conidia do not exceed a length of 50 µm and are consistently 0–3-septate, and the examined and sequenced Japanese collection on *Crateva formosensis* agrees completely. Therefore, we prefer to maintain *Macraea punjabensis* (*Prathigada punjabensis*) as separate, easily distinguishable species and transfer it to *Pseudocercospora* as well:

***Pseudocercospora subramanianii*** U. Braun & C. Nakash., **nom. nov.**

MycoBank MB805518

*Basionym:* *Macraea punjabensis* Subram., *Proc. Indian Acad. Sci., B, Biol. Sci.*, **36**: 166 “1952” (1953), non *Pseudocercospora punjabensis* (Syd.) U. Braun & Bagyan., 1999.

*Synonym:* *Prathigada punjabensis* (Subram.) Subram., in Subramanian & Ramakrishnan, *J. Madras Univ., B*, **26**: 367 (1956).

*Notes:* It is not surprising that the structure of the conidiogenous loci of *Prathigada* was previously misinterpreted and confused with scars of genera with thickened and darkened loci. Due to at least partly conspicuous conidiogenous loci, *Prathigada* has previously been interpreted as a genus close to *Passalora*, but distinct by having obclavate, relatively thick-walled, often apically rostrate conidia (Braun 1995a, Crous & Braun 2003). As discussed above, the loci may be visible by being more rigid and somewhat darkened-refractive, but they are always unthickened, i.e. they fall into the morphological range of *Pseudocercospora*. Due to the discussed confusion, additional prathigada-like cercosporoid hyphomycetes have been assigned to *Prathigada*, including several species with true passalora-like conidiogenous loci, i.e. with conspicuously thickened and darkened scars, which cannot be reallocated to *Pseudocercospora*. They belong in *Passalora* in its current circumscription. The latter genus is, as far as known, not monophyletic, but a comprehensive phylogenetic revision is not yet available. Hence, the species concerned can currently only be assigned to *Passalora s. lat.*:

***Passalora austroplenckiae*** (A. Hernández-Gutiérrez & Dianese) U. Braun, **comb. nov.**

MycoBank MB805519

*Basionym:* *Prathigada austroplenckiae* A. Hernández-Gutiérrez & Dianese, *Mycotaxon* **106**: 57 (2009).

***Passalora backmanii*** (Furlan. & Dianese) U. Braun, **comb. nov.**

MycoBank MB805520

*Basionym:* *Prathigada backmanii* Furlan. & Dianese, *Mycol. Res.* **103**: 1203 (1999).

***Passalora condensata*** (Ellis & Kellerm.) U. Braun, **comb. nov.**

MycoBank MB805521

*Basionym:* *Cercospora condensata* Ellis & Kellerm., *J. Mycol.* **1**(1): 2 (1885).

*Synonym:* *Prathigada condensata* (Ellis & Kellerm.) U. Braun, *Cryptog. Mycol.* **20**: 166 (1999).

***Passalora gymnocladi*** (Ellis & Kellerm.) U. Braun, **comb. nov.**

MycoBank MB805522

*Basionym:* *Cercospora gymnocladi* Ellis & Kellerm., *Bull. Torrey Bot. Club* **11**: 121 (1884).

*Synonym:* *Prathigada gymnocladi* (Ellis & Kellerm.) U. Braun, *Sydowia* **48**: 209 (1996).

***Passalora thalictri*** (Thüm.) U. Braun, **comb. nov.**

MycoBank, MB805523

*Basionym:* *Cercospora thalictri* Thüm., *Contr. Fl. Mycol. Lusat.* **2**: 5 (1879).

*Synonym:* *Cercospora thalictri* var. *thalictri-flavi* Thüm., *Mycoth. Univ.*: 1470 (1886).

*Prathigada thalictri* (Thüm.) U. Braun, in Braun & Mel'nik, *Trudy Bot. Inst. Im. V.L. Komarova* **20**: 97 (1997).

*Notes:* Other species assigned to *Prathigada* do not agree with *Passalora*, belong elsewhere or they are doubtful and unclear. The status of *Prathigada bauhiniiae* (Rao *et al.* 1975) is unclear. *Stenellopsis shoreae* was reallocated to *Prathigada* by Kamal (2010), but due to unthickened hila it is possible that this species belongs to *Pseudocercospora*. *Prathigada tamarindi* (Muthappa 1968) is a doubtful species characterised by its unusual conidia which are about 20–30 × 8.5–11 µm and 1–2-septate. A re-examination of type material or examinations of new collections are necessary to reassess this species. *Prathigada terminaliae* (Sutton 1994) is better considered a species of *Pseudocercospora* (*P. terminaliae*). *Prathigada terminaliae-bellericae* (Kamal 2010) is tentatively reduced to synonymy with *P. terminaliae*. The significance of differences in the length of conidiophores and conidia between *P. terminaliae* and *P. terminaliae-bellericae* is unclear and doubtful as the values for these structures of the latter species are intermediate between *P. terminaliae* and *P. kenemensis*, which has been reduced to synonymy with the former species as well (Crous & Braun 2003). *Prathigada ziziphi* (Rao & Ramakrishnan 1965) is tentatively reduced to synonymy with *Pseudocercospora jujubae*. Type material was not available, but the shape and size of the conidia agree well.

There are several other morphological characteristics which were proposed for a further splitting of *Pseudocercospora* into smaller generic units, but all of them failed due to a morphological continuum between the particular morphological types and numerous intermediate taxa. Furthermore, there is no molecular (phylogenetic) evidence for and support of genera to be segregated based on morphology (Crous *et al.* 2000, 2001, 2013). Braun (1998) tried to use morphological characters for a separation of *Pseudocercospora* into morphological, non-phylogenetic sections, which are, however, little useful. *Pallidocercospora*

(Crous *et al.* 2013), recently introduced for the “*Mycosphaerella heimii*” complex (Crous *et al.* 2004a), is a segregation from *Pseudocercospora* mainly based on its distinct phylogenetic position and culture characteristics (formation of red crystals on MEA, PDA, SNA and WA), whereas the morphology of the asexual and sexual morphs is pseudocercospora- and mycosphaerella-like, respectively.

*Cercoseptoria* was recognised and reintroduced in Deighton (1976) for pseudocercosporoid species with acicular conidia. Most of the species assigned to *Cercoseptoria* are distinctly sporodochial. Deighton (1987) and Braun (1988) questioned *Cercoseptoria* as properly distinguished genus and reduced it to synonymy with *Pseudocercospora*. Absence or presence of stromata and conidial shape are too variable in *Pseudocercospora* to be used for the discrimination of smaller units on generic rank. Braun’s (1993) introduction of *Cercostigmia* for pseudocercospora-like former *Stigmia* species (conidiophores and conidia thin-walled, conidia scolecosporous) with consistently percurrently proliferating conidiogenous cells, partly associated with mycosphaerella-like sexual morphs, is another example. Sympodial and percurrent proliferations of conidiogenous cells are often mixed in particular *Pseudocercospora* species, and species with consistently percurrent proliferation cluster within the big *Pseudocercospora* clade as well (Crous *et al.* 2001, 2013; Taylor *et al.* 2003).

The conidiogenous loci of *Phaeoisariopsis griseola*, type species of *Phaeoisariopsis*, were previously considered to be passalora-like, i.e. slightly thickened and darkened. However, the loci in *P. griseola* range from being quite inconspicuous (neither thickened nor darkened), as exhibited in the type material of *Pseudocercospora columnaris* (*Cercospora columnaris*), one of the synonyms of *P. griseola*, to subconspicuous (i.e. non-protuberant, lying flat around the conidiogenous cells, unthickened, but slightly darkened-refractive). Deighton (1990) maintained *Phaeoisariopsis* as separate genus, but confined it to a few species with scars similar to those of its type species, *P. griseola*. He reallocated synnematous species with inconspicuous conidiogenous loci to *Pseudocercospora* and those with distinctly sympodial conidiogenous cells and conspicuously thickened and darkened loci to *Passalora*, whereas Braun (1992) considered *Phaeoisariopsis* a synnematous counterpart of *Passalora*. However, the locus type of *Phaeoisariopsis griseola*, type species of *Phaeoisariopsis*, falls within the range of loci in *Pseudocercospora*, which has been proven by means of results of molecular sequence analyses (Crous *et al.* 2006). These comprehensive examinations of angular leaf spot of bean (*P. griseola*) showed that this species clusters within the *Pseudocercospora* clade and revealed that the formation of synnematous conidiomata does not play any taxonomic role on generic level within the *Pseudocercospora* complex (Crous *et al.* 2006, 2013). Hence, this species was reallocated to the latter genus and *Phaeoisariopsis* was reduced to synonym with *Pseudocercospora*, which was proposed to be conserved as the former genus name is older (Braun & Crous 2006), i.e. former *Phaeoisariopsis* species with subconspicuous, *P. griseola*-like scars as well as inconspicuous loci are now part of *Pseudocercospora* and those with conspicuously thickened loci belong to *Passalora*. Furthermore, Crous

*et al.* (2006) demonstrated the unexpected phylogenetic position of *Stigmia platani*, type species of *Stigmia*, within the *Pseudocercospora* clade. Although older than *Pseudocercospora*, the latter genus name was conserved over that of *Stigmia* (Braun & Crous 2006).

*Paracercospora* (Deighton 1979), with *P. egenula* as type species, was introduced for former pseudocercosporoid hyphomycetes characterised by having a special type of conidiogenous loci, viz. the scars are only visible by a ring-like structure formed by a slightly thickened and darkened rim. *P. fijiensis* was originally assigned to *Pseudocercospora*, a position later confirmed in molecular sequence analyses (Crous *et al.* 2000, 2001, Stewart *et al.* 1999, Arzanlou *et al.* 2008). Therefore, Crous & Braun (2003) reduced *Paracercospora* to synonymy with *Pseudocercospora*, but the situation is more complicated as *P. fijiensis* is, indeed, a species of the latter genus, but *P. egenula*, the type species of *Paracercospora*, does not cluster within the *Pseudocercospora* clade and is tentatively maintained as separate genus (Crous *et al.* 2013). The problem is that the scar structure (*Paracercospora* type) is not informative and distinctive in this case, i.e. *Paracercospora* is confined to its type species and only phylogenetically distinguished from *Pseudocercospora*. *Phaeocercospora* (Crous *et al.* 2013) is another pseudocercospora-like genus just based on its separate phylogenetic position.

Based on detailed multilocal phylogenetic examinations, Crous *et al.* (2013) revealed a large monophyletic *Pseudocercospora* (*s. str.*) clade, including the type species of this genus, representing *Pseudocercospora emend.*, which is now a holomorph genus in its own right. Beside species of the “*Mycosphaerella heimii*” complex, forming a separate clade that is now treated as *Pallidocercospora*, and *Phaeocercospora*, there are some additional species morphologically indistinguishable from *Pseudocercospora* which cluster, however, apart from *Pseudocercospora* (*s. str.*) in other clades. Such phylogenetically unresolved species, as for instance *P. colombiensis* on *Eucalyptus* (Crous 1998), *P. thailandica* on *Acacia* (Crous *et al.* 2004b), and *P. tibouchinigena* on *Tibouchina* (Crous *et al.* 2013), are tentatively retained in *Pseudocercospora*. *Pseudocercospora s. str.* is characterised as follows:

***Pseudocercospora* Speg., Anales Mus. Nac. Buenos Aires 20: 438, 1910 (nom. cons.).**

*Type species: Pseudocercospora vitis* (Lév.) Speg. 1910.

*Synonyms: Stigmia* Sacc., *Michelia* 2: 22 (1880), *nom. rej.*

[type species: *S. platani* (Fuckel) Sacc. 1880].

*Phaeoisariopsis* Ferraris, *Ann. Mycol.* 7: 280 (1909), *nom. rej.*

[type species: *Ph. griseola* (Sacc.) Ferraris 1909].

*Cercosporiopsis* Miura, *Flora of Manchuria and East Mongolia*, 3, *Cryptogams*: 527 (1928), *nom. illeg.* (Art. 53.1).

*Septoriopsis* F. Stevens & Dalbey, *Mycologia* 11: 4 (1918), *nom. illeg.* (Art. 53.1).

*Cercoseptoria* Petr., *Ann. Mycol.* 23: 69 (1925) [type species: *C. chamaesycae* (F. Stevens & Dalbey) Petr. 1925].

*Ancylospora* Sawada, *Rep. Govt. Agric. Res. Inst. Taiwan* 87: 78 (1944), *nom. inval.* (Art. 39.1).

*Helicomina* L.S. Olive, *Mycologia* 40: 17 (1948) [type species: *H. caperoniae* L.S. Olive 1948].

*Macraea* Subram., *Proc. Indian Acad. Sci., Section B, Biol. Sci.*, **36**: 164 "1952" (1953), *nom. illeg.* (Art. 53.1).

*Prathigada* Subram., in Subramanian & Ramakrishnan, *J. Madras Univ., B*, **26**: 366 (1956).

*Cercocladospora* G.P. Agarwal & S.M. Singh, *Proc. Natl. Acad. Sci. India, B*, **42**: 439 "1972" (1974) [type species: *C. andinae* G.P. Agarwal & S.M. Singh 1974].

*Cercostigmia* U. Braun, *Cryptog. Bot.* **4**: 107 (1993) [type species: *C. concentrica* (Cooke & Ellis) U. Braun 1993].

*Pseudophaeoramularia* U. Braun, *Trudy Bot. Inst. Im. V.L. Komarova* **20**: 18 (1997) [type species: *P. geranii* (W.B. Cooke & C.G. Shaw) U. Braun 1997].

*Paracercospora* p.p. [see Crous *et al.* (2013)].

**Literature:** Deighton (1976), Yen & Lim (1980: 168–190), Pons & Sutton (1988), Hsieh & Goh (1990), Braun (1995a: 42), Guo & Hsieh (1995), Braun & Mel'nik (1997: 18), Guo *et al.* (1998), Shin & Kim (2001: 158), Crous & Braun (2003: 25), Kamal (2010: 143), Seifert *et al.* (2011: 364–367).

**Description** [emend. Crous *et al.* (2013)]: *Hyphomycetes* (asexual morphs or asexual holomorphs) or *Pseudocercospora* with mycosphaerella-like sexual morphs; *Mycosphaerellaceae*. *Foliicolous*, occasionally also caulicolous or on fruits, usually phytopathogenic, causing leaf spots or other lesions, occasionally symptomless or endophytic. *Mycelium in vivo* internal and/or external, superficial, sometimes climbing leaf hairs; hyphae branched, septate, hyaline to pigmented, mostly thin-walled, smooth or only faintly rough-walled, mostly about 1–6 µm wide, external hyphae emerging through stomata, rarely erumpent. *Stromata* lacking to well-developed, small to large, substomatal, intraepidermal to deeply immersed, mostly between 10 and 120 µm diam, pale olivaceous to dark brown. Colonies on leaves, amphigenous, sometimes also on fruits and stems, almost colourless to dark brown, scattered to dense. *Conidiophores* semimacronematous to mostly macronematous, in small to large, loose to dense fascicles, arising from internal hyphae or stromata, emerging through stomata or erumpent, and/or conidiophores solitary, arising from superficial hyphae, lateral or occasionally terminal, sometimes forming sporodochial conidiomata (numerous conidiogenous cells or short conidiophores arising from well-developed stromata) or distinct synnemata, conical, cylindrical, filiform to strongly geniculate-sinuous, unbranched to branched, aseptate (conidiophores reduced to conidiogenous cells) to pluriseptate, subhyaline to dark brown, wall thin to moderately thick, smooth to somewhat rough-walled, occasionally with annellations caused by rejuvenation; conidiogenous cells integrated, terminal, occasionally intercalary, or conidiophores often reduced to conidiogenous cells, mono- to polyblastic, sympodially or percurrently proliferating, sometimes both types of proliferation mixed, conidiogenous loci inconspicuous or conspicuous by being more or less denticle-like, but locus wall always unthickened or almost so, usually neither darkened nor refractive, rarely more rigid and more conspicuous by being somewhat darkened-refractive or slightly thickened along the rim, but not thickened throughout. *Conidia* usually formed singly, rarely disarticulating or in short acropetal chains,

usually scolecosporous, i.e. obclavate, cylindrical, filiform, acicular and pluriseptate, rarely amero- to phragmosporous, i.e. ellipsoid-ovoid, short cylindrical, fusiform, aseptate or only with few septa, euseptate, rarely eusepta mixed with few distosepta, but not consistently distoseptate, hyaline or subhyaline, olivaceous, olivaceous-brown to medium dark brown, wall thin to somewhat thickened, smooth to faintly verruculose, ends rounded, truncate to obconically truncate, hila unthickened or almost so, planate, rarely slightly bulging, without marginal frill or rarely with minute frill, conidial secession schizolytic.

**Pallidocercospora** Crous, *Stud. Mycol.* **75**: 73 (2012) [2013].

*Type species: Pallidocercospora heimii* (Crous) Crous 2013.

*Pseudocercospora* p.p. [see Crous *et al.* (2013)].

**Description:** *Hyphomycetes* (asexual morphs or asexual holomorphs) or *Pallidocercospora* with mycosphaerella-like sexual morphs; *Mycosphaerellaceae*. Phylogenetically distinct from *Pseudocercospora*, forming a separate clade. *In vivo* morphologically indistinguishable from *Pseudocercospora*, but *in vitro* forming red crystals on MEA, PDA, SNA and WA.

**Phaeocercospora** Crous, *Persoonia* **28**: 171 (2012) [Fungal Planet 122, 2012]

*Type species: Phaeocercospora colophospermi* Crous 2012.

**Description:** *Hyphomycetes* (asexual morphs or asexual holomorphs); *Mycosphaerellaceae*. Phylogenetically distinct from *Pseudocercospora*, belonging to the "Dothistroma clade". Morphologically close to and barely distinguishable from former *Cercostigmia* species (*Cercostigmia*-like *Pseudocercospora* species), i.e. with unilocal, determinate to percurrent conidiogenous cells. Hitherto monotypic (the type species occurs in South Africa on the legume *Colophospermum mopane*).

## STENELLA AND ZASMIDIUM

*Stenella* was introduced by Sydow (1930) as monotypic genus for *S. araguata*, a species with conspicuously thickened, darkened conidiogenous loci and hila. However, this genus was little applied until Ellis (1976) and Deighton (1979) widened its concept and added numerous morphologically similar species, previously mostly assigned to *Cercospora*, characterised by forming distinctly verruculose superficial mycelium *in vivo* and verruculose conidia, formed singly or in chains. The number of new and reallocated species increased rapidly, encompassing a wide range of morphological types, i.e. species with exclusively solitary conidiophores arising from superficial hyphae to taxa with solitary as well as fasciculate conidiophores, with or without stromata, with catenate or solitary amero- to scolecosporous conidia or both types mixed in particular species. Similar species with stenella-like conidia, but without any verruculose superficial hyphae *in vivo* have previously been placed in *Stenellopsis*, but Braun & Crous (2005) reduced the latter genus to synonym with *Stenella*, a conclusion supported by results of molecular sequence



analyses (Shivas *et al.* 2009). The presence of superficial mycelium in *Stenella* is not essential on generic rank, which is comparable to the situation in other cercosporoid genera like *Passalora* and *Pseudocercospora*. *Verrucisporota*, introduced by Shaw & Alcorn (1993) as replacement for the illegitimate *Verrucospora*, with *V. proteacearum* as type species, is morphologically very close to *Zasmidium* and barely distinguishable. Previous attempts to distinguish this genus from *Stenellopsis* on the base of differences in the stroma structure, broad loci and rugose conidia (Ellis 1971, David 1997) are neither practicable nor tenable. New species of this genus described by Beilharz & Pascoe (2002) are rather zasmidium-like. One of these species, *V. davisiae*, has a mycosphaerella-like sexual morph. Phylogenetic analyses of *Verrucisporota* species carried out by Crous *et al.* (2009c) showed that they cluster within the *Mycosphaerellaceae* clade together with *Zasmidium* species. Therefore, *Verrucisporota* is tentatively considered a synonym of the non-monophyletic genus *Zasmidium* until the exact phylogenetic position of its type species will be known.

Arzanlou *et al.* (2007) carried out comprehensive molecular examinations of *Ramichloridium* and morphologically similar genera, including *Stenella* and *Zasmidium*. *Stenella araguata*, the type species of *Stenella*, surprisingly clustered in the *Teratosphaeriaceae*, whereas all other examined *Stenella* species belong to the *Mycosphaerellaceae* phylogenetically. These results led to the conclusion that *Stenella* has to be confined to its type species, whereas the other species in the *Mycosphaerellaceae* need to be assigned to another genus. *Zasmidium* proved to be an available name, as the type species of this genus clusters in the *Mycosphaerellaceae* and coincides morphologically with *Stenella* (Arzanlou *et al.* 2007). Therefore, Braun *et al.* (2010a) introduced *Zasmidium* as genus for stenella-like fungi belonging to the *Mycosphaerellaceae* and reallocate numerous species, although *Zasmidium s. lat.* does not form a single monophyletic clade within the *Mycosphaerellaceae* (Crous *et al.* 2009a, b). The conidiogenous loci and hila of the conidia in *Zasmidium* are cercosporoid, i.e. planate and somewhat thickened and darkened. *Stenella s. str.* is currently monotypic, i.e. confined to its type species, and the conidiogenous loci are according to David (1993) pileate. Otherwise, *Stenella* and *Zasmidium* species are morphologically barely distinguished. Braun *et al.* (2010b) and Kamal (2010) reallocated numerous additional *Stenella* species described from Brazil, New Zealand, Venezuela and known from India to *Zasmidium*.

### **Zasmidium** Fr., *Summa Veg. Scand.* 2: 407 (1848).

*Type species:* *Zasmidium cellare* (Pers. : Fr.) Fr. 1848.

*Synonyms:* *Biharia* Thirum. & Mishra, *Sydowia* 7: 79 (1953) [type species: *B. vanguardiae* Thirum. & Mishra 1953].

*Stenellopsis* B. Huguenin, *Bull. Trimestriel Soc. Mycol. France* 81: 695 (1966) [type species: *St. fagraeae* B. Huguenin 1966].

*Verrucospora* D.E. Shaw & Alcorn, *Proc. Linn. Soc. New South Wales* 92: 171 (1967), *nom. illeg.* (Art. 53.1).

*Verrucisporota* D.E. Shaw & Alcorn, *Austral. Syst. Bot.* 6: 273 (1993) [type species: *V. proteacearum* D.E. Shaw & Alcorn 1993].

*Stenella* p.p. [see Braun *et al.* (2010a, b)].

*Literature:* Deighton (1979: 52–54, as *Stenella*), Ellis (1976: 307–314, as *Stenella*), Braun & Mel'nik (1997: 21), Braun *et al.* (2010a, b), Shivas *et al.* (2009), Seifert *et al.* (2011: 478).

*Description* [emend. Braun *et al.* (2010a)]: *Hyphomyces* (asexual morphs or asexual holomorphs) or *Zasmidium* with mycosphaerella-like sexual morphs; *Mycosphaerellaceae*. Saprobic or mostly biotrophic, usually foliicolous, symptomless or causing various lesions, ranging from yellowish discolorations to distinct leaf spots. In plant pathogenic species, mycelium mostly immersed as well as superficial, rarely only immersed; hyphae branched, septate, colourless or almost so to pigmented, pale olivaceous to brown, wall thin to somewhat thickened, immersed hyphae smooth or almost so to faintly rough, external hyphae distinctly verruculose to verrucose (in culture immersed hyphae usually smooth or almost so, aerial hyphae verruculose). *Stromata* lacking to well-developed, pigmented. *Conidiophores* solitary, arising from superficial hyphae, lateral, occasionally terminal, *in vivo* (in plant pathogenic taxa) sometimes also fasciculate, arising from internal hyphae or stromata, semimacronematous to macronematous, in culture occasionally micronematous, cylindrical, filiform, subuliform, straight to strongly geniculate-sinuous, mostly unbranched, aseptate, i.e. reduced to conidiogenous cells, to pluriseptate, subhyaline to pigmented, pale olivaceous to medium dark brown, wall thin to somewhat thickened, smooth to verruculose; conidiogenous cells integrated, terminal, occasionally intercalary, rarely pleurogenous, or conidiophores reduced to conidiogenous cells, mostly polyblastic, sympodial, conidiogenous loci conspicuous, somewhat thickened and darkened-refractive, planate. *Conidia* solitary or catenate, in simple or branched acropetal chains, shape and size variable, ranging from amero- to scolecosporous, aseptate to transversely pluriseptate, subhyaline to pigmented, pale olivaceous to brown, wall thin to somewhat thickened, smooth or almost so to usually distinctly verruculose (in plant pathogenic species without superficial mycelium always verruculose), hila somewhat thickened and darkened-refractive, planate, conidial secession schizolytic.

**Stenella** Syd., *Ann. Mycol.* 28: 205 (1930).

*Type species:* *Stenella araguata* Syd. 1930.

*Description:* Morphologically agreeing with plant pathogenic *Zasmidium* species, except for pileate conidiogenous loci. Phylogenetically belonging in the *Teratosphaeriaceae* (in its current circumscription monotypic). *Stenella araguata* was redescribed in Ellis (1971).

## TENTATIVELY RECOGNISED CERCOSPOROID GENERA

**Asperisporium** Maubl., *Lavoura* 16: 212, "1912" (1913) and *Bull. Trimestriel Soc. Mycol. France* 29: 357 (1913).

*Type species:* *Asperisporium caricae* (Speg.) Maubl. 1913.

*Literature:* Ellis (1971: 273–274; 1976: 240–243), Sutton (1975: 182–185), von Arx (1983), Braun (1995a: 40), Braun

& Mel'nik (1997: 14), Crous & Braun (2003: 13), Minnis *et al.* (2011), Seifert *et al.* (2011: 95).

**Description:** Usually foliicolous, leaf-spotting hyphomycetes, *Mycosphaerellaceae*. *Mycelium in vivo* internal; hyphae branched, septate, colourless to pigmented, thin-walled, smooth or almost so. *Stromata* usually well-developed, substomatal to intraepidermal, often somewhat erumpent, pigmented. *Conidiophores* macronematous, usually densely fasciculate, forming sporodochial conidiomata, continuous to septate, pigmented, wall thin to slightly thickened, smooth or almost so; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, usually polyblastic, sympodial, but mostly not strongly geniculate, conidiogenous loci conspicuous, thickened and darkened. *Conidia* solitary, amero- to phragmosporous (non-scolecosporous), mostly ellipsoid-ovoid, obovoid, fusiform to short cylindrical or obclavate, mostly with 0–3 eusepta, sometimes with a single or several oblique or longitudinal septa, pigmented, distinctly verruculose to coarsely verrucose, basal hilum thickened and darkened, conidial secession schizolytic.

**Notes:** *Asperisporium* is morphologically very close to *Passalora*, as already emphasized by Crous & Braun (2003), except for verrucose conidia. The phylogenetic position of *A. caricae*, its type species, has recently been elucidated in Minnis *et al.* (2011), based on DNA sequences from the ITS region and nLSU, showing that this species clusters within the *Mycosphaerellaceae* clade close to several *Passalora* species, including *P. brachycarpa*. According to this result, *Asperisporium* is undoubtedly a potential synonym of *Passalora*. However, as *Passalora* is still para- or even polyphyletic and the phylogenetic position of its type species is still unknown, a formal reassessment of *Asperisporium* was postponed by Minnis *et al.* (2011) until the whole *Passalora* complex will be phylogenetically examined and reassessed in detail. However, the postponed reassessment of the genus name *Asperisporium* does only concern its type species. Other species assigned to *Asperisporium* have to be individually reassessed, if possible based on molecular sequence data. *Asperisporium sequoiae* and *A. juniperinum*, two species on Gymnosperms with relatively delicately rough-walled conidia, are typical examples. Sequences of the two species are rather similar, cluster with other species of *Passalora s. lat.*, but they are only distantly related to the type species of *Asperisporium* (Solheim 2013). Therefore, these species are better assigned to the polyphyletic *Passalora* in its current circumscription. Comprehensive phylogenetic examinations of the whole complex of asperisporium- and passalora-like hyphomycetes are necessary to reach a better more natural genus concept in this group of cercosporoid hyphomycetes. The surface sculpture of the conidia as character for the discrimination of *Asperisporium* from *Passalora* is undoubtedly unreliable, at least species with delicately verruculose conidia may belong to *Passalora*, which is supported by phylogenetic data.

**Cladosporiella** Deighton, *Mycol. Pap.* **101**: 34 (1965).  
*Type species: Cladosporiella cercosporicola* Deighton 1965.

**Literature:** Deighton (1969: 33–39), Ellis (1971: 303), Braun (1995a: 39), Seifert *et al.* (2011: 145).

**Notes:** Morphologically close to *Cladosporium* and mycovellosiella-like *Passalora* species (with superficial hyphae, conidiophores fasciculate or solitary, arising from superficial hyphae, conidiogenous loci conspicuous, thickened and darkened, conidia catenate, pigmented), but the loci and hila are not cladosporium-like (not coronate) and all species assigned to this genus are hyperparasitic. The hyperparasitic habit as single character is barely acceptable and usable to discriminate this genus from *Passalora*, but since the phylogenetic position of *Cladosporiella* and its relation to the *Mycosphaerellaceae* are still unclear and unproven, we tentatively prefer to maintain it as separate genus.

**Denticularia** Deighton, *Trans. Brit. Mycol. Soc.* **59**: 421 (1972).

*Type species: Denticularia modesta* (Syd.) Deighton 1972.

**Literature:** Ellis (1976: 182–183), Braun (1995a: 42), Crous & Braun (2003: 23), Seifert *et al.* (2011: 176).

**Notes:** Morphologically close to *Pseudocercospora* (leaf spotting hyphomycetes with unthickened, not darkened conidiogenous loci and hila), but the conidiogenous loci are distinctly denticle-like, and the catenate conidia are non-scolecosporous, only with 0–1(–3) septa.

Cultures of the type species of this genus and results of molecular sequence analyses are necessary to resolve its phylogenetic position and clarify its relation to *Pseudocercospora*. It is still unclear and unproven if this genus belongs in the *Mycosphaerellaceae*. Therefore, *Denticularia* is tentatively retained as genus on its own.

**Elletevera** Deighton, *Mycol. Pap.* **118**: 17 (1969).

*Type species: Elletevera parasitica* (Ellis & Everh.) Deighton 1969.

**Literature:** Braun (1995a: 37), Crous & Braun (2003: 17), Seifert *et al.* (2011: 193).

**Description:** *Fungicolous*, hyperparasitic dematiaceous hyphomycetes. *Mycelium* immersed; hyphae hyaline to faintly pigmented; stromata lacking; conidiophores macronematous, erect, laxly fasciculate, frequently branched, septate, faintly pigmented, thin-walled, smooth; conidiogenous cells integrated, terminal or formed as lateral branchlets, conidiogenous loci neither thickened nor darkened, but distinct by being denticle-like and somewhat refractive; conidia solitary, rarely catenate, phragmo- to scolecosporous, pigmented, with slightly refractive basal hilum.

**Notes:** This genus was introduced for hyperparasitic cercosporoid hyphomycetes with “distinct” conidiogenous loci, morphologically resembling species of the former genus *Mycovellosiella*. However, the re-examination of several collections of the type species of *Elletevera* showed that Deighton's (1969) original description of the conidiogenous

loci (scars) is misleading (Crous & Braun 2003). Due to denticle-like loci with unthickened, not darkened walls, *Elletevera* is possibly related to *Pseudocercospora* or perhaps not cercosporoid at all. But this question cannot be answered without knowledge of the phylogenetic affinity of this genus, which is still unproven and unclear. The hyperparasitic habit alone is insufficient to uphold *Elletevera* as separate genus, but until its phylogenetic position is proven the latter genus is tentatively maintained.

**Eriocercospora** Deighton, *Mycol. Pap.* **118**: 5 (1969).  
*Type species: Eriocercospora balladynae* (Hansf.) Deighton 1969.

*Literature:* Ellis (1971: 248–249), Rao et al. (1982: 1155), Braun (1995a: 39), Seifert et al. (2011: 199).

*Description:* *Fungicolous*, hyperparasitic dematiaceous hyphomycetes. *Mycelium* superficial; hyphae branched, septate, pigmented, thin-walled, smooth. *Stromata* lacking. *Conidiophores* macronematous, mononematous, solitary, *in vivo* arising from superficial hyphae, lateral, erect, usually unbranched, continuous to septate, pigmented, thin-walled, smooth; *conidiogenous cells* integrated, terminal and intercalary, sympodially proliferating, but usually not distinctly geniculate, conidiogenous loci subconspicuous, i.e. unthickened, not or barely protuberant, not or only slightly darkened-refractive. *Conidia* solitary, scolecosporous, transversely euseptate, pigmented, thin-walled, smooth or almost so, hila unthickened, not or barely darkened-refractive.

*Notes:* Crous & Braun (2003) re-examined type material and numerous other collections of *E. balladynae* and found that Deighton's (1969) original description of the conidiogenous loci (scars), which were compared with those of the former genus *Mycovellosiella*, are misleading. The loci are neither thickened nor conspicuously darkened (at most they are only slightly darkened-refractive), i.e. they are rather *Pseudocercospora*-like. In *E. olivacea*, another hyperparasitic species, the loci and hila are quite unthickened and also not darkened-refractive. *Eriocercospora websteri* and *E. moghaniae* are two excluded plant pathogenic species that were reallocated to *Pseudocercospora* (Braun 2002, Crous & Braun 2003). *Eriocercospora* is possibly a synonym of *Pseudocercospora*, but without proof based on molecular DNA sequence analyses a final decision has to be postponed. *Stenospora* (type species: *Stenospora uredinicola*, Deighton 1969) is very close to *Eriocercospora* but mucedinaceous (colourless).

**Eriocercosporella** R. Kumar, A.N. Rai & Kamal ex U. Braun, *Monogr. Cercosporella, Ramularia* **2**: 398 (1998).

*Type species: Eriocercosporella indica* R. Kumar, A.N. Rai & Kamal ex U. Braun 1998.

*Synonym: Eriocercosporella* R. Kumar, A.N. Rai & Kamal, *Indian Phytopathol.* **47**: 127 (1994), *nom. inval.*

*Literature:* Seifert et al. (2011: 199).

*Description:* *Foliicolous* hyphomycetes, associated with leaf spots. *Mycelium* internal and external, superficial hyphae emerging through stomata, branched, pigmented, septate, thin-walled, smooth. *Stromata* lacking. *Conidiophores* macronematous, mononematous, *in vivo* solitary, arising from superficial hyphae, lateral, simple, occasionally branched, pigmented, septate, thick-walled, smooth; conidiogenous cells integrated, terminal, uni- to multilocal, sympodially or occasionally percurrently proliferating, loci truncate, flat, broad, neither thickened nor darkened, conidiogenesis thalloblastic, i.e. at first blastic, then thallic (base of conidia ± agreeing in width with the diameter of the broad conidiogenous loci). *Conidia* solitary, cylindrical to subclavate, occasionally disarticulating, pluriseptate, occasionally with 1–2 additional distosepta, thick-walled, brown, smooth, not attenuated at the base, hila truncate, broad, width ± agreeing with the diameter of the conidiogenous loci, neither thickened nor darkened, conidial secession schizolytic.

*Notes:* Due to the conidiogenesis, the structure of the conidiogenous cells and the thick-walled conidia, this genus seems to be allied to the *Sporidesmium* complex, but an affinity to *Pseudocercospora* can also not be excluded with certainty. However, the phylogenetic affinity of *Eriocercosporella* and its relation to the *Mycosphaerellaceae* are currently quite unclear. Molecular examinations of the phylogenetic position of the type species of this genus are necessary to decide if *Eriocercosporella* belongs to the cercosporoid or to the sporidesmioid complex. Therefore, this genus is only tentatively treated in the present context of cercosporoid genera.

**Pantospora** Cif., *Ann. Mycol.* **36**: 242 (1938).

*Type species: Pantospora guazumae* Cif. 1938.

*Dictyocephala* A.G. Medeiros, *Publ. Univ. Recife Inst. Micol.* **373**: 13 (1962) [type species: *D. ulmifoliae* (Obreg.-Bot.) A.G. Medeiros 1962].

*Literature:* Deighton (1976: 156–159), Crous & Braun (2003: 23), Minnis et al. (2011), Seifert et al. (2011: 325).

*Description:* *Foliicolous* hyphomycetes, associated with leaf spots, *Mycosphaerellaceae*. *Mycelium* internal; hyphae colourless or almost so. *Stromata* developed, pigmented. *Conidiophores* macronematous, in dense coremioid fascicles or synnemata, septate, pigmented, thin-walled, smooth; conidiogenous cells integrated, terminal, proliferation sympodial and percurrent, conidiogenous loci planate to slightly convex, neither thickened nor darkened (*pseudocercospora*-like). *Conidia* formed singly, shape variable, ellipsoid-ovoid, fusiform, clavate to obclavate, didymo- to scolecosporous, with 1–11 transverse eusepta and often a single or few oblique to longitudinal septa, hila neither thickened nor darkened.

*Notes:* The genus *Pantospora* was described by Ciferri (1938). *Pantospora guazumae*, the type species, is a leaf-spotting hyphomycete on *Guazuma ulmifolia*. *Dictyocephala*, based on *Cercospora ulmifolia* described from Colombia on



*G. ulmifolia*, is undoubtedly a synonym of *Pantospora* as already pointed out by Deighton (1976), who recognised the latter genus although its type species is very similar to the type species of *Pseudocercospora* by forming conidiophores in dense coremioid fascicles or distinct synnemata and sympodially to percurrently proliferating conidiogenous cells with unthickened, not darkened conidiogenous loci. The regular formation of oblique to longitudinal conidial septa was considered to be the only difference, although a few non-horizontal septa may also occur in some *Pseudocercospora* species, including *P. vitis*, its type species. As there is no rational base for a morphological discrimination between the two genera, Crous & Braun (2003) reduced *Pantospora* to synonymy with *Pseudocercospora*. However, sequence analyses based on data from the rDNA ITS and nLSU region, recently carried out by Minnis *et al.* (2011), showed that *Pantospora guazumae* did neither cluster within the *Pseudocercospora s. str.* clade [= clade 16, including the type species *P. vitis*, according to Crous *et al.* (2009b)] nor in clade 14 with other pseudocercospora-like species. The closest relatives were rather passalora-like. These results suggest that *Pantospora* cannot be considered a synonym of *Pseudocercospora*. This genus is, at least tentatively, maintained as separate genus until a better resolution of the assemblage of species around *P. guazumae* will be available.

**Paracercospora** Deighton, *Mycol. Pap.* **144**: 47 (1979).  
*Type species: Paracercospora egenula* (Syd.) Deighton 1979.

*Literature:* Crous & Braun (2003: 22), Crous *et al.* (2012).

*Description:* Dematiaceous hyphomycete genus morphologically barely distinguishable from *Pseudocercospora*, but phylogenetically distinct; *Mycosphaerellaceae*. *Mycelium in vivo* internal. *Conidiophores* macronematous, fasciculate, pigmented; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, conidiogenous loci subconspicuous by being circular with very slightly thickened and darkened-refractive rim. *Conidia* solitary, scolecosporous, subhyaline to very pale olivaceous, hila very slightly thickened and darkened-refractive along the rim.

*Notes:* The phylogenetic position and taxonomy of *Paracercospora* is complicated and not yet fully understood. Based on early phylogenetic analyses, Stewart *et al.* (1999) considered *Paracercospora* a synonym of *Pseudocercospora* and concluded that conidiogenous loci (scars) only slightly thickened and darkened around the rim are not sufficiently different from quite unthickened loci to be used as distinctive character on generic level, which was supported by additional rDNA ITS examinations (Crous *et al.* 2000, 2001). Therefore, Crous & Braun (2003) followed this conclusion and treated *Paracercospora* as synonym of *Pseudocercospora*. However, the reassessment of *Paracercospora* was based on data derived from non-type species, mainly *P. fijiensis* and *P. basiramifera* (Crous 1998, Arzanlou *et al.* 2008), which indeed cluster within the big *Pseudocercospora* clade. *Paracercospora egenula*, the type species of *Paracercospora*, has recently been included

in molecular sequence analyses, but clustered apart of the *Pseudocercospora* clade in a not yet fully understood clade together with *Passalora brachycarpa*, a species with catenate conidia, *Pseudocercospora tibuchinigena*, which is morphologically indistinguishable from genuine *Pseudocercospora* spp., and several *Mycosphaerella* spp. (Crous *et al.* 2012). Hence, *Paracercospora* is currently confined to its type species, characterised by circular conidiogenous loci with slightly thickened, darkened-refractive rim and very pale conidia. Since such paracercosporoid loci as well as subhyaline or pale conidia are also known in several genuine *Pseudocercospora* species, there is no rational base for a morphological discrimination of the two genera, i.e. *Paracercospora s. str.* is currently just a phylogenetically differentiated monotypic genus.

**Parastenella** J.C. David, *Mycol. Res.* **95**: 124 (1991).  
*Type species: Parastenella magnoliae* (Weedon) J.C. David 1991.

*Synonym: Stenellopsis* Morgan-Jones, *Mycotaxon* **10**: 405 (1980), *nom illeg.* (Art. 53.1).

*Literature:* Braun (1995a: 41), Seifert *et al.* (2011: 330).

*Description:* Dematiaceous hyphomycete genus resembling *Zasmidium* (*in vivo* with superficial mycelium, hyphae, conidiophores and solitary conidia pigmented, distinctly verruculose to verrucose), but the conidiogenous cells are terminal and intercalary, denticulate, with lateral short peg-like protuberances, conidiogenous loci inconspicuous, neither thickened nor darkened.

*Notes:* The phylogenetic position of this genus is unknown. It is quite unclear if it is part of the *Capnodiales* and *Mycosphaerellaceae* at all.

**Pseudoasperisporium** U. Braun, *Schlechtendalia* **5**: 72 (2000).

*Type species: Pseudoasperisporium tupae* (Speg.) U. Braun 2000.

*Literature:* Seifert *et al.* (2011: 363).

*Notes:* Morphologically close to *Asperisporium*, but the conidiogenous loci and hila at the base of conidia are unthickened and not darkened. Species of *Pseudoasperisporium* are distinguished from superficially similar *Fusicladium* species (*Venturiaceae*) by having coarsely verruculose conidia. The phylogenetic affinity of this genus is, however, unclear and unproven.

**Pseudocercosporidium** Deighton, *Mycol. Pap.* **133**: 55 (1973).

*Type species: Pseudocercosporidium venezuelanum* (Syd.) Deighton 1973.

*Literature:* Ellis (1971: 297–299), Braun (1995a: 37), Crous & Braun (2003: 14), Seifert *et al.* (2011: 367).

**Description:** *Foliicolous*, plant pathogenic, leaf spotting hyphomycetes, teleomorph unknown. *Mycelium* internal. *Stromata* lacking. *Conidiophores in vivo* solitary or in small loose fascicles (groups) emerging through stomata, laxly erect, macronematous, frequently branched, septate, pigmented (very pale brown), thin-walled, smooth; conidiogenous cells integrated, terminal, intercalary or pleurogenous (as lateral branchlets), sympodial, polyblastic, conidiogenous loci conspicuous, protruding, convex (papilla-like), but wall of the loci neither thickened nor darkened, only somewhat refractive. *Conidia* solitary, didymo- to scolecosporous, pigmented (deeper in pigmentation than the conidiophores), thin-walled, smooth or almost so, hila neither thickened nor darkened.

**Notes:** The phylogenetic affinity of *P. venezuelanum* and its relation to the *Mycosphaerellaceae* are unknown. *Pseudocercosporidium* resembles *Passalora*, but the structure of the conidiogenous loci is quite distinct and closer to scars of genera like *Neoovularia* and *Pseudodidymaria* (Braun 1998).

**Quasiphloeospora** B. Sutton, Crous & Shamoun, *Mycol. Res.* **100**: 979 (1996).

**Type species:** *Quasiphloeospora saximontanensis* (Deighton) B. Sutton, Crous & Shamoun 1996.

**Literature:** Deighton (1983: 7–8), Braun (1998: 400–401), Crous & Braun (2003: 14), Seifert *et al.* (2011: 376–377).

**Description:** Cercosporoid hyphomycetes characterised by forming large immersed sporodochium-like conidiomata with filiform, somewhat pigmented, irregularly verruculose conidiophores, aseptate, i.e. reduced to conidiogenous cells, monoblastic, determinate or sympodially to percurrently proliferating, with slightly thickened and darkened conidiogenous loci, and very pale to somewhat pigmented scolecosporous conidia formed singly.

**Notes:** *Quasiphloeospora* is a cercosporoid genus with intricate morphology and complex morphological relations to several other genera, including *Cercospora*, *Passalora* and *Pseudocercospora* (Crous & Braun 2003), but due to very pale, almost colourless structures also to genera like *Pseudocercosporella*. Sutton *et al.* (1996) classified the conidiomata as acervuli, although they may better be referred to as sporodochia. The particular characters of *Q. saximontanensis*, above all the structure of the conidiogenous loci, are intermediate between the three similar genera cited above. A clear affiliation to one of these genera, just based on morphology, is not possible. It is also possible that this species is unrelated to any of the cercosporoid genera. Affinity and position of *Quasiphloeospora* can only be proven by means of results of molecular sequence analyses, which are, however, not yet available. This genus might belong in the *Mycosphaerellaceae*, but this is unproven. Thus, *Quasiphloeospora* is only tentatively maintained as separate cercosporoid genus.

**Scolecostigmia** U. Braun, *New Zealand J. Bot.* **37**: 323 (1999).

**Type species:** *Scolecostigmia mangiferae* (Koord.) U. Braun & Mouch. 1999.

*Stigmia* p.p. [see Braun (1999), Crous *et al.* (2013)].

**Literature:** Crous & Braun (2003: 24), Crous *et al.* (2013: 74–75), Seifert *et al.* (2011: 396).

**Description:** *Scolecostigmia* is morphologically close to *Pseudocercospora*, above all to former *Cercostigmia* species (leaf spotting dematiaceous hyphomycetes with sporodochial conidiomata, macronematous densely fasciculate conidiophores, percurrently proliferating conidiogenous cells, neither thickened nor darkened applanate loci, and scolecosporous, pluriseptate, pigmented conidia formed singly), but the wall of the conidiophores is somewhat thickened and mostly verruculose, possesses conspicuous, coarse annellations and the conidia are transversely and occasionally also obliquely or longitudinally septate.

**Notes:** *S. mangiferae*, the type species, which belongs in the *Mycosphaerellaceae*, does not cluster within the *Pseudocercospora* clade, i.e. it is phylogenetically distinct, supporting *Scolecostigmia* as separate genus. The correct placement of numerous additional species in *Scolecostigmia* is, however, phylogenetically unproven and quite unclear. Sequence data derived from cultures of *Scolecostigmia chibaensis* on *Pinus* spp. in Japan (Nakashima *et al.* 2007) have been analysed and showed that this species is not allied to the type species of *Scolecostigmia* and does not belong to the *Mycosphaerellaceae* at all. It takes an isolated position with unclear affinity on family level, and does not belong to any other families containing cercosporoid hyphomycetes as for instance *Cladosporiaceae*, *Dissoconiaceae* or *Teratosphaericeae* (Nakashima, unpubl. data). Due to the phylogenetic position of *Cercospora cryptomeriicola* within the *Pseudocercospora* clade, this species has been reallocated to the latter genus, although its morphology is rather scolecostigmia-like. The conidiomata are sporodochial, conidiogenous cells proliferate percurrently with conspicuous annellations, and the walls of the conidia are thickened (Nakashima *et al.* 2007). These data indicate that the typical “*Scolecostigmia*” morphology is unreliable, i.e. all species assigned to *Scolecostigmia* have to be re-examined and reassessed once molecular data are available.

**Semipseudocercospora** J.M. Yen, *Mycotaxon* **17**: 361 (1983).

**Type species:** *Semipseudocercospora peristrophes-acuminatae* (J.M. Yen) J.M. Yen 1983.

**Description:** Morphologically close to *Pseudocercospora* (leaf spotting hyphomycetes with unthickened, not darkened conidiogenous loci and hila), but the conidiogenous cells are not geniculate, i.e. not distinctly sympodially proliferating, the conidiogenous loci are distinctly denticle-like, and the solitary conidia are didymo- to phragmosporous, i.e. not scolecosporous.

**Notes:** The phylogenetic position of the type species of this genus and its relation to the *Mycosphaerellaceae* as well as to the genus *Pseudocercospora* are still unknown

and unproven. Therefore, *Semipseudocercospora* is only tentatively maintained as separate cercosporoid genus.

**Sirosporium** Bubák & Serebrian., *Hedwigia* **52**: 272 (1912).

*Type species*: *Sirosporium antenniforme* (Berk. & M.A. Curtis) Bubák & Serebrian. 1912.

*Literature*: Ellis (1963: 2–11; 1971: 288–290; 1976: 299–303), Braun (1995a: 39), Mel'nik (2000: 284–288), Crous & Braun (2003: 18), Seifert *et al.* (2011: 404).

*Description*: Morphologically close to *Passalora*, i.e. above all mycovellosiella-like (leaf spotting dematiaceous hyphomycetes with internal and external mycelium, superficial hyphae giving rise to solitary conidiophores, lateral and terminal, conidiophores may also be formed in fascicles, conspicuous conidiogenous loci and hila, thickened and darkened, conidia solitary, size, shape and septation variable), but the conidia are relatively thick-walled and at least partly dictyosporous.

*Notes*: The morphological differentiation between *Sirosporium* and mycovellosiella-like *Passalora* species is vague. The phylogenetic meaning and value of thick conidial walls and oblique to longitudinal septa as distinguishing characters between *Sirosporium* and *Passalora* is unclear. The phylogenetic position of the type species of *Sirosporium* is still unknown. As already proposed in Braun (1995a) as well as Crous & Braun (2003), *Sirosporium* is tentatively treated as separate genus and should be confined to species with dictyosporous conidia with thick walls.

## DOUBTFUL AND EXCLUDED GENERA

Several hyphomycete genera have previously been considered to be and treated as cercosporoid genera, but based on modern phylogenetic examinations they are not part of the family *Mycosphaerellaceae* and the corresponding clade, i.e. they belong elsewhere and are not cercosporoid *s. str.* Species of such genera are not treated here:

**Miuraea** Hara, *Byochugai-Hoten (Manual of Pests and Diseases)*: (260), 779 (1948).

*Type species*: *Miuraea degenerans* (Syd. & P. Syd.) Hara 1948.

*Literature*: von Arx (1983: 39), Braun (1995a: 218–223), Seifert *et al.* (2011: 293), Crous *et al.* (2013: 69).

*Notes*: Statements that *Miuraea* is associated with mycosphaerella-like teleomorphs and belongs to the *Mycosphaerellaceae* were based on *Miuraea persicae* (sexual morph: *Mycosphaerella pruni-persicae*). This species clusters together with *Pseudocercospora* species within the *Mycosphaerellaceae* (Crous *et al.* 2013) and should rather be assigned to the latter genus, which is in its current circumscription non-monophyletic. It is quite unclear and phylogenetically unproven if *M. persicae* is congeneric with

*M. degenerans*, the type species of *Miuraea*. The latter species differs from *M. persicae* in having thin-walled, hyaline hyphae and conidia, which become thick-walled and pigmented with age. Longitudinal and oblique septa are rather common. *Miuraea s. str.* does possibly not belong to the *Mycosphaerellaceae* at all, but this is not yet proven. *Miuraea asiminae*, another species treated under *Miuraea* in Braun (1995a), was later reallocated to *Pseudocercospora* (Braun & Crous 2008).

**Phaeomycoentrospora** Crous, H.D. Shin & U. Braun, *Stud. Mycol.* **75**: 61 (2012) [2013] [**Pleosporales**]

*Type species*: *Phaeomycoentrospora cantuariensis* (E.S. Salmon & Wormald) Crous, H.D. Shin & U. Braun 2013.

*Notes*: The type species, originally described as species of *Cercospora*, was later reallocated to *Pseudocercospora* (Braun 1993). However, based on molecular sequence analyses, recently carried out by Crous *et al.* (2013), it was demonstrated that it represents an undescribed genus belonging to the *Pleosporales*.

**Thedongia** B. Sutton, *Trans. Brit. Mycol. Soc.* **61**: 426 (1973) [**Helotiales**]

*Type species*: *Thedongia ligustrina* (Boerema) B. Sutton 1973.

*Literature*: von Arx (1981, 1983), Braun (1990: 71; 1995a: 211–215), Crous & Braun (2003: 22), Seifert *et al.* (2011: 437), Crous *et al.* (2013: 61).

*Notes*: *Thedongia* was previously considered a cercosporoid genus with a type species originally assigned to *Cercospora s. lat.* (von Arx 1983, Braun 1995a), which was seemingly supported by the finding of the sexual morph of *T. lupini*, described as *Mycosphaerella lupini* (Kaiser & Crous 1998), and the phylogenetic position of this species in the *Mycosphaerellaceae* (Crous & Braun 2003). However, *T. ligustrina*, the type species of *Thedongia*, and *T. lupini* are not congeneric and phylogenetically distinct since *T. ligustrina* clusters within the *Helotiales* (Crous *et al.* 2009a, 2013). *Thedongia lupini* has to be reassessed and reallocated to a genus within the *Mycosphaerellaceae*, maybe to the non-monophyletic genus *Pseudocercospora* to which this species roughly fits. The affinity of other species assigned to *Thedongia* is unclear and unproven.

**Xenostigmata** Crous, *Mycol. Mem.* **21**: 154 (1998) [**Pleosporales**, **Phaeosphaeriaceae**]

*Type species*: *Xenostigmata zilleri* (A. Funk) Crous 1998.

*Notes*: *Xenostigmata* and its synasexual morphs in *Mycopappus* belong to the *Pleosporales* (Crous *et al.* 2013), i.e. they are not part of the *Mycosphaerellaceae*, in contrast to *Stigmata s. str.* which has been reduced to synonym with *Pseudocercospora* (Crous *et al.* 2006).



## KEY TO CURRENTLY RECOGNISED CERCOSPOROID GENERA

Expanded keys to cercosporoid genera and morphologically similar and confusable genera have been published in Braun (1995a: 23–36), Crous & Braun (2003: 28–32) and Braun in Seifert *et al.* (2011: 887–893).

- 1 Saprobiic or biotrophic, plant pathogenic hyphomycetes, causing various lesions, mostly leaf-spotting ..... 2  
Hyperparasitic (pathogenic on other fungi) or strictly fungicolous ..... 23
- 2 (1) Very large immersed sporodochium-like conidiomata, about 40–130 µm diam, with filiform, somewhat pigmented, irregularly verruculose conidiophores, aseptate, i.e. reduced to conidiogenous cells, monoblastic, determinate or sympodially to percurrently proliferating, with slightly thickened and darkened conidiogenous loci, and pale (subhyaline) to somewhat pigmented scolecosporous conidia formed singly; on *Ribes saximontanensis* in North America ..... **Quasiphloeospora**  
With other characters or combinations of characters ..... 3
- 3 (2) Stromata lacking; conidiophores *in vivo* solitary or in small loose fascicles (groups) emerging through stomata, laxly erect, frequently branched, very pale brown; conidiogenous cells integrated, terminal, intercalary or pleurogenous (as lateral branchlets), conidiogenous loci conspicuous, protruding, convex (papilla-like), but wall of the loci neither distinctly thickened nor darkened, only somewhat refractive; conidia solitary, didymo- to scolecosporous, pigmented (deeper in pigmentation than the conidiophores), hila neither thickened nor darkened ..... **Pseudocercosporidium**  
With other characters or combinations of characters; conidiogenous loci different, not papilla-like, but truncate, either inconspicuous or more denticle-like, but always unthickened and not darkened, or with conspicuously thickened and darkened-refractive loci ..... 4
- 4 (3) Conidiogenous loci inconspicuous, neither thickened nor darkened or subconspicuous by being more rigid or denticle-like, but wall of the loci always unthickened and not darkened, at most somewhat refractive, or only slightly thickened and darkened around the rim (formed as minute somewhat darker rim visible as darker circle) ..... 5  
Conidiogenous loci conspicuous, thickened and darkened throughout, except for a very minute centre pore (in front view visible as minute dark circle) ..... 14
- 5 (4) Forming superficial mycelium *in vivo*, hyphae verruculose-verrucose; conidiogenous cells terminal and intercalary, denticulate, with lateral short peg-like protuberances, conidiogenous loci inconspicuous, neither thickened nor darkened ..... **Parastenella**  
Superficial hyphae *in vivo* lacking or, if present, smooth or almost so; with genuine conidiophores, at least not with consistently peg-like protuberances ..... 6
- 6 (5) Conidiophores *in vivo* in synnematosus conidiomata ..... 7  
Conidiophores *in vivo* solitary, fasciculate or in sporodochia ..... 8
- 7 (6) Conidia often dictyosporous; on *Guazuma ulmifolia*, South America ..... **Pantospora**  
Conidia usually consistently transversely septate; on other hosts ..... **Pseudocercospora** (synnematosus species)
- 8 (6) Conidiophores in sporodochial conidiomata; wall of the densely arranged conidiophores somewhat thickened and mostly distinctly verruculose, forming conspicuous, coarse annellations; conidia transversely and occasionally also obliquely or longitudinally septate, wall often somewhat thickened ..... **Scolecostigmina**  
Conidiophores thin-walled, rarely somewhat thickened, but then always smooth, annellations lacking or if present fine and rather inconspicuous; conidia usually thin-walled and transversely septate ..... 9
- 9 (8) Conidiophores in dense fascicles or in sporodochial conidiomata, distinctly verruculose; conidia solitary, didymo- to phragmosporous, distinctly verruculose-verrucose ..... **Pseudoasperisporium**  
Conidiophores and conidia smooth or almost so, at most faintly rough-walled ..... 10
- 10 (9) Conidiogenous cells with distinct denticles; conidia amero- to phragmosporous, i.e. not scolecosporous ..... 11  
Conidiogenous cells not denticulate or only subdenticulate (conidiogenous loci on shoulders caused by sympodial proliferation) and then scolecosporous ..... 12

- 11 (10) Conidiogenous cells not geniculate, i.e. not distinctly sympodially proliferating, conidiogenous loci formed as distinct terminal to lateral denticles; conidia solitary, didymo- to phragmosporous; on *Peristrophe*, Asia ..... **Semipseudocercospora**  
 Conidiogenous cells sympodially proliferating; conidia catenate, 0–1(–3)-septate ..... **Denticularia**
- 12 (10) Conidiophores fasciculate and solitary, arising from superficial hyphae; conidiogenesis thalloblastic; conidiogenous loci truncate, flat, broad, loci and conidium initials of similar width, conidial base not or barely constricted; conidia thick-walled; on *Marsdenia* in India ..... **Eriocercospora**  
 Conidiogenesis holoblastic; width of loci and conidium initials different, narrowed at the attachment point between conidiogenous cells and conidium initial ..... 13
- 13 (12) Conidiophores solitary, arising from superficial hyphae, fasciculate, in sporodochia or even synnemata; conidiogenous loci inconspicuous or conspicuous by being more or less denticle-like, but locus wall always unthickened or almost so, usually neither darkened nor refractive, rarely more rigid and more conspicuous by being somewhat darkened-refractive or slightly thickened and darkened along the rim [loci ring-like, slightly thickened and darkened along the rim, on *Solanum*, see *Paracercospora* s. str.]; conidia solitary, rarely in short chains, usually scolecosporous, rarely amero- to phragmosporous, subhyaline to usually pigmented [in vitro without red crystals] ..... **Pseudocercospora**  
 [On *Colophospermum copane*, South Africa; conidiogenous cells unilocal, determinate to percurrent, *Cercostigmia*-like; phylogenetically distinct from *Pseudocercospora* s. str., see *Phaeocercospora*]  
 Conidiophores solitary or fasciculate; morphologically barely distinguishable from *Pseudocercospora*, but phylogenetically distinct and with red crystals in vitro (*P. heimii* complex) ..... **Pallidocercospora**
- 14 (4) *In vivo* with distinctly verruculose-verrucose superficial hyphae (aerial mycelium in vitro also verruculose); conidia smooth or almost so to mostly verruculose-verrucose as well ..... 15  
 Superficial hyphae in vivo lacking or, if present, smooth or almost so ..... 16
- 15 (14) Conidiogenous loci pileate; conidiophores in vivo solitary as well as fasciculate; conidia catenate; on *Pithecellobium*, South America [*Teratosphaeriaceae*] ..... **Stenella**  
 Conidiogenous loci planate (*Cercospora*-like) [*Mycosphaerellaceae*] ..... **Zasmidium**
- 16 (14) Conidiophores pigmented, rarely hyaline or subhyaline [subgen. *Hyalocercospora*]; conidia always colourless, usually scolecosporous, acicular, filiform, obclavate-cylindrical, and pluriseptate, rarely amero- to phragmosporous ..... **Cercospora**  
 Conidiophores and conidia pigmented, at least faintly olivaceous ..... 17
- 17 (16) Conidia consistently distoseptate; conidiophores mostly frequently branched ..... **Distocercospora**  
 Conidia aseptate to euseptate or at most few distosepta mixed with eusepta ..... 18
- 18 (17) Conidia distinctly (usually coarsely) verruculose-verrucose ..... 19  
 Conidia smooth or almost so ..... 20
- 19 (18) Conidiophores mostly numerous in dense sporodochial conidiomata; conidia solitary, usually amero- to phragmosporous, occasionally with longitudinal or oblique septa ..... **Asperisporium**  
 Conidiophores fasciculate; conidia solitary, but scolecosporous, only transversely septate ..... **Zasmidium** (p.p., species without superficial hyphae in vivo)
- 20 (18) Conidia solitary, ± scolecosporous, fully developed conidia usually attenuated towards the tip, somewhat rostrate, often somewhat curved, wall thickened; conidiogenous loci subconspicuous, ranging from inconspicuous to conspicuous by being denticle-like or somewhat darkened-refractive, but always unthickened; in vivo without superficial mycelium ..... see **Pseudocercospora** p.p. (incl. *Prathigada*)  
 Conidia solitary to catenate, amero- to scolecosporous, not rostrate, usually thin-walled; in vivo with or without superficial mycelium ..... 21
- 21 (20) *In vivo* with solitary conidiophores arising from superficial hyphae; conidia scolecosporous, fairly thick-walled, with transverse and occasionally also longitudinal and oblique septa ..... **Sirosporium**  
*In vivo* with internal or internal and external hyphae; conidia amero- to scolecosporous, thin-walled, transversely septate ..... 22

- 22 (21) Conidia solitary or catenate; conidiogenous loci and conidial hila always distinctly thickened and darkened ..... **Passalora**  
 Conidia catenate; conidiogenous loci subconspicuous, ranging from inconspicuous to conspicuous by being somewhat darkened-refractive, but always unthickened ..... see **Pseudocercospora** p.p. (incl. *Pseudophaeoramularia*)
- 23 (1) Conidiophores laxly fasciculate, often branched; conidiogenous cells denticulate, but conidiogenous loci not thickened and not darkened; hyperparasitic on ascomycetes (*Phyllachora*) ..... **Elletevera**  
*In vivo* with solitary conidiophores arising from superficial hyphae; conidiogenous loci not denticle-like ..... 24
- 24 (23) Conidia catenate; conidiogenous loci somewhat thickened and darkened; on cercosporoid hyphomycetes and rusts ..... **Cladosporiella**  
 Conidia solitary; conidiogenous loci subconspicuous, unthickened, not or only slightly darkened-refractive; on sooty moulds ..... **Eriocercospora**

## TAXONOMIC TREATMENT

### Fungicolous cercosporoid species

The genera *Cladosporiella*, *Elletevera* and *Eriocercospora*, which may have affinity to cercosporoid genera, are treated in this chapter. However, the phylogenetic positions of these genera are quite unclear. Molecular data are not yet known. *Elletevera* and *Eriocercospora* species are rather pseudocercospora-like, but might also be related to similar denticulate hyphomycete genera or to the *Sporidesmium* complex. Affinity and position of *Cladosporiella*,

morphologically superficially similar to the *Cladosporium* complex, is also quite unclear. This genus is treated here due to rough similarity to phaeoramularia-like *Passalora* species. All hyperparasitic taxa are only tentatively included in this work on cercosporoids. The name *Cercospora uredinophila* (Deighton 1969) suggests a hyperparasitic habit, but proved to be a common phytopathogenic fungus on various *Scirpus* spp. A comprehensive treatment of this species with full synonymy was published in Braun (1995a). *Cercospora uromycestri* and *C. acori*, reallocated to *Passalora* in Crous & Braun (2003), seems to be the only true cercosporoid species hyperparasitic or at least fungicolous on rust fungi.

## CLADOSPORIELLA

### Key to the species of *Cladosporiella*

- 1 Conidiophores very long, about 25–500 µm; on rust fungi ..... 2  
 Conidiophores much shorter, about 8–40 µm; on cercosporoid hyphomycetes ..... 3
- 2 (1) Stromata lacking; conidia (7–)15–40(–50) × 3.5–4.5 µm, (0–)1–2(–5)-septate ..... **C. uredinicola**  
 Stromata well-developed and large, 20–90(–150) µm diam; conidia broader, 4–6.5 µm, (0–)1(–3)-septate ..... **C. uredines**
- 3 (1) Conidia 20–135 × 2–5 µm, 0–9-septate ..... **C. cercosporicola**  
 Conidia much shorter, 9–15 × 3–4 µm, 0–3-septate ..... **C. deightonii**

### List of *Cladosporiella* species

***Cladosporiella cercosporicola*** Deighton, *Mycol. Pap.* 101: 35 (1965).  
 (Fig. 2)

*Illustrations:* Deighton (1965: 36, fig. 14), Ellis (1971: 303, fig. 209), Seifert et al. (2011: 709, fig. 227B).

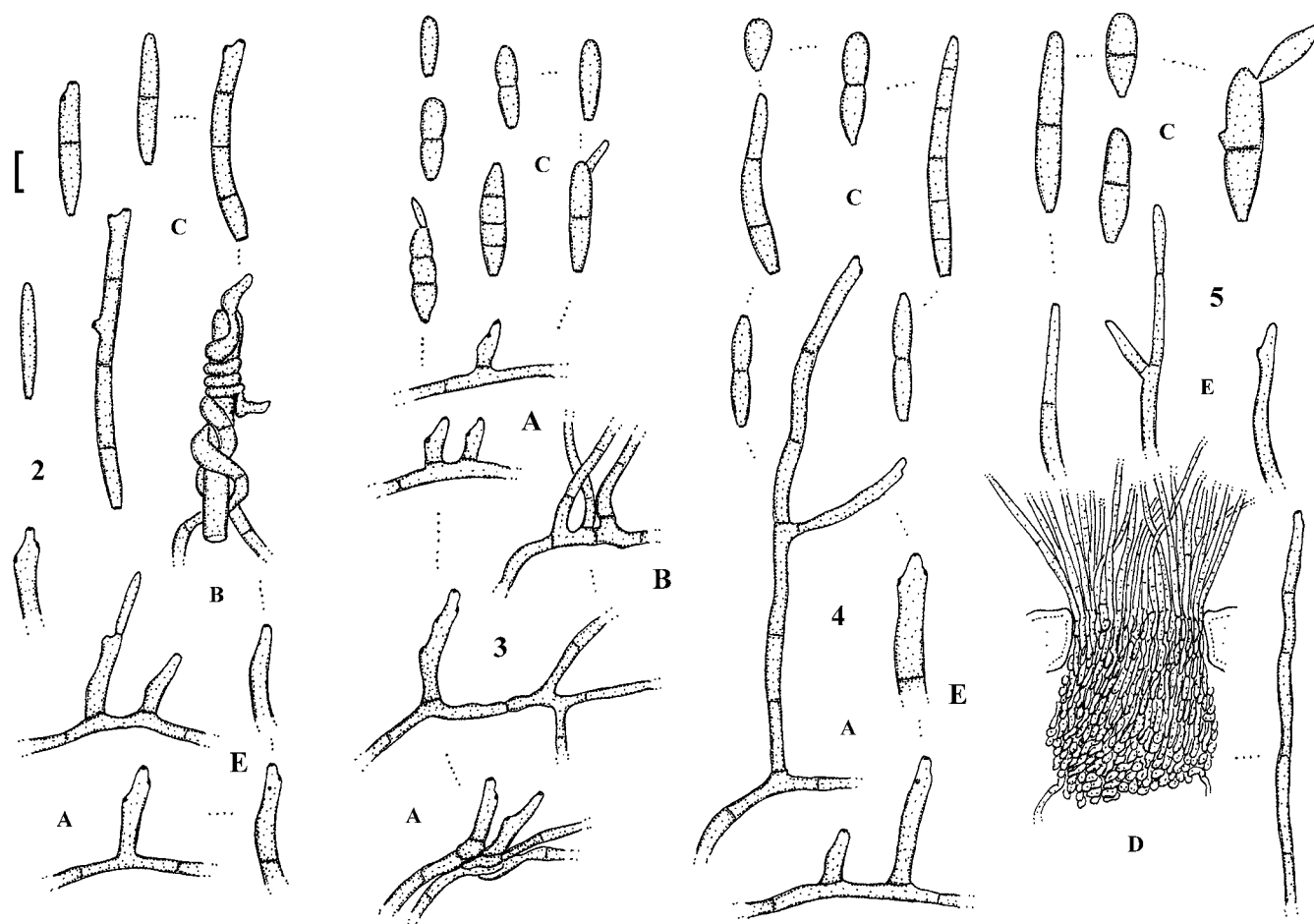
*Literature:* Ellis (1971: 303).

*Description:* Colonies hyperparasitic on *Passalora koepkei*, loosely floccose, pale. Mycelium superficial, some pale hyphae tightly coiled around conidiophores and conidia, branched, septate, thin-walled, smooth. Stromata none. Conidiophores

arising from superficial hyphae, erect, straight to flexuous, unbranched, 8–40 × 3–4 µm, continuous or sparingly septate, pale olivaceous, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, about 5–20 µm long, conidiogenous loci conspicuous, slightly thickened and darkened, small, about 0.8–1 µm diam. Conidia catenate, in branched chains, subcylindrical to filiform or somewhat obclavate, 20–135 × 2–4.5(–5) µm, 0–9-septate, pale olivaceous, smooth, thin-walled, ends short obconical, occasionally slightly swollen, hila slightly thickened and darkened.

*Holotype:* **Sabah:** on *Passalora koepkei*, *Mycosphaerellaceae*, on *Saccharum officinarum*, *Poaceae*, 1964, J. Solomon (K(M) IMI 107538b).





**Figs 2–5.** 2. *Cladosporiella cercosporoides* (K(M) IMI 107538b). 3. *C. deightonii* (HAL 1649 F). 4. *C. uredinicola* (K(M) IMI 43280b). 5. *C. uredinis* (K(M) IMI 16432b). **A.** Solitary conidiophores arising from superficial hyphae. **B.** Superficial hyphae. **C.** Conidia. **D.** Conidiophore fascicles. **E.** Conidiophore tips. Bar = 10 µm.

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

***Cladosporiella deightonii*** R.F. Castañeda & U. Braun, *Cryptog. Bot.* 1: 43 (1989). (Fig. 3)

**Illustration:** Castañeda & Braun (1989: 45, fig. 9).

**Description:** Colonies on leaf spots of and associated with *Cercospora coffeicola*, hypophyllous, pale. Mycelium superficial; hyphae flexuous, richly branched, 1–4 µm wide, pale olivaceous-brown, septate, thin-walled, smooth. Stromata lacking. Conidiophores arising from superficial hyphae, lateral, erect, almost straight to geniculate-sinuous, narrowed towards the apex, unbranched, 8–30 × 2–3 µm, aseptate, rarely with 1–2 septa, olivaceous, thin-walled, smooth; conidiophores usually reduced to conidiogenous cells, rarely with integrated, terminal conidiogenous cells, conidiogenous loci conspicuous, minute, about 1 µm diam, slightly thickened and darkened, often situated on short peg-like protuberances or shoulders caused by sympodial proliferation near the apex. Conidia formed singly or in short chains, ellipsoid, subcylindrical, subclavate, 9–15 × 3–4

µm, 0–3-septate, pale olivaceous to brownish, thin-walled, smooth, ends rounded to attenuated, hila slightly thickened and darkened, about 1–1.5 µm wide.

**Types:** **Cuba:** Los Corrales de Guisa, Granma, on *Cercospora coffeicola*, *Mycosphaerellaceae*, on *Coffea arabica*, *Rubiaceae*, 24 June 1987, R. F. Castañeda (INIFAT C87/171 - holotype; HAL 1649 F – isotype).

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

***Cladosporiella uredinicola*** Deighton, *Mycol. Pap.* 118: 33 (1969). (Fig. 4)

**Illustration:** Deighton (1969: 34–35, figs 19–20).

**Description:** Colonies on uredosori, effuse, subvelutinous, grey-brown to brown. Mycelium immersed in the sori as well as superficial; hyphae 2–3 µm wide, sparingly branched, olivaceous, thin-walled, smooth. Stromata lacking. Conidiophores arising from superficial hyphae, lateral or sometimes terminal, erect, straight to curved or somewhat

geniculate-sinuous, unbranched or branched, 25–500 × 2.5–4 µm, pluriseptate, moderately olivaceous, paler towards the tip, thin-walled, smooth; conidiogenous cells integrated, terminal to intercalary, about 10–30 µm long, proliferation sympodial; conidiogenous loci conspicuous, mostly slightly prominent or on peg-like protuberances, slightly thickened and darkened. *Conidia* in simple or occasionally branched chains, ellipsoid-ovoid, subcylindrical, fusiform, obclavate, (7–)15–40(–50) × (3.5–)4–4.5 µm, (0–)1–2(–5)-septate, pale olivaceous, thin-walled, smooth, ends rounded to narrowed, hila slightly thickened and darkened.

**Holotype:** Sierra Leone: Dodo, on uredosori of *Puccinia eucomi*, *Pucciniaceae*, on *Andropogon auriculatus*, *Poaceae*, 15 Apr. 1940, F. C. Deighton (K(M) IMI 43280b).

**Host range and distribution:** On uredo- and teleutosori of rust fungi, on *Puccinia eucomi*, *Pucciniaceae*, and *Ravenelia zygiae*, *Raveneliaceae*, Africa (Sierra Leone).

**Cladosporiella uredinis** Deighton, *Mycol. Pap.* 118: 36 (1969).  
(Fig. 5)

**Illustrations:** Deighton (1969: 37–38, figs 21–22).

**Exsiccatae:** Sydow, *Fungi Exot. Exs.* 444.

**Description:** Colonies on uredo- and teleutosori, pale to deep grey-green, short and densely velutinous-floccose to densely floccose, sometimes forming dense round to elliptic masses up to 4 mm diam. *Mycelium* immersed within the sori and extending into the surrounding leaf-tissue; hyphae branched, 1.5–2 µm diam, septate, pale olivaceous, thin-walled, smooth, sometimes completely suppressing the formation of uredospores. *Stromata* small to well-developed, immediately above the sori hyphae aggregated, forming dense stromata, often 25–80 µm wide and 20–90 µm deep, occasionally up to 150 µm diam, composed of densely packed, ascending, sparingly branched hyphae developing to conidiophores. *Conidiophores* in smaller to mostly large or very large, dense

fascicles, arising from stromata, laxly erect, straight or almost so to flexuous, filiform, simple or occasionally with short branchlets, 60–350 × 2.5–4 µm, pluriseptate, pale yellowish olivaceous to medium olivaceous, paler towards the tip, thin-walled, smooth; conidiogenous cells integrated, terminal to intercalary, conidiogenous loci truncate, occasionally subdenticulate, 1–1.5(–2) µm diam, very slightly thickened and darkened-refractive. *Conidia* in simple or branched acropetal chains, ellipsoid-ovoid, fusiform, subcylindrical, straight to somewhat curved, (12–)15–35(–45) × 4–6.5 µm, (0–)1(–3)-septate, pale olivaceous, thin-walled, smooth, primary conidia with broadly rounded apex, otherwise both ends short obconically truncate, hila 1–1.5 µm wide, very slightly thickened, darkened-refractive.

**Types:** Philippines: on uredosori (*Uredo* sp.) on *Scirpus grossus*, *Cyperaceae*, 20 Mar. 1913, P. W. Graff, Sydow, *Fungi Exot. Exs.* 444 (p.p.) (K(M) IMI 164332b – holotype; Sydow, *Fungi Exot. Exs.* 444 (e.g. BPI 420980) – isotypes).

**Host range and distribution:** On uredo- and teleutosori of rust fungi, on *Puccinia (polygona-amphibi, scleriae, solmsii, thaliae)* and *Uredo* sp., *Pucciniaceae*, Asia (India, Malaysia, Philippines), West Indies (Trinidad).

### Excluded *Cladosporiella* species

*Cladosporiella foliicola* R.F. Castañeda, *Fungi Cubenses* 3: 3 (1988).

**Illustration:** Castañeda (1988: fig. 2).

**Holotype:** Cuba: Prov. Pinar del Rio: Soroa, on living leaves of *Blechnum occidentale* L., *Blechnaceae*, 11 Mar. 1987, R. F. Castañeda (INIFAT C87/82).

**Notes:** This is a foliicolous species with very long, simple or branched, pigmented, 8–15-septate conidiophores, 180–300 × 6–7 µm, ramoconidia and extremely long, brown conidia, 100–310 × 4–5 µm, with 15–30(–35) septa. The generic affinity of this unusual species is quite unclear.

## ELLETEVERA

### Key to the species of *Elletevera*

- Conidiophores very long, 100–250 µm, frequently branched; conidia 12–60 × (4–)5–7.5(–10) µm, (0–)2–4(–6)-septate, very pale olivaceous; on *Phyllachora parasitica* and *Phyllachora* sp., Africa, North and South America ..... **E. parasitica**
- Conidiophores shorter, 85–120 µm, unbranched; conidia 17–23 × 7–9 µm, (1–)2(–3)-septate, pale olivaceous-ochraceous; on *Phyllachora shiraiana*, Asia, Japan ..... **E. ochracea**

### List of *Elletevera* species

**Elletevera ochracea** Katum., *Bull. Fac. Agric. Yamaguchi Univ.* 35: 110 (1988).  
(Fig. 6)

**Illustration:** Katumoto (1988: 110, fig. 2).

**Description:** Colonies hypophyllous, on stromata of *Phyllachora shiraiana*, ochraceous to brownish, elliptical to oblong in shape, 1.5–7 × 1.5–3.5 mm. *Mycelium* immersed; hyphae 2.5–3 µm wide, branched, septate, subhyaline to

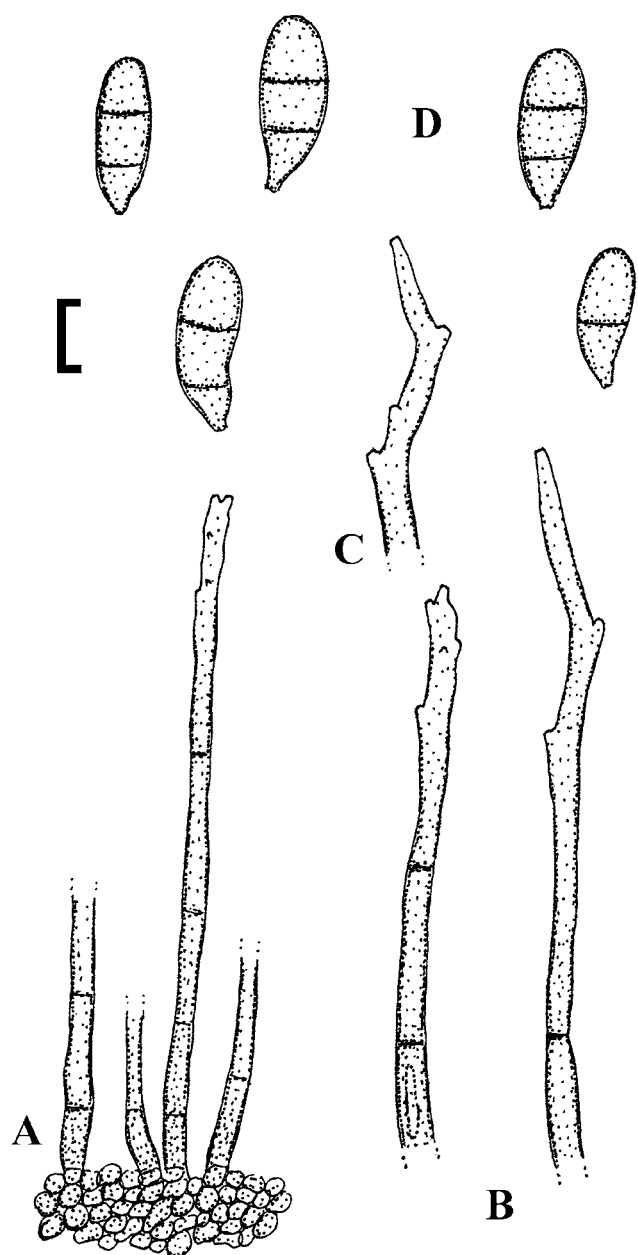


Fig. 6. *Elletevera ochracea* (YAM 24294). A. Conidiophores arising from stroma cells. B. Conidiophores. C. Conidiophore tip. D. Conidia. Bar = 10  $\mu$ m.

very pale olivaceous. *Conidiophores* numerous, arising from superficial stromata, flat, pseudoparenchymatous, 35–40  $\mu$ m diam, olivaceous-ochraceous, erect, divergent, cylindrical, straight to sinuous, sometimes geniculate in the upper portion, unbranched, 85–120  $\times$  4.5–6.5  $\mu$ m, attenuated towards the tip (to about 2.5  $\mu$ m), 1–2-septate in the lower portion, pale olivaceous, thin-walled, smooth; conidiogenous cells integrated, terminal, long, conidiogenous loci visible, subdentate. *Conidia* solitary, short cylindrical-obovoid to oblong, straight to slightly curved, 17–23  $\times$  7–9  $\mu$ m, (1–)2(–3)-septate, pale olivaceous-ochraceous, thin-walled, smooth, apex broadly rounded, base short obconically truncate, hila 0.8–1  $\mu$ m wide.

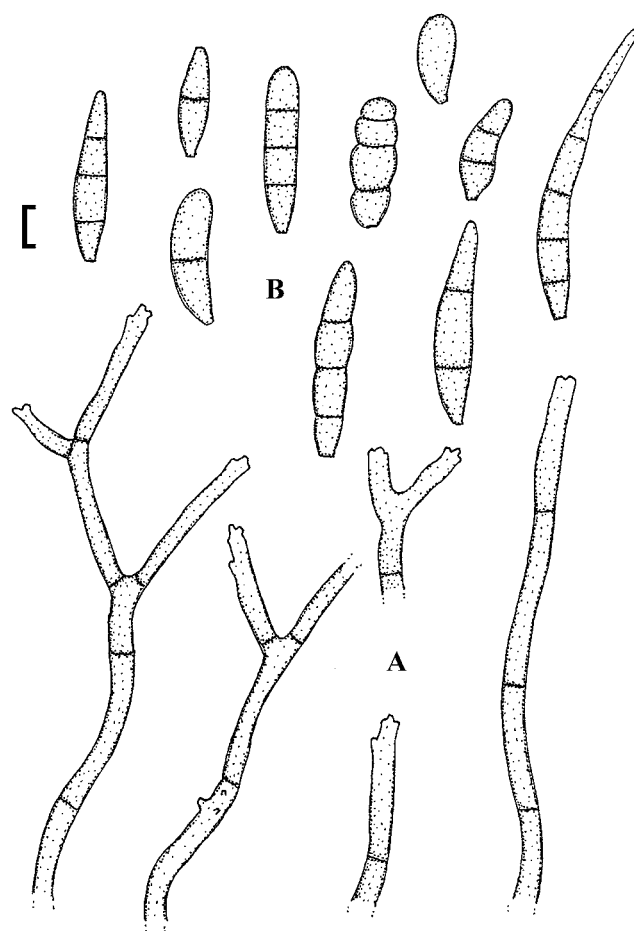


Fig. 7. *Elletevera parasitica* (NY, holotype). A. Conidiophores. B. Conidia. Bar = 10  $\mu$ m.

**Holotype:** Japan: Yamaguchi Pref.: Nishiki-cho, Mt. Jakuchi, on stromata of *Phyllachora shiraiana*, *Phyllachoraceae*, on leaves of *Sasa palmata*, *Poaceae*, 6 May 1985, K. Katumoto (YAM 24294).

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

***Elletevera parasitica*** (Ellis & Everh.) Deighton, *Mycol. Pap.* **118**: 19 (1969). (Fig. 7)

**Basionym:** *Pyricularia parasitica* Ellis & Everh., *Proc. Acad. Nat. Sci. Philadelphia* **45**: 462 “1893” (1894).

**Synonym:** *Pyricularia grisea* var. *parasitica* Ellis & Everh., in Sumstine, *Mycologia* **41**: 13 (1949), *nom. nud.*

**Illustrations:** Deighton (1969: 19, fig. 11 and pl. 1), Seifert *et al.* (2011: 701, fig. 219C).

**Exsiccatae:** Davis, *Fungi Wiscon. Exs.* 152.

**Description:** Colonies amphigenous, mainly hypophyllous, on and around *Phyllachora* spp., pale greenish, floccose, often contiguous. *Mycelium* immersed in ascumata of the host fungus; hyphae 1.5–3  $\mu$ m wide, branched, septate, subhyaline to faintly olivaceous, thin-walled, smooth.



*Stromata* formed by aggregated pale olivaceous, ascending hyphae, about 3–4 µm wide, in ostioles of the ascomata, 40–50 µm diam. *Conidiophores* numerous, in divergent floccose fascicles, arising from stromata, through ostioles, also erumpent through the wall of ascomata and from repent external hyphae, erect, cylindrical-filiform, 100–250 × 4–5 µm, sometimes narrowed towards the tip and 2.5–4 µm wide, simple or branched, with 1–2 main branches and short lateral branchlets, about 20–25 µm long, pluriseptate, very pale olivaceous, thin-walled, smooth; conidiogenous cells integrated, terminal, conidiogenous loci neither thickened nor darkened, but distinct by being denticle-like and somewhat refractive, about 1–1.5 µm diam. *Conidia* solitary, broadly ellipsoid-ovoid, obovoid, fusiform, obclavate, cylindrical-clavate, occasionally rostrate, straight to somewhat curved, 12–60 × (4–)5–7.5(–10) µm, (0–)2–4(–6)-septate, very pale olivaceous, thin-walled, smooth, apex broadly rounded, more attenuated in conidia with rostrate apex, base short obconically truncate, hila about 1–2 µm wide.

## ERIOCERCOSPORA

### Key to the species of *Eriocercospora*

- 1 Conidiophores up to 600 µm long and (3.5–)5–9(–13) µm wide; conidia (3.5–)5–9(–13) µm wide; on various hosts belonging to the *Asterinaceae*, *Englerulaceae* and *Parodiopsidaceae* ..... **E. balladynae**  
 Conidiophores shorter, up to 120 µm long, and only 2.5–4 µm wide; conidia narrower, only up to 4.5 µm; on *Meliolina molle*, *Meliolinaceae* ..... **E. olivacea**

### List of *Eriocercospora* species

***Eriocercospora balladynae*** (Hansf.) Deighton, *Mycol. Pap.* **118**: 6 (1969).

(Fig. 8)

*Basionym*: *Helminthosporium balladynae* Hansf., *Proc. Linn. Soc. London* **157**: 39 (1945).

*Synonyms*: *Cercospora schiffnerulae* Hansf., *Mycol. Pap.* **15**: 216 (1946).

*Cercospora balladynae* Hansf., *Proc. Linn. Soc. London* **158**: 50 (1947).

*Literature*: Ellis (1971: 248–249).

*Illustrations*: Deighton (1969: 7–15, figs 2–9), Ellis (1971: 249, fig. 170), Seifert et al. (2011: 693, fig. 211D).

*Description*: Colonies overgrowing those of the host fungi, olivaceous, velutinous to wooly. *Mycelium* superficial; hyphae growing between host hyphae, branched, 2–3.5 µm diam, occasionally swollen, up to 5 µm wide, septate, pale olivaceous, darker around conidiophores. *Conidiophores* arising from superficial hyphae, erect or almost so, straight to curved, flexuous, sinuous or somewhat geniculate, simple or branched, length very variable, 15–600 × 4–7.5(–10.5) µm, width often variable throughout their length, pluriseptate, pale to medium olivaceous, thin-walled, smooth; conidiogenous cells integrated, terminal or intercalary, about 10–30 µm long, conidiogenous loci subconspicuous, i.e. unthickened, not or barely protuberant,

*Holotype*: **USA**: Wisconsin: Kenosha Co., on *Phyllachora graminis*, on leaves of *Elymus virginicus*, 13 Aug. 1883, J. J. Davis 9311 (NY).

*Host range and distribution*: On *Phyllachora* (*graminis*, *vulgata*, *Phyllachora* sp.), *Phyllachoraceae*, on *Beckeropsis uniseta*, *Elymus* (*canadensis*, *hystrix*, *virginicus*), *Muhlenbergia* sp. and *Paspalum virgatum*, *Poaceae*, Africa (Zambia), North America (USA, Delaware, Indiana, Iowa, Oregon, Wisconsin), South America (Venezuela).

*Notes*: Most collections have been made in the USA on *Phyllachora graminis* on *Elymus* ssp. and *Muhlenbergia* sp. Other collections have been made on *Phyllachora* sp. in Zambia on *Beckeropsis uniseta* (Deighton 1969) and Venezuela on *Paspalum virgatum* (Urutiaga 1986). A collection of this species on *Musa paradisiaca* from Sierra Leone (K(M) IMI 45910) is unclear and unproven.

not or only slightly darkened-refractive, about 1.5–2.5 µm diam. *Conidia* solitary, shape rather variable, ellipsoid-ovoid, obovoid, fusiform, subclavate to obclavate, (15–) 25–70(–135) × (3.5–)5–9(–13) µm, (1–)3–6(–9)-septate, occasionally slightly constricted at the septa, very pale olivaceous to medium pale olivaceous, thin-walled, smooth, apex obtuse, broadly rounded to somewhat attenuated, base obconically truncate, hila about 1–2.5 µm wide, not to slightly darkened-refractive, barely thickened.

*Holotype*: **Uganda**: Entebbe road, on *Balladynopsis entebbeensis*, on leaves of *Grumilea succulenta*, Nov. 1943, C. G. Hansford 3264 (K(M) IMI 562c).

*Host range and distribution*: On *Asterina* sp., *Asterinaceae*; *Balladyna* (*tenuis*, *velutina*, *Balladyna* sp.), *Balladynocallia glabra*, *Balladynopsis entebbeensis*, *Parodiopsidaceae*; *Clypeolella* (*camelliae*, *Clypeolella* sp.), *Schiffnerula* (*hippocrateae*, *mirabilis*, *periplocae*, *toddaliae*, *Schiffnerula* sp.), *Englerulaceae*, Africa (Ghana, Sierra Leone, South Africa, Uganda), Asia (Malaysia, Myanmar, Papua New Guinea), Central America (Costa Rica, Panama).

***Eriocercospora olivacea*** Piroz., *Kavaka* **2**: 38 (1974). (Fig. 9)

*Illustration*: Pirozynski (1974: 39, fig. 3).

*Description*: Colonies confined to colonies of *Meliolina molle*, olivaceous, felty, 1–2 mm thick, completely obscuring

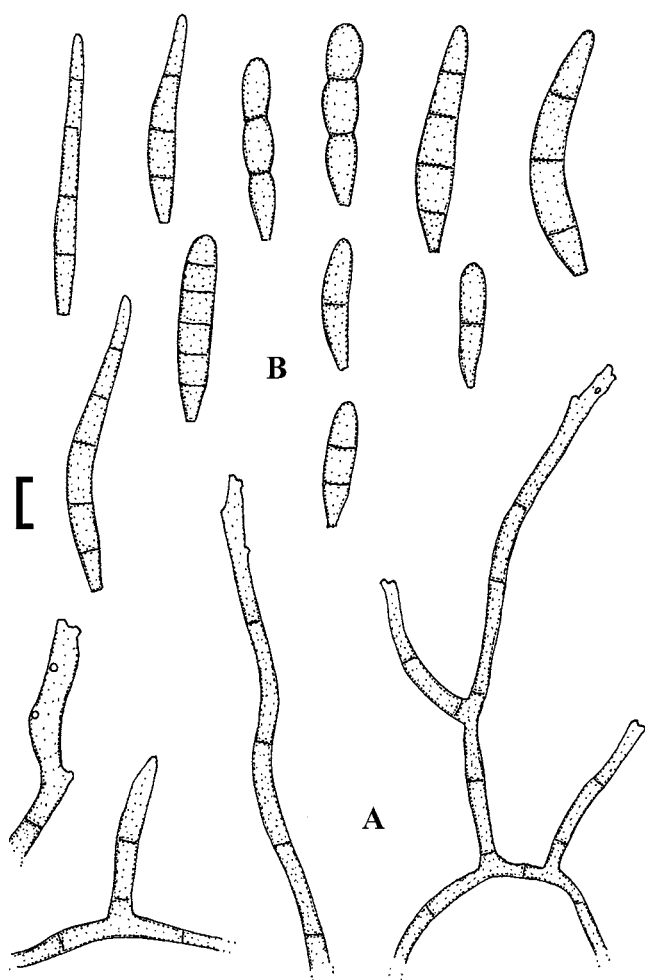


Fig. 8. *Eriocercospora balladynae* (K(M) IMI 562c). A. Conidiophores. B. Conidia. Bar = 10  $\mu$ m.

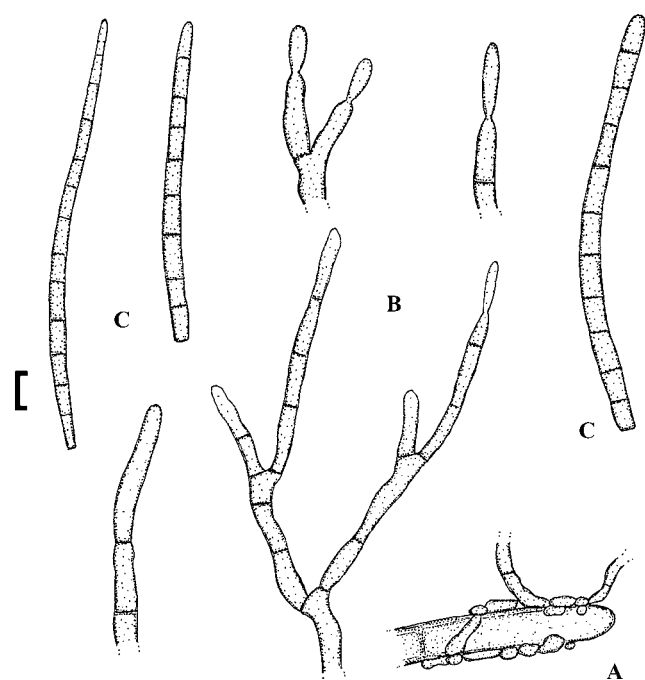


Fig. 9. *Eriocercospora olivacea* (K(M) IMI 120229b). A. Superficial hyphae. B. Conidiophores. C. Conidia. Bar = 10  $\mu$ m.

the host fungus. Mycelium superficial; hyphae appressed to host hyphae but not penetrating them, often toruloid, 2.5–5  $\mu$ m wide, septate, pale olivaceous, thin-walled, smooth. Conidiophores arising from superficial hyphae, lateral, occasionally terminal, erect, geniculate-sinuous, simple or branched, up to 120  $\mu$ m long and 2.5–4  $\mu$ m wide, pluriseptate, pale olivaceous, thin-walled, smooth; conidiogenous cells integrated, terminal and intercalary, 10–20  $\mu$ m long; conidiogenous loci truncate, about 1.8–2.5  $\mu$ m diam, neither thickened nor darkened or at most refractive or very slightly darkened. Conidia solitary, long, cylindrical-vermiform or filiform to somewhat obclavate, up to 150  $\mu$ m long and 4.5  $\mu$ m wide, pluriseptate (up to 22 septa), pale olivaceous to olivaceous, thin-walled, smooth, apex obtuse, rounded, base truncate to short obconically truncate, about 2–2.5  $\mu$ m, hila neither thickened nor darkened.

**Types:** **India:** *Tamil Nadu:* Nilgiris, Gudalpur, on *Meliolina molle*, *Meliolinaceae*, on *Syzygium* cf. *grande* (*S.* cf. *montanum*), *Myrtaceae*, 22 Feb. 1966, K. A. Pirozynski (K(M) 120229b – holotypes; DAOM 145763 – isotype).

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

#### **Excluded *Eriocercospora* species**

*Eriocercospora moghaniae* Suj. Singh, *Indian Phytopathol.* **33**: 610 “1980” (1981).

*Synonym:* *Stenella moghaniae* (Suj. Singh) Kamal & Narayan, *Indian Phytopathol.* **39**: 201 (1987).

= *Pseudocercospora moghaniae* (Suj. Singh) U. Braun & Crous, in Crous & Braun, *Mycosphaerella and Anam.* **1**: 18 (2003).

*Eriocercospora palustris* R.F. Castañeda & W.B. Kendr., *Univ. Waterloo Biol. Ser.* **35**: 52 (1991).

**Notes:** This is a saprobic mucedinaceous hyphomycete of unknown generic affinity, in any case not belonging to *Eriocercospora*. It is superficially somewhat reminiscent of plant pathogenic species of *Pseudocercospora*.

*Eriocercospora websteri* P. Rag. Rao, Manohar. & P. Ram Rao, *Curr. Sci.* **51**: 1155 (1982).

= *Pseudocercospora websteri* (P. Rag. Rao, Manohar. & P. Ram Rao) U. Braun, *Schlechtendalia* **8**: 36 (2002).

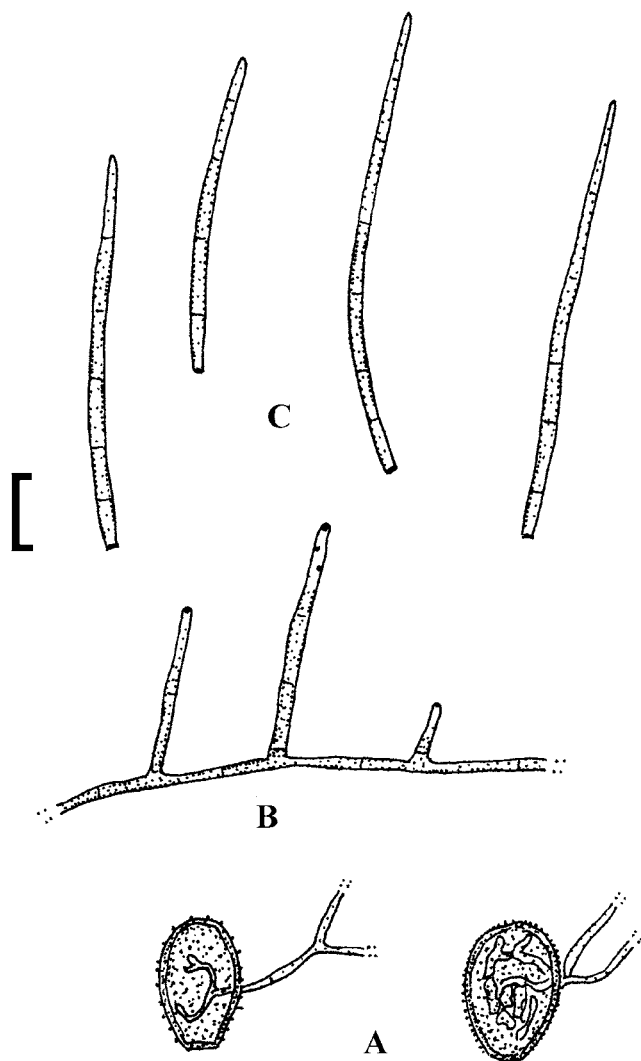


Fig. 10. *Passalora acori* (PC, holotype). A. Hyphae in uredo spores. B. Solitary conidiophores arising from a superficial hypha. C. Conidia. Bar = 10 µm.

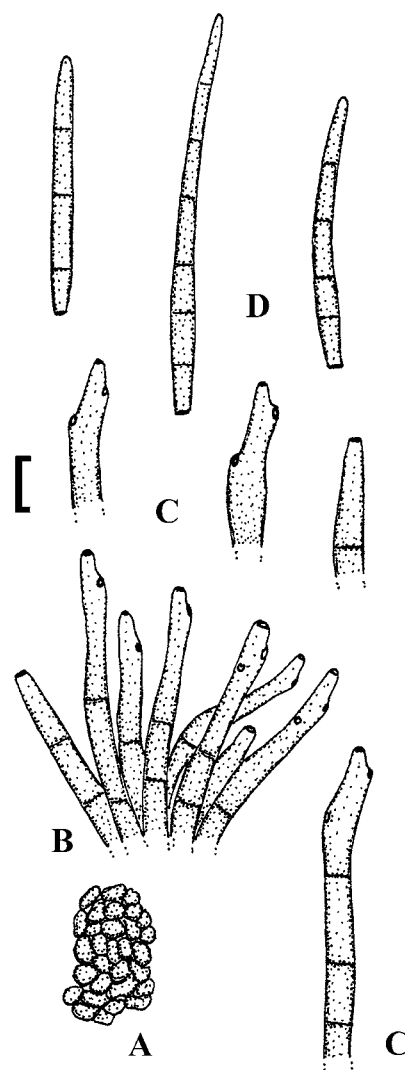


Fig. 11. *Passalora uromycesti* (BPI 71801). A. Stroma. B. Conidiophore fascicle. C. Conidiogenous cells. D. Conidia. Bar = 10 µm.

**FUNGIICOLOUS PASSALORA SPECIES**

**Key to fungiicolous Passalora species**

- 1 Mycelium internal and external, superficial; stromata lacking; conidiophores consistently solitary, arising from superficial hyphae; on *Uromyces sparganii*, Asia ..... **P. acori**
- Mycelium immersed; stromata present, dark brown, columnar, globose to linear, often confluent to form continuous stromatic areas over and within aecia; conidiophores arising from stromatic structures, in small to moderately large fascicles; on aecia of *Uromyces cestri*, North America ..... **P. uromycestri**

**List of fungiicolous Passalora species**

**Passalora acori** (J.M. Yen) U. Braun & Crous, in Crous & Braun, *Mycosphaerella and Anam.* 1: 43 (2003). (Fig. 10)  
*Basionym:* *Cercospora acori* J.M. Yen, *Rev. Mycol.* 29: 209 (1964).  
*Synonym:* *Mycovellosiella acori* (J.M. Yen) J.M. Yen, *Bull. Trimestriel Soc. Mycol. France* 97: 131 (1981).

*Description:* Yen & Lim (1980: 154).

*Illustration:* Yen & Lim (1980: 205, fig. 8).

*Description:* *Leaf spots* indistinct, sometimes forming dark grey specks. *Colonies* on uredospores, amphigenous, effuse, dark brown. *Mycelium* internal and external, hyphae branched, septate, 2.5–5 µm wide, yellowish brown to brown, thin-walled, smooth. *Conidiophores* consistently



solitary, arising from superficial hyphae, erect, cylindrical, not geniculate, unbranched, 20–190 × 4–5 µm, 2–6(–8)-septate, brown to dark brown, tips rounded to conical; conidiogenous cells integrated, terminal, with several minute brown conidiogenous loci. *Conidia* solitary, obclavate to obclavate-subacicular, 40–120 × 2–2.5 µm, 4–9(–12)-septate, pale olivaceous-brown, thin-walled, smooth, apex pointed, base obconically truncate, hila slightly thickened and darkened.

**Holotype: Singapore:** Botanic Gardens, on uredospores of *Uromyces sparganii* [probably *U. sparganii* subsp. *acori* ≡ *U. acori*], *Pucciniaceae*, on *Acorus calamus*, *Acoraceae*, 26 Jan. 1964, S. H. Yen, No. 7 (PC).

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

**Passalora uromycestri** (Pollack) U. Braun & Crous, in Crous & Braun, *Mycosphaerella and Anam.* 1: 417 (2003). (Fig. 11)

**Basionym:** *Cercospora uromycestri* Pollack, *Mycologia* 63: 691 (1971).

**Illustrations:** Pollack (1971: 690, figs 1–8).

**Description:** Colonies formed as dark brown to blackish felt-like

growth on aecial pustules of *Uromyces cestri*, which formed small, swollen punctiform spots, 1–3 mm diam, surrounded by a yellowish halo. *Mycelium* immersed. *Stromata* dark brown, columnar, globose to linear, often confluent to form continuous stromatic areas over and within the aecia. *Conidiophores* arising from stromatic structures, in small to moderately large fascicles, loose to rather dense, erect, straight to slightly geniculate-sinuous, mostly unbranched, about (15–)20–110(–130) × 4–6 µm, pluriseptate, light to dark brown, wall thin to slightly thickened, smooth or almost so; conidiogenous cells integrated, terminal, about 10–30 µm long, conidiogenous loci conspicuous, thickened and darkened, slightly protuberant or often lateral and flat, appressed, 1–2 µm diam. *Conidia* solitary, obclavate, 30–100 × 2.5–4 µm, (0–)3–6(–7)-septate, subhyaline to usually pale olivaceous, thin-walled, smooth, apex obtuse, base short obconically truncate, hila 1.5–2 µm broad, slightly thickened and darkened.

**Types: USA: Florida:** Miami, on aecia of *Uromyces cestri*, on leaves of *Cestrum diurnum*, 6 Nov. 1969, F. D. Matthews (BPI 71801 – holotype; BPI 71802–71804 and K(M) IMI 16083 – paratypes).

**Host range and distribution:** On *Uromyces cestri*, *Pucciniaceae*, on leaves of *Cestrum diurnum*, *Solanaceae*, North America (USA, Florida).

## CERCOSPOROID SPECIES ON FERNS (PTERIDOPHYTA)

### *Cercospora*

#### **Tabular key to *Cercospora* species on ferns**

Most species on ferns belong to the *Cercospora apii* complex (*sensu* Crous & Braun 2003), i.e. they are morphologically very similar and morphologically little differentiated, so that it is barely possible to key out the species concerned just based on morphology. Phylogenetic data are not yet available. Therefore, we prefer to list these species in form of a tabular key based on host genera and families.

*Adiantaceae* = *Pteridaceae* subfam. *Vittarioideae*

#### **Aspleniaceae**

- 1 Conidia acicular, base truncate; on *Asplenium* spp., Europe, North America ..... **C. asplenii**  
Conidia narrowly obclavate-filiform, base obconically truncate; on *Asplenium radicans* ..... **Cercospora camptosori**

*Cheilantheaceae* = *Pteridaceae* subfam. *Cheilantheoideae*

#### **Cyatheaceae**

- On *Alsophila*, North America ..... **C. asplenii**

#### **Dryopteridaceae**

- 1 Stromata 20–50 µm diam; conidia 30–125 × 1.5–3.5 µm, base obconically truncate, 1–2 µm wide;  
on *Dryopteris* sp., North America ..... **C. camptosori**  
Stromata lacking or very small; conidia 95–250 × 3.5–5 µm, base truncate, wider, about 3–4 µm wide;  
on *Dryopteris polypodioides*, China ..... **C. dryopteridis**

#### **Lygodiaceae**

- On *Lygodium japonicum*, India ..... **C. lygodiicola**

**Marsileaceae**

On *Marsilea quadrifolia*, India ..... **C. marsileae**

**Polypodiaceae**

- 1 Stromata lacking or almost so; on *Platycterium* spp., North America ..... **P. platycerii**  
 Stromata 20–45 µm diam; on *Microsorium membranaceum* (*Pleopeltis membranacea*), Asia (India) ..... **P. pleopeltidis**

**Pteridaceae subfam. Cheilantheoideae (= Cheilanthaceae)**

On *Aleuritopteris farinosa* (*Cheilanthes farinosa*), India ..... **C. cheilanthis**

**Pteridaceae subfam. Vittarioideae (= Adiantaceae)**

- 1 Conidia broadly obclavate-cylindrical, short conidia sometimes fusiform, 40–90 × (4–)5–8 µm; on *Adiantum*, Tanzania ..... **C. adiantigena**  
 Conidia acicular, only 2–5 µm wide ..... 2
- 2 (1) Conidia 145.5–455.5 × 3.5–5 µm; on *Adiantum*, India ..... **C. pteridigena**  
 Conidia much shorter and narrower, up to 120 µm long and 2–4 µm wide ..... 3
- 3 (2) Stromata lacking or very small; on *Adiantum*, Asia ..... **C. adianticola**  
 Stromata well-developed, up to 75 µm diam; on *Adiantum*, North America ..... **C. asplenii**

**Selaginellaceae**

On *Selaginella* spp., Europe, North America ..... **C. selaginellarum**

**Thelypteridaceae**

- 1 Conidia long, 60–400 × 2–4 µm, 1–35-septate; on *Abacopteris*, Singapore ..... **C. abacopteridis**  
 Conidia shorter, 50–110 × 3–4 µm, usually 4–10-septate; on *Cyclosorus*, India, Taiwan ..... **C. cyclosori**

**Woodsiaceae**

- 1 Conidia acicular, 20–90 µm long, base truncate; on *Diplazium esculentum*, Philippines ..... **C. athyrii**  
 Conidia acicular to narrowly obclavate, 45–155(–230) µm, base truncate to short obconically truncate;  
 on *Diplazium esculentum*, India ..... **C. diplaziicola**

**List of Cercospora species on ferns**

**Cercospora abacopteridis** J.M. Yen & Lim, *Cah. Pacifique* 17: 96 (1973).  
 (Fig. 12)

*Literature*: Yen & Lim (1980: 154), Crous & Braun (2003: 37).

*Illustrations*: Yen & Lim (1980: 204, fig. 7C–E).

*Description*: *Leaf spots* amphigenous, vein-limited, brown, later confluent. *Caespituli* hypophyllous, inconspicuous. *Mycelium* internal. *Stromata* lacking. *Conidiophores* in relatively small fascicles, 2–18, divergent or somewhat denser, arising from internal hyphae, emerging through stomata, erect, straight, subcylindrical to somewhat sinuous, 0–2 times geniculate above, unbranched, 15–120 × 4–5 µm, 1–5-septate, dark brown, paler towards the tip, wall thin to slightly thickened, smooth; conidiogenous cells integrated, terminal, occasionally intercalary, conidiogenous loci conspicuous, 2–2.5 µm wide, darkened and thickened. *Conidia* solitary, acicular to filiform, straight to somewhat curved, 60–400 × 2–4 µm, 1–35-septate, hyaline, thin-walled, smooth, apex acute, base truncate, hilum about 2–3 µm wide, thickened and darkened.

*Holotype*: **Singapore**: on *Abacopteris urophylla*, *Thelypteridaceae*, 3 Mar. 1972, G. Lim (PC).

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

**Cercospora adianticola** R.K. Srivast., A.K. Srivast. & Kamal, *Kavaka* 20/21: 38 “1992/1993” (1995); as “*adiantiicola*”.  
 (Fig. 13)

*Literature*: Crous & Braun (2003: 44), Kamal (2010: 13).

*Illustration*: Srivastava et al. (1995: 38, fig. 1).

*Description*: *Leaf spots* amphigenous, 0.5–3 mm diam, irregular, streak-like, sometimes confluent, spread over the whole leaf surface. *Mycelium* internal; hyphae septate, branched. *Stromata* lacking or poorly developed. *Conidiophores* in small fascicles, erect, straight, subcylindrical to 1–3 times geniculate, unbranched, 70–140 × 3–6 µm, septate, olivaceous; conidiogenous cells integrated, terminal and intercalary, conidiogenous loci conspicuous, 2–4.5 µm diam, thickened and darkened. *Conidia* solitary, acicular, 50–100 × 2–4 µm, 3–11-septate, hyaline, thin-walled, smooth, apex acute, base truncate or

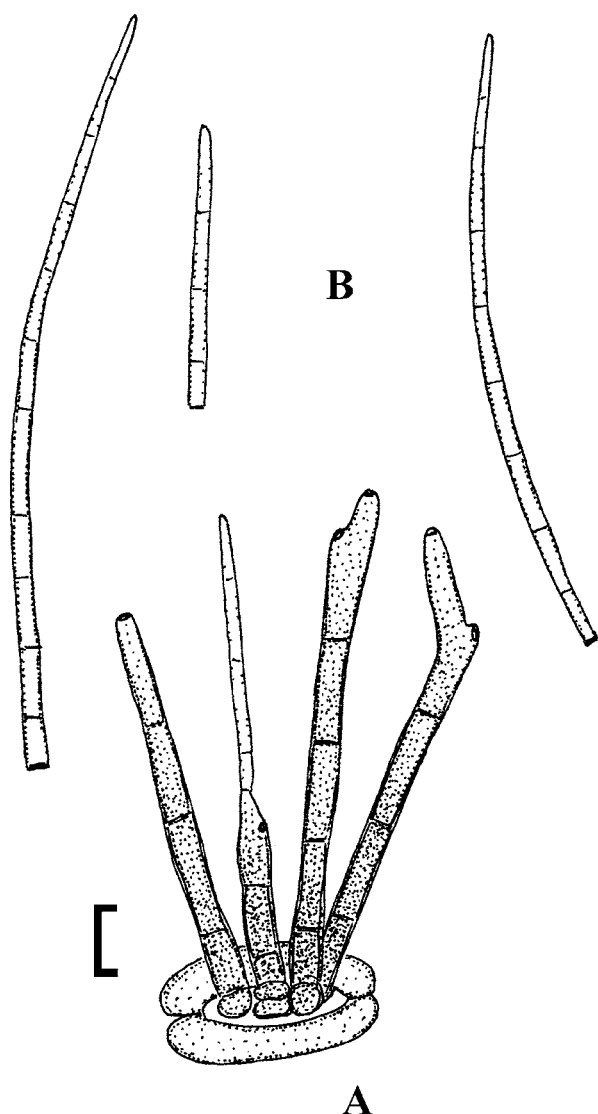


Fig. 12. *Cercospora abacopteridis* (PC, holotype). A. Conidiophore fascicle. B. Conidia. Bar = 10  $\mu$ m.

slightly attenuated, hila about 1.5–2.5  $\mu$ m wide, thickened and darkened.

**Holotype:** India: U.P.: Maharaj Ganj, Nepal, Pakari Forest, Narayan Ghat, on *Adiantum venustum*, Pteridaceae subfam. Vittarioideae (= Adiantaceae), Nov. 1989, V. P. Pandey (K(M) IMI 243785).

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

**Notes:** This species belongs to the *C. apii* s. lat. complex. Thaug (1984) recorded "*Cercospora asplenii*" on *Adiantum* sp. from Myanmar, but this collection seems to belong to *C. adianticola*.

***Cercospora adiantigena*** U. Braun & Crous, in Crous & Braun, *Mycosphaerella and Anam.* 1: 44 (2003). (Fig. 14)

**Literature:** To-anun *et al.* (2011: 32), Begum *et al.* (2012).

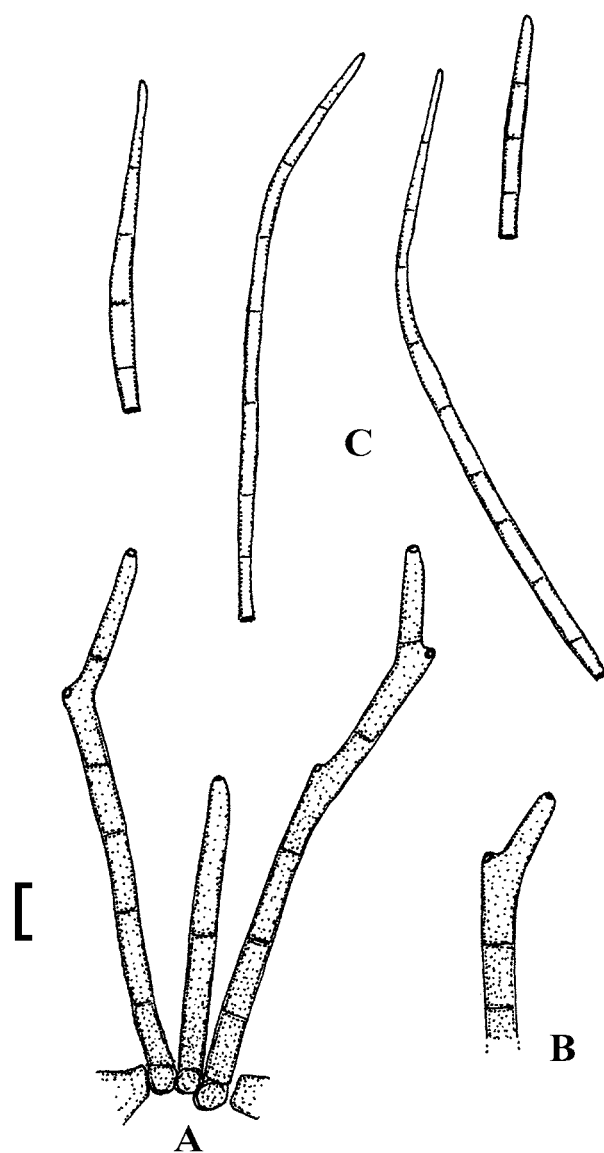


Fig. 13. *Cercospora adianticola* (K(M) IMI 243785). A. Conidiophore fascicle. B. Conidiogenous cells. C. Conidia. Bar = 10  $\mu$ m.

**Illustrations:** Crous & Braun (2003: 45, fig. 2), To-anun *et al.* (2011: 32, fig. 14).

**Description:** Leaf spots amphigenous, oblong, linear, spread between veins, 2–15  $\times$  0.5–1.5 mm or confluent, forming larger patches, brown. Caespituli amphigenous, punctiform to subeffuse, greyish brown to dingy greyish white. Mycelium internal. Stromata well-developed, immersed, 10–50  $\mu$ m diam, subhyaline to pale olivaceous-brown. Conidiophores in small to moderately large fascicles, loose to fairly dense, arising from stromata, erumpent, erect, straight, subcylindrical to moderately geniculate-sinuous, unbranched, 25–150  $\times$  4–10  $\mu$ m, pluriseptate, subhyaline, occasionally with a faintly greenish to olivaceous tinge, thin-walled, smooth; conidiogenous cells integrated, terminal or occasionally intercalary, 10–35  $\mu$ m long, conidiogenous loci conspicuous, planate, thickened and darkened throughout, 2.5–4  $\mu$ m diam. Conidia solitary, broadly obclavate-cylindrical, short conidia sometimes fusiform, 40–90  $\times$  (4–)5–8  $\mu$ m, (1–)3–6(–8)-septate, colourless, thin-walled, smooth, apex



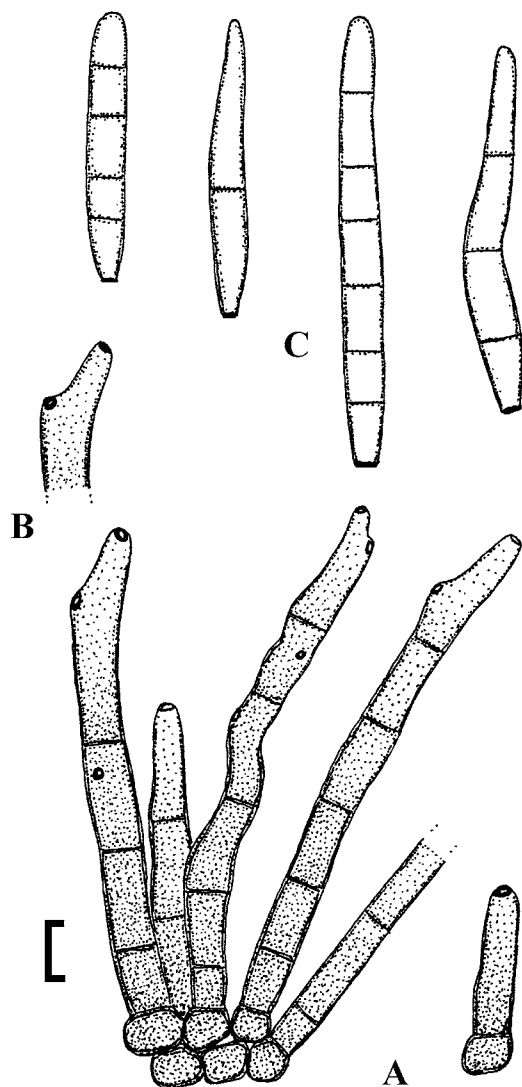


Fig. 14. *Cercospora adiantigena* (K(M) IMI 106709b). A. Conidiophore fascicle. B. Conidiogenous cells. C. Conidia. Bar = 10  $\mu$ m.

obtuse, base short obconically truncate, 3–4  $\mu$ m wide, hila thickened and darkened.

**Holotype:** Tanzania: Kigoma, Kakombe, on *Adiantum philippense*, 21 Feb. 1964, K. A. Pirozynski (K(M) IMI 106709b).

**Host range and distribution:** On *Adiantum philippense* and *Doryopteris* sp., Pteridaceae subfam. Vittarioideae (Adiantaceae), Africa (Tanzania), Asia (Philippines, Thailand).

**Notes:** This species is reminiscent of *Cercosporella*, but the conidiogenous loci are planate, thickened and darkened throughout, i.e. they are cercosporoid. Thus this species rather pertains to *Cercospora* subgen. *Hyalocercospora*.

***Cercospora asplenii* Jaap, *Ann. Mycol.* 14: 43 (1916). (Fig. 15)**

**Synonym:** *Mycosphaerella asplenii* Thirum. & Govindu, *Sydowia* 8: 345 (1954), *nom. illeg.*, (Art. 53.1).

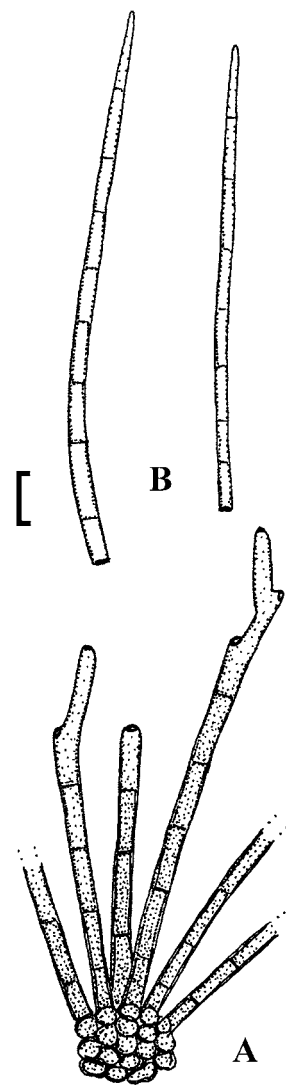


Fig. 15. *Cercospora asplenii* (HBG, holotype). A. Conidiophore fascicle. B. Conidia. Bar = 10  $\mu$ m.

**Literature:** Chupp (1954: 454), Vassiljevsky & Karakulin (1937: 219), Vasudeva (1963: 43–44), Crous & Braun (2003: 69), Kamal (2010: 19), Motohashi *et al.* (2010).

**Exsiccatae:** Jaap, *Fungi Sel. Exs.* 616. Petrak, *Mycoth. Gen.* 327.

**Description:** Leaf spots variable in shape and size, small to relatively large, pale to dark brown or almost blackish, centre later paler, pale brown to dingy grey. *Caespituli* amphigenous. *Stromata* subglobose, small to large, up to 75  $\mu$ m diam, brown to almost blackish brown. *Conidiophores* in small to moderately large fascicles, 2–20, occasionally solitary, divergent, straight, subcylindrical to geniculate-sinuous, 0–5 times geniculate, usually unbranched, 20–120  $\times$  4–5.5  $\mu$ m, pluriseptate, medium olivaceous-brown throughout, wall slightly thickened, smooth; conidiogenous cells integrated, mostly terminal, conidiogenous loci conspicuous, thickened and darkened. *Conidia* solitary, acicular, 20–120  $\times$  2–4  $\mu$ m, indistinctly pluriseptate, hyaline, thin-walled, smooth, apex subacute, base truncate, hilum about 2–2.5  $\mu$ m wide, thickened and darkened.

**Holotype:** Croatia: Dalmatia, Lapad near Ragusa, on *Asplenium trichomanes*, 18 Mar. 1914, O. Jaap (HBG).

**Host range and distribution:** On ?*Adiantum* sp., *Pteridaceae* subfam. *Vittarioideae* (*Adiantaceae*); ?*Alsophila australis*, *Cyatheaceae*; *Asplenium* (*nidus* [*antiquum*], *trichomanes*, *Asplenium* sp.), *Aspleniaceae*; North America (Canada, USA, Florida), Asia (India, Japan, Myanmar), Europe (Czech Republic, Germany, Croatia, Switzerland).

***Cercospora athyrii*** Mendoza, *Philipp. J. Sci.* **75**: 165 (1941).

**Literature:** Chupp (1954: 454), Crous & Braun (2003: 70).

**Description:** Leaf spots subcircular, 1–8 mm diam, brown, somewhat sunken on the upper surface. *Mycelium* internal. *Stromata* small, only filling the substomatal cavity, brown. *Conidiophores* in dense fascicles, arising from stromata, erect, subcylindrical or somewhat attenuated towards the tip, or only 1–2 times geniculate, unbranched, 30–105 × 3.5–5 µm, pluriseptate, medium to dark olivaceous-brown, paler towards the tip; conidiogenous loci conspicuous, thickened and darkened. *Conidia* solitary, acicular, straight to curved, 20–90 × 3–5 µm, distinctly pluriseptate, hyaline, thin-walled, smooth, apex acute, base truncate.

**Holotype:** Philippines: Luzon, Manila, on *Diplazium esculentum* (*Athyrium esculentum*), *Woodsiaceae*, Mendoza, No. 55483 (not seen).

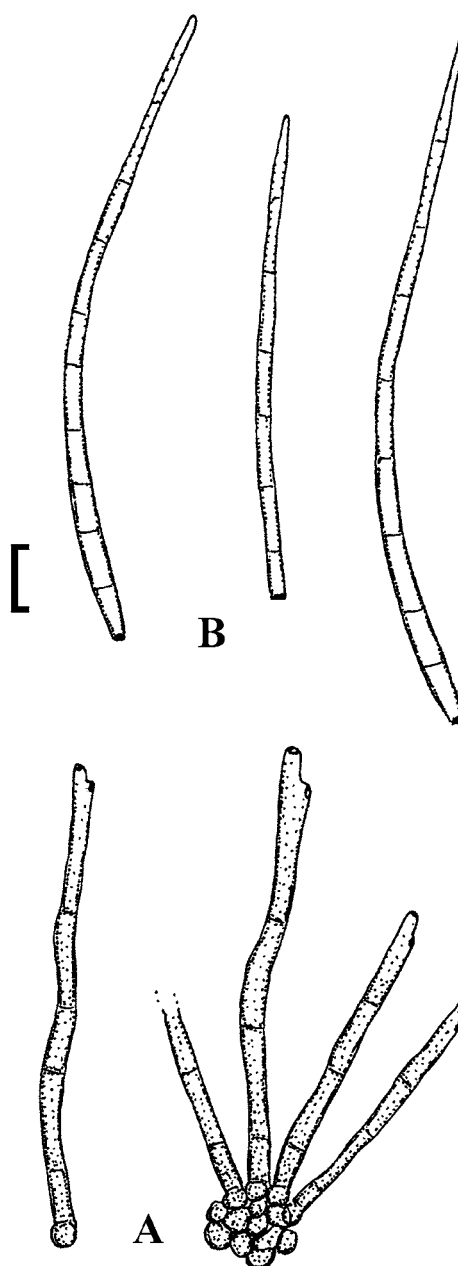
**Host range and distribution:** Only known from the type collections.

***Cercospora camptosori*** Davis, *Trans. Wisconsin Acad. Sci.* **18**: 267 (1915). (Fig. 16)

**Literature:** Chupp (1954: 455), Crous & Braun (2003: 98).

**Description:** Leaf spots amphigenous, circular to angular-irregular, small to large, sometimes covering large leaf segments, brown, margin indefinite. *Caespituli* amphigenous, punctiform. *Mycelium* internal. *Stromata* 20–50 µm diam, dark brown. *Conidiophores* in dense fascicles, arising from stromata, erect, subcylindrical or somewhat attenuated towards the tip, straight to somewhat geniculate near the apex, unbranched, 20–60 × 4–5 µm, septate, pale olivaceous-brown, paler towards the tip, thin-walled, smooth; conidiogenous cells integrated, terminal, conidiogenous loci conspicuous, thickened and darkened, 1–2 µm diam. *Conidia* solitary, narrowly obclavate-filiform, 30–125 × 1.5–3.5 µm, indistinctly pluriseptate, hyaline, thin-walled, smooth, apex acute or subacute, base obconically truncate, 1–2 µm wide, hila somewhat thickened and darkened.

**Lectotype (designated here,** MycoBank, MBT176146): **USA:** Wisconsin: Grant County, Marquette State Park, on



**Fig. 16.** *Cercospora camptosori* (BPI 433994). **A.** Conidiophore fascicle. **B.** Conidia. Bar = 10 µm.

*Asplenium radicans* (*Camptosorus rhizophyllus*), 1 Aug. 1914, J. J. Davis (WIS). Isolectotype: BPI 433994.

**Host range and distribution:** On *Asplenium radicans*, *Aspleniaceae*; ?*Dryopteris* sp., *Dryopteridaceae*; North America (USA, ?Florida, Wisconsin).

**Notes:** This species differs from fern-inhabiting species belonging to the *C. apii* complex in having narrowly obclavate-filiform conidia with obconically truncate base and narrow conidiogenous loci and hila, only 1–2 µm diam.

***Cercospora cheilanthis*** Chowdhry, D. Gupta & Padhi, *Indian Phytopathol.* **36**: 624 (1983); as “*cheilanthe*”. (Fig. 17)

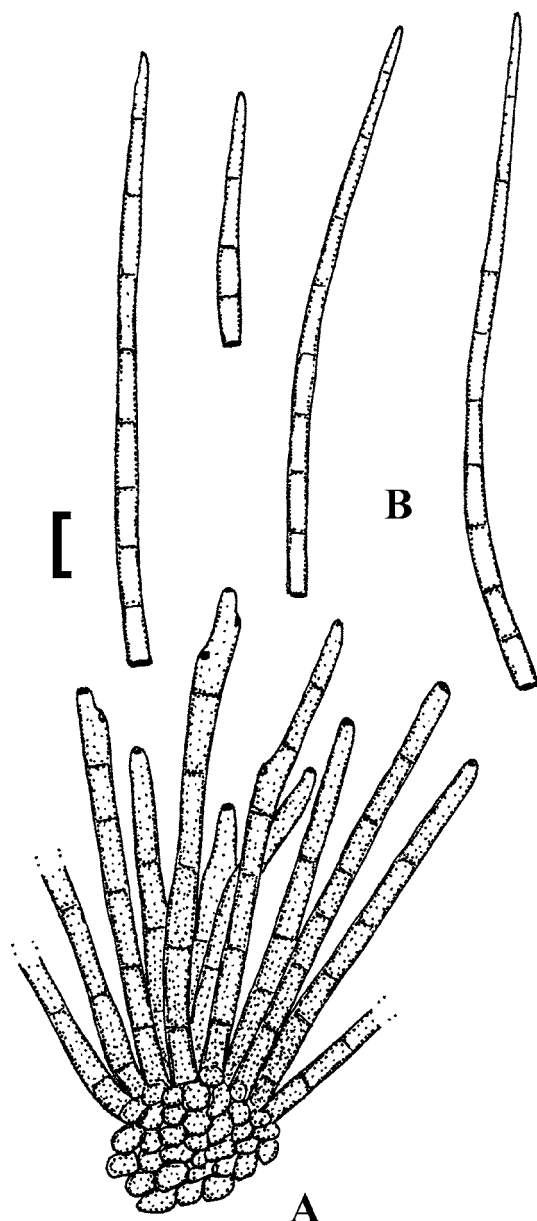


Fig. 17. *Cercospora cheilanthis* (based on the original illustration). A. Conidiophore fascicle. B. Conidia. Bar = 10  $\mu$ m.

*Literature:* Chupp & Braun (2003: 118), Kamal (2010: 31).

*Illustration:* Chowdhry et al. (1983: 625, fig. 1).

*Description:* Leaf spots amphigenous, circular to elongated, 1–3 mm diam, blackish brown, *Caespituli* amphigenous, mainly epiphyllous. *Mycelium* internal. *Stromata* well-developed, 15–45  $\mu$ m diam, globular, dark brown. *Conidiophores* in large, dense fascicles, arising from stromata, about 10–40, erect, straight to somewhat curved, cylindrical, 1–3 times geniculate above, unbranched, 30–165  $\times$  3–5.5  $\mu$ m, 2–6-septate, deep olivaceous-brown; conidiogenous cells integrated, terminal and intercalary, conidiogenous loci conspicuous, thickened and darkened. *Conidia* solitary, acicular, about 10–130  $\times$  1.5–3  $\mu$ m, 1–19-septate, hyaline, thin-walled, smooth, apex acute, base truncate, hila thickened and darkened.

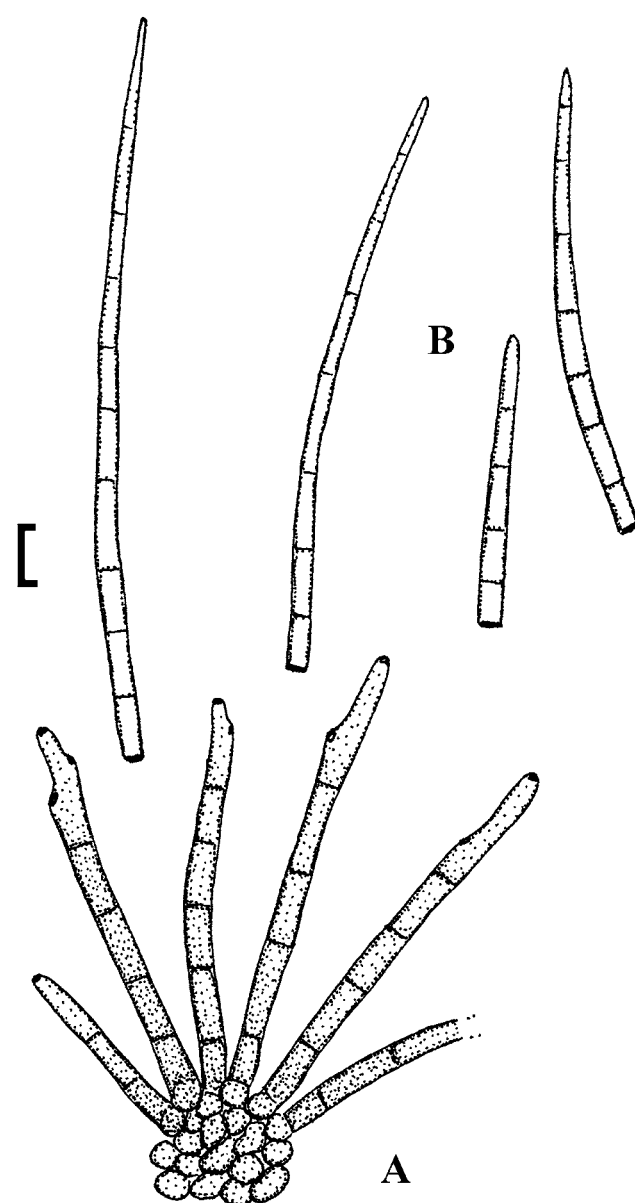


Fig. 18. *Cercospora cyclosori* (K(M) IMI 312082). A. Conidiophore fascicle. B. Conidia. Bar = 10  $\mu$ m.

*Holotype:* India: Odisha (Orissa): Bhubaneswar, on leaves of *Aleuritopteris farinosa* (*Cheilanthus farinosa*), *Pteridaceae* subfam. *Cheilantheoideae* (= *Cheilanthaceae*), 30 Nov. 1977, D. Gupta (HCIO 32848).

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

*Note:* This species belongs to *Cercospora apii* s. lat. (*sensu* Crous & Braun 2003).

***Cercospora cyclosori*** Goh & W.H. Hsieh, *Trans. Mycol. Soc. Republ. China* 4: 26 (1989). (Fig. 18)

*Synonym:* *Cercospora cyclosori* Sarbajna & Chattopadh, *J. Mycopathol. Res.* 28: 14 (1990), *nom. illeg.* (Art. 53.1) [*type:* on *Cyclosorus* sp., India, West Bengal, Hooghly,

Mankundu, 28 Aug. 1986, K. K. Sarbajna (K(M) IMI 311128)].

*Literature:* Hsieh & Goh (1990: 327).

*Illustration:* Hsieh & Goh (1990: 329, fig. 249).

*Description:* Leaf spots irregularly shaped, 1–4 mm diam, often confluent and larger, dark brown, margin indefinite. *Caespituli* amphigenous. *Mycelium* internal. *Stromata* lacking or small, only formed as small aggregation of swollen hyphal cells, substomatal or intraepidermal, dark brown. *Conidiophores* solitary or in small, loose fascicles, 2–8, arising from stromata, erect, straight or almost so, subcylindrical or somewhat geniculate, above all in the upper half, unbranched, uniform in width or somewhat attenuated towards the apex, 25–160 × 4–5 µm, 0–4-septate, brown, paler towards the apex; conidiogenous cells integrated, terminal, conidiogenous loci conspicuous, about 2–2.5 µm diam, thickened and darkened. *Conidia* formed singly, acicular, 50–110 × 3–4 µm, indistinctly pluriseptate (about 4–10), hyaline, thin-walled, smooth, apex acute or subacute, base truncate, 2.5–3 µm wide, hila somewhat thickened and darkened.

*Type: Taiwan:* Hualien Hsien, Fengpin, on *Cyclosorus acuminatus*, 30 Aug. 1984, T. K. Goh (NCHUPP-37a – holotype; K(M) IMI 312082 – isotype)..

*Host range and distribution:* On *Cyclosorus* (*acuminatus*, *Cyclosorus* sp.), *Thelypteridaceae*, Asia, (India, Taiwan).

*Notes:* Type material of *C. cyclosori* (Sarbajna & Chattopadhyay 1990) has been examined and proved to be identical with *C. cyclosori* Goh & W.H. Hsieh. To-anun *et al.* (2011: 75, fig. 58) described and illustrated a *Cercospora* collection on *Pteris biaurita* from Thailand and referred it to *C. cyclosori*. This identification is, however, doubtful. *Cyclosorus* is part of the *Thelypteridaceae* whereas *Pteris* belongs in the *Pteridaceae*. Several *Cercospora* spp. have been described from other hosts of the *Pteridaceae*. Furthermore, *C. cyclosori*, to which this collection was assigned, is morphologically *C. apii*-like.

***Cercospora diplaziicola*** A.K. Das, *Indian J. Mycol. Res.* 27: 37 (1989).  
(Fig. 19)

*Literature:* Crous & Braun (2003: 163), Kamal (2010: 41), Phengsintham *et al.* (2010b, 2013a).

*Illustrations:* Das (1989: 38, fig. 1), Phengsintham *et al.* (2013a: 38, figs 20–21).

*Description:* Leaf spots subcircular to irregular, 1–5 mm diam, grey-brown to dark brown in the centre, margin indefinite to dark brown. *Caespituli* amphigenous, scattered, dark brown. *Mycelium* internal; hyphae branched, 2–3 µm wide, septate, constricted at the septa, distance between septa 5–10 µm, brownish or green-hyaline, wall thin, smooth, forming plate-like plectenchymatous stromatic hyphal aggregations. *Stromata*

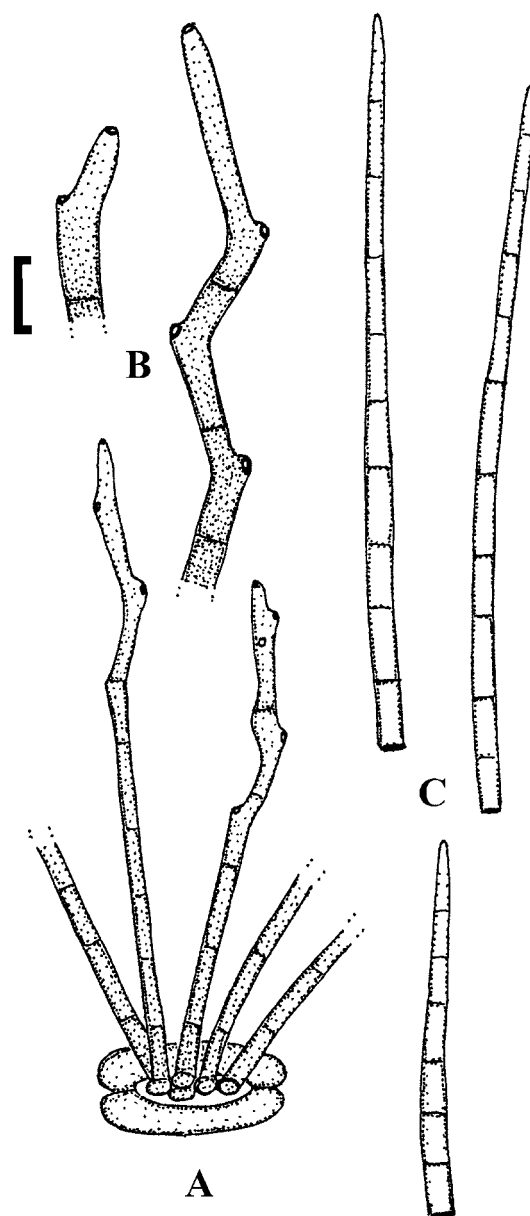


Fig. 19. *Cercospora diplaziicola* (K(M) IMI 292584). A. Conidiophore fascicle. B. Conidiogenous cells. C. Conidia. Bar = 10 µm.

small to well-developed, oval to ellipsoidal, 15–25 µm diam, brown, substomatal or intraepidermal, composed of swollen hyphal cells, subglobose, rounded to angular in outline, 6–17 µm wide, brown to dark brown, wall thin. *Conidiophores* formed singly or fasciculate, arising from stromata (2–12 per fascicle), emerging through stomata, unbranched, straight to curved, cylindrical, 40–190 × 4–6.5 µm, 2–8-septate, distance between septa 8–28 µm long, medium brown or olivaceous-brown, paler at the apex, wall 0.5–0.8 µm wide, smooth, slightly to strongly geniculate, width ± uniform; conidiogenous cells integrated, terminal or intercalary, cylindrical, 10–20 × 3–5 µm, pale brown; conidiogenous loci conspicuous, subcircular, 2–3 µm wide, brown. *Conidia* solitary, acicular to narrowly obclavate, straight to curved, 45–155(–230) × 3–5(–6) µm, 3–20-septate, hyaline, thin-walled, smooth, tip acute, base truncate to short obconically truncate, 2–3 µm wide, hila thickened and darkened.



**Holotype:** India: West Bengal: Jalpaiguri, Baradighi, on *Diplazium esculentum*, 10 Oct. 1983, A. K. Das PCC 3669 (K(M) IMI 292584).

**Host range and distribution:** On *Diplazium esculentum*, *Woodsiaceae*, Asia (India, Laos, Thailand).

**Notes:** *Cercospora diplaziicola* with acicular to obclavate conidia is very close to *C. athyrii*, which was described to have acicular conidia. However, type material of the latter species could not be traced, is probably not maintained and thus cannot be re-examined to prove the variation of the conidial shape. It is possible that the two species described from *Diplazium esculentum* in Asia are conspecific. *Cercospora diplaziicola* is only tentatively maintained as separate species.

***Cercospora dryopteridis* Y.L. Guo, *Mycosystema* 16: 1 (1997).**  
(Fig. 20)

**Literature:** Crous & Braun (2003: 166), Zhuang (2005).

**Illustration:** Guo (1997: 2, fig. 1).

**Description:** Leaf spots amphigenous, subcircular to angular-irregular, 1–3 mm diam, often confluent, greyish white to pale yellowish brown, with dark brown halo on the upper side, paler on the lower side. *Caespituli* mainly hypophyllous. *Mycelium* internal. *Stromata* lacking or only with a few aggregated swollen hyphal cells. *Conidiophores* solitary or in small fascicles, 2–12, divergent, erect, straight, subcylindrical to 1–4 times geniculate, usually unbranched, 40–150(–210) × 4–6 µm, 1–5-septate, olivaceous-brown to medium brown, paler towards the tip; conidiogenous cells integrated, terminal and intercalary, conidiogenous loci conspicuous, thickened and darkened, 2.5–3.5 µm diam. *Conidia* solitary, acicular, 95–250 × 3.5–5 µm, pluriseptate, hyaline, thin-walled, smooth, apex acute, base truncate, about 3–4 µm wide, hila somewhat thickened and darkened.

**Holotype:** China: Prov. Shaanxi: Foping, on *Dryopteris polypodioides*, *Dryopteridaceae*, 27 Nov. 1991, Y. L. Guo 3139 (HMAS 73548).

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

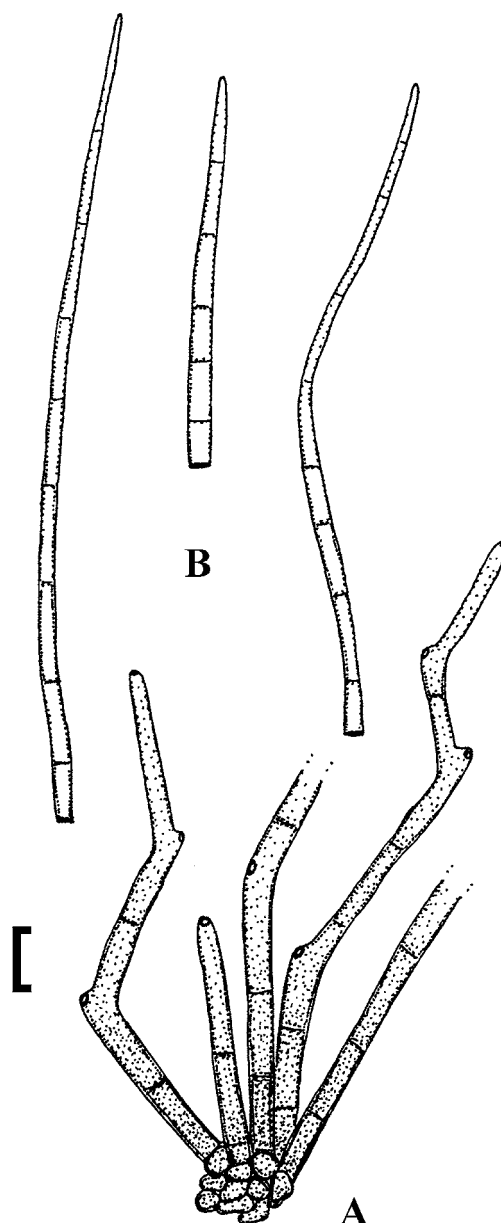
**Note:** This species is part of the *Cercospora apii* complex.

***Cercospora lygodiicola* Lall, J.N. Kapoor & Munjal, *Indian Phytopathol.* 17: 181 (1964).**

**Literature:** Crous & Braun (2003: 258), Kamal (2010: 61).

**Illustration:** Lall et al. (1964: 182, fig. 1).

**Description:** Leaf spots amphigenous, irregularly shaped, 2–15 mm diam, fuliginous, margin paler, sometimes covering the whole surface of leaflets. *Caespituli* amphigenous. *Stromata* lacking or small, composed of a few swollen hyphal cells.



**Fig. 20.** *Cercospora dryopteridis* (HMAS 73548). **A.** Conidiophore fascicle. **B.** Conidia. Bar = 10 µm.

*Conidiophores* solitary or few to many in loose fascicles, arising from internal hyphae or small stromatic hyphal aggregations, erect, subcylindrical to somewhat geniculate, unbranched, about 15–50 × 4–5 µm, continuous to sparingly septate, olivaceous-brown below, paler towards the apex; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, conidiogenous loci thickened and darkened. *Conidia* solitary, narrowly obclavate, 25–130 × 3–4 µm, indistinctly pluriseptate, subhyaline, thin-walled, smooth, apex subacute or acute, base short obconically truncate.

**Holotype:** India: Punjab: Kulu, Manali, on *Lygodium japonicum*, *Lygodiaceae*, 9 Nov. 1962, V. S. Sharma (HCIO 28172).

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

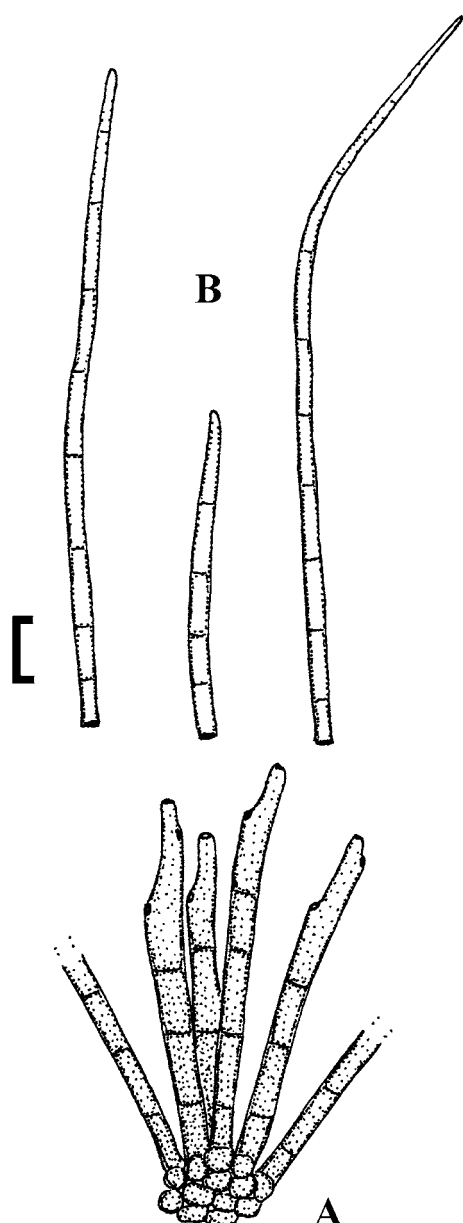


Fig. 21. *Cercospora marsileae* (based on the original illustration). A. Conidiophore fascicle. B. Conidia. Bar = 10  $\mu$ m.

***Cercospora marsileae*** Ragunathan, Prasad & Purushot., *Curr. Sci.* **39**: 305 (1970). (Fig. 21)

*Literature*: Thuang (1984: 441), Crous & Braun (2003: 268), Kamal (2010: 63).

*Illustration*: Ragunathan *et al.* (1970: 305, figs 1–2).

*Description*: Leaf spots brown to rusty brown, with chlorotic halo, 2–14 mm in length, sometimes spreading over the whole leaflet. *Caespituli* amphigenous. *Mycelium* internal. *Stromata* well-developed, consisting of brown cells. *Conidiophores* in fascicles, 2–10, erect, straight, subcylindrical, unbranched, apical part geniculate, about 50–110  $\times$  3.5–5  $\mu$ m, 1–3-septate, brown, paler towards the tip, thin-walled, smooth; conidiogenous cells integrated, terminal,

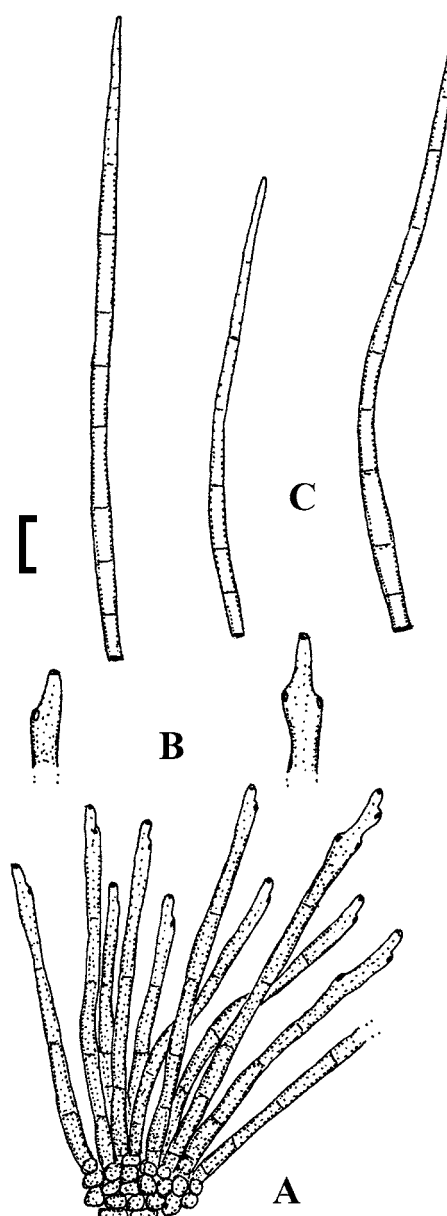


Fig. 22. *Cercospora platycerii* (CUP, holotype). A. Conidiophore fascicle. B. Conidiogenous cells. C. Conidia. Bar = 10  $\mu$ m.

conidiogenous loci thickened and darkened. *Conidia* formed singly, acicular, about 45–225  $\times$  3–5.5  $\mu$ m, 4–26-septate, hyaline, thin-walled, smooth, apex pointed, base truncate.

*Holotype*: **India**: Tamil Nadu: Annamalainagar, on living leaves of *Marsilea quadrifolia*, 5 Nov. 1965, V. Ragunathan (HCIO 29330).

*Host range and distribution*: On *Marsilea quadrifolia*, *Marsileaceae*, Asia (India, Myanmar).

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

***Cercospora platycerii*** Chupp, A monograph of the fungus genus *Cercospora*: 456 (1954). (Fig. 22)

*Literature:* Raabe et al. (1981), Crous & Braun (2003: 327), Phengsintham et al. (2010b), To-anun et al. (2011: 73).

*Illustration:* To-anun et al. (2011: 74, fig. 57).

*Description:* Leaf spots amphigenous, subcircular, 10–30 mm diam, dark brown to blackish, zonate, margin slightly raised and centre depressed or vice versa. *Caespituli* hypophyllous. *Mycelium* internal. *Stromata* lacking or small, only with small aggregations of a few swollen hyphal cells, substomatal, brown. *Conidiophores* solitary or in small fascicles, 2–9, divergent, arising from internal hyphae or hyphal aggregations, through stomata, erect, straight, subcylindrical, geniculate above, unbranched, 30–200 × 3–5 µm, pluriseptate, pale to medium olivaceous-brown, wall slightly thickened, smooth; conidiogenous cells integrated, terminal, conidiogenous loci conspicuous, thickened and darkened, 2–3.5 µm diam. *Conidia* solitary, acicular, straight to somewhat curved, 40–150 × 2.5–5 µm, pluriseptate, hyaline, thin-walled, smooth, apex subacute, base truncate, 2–4 µm wide, hila somewhat thickened and darkened.

*Holotype:* USA: New Jersey: East Orange, on *Platyserium* sp., 21 Sep. 1933, D. L. Gill (CUP).

*Host range and distribution:* on *Platyserium* (*bifurcicum*, *grande*, *Platyserium* sp.), *Polypodiaceae*, Asia (Thailand), North America (USA, Florida, New Jersey), Hawaii.

***Cercospora pleopeltidis*** Chidd., *Mycopathol. Mycol. Appl.* 17: 73 (1962).

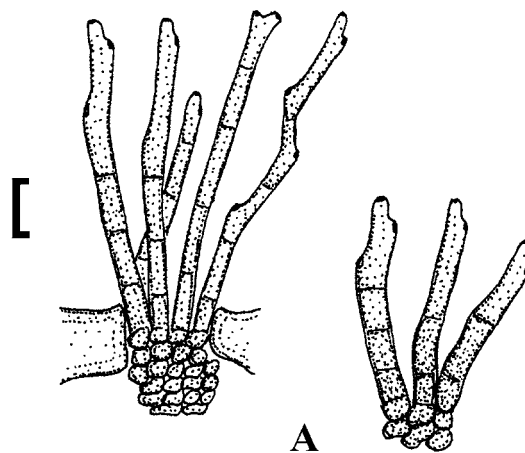
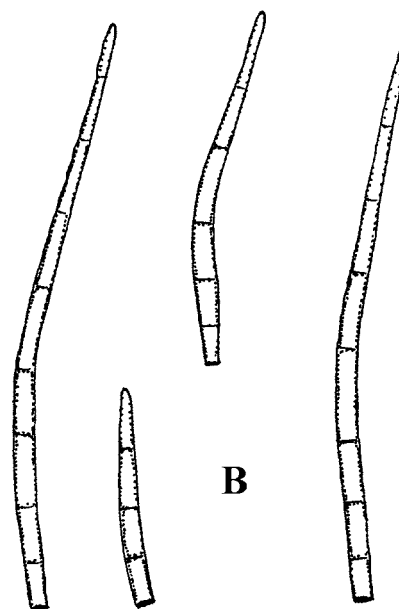
(Fig. 23)

*Synonym:* *Cercospora microsori* P. Kumar & Kamal, *Curr. Sci.* 50: 509 (1981); as “*microsori*” [type: on *Microsorium membranaceum*, India, U.P., Gorakhpur, Feb. 1978, P. Kumar 96 (K(M) IMI 230606b)].

*Literature:* Crous & Braun (2003: 275, 328), Kamal (2010: 65, 76).

*Illustrations:* Chiddarwar (1962: pl. I, figs 7–9), Kumar & Kamal (1981: 509, fig. 2).

*Description:* Leaf spots amphigenous, circular to oval, confluent, forming irregular patches, pale brown to brown. *Caespituli* amphigenous. *Mycelium* internal. *Stromata* substomatal, subglobose, 20–45 µm diam, brown. *Conidiophores* 5–16, in loose fascicles, arising from stromata, through stomata, erect, straight, subcylindrical to distinctly geniculate-sinuuous, unbranched, 20–110(–150) × 3–4.5(–5) µm, 2–7-septate, pale to brown, wall somewhat thickened, smooth; conidiogenous cells integrated, terminal or intercalary, with conspicuous conidiogenous loci, about 2–2.5 µm wide, thickened and darkened. *Conidia* solitary, acicular to somewhat obclavate, straight to curved, 15–150 × 3–4 µm, 2–16-septate, hyaline, thin-walled, smooth, apex acute or subobtuse, base truncate or slightly attenuated at the very base, 2–2.5 µm wide, hila somewhat thickened and darkened.



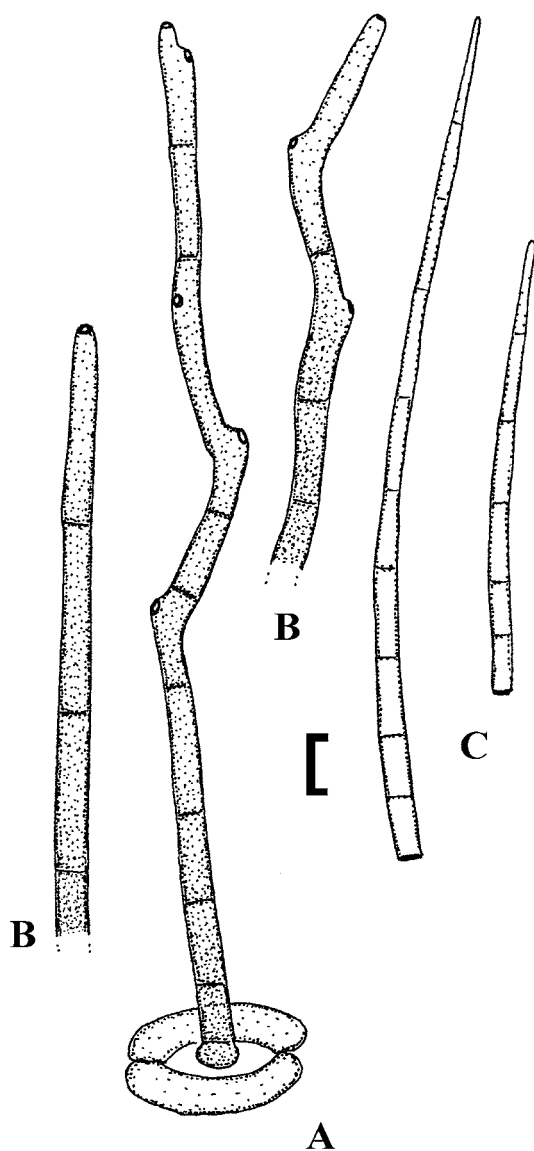
**Fig. 23.** *Cercospora pleopeltidis* (K(M) IMI 83185). **A.** Conidiophore fascicle. **B.** Conidia. Bar = 10 µm.

*Types:* India: Bombay, Mahabaleshwar, on leaves of *Microsorium membranaceum*, 14 Oct. 1955, P. P. Chiddarwar (K (M) IMI 83185 – holotype; BPI 439783 – isotype).

*Host range and distribution:* on *Microsorium membranaceum* (*Pleopeltis membranacea*), *Polypodiaceae*, Asia (India, M.S., U.P.).

*Notes:* A morphologically similar *Cercospora* was found on *Nephrolepis cordifolia* (*Polypodium cordifolium*), *Davalliaceae*, in Venezuela (Lara, La Cuchilla, Dec. 2006, R. Urtiaga, HAL 2601 F, deposited as *Cercospora* sp.). The sample concerned is, however, too meager for a final determination and description.

***Cercospora pteridigena*** M.K. Khan, R.K. Verma & Kamal, *Indian Phytopathol.* 45: 26 (1994). (Fig. 24)



**Fig. 24.** *Cercospora pteridigena* (K(M) IMI 321263). **A.** Conidiophore arising from a stroma. **B.** Conidiogenous cells. **C.** Conidia. Bar = 10  $\mu$ m.

**Literature:** Crous & Braun (2003: 340), Kamal (2010: 78).

**Illustration:** Khan *et al.* (1992: 27, fig. 1).

**Description:** Lesions amphigenous, mainly on young leaves and leaflets, 2.5–15 mm diam, scattered, sometimes covering the whole leaf surface, light yellow to dark brown. *Mycelium* internal; hyphae up to 2.5  $\mu$ m wide, septate, smooth. *Stromata* lacking or only poorly developed, small aggregations of swollen hyphal cells, about 10–20  $\mu$ m diam, olivaceous. *Conidiophores* solitary or in small fascicles, arising from internal hyphae or small stromata, erect, straight to somewhat geniculate, unbranched, about 80–205  $\times$  6.5–7  $\mu$ m, pluriseptate, pale brown, thin-walled, smooth; conidiogenous cells integrated, terminal or intercalary, with conspicuously thickened and darkened conidiogenous loci, 4–5.5  $\mu$ m diam. *Conidia* solitary, acicular, very rarely branched, 145.5–495.5  $\times$  3.5–5  $\mu$ m, 10–25-septate, hyaline, base truncate, about 3–4  $\mu$ m wide, apex pointed, hila thickened and darkened.

**Types:** **India:** U.P.: Baharaich, on leaves of *Adiantum venustum*, 14 Nov. 1987, M. K. Khan, (GPU, KS 239 – holotype; K(M) IMI 3212623 – isotype).

**Host range and distribution:** On *Adiantum* (*philippense* [*lunulatum*], *venustum*), *Pteridaceae* subfam. *Vittarioideae* (*Adiantaceae*), Asia (India).

**Note:** An additional collection of this species from India on *Adiantum philippense* is deposited at K (IMI 136020).

***Cercospora selaginellarum*** P. Joly, *Rev. Mycol.* **30:** 228 “1965” (1966).

**Literature:** Farr & Horner (1968).

**Illustration:** Cour & Joly (1965: 227, pl. 1–4, 229, fig. 1).

**Description:** Lesions formed as small leaf spots. *Mycelium* internal; hyphae 4–7  $\mu$ m wide, brown. *Stromata* composed of aggregated swollen hyphal cells, 15–40  $\mu$ m diam, brown. *Conidiophores* loosely fasciculate, 2–20, arising from stromata, erect, unbranched, straight to geniculate-sinuuous, length variable, about 150–400  $\mu$ m long and 4.5–6  $\mu$ m wide, pluriseptate, brown; conidiogenous cells integrated, terminal and intercalary, conidiogenous loci conspicuous, thickened and darkened. *Conidia* solitary, acicular, up to 300  $\mu$ m long, pluriseptate, hyaline, thin-walled, apex pointed, base truncate, hila thickened and darkened.

**Syntypes:** **France:** on leaves of *Selaginella denticulata* and *S. helvetica* (details not indicated).

**Host range and distribution:** on leaves of *Selaginella* (*apoda*, *helvetica*, *kraussiana* [*denticulata*]), *Selaginellaceae*, Europe (France), North America (USA, Minnesota).

**Notes:** This species belongs to the *C. apii* complex. Cour & Joly (1965) compared *C. selaginellarum* with the latter species and discussed the morphological similarity of the two species. Type material was not indicated in the original publication, and two different host species were cited, *Selaginella helvetica* and *S. denticulata*. Original material could not be traced. Jaap, *Fungi Sel. Exs.* 619, issued as *Leptosphaeria helvetica* var. *major*, on *Selaginella helvetica*, Italy, Liguria, Portofino, 26 Mar. 1913, O. Jaap (material deposited at HAL examined) contains conidiophores and conidia of *Cercospora* sp., but the latter material does not belong to *C. selaginellarum*. The conidia are much shorter, narrower and obclavate, and the conidiogenous loci are rather small, 1.5–2  $\mu$ m diam (stromata immersed, about 10–40  $\mu$ m diam, brown; conidiophores fasciculate, straight, subcylindrical, 80–150  $\times$  3–6  $\mu$ m, pluriseptate, medium to darker brown, tips much paler, conidiogenous loci 1.5–2  $\mu$ m wide, slightly thickened and darkened; conidia solitary, obclavate, about 40–90  $\times$  4–5  $\mu$ m, 3–8-septate, hyaline or almost so, smooth, apex subobtuse, base rounded to short obconically truncate, 2  $\mu$ m wide, hila slightly thickened and darkened). However, the material from Italy is not sufficient for a final taxonomic conclusion.



**Passalora****Key to the species of *Passalora* on ferns**

- 1 Conidiophores 30–80 × 3–5 µm; conidia obclavate, long and narrow, 40–210 × 2–4 µm, subhyaline to pale olivaceous; on *Pteridium aquilinum*, widespread ..... ***P. pteridis***  
 Conidiophores longer and broader, about 25–350 × 4–7.5 µm; conidia obclavate-cylindrical, shorter and broader, 25–100 × 4–6 µm, olivaceous-brown or brown; on *Pyrrhosia lingua*, Japan ..... ***P. pyrrhosiae***

**List of *Passalora* species on ferns**

***Passalora pteridis*** (Siemaszko) U. Braun & Crous, in Crous & Braun, *Mycosphaerella and Anam.* **1**: 340 (2003).

(Fig. 25)

**Basionym:** *Cercospora pteridis* Siemaszko, *Arch. Nauk. Biol. Towarz. Nauk. Warszaw.* **1**: 57 (1923).

**Synonyms:** *Pseudocercospora pteridis* (Siemaszko) Y.L. Guo & X.J. Liu, *Acta Mycol. Sin.* **11**: 298 (1992) [misapplied].

*Mycovellosiella pteridis* (Siemaszko) U. Braun, *Trudy Bot. Inst. Im. V.L. Komarova* **20**: 83 (1997).

*Cercospora pteridicola* Gonz.Frag., *Mem. Real. Acad. Ci. Exact. Madrid, Ser. 2*, **6**: 227 (1927) [*holotype*: on *Pteridium aquilinum*, Spain, near San Filipe de Ballaróls, Fuente de la Salud, Gerona, 16 Nov. 1920, *Sennen* (MA)].

**Literature:** Chupp (1954: 457), Vassiljevsky & Karakulin (1937: 219), Lall et al. (1964: 182–183), Greene (1960), Saccardo (1972: 1382), Crous & Braun (2003: 340), Kamal (2010: 133).

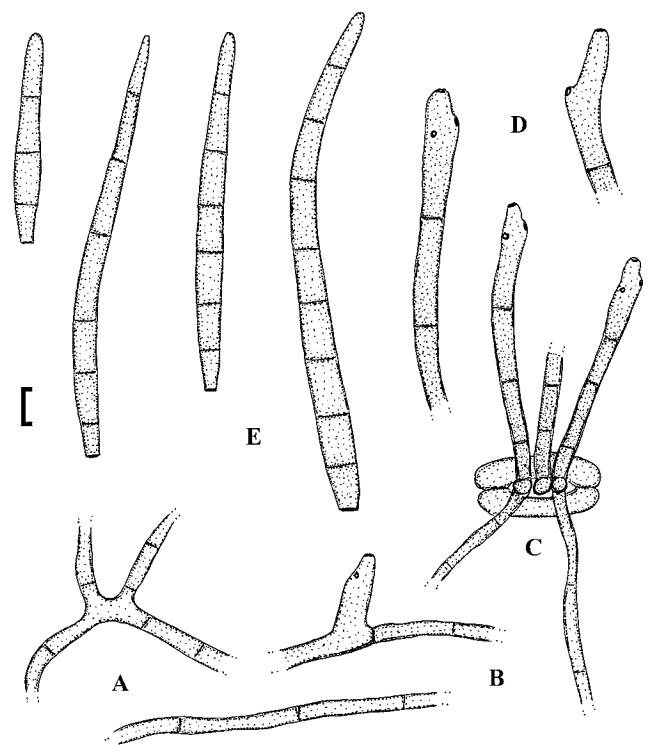
**Illustrations:** Lall et al. (1964: 182, fig. 3), Braun & Mel'nik (1997: 121, fig. 49).

**Description:** Leaf spots amphigenous, formed as irregular discolorations, yellowish brown, brown, later darker, margin indefinite. *Caespituli* hypophyllous, subeffuse, not very conspicuous. *Mycelium* internal and external; superficial hyphae branched, septate, 2–6 µm wide, smooth, thin-walled, subhyaline to olivaceous. *Stromata* lacking or only formed as small substomatal hyphal aggregations. *Conidiophores* in small, loose fascicles, arising from internal hyphae or hyphal aggregations, or solitary, arising from superficial hyphae, erect to decumbent, flexuous, simple or occasionally branched, subcylindrical to somewhat clavate, to geniculate-sinuous, 20–100 × 5–10 µm, continuous to pluriseptate, olivaceous to brownish, thin-walled, smooth; conidiogenous cells integrated, terminal, often somewhat swollen, subclavate, about 20–40 µm long, conidiogenous loci conspicuous, somewhat thickened and darkened. *Conidia* solitary, broadly obclavate-subcylindrical, (30–)40–120(–140) × 5–8 µm, pluriseptate, hyaline, subhyaline to pale olivaceous, thin-walled, smooth, apex obtuse, base obconically truncate, hila slightly thickened and darkened.

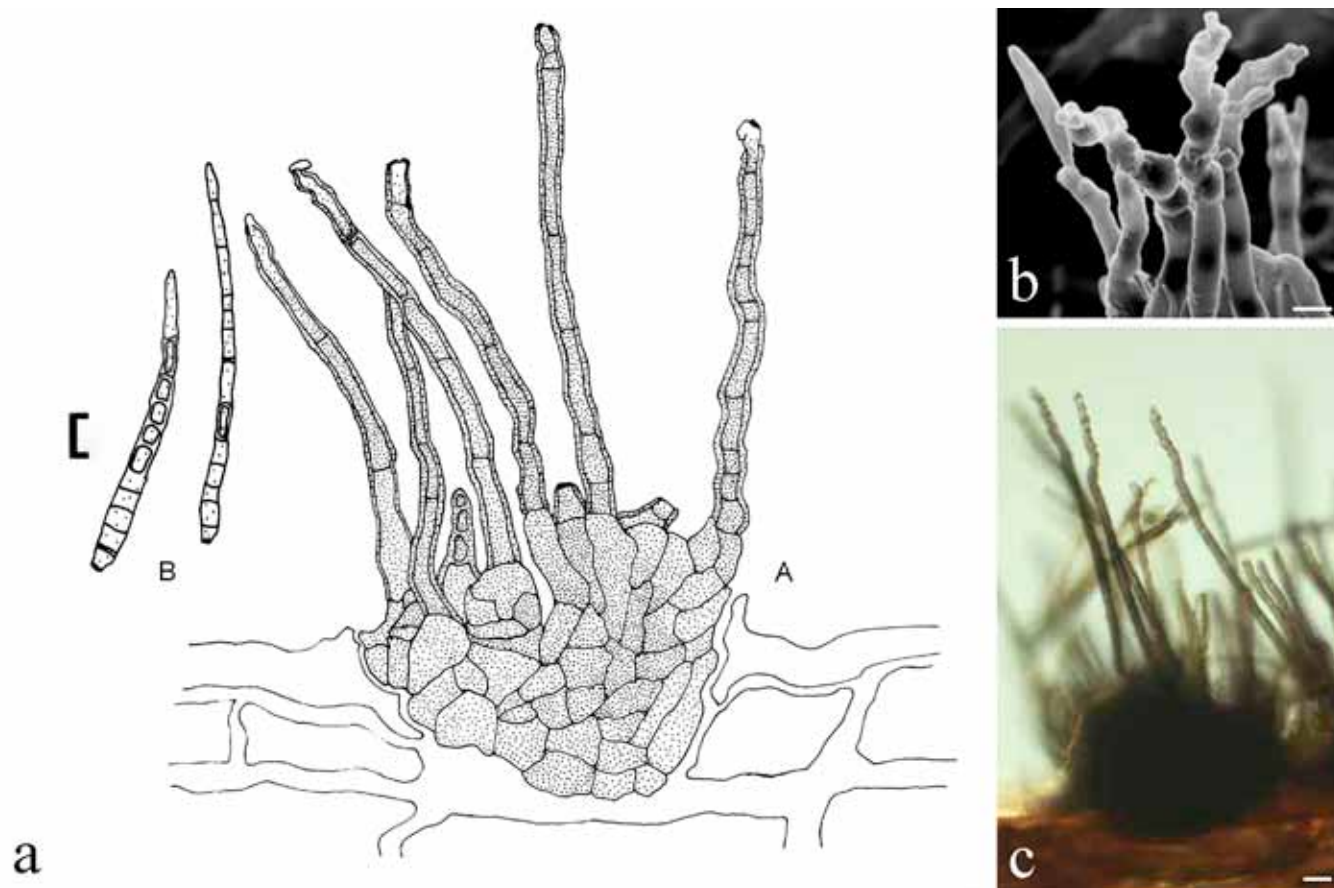
**Holotype:** **Russia:** Pskhu, Caucasus Mts., on *Pteridium aquilinum*, 1917, *W. Siemaszko* (not seen).

**Host range and distribution:** On *Pteridium* (*aquilinum*, *Pteridium* sp.), *Dennstaedtiaceae*, Asia (India, Japan), Caucasus (Georgia), Europe (Russia, Spain), North America (USA, Wisconsin).

**Notes:** Type material of *C. pteridis* could not be traced in Siemaszko's herbarium at WA. The reallocation of this species to *Mycovellosiella* and *Passalora*, respectively, was based on the examination of type material of *Cercospora pteridicola*. The identity of a Japanese collection on *Pteridium aquilinum* subsp. *japonicum* (*P. aquilinum* var. *latiusculum*), Iwate, 31 Aug. 1947, *K. Sawada* (IUM-FS79), recorded by Sawada (1958) as *Cercospora pteridis*, is unclear and remains unproven as this sample is devoid of any fructification, which has been confirmed by a recently made re-examination. Records of this species from India and Myanmar on *Pteridium* sp. (Lall et al. 1964, Thaug 1984) are also unclear and unproven. Material was not available for a re-examination. A previous record from Colombia on



**Fig. 25.** *Passalora pteridis* (MA, holotype of *Cercospora pteridicola*). **A.** Superficial hypha. **B.** Solitary conidiophore arising from a superficial hypha. **C.** Conidiophore fascicle. **D.** Conidiogenous cells. **E.** Conidia. Bar = 10 µm.



**Fig. 26.** *Passalora pyrrrosiae* (TFM : FPH-7852). **a.** Drawing (**A.** Conidiophore fascicle, **B.** Conidia). **b.** Micrograph of conidiophores (SEM). **c.** Micrograph of conidiophores (light microscopy).

*Pteris* sp. (Chupp 1954) was based on a misidentification and belongs to a *Pseudocercospora* described in this paper as *P. pteridigena*.

***Passalora pyrrrosiae*** (Togashi & Katsuki) C. Nakash. & I. Araki, *Mycoscience* **49**: 144 (2008). (Fig. 26)

*Basionym*: *Pseudocercospora pyrrrosiae* Togashi & Katsuki, *J. Jap. Bot.* **28**: 287 (1953).

*Literature*: Katsuki (1965: 76).

*Illustration*: Motohashi *et al.* (2008: 143, fig. 6).

*Description*: Lesions indistinct or with distinct discolorations, 3–8 mm diam, greyish brown to reddish brown above, with darker border line and greyish brown or brown below, sometimes covering the whole surface. *Caespituli* hypophyllous, fuliginous. *Mycelium* internal. *Stromata* intraepidermal, small to large, up to 135 µm diam, olivaceous-brown to dark brown. *Conidiophores* solitary or in moderately large fascicles, 2–18, loose to dense, arising from stromata,

erumpent, erect, straight to slightly curved, subcylindrical to geniculate-sinuose, unbranched, about 25–350 × 4–7.5 µm, 4–10-septate, pale olivaceous-brown to brown, thick-walled, asperulate; conidiogenous cells integrated, terminal, sympodially or percurrently proliferating, conidiogenous loci thickened and darkened, 2.5–5 µm diam. *Conidia* solitary, obclavate-cylindrical, straight to curved, 25–100 × 4–6 µm, 1–11-euseptate, rarely distoseptate, occasionally constricted at the septa, olivaceous-brown or brown, wall thickened, asperulate, base obconically truncate, apex obtuse, hila somewhat thickened and darkened.

*Types*: **Japan**: Pref. Kagoshima, Kosugidani, Yaku I., on *Pyrrrosia lingua*, 7 Aug. 1951, K. Togashi & S. Katsuki (holotype not preserved); neotype (designated in Motohashi *et al.* 2008), Aichi Pref., Nagoya, Chikusa, Higashiyama Botanical Garden, on *Pyrrrosia lingua*, 6 June 2005, I. Araki (TFM : FPH-7852, ex-neotype culture: MAFF 240280).

*Host range and distribution*: On *Pyrrrosia lingua*, *Polypodiaceae*; Asia (Japan).

**Pseudocercospora****Key to the species of Pseudocercospora on ferns**

- 1 Mycelium internal and external; superficial hyphae usually with solitary conidiophores ..... 2  
Mycelium internal; superficial hyphae with solitary conidiophores lacking ..... 14
- 2 (1) Stromata lacking; conidiophores only solitary, arising from superficial hyphae ..... 3  
Stromata mostly present, small to large; conidiophores fasciculate, arising from internal hyphae or  
stromata as well as solitary, arising from superficial hyphae ..... 6
- 3 (2) Conidiophores very long, 100–300 µm, pluriseptate (10–30 septa); conidia subcylindrical,  
ellipsoid to short obclavate-obovoid, 12–25 × 4.5–6 µm, (2–)3–4(–5)-septate;  
on *Dicranopteris linearis*, Africa, Gabon ..... **P. gleicheniae**  
Conidiophores much shorter, 2–40 µm, 0–2-septate; conidia acicular-filiform or narrowly  
obclavate-cylindrical, much longer and narrower; on other hosts ..... 4
- 4 (3) Conidia narrowly cylindrical to obclavate-cylindrical, 30–80 × 2–3 µm; on *Abacopteris urophylla*,  
Singapore ..... **P. abacopteridis**  
Conidia acicular-filiform, 60–120 × 2–3.5 µm; on other hosts ..... 5
- 5 (4) Conidia 3–3.5 µm wide, hila 2.5–3 µm wide; on *Rumohra adiantiformis*, Taiwan ..... **P. rumohrae**  
Conidia narrower, 2–3 µm, hila 1.5–2 µm wide; on *Ptisana salicina*, New Zealand ..... **P. ptisananae**
- 6 (2) Stromata lacking; forming fasciculate conidiophores arising from internal hyphae, emerging through stomata;  
conidia short, only 10–35 × 1.5–4 µm, 1–3-septate; on *Lygodium japonicum*, Asia ..... **P. lygonii**  
Stromata developed, giving rise to fasciculate conidiophores; conidia longer, pluriseptate ..... 7
- 7 (6) Stromata very large, up to 150 µm diam; on *Nephrolepis falcata*, Australia ..... **P. nephrolepidicola**  
Stromata much smaller, 10–80 µm diam ..... 8
- 8 (7) Superficial hyphae present, but without solitary conidiophores; on *Davallia fejeensis*, Brazil ..... **P. davalliicola**  
Superficial hyphae with solitary conidiophores present and usually abundant ..... 9
- 9 (8) Conidia narrow, only 2–4 µm wide; on *Lygodium*, *Nephrolepis* or *Pteris* spp. .... 10  
Conidia wider, 3–5.5 µm; on other hosts ..... 13
- 10 (9) Conidiophores very long, 30–150 µm; conidia acicular to narrowly obclavate, very long, 40–250 µm;  
on *Pteris* sp., Colombia ..... **P. pteridigena**  
Conidiophores much shorter, 5–70 µm; conidia much shorter, up to 125 µm ..... 11
- 11 (10) Conidia acicular to narrowly cylindrical, base truncate; on *Nephrolepis* spp., Asia ..... **P. nephrolepidigena**  
Conidia obclavate-cylindrical, base obconically truncate; on *Lygodium* or *Pteris* spp. .... 12
- 12 (11) Hyphae subhyaline; conidiophores thin-walled; on *Pteris* spp., Asia ..... **P. pteridicola**  
Hyphae subhyaline, but distinctly pigmented where conidiophores arise; wall of longer  
conidiophores somewhat thickened; on *Lygodium* sp., Asia ..... **P. lygodiigena**
- 13 (9) Leaf spots lacking or indistinct; colonies hypophyllous; stromata small, 10–20 µm diam;  
conidiophores up to 150 × 7 µm; on *Adiantum*, Asia, South America ..... **P. adiantii**  
Leaf spots developed; colonies amphigenous; with large epiphyllous stromata, 20–60 µm diam;  
conidiophores up to 100 × 5 µm; on *Lonchitis hirsuta*, Venezuela ..... **P. lonchitidis**
- 14 (1) Stromata lacking or almost so ..... 15  
Stromata developed, 10–110 µm diam ..... 16
- 15 (14) Conidiophores 60–180 × 4–7 µm; conidia 3–5 µm wide; on *Plagiogyria euphlebia*, Taiwan  
..... **P. plagiogyriae**

- Conidiophores much shorter and narrower, 7–35 × 2.5–3 µm; conidia only 2–3 µm wide;  
on *Nephrolepis auriculata*, Taiwan ..... **P. nephrolepidis**
- 16 (14) Stromata epiphyllous, immersed, very large, 60–110 µm diam; on *Cyathea* sp., Japan ..... **P. cyatheae**  
Stromata much smaller, 10–75 µm diam ..... 17
- 17 (16) Conidia acicular-filiform ..... 18  
Conidia obclavate-cylindrical ..... 22
- 18 (17) Conidia very narrow, 1–1.5 µm wide; on *Cyclosorus acuminatus*, Taiwan ..... **P. pteridophytophila**  
Conidia wider, 1.5–4 µm; on other hosts ..... 19
- 19 (18) Conidiophores relatively short, 5–30 µm; on *Arachniodes* or *Microsorium* spp. .... 20  
Conidiophores longer, up to 70 µm; on other hosts ..... 21
- 20 (19) Colonies hypophyllous; conidiophores usually aseptate; on *Arachniodes* sp., China ..... **P. arachnioidis**  
Colonies amphigenous; conidiophores 1–5-septate; on *Microsorium* ..... **P. microsori**
- 21 (19) Conidiophores usually aseptate; conidia 50–120 µm long; on *Metathelypteris laxa*, Taiwan ..... **P. thelypteridis**  
Conidiophores 0–2-septate; conidia 60–80 µm long; on *Deparia japonica*, Taiwan ..... **P. athyrii**
- 22 (17) Conidiophores very short, 9–14 × 2–4 µm; on *Christella parasitica*, Thailand ..... **P. christellae**  
Conidiophores longer, (5–)10–280 µm; on other hosts ..... 23
- 23 (22) Conidiophores very long, 160–280 µm; on *Lygodium* sp., India ..... **P. polypodiacearum**  
Conidiophores shorter, 5–150 µm; on other hosts ..... 24
- 24 (23) Conidiophores long, up to 150 µm; on *Angiopteris* or *Pityrogramma* ..... 25  
Conidiophores shorter, 10–75 µm; on other hosts ..... 26
- 25 (24) Conidiophores 2–6 µm wide; conidia 30–60 × 3–5 µm; on *Angiopteris* sp., Asia ..... **P. angiopteridis**  
Conidiophores 5–7 µm wide; conidia 25–200 × 5–7.5 µm; on *Pityrogramma*, Ecuador  
..... (?) *Cercospora trismeriae* (see “Doubtful, excluded and insufficiently known species”)
- 26 (24) Superficial hyphae present, but without solitary conidiophores; on *Davallia fejeensis*, Brazil ..... **P. davalliicola**  
Superficial hyphae lacking ..... 27
- 27 (26) Conidia narrow, 2–4 µm ..... 28  
Conidia wider, 3–6 µm ..... 30
- 28 (27) Conidia 20–80 µm long, only 3–5-septate; on diverse ferns of different families;  
North and South America and Europe (introduced) ..... **P. phyllitidis**  
Conidia 20.5–110 µm long, 2–12-septate ..... 29
- 29 (28) Conidia never acicular, base short obconically truncate; on *Odontosoria chinensis*, India ..... **P. davalliae**  
Conidia acicular to somewhat obclavate-cylindrical, base mostly truncate or only slightly obconically  
truncate; on *Microsorium pustulatum*, Australia ..... **P. microsori**
- 30(27) Stromata 20–75 µm diam; conidiophores 10–70 µm long, 0–3-septate; conidia 4–7 µm wide;  
on *Tectaria zeylanica*, Asia ..... **P. helminthostachydis**  
Stromata smaller, 10–40 µm diam; conidiophores 15–40 µm long, 0–1-septate; conidia 3–5 µm wide;  
on *Lygodium japonicum*, China ..... **P. lygodiicola**

### Tabular key to *Pseudocercospora* species on ferns

*Adiantaceae* (*Pteridaceae* subfam. *Vittarioideae*)

#### **Athyriaceae**

On *Deparia japonica* (*Athyrium japonicum*), Taiwan ..... **P. athyrii**



**Cyatheaceae**

- 1 Distinct leaf spots formed; colonies epiphyllous; stromata very large, 60–110 µm diam; conidiophores 25–50 × 3–5 µm; conidia cylindrical-obclavate, 30–50 × 3.5–5.5 µm, base rounded to distinctly obconically truncate; on *Cyathea* sp., Japan ..... **P. cyatheae**  
 On dead fronds; colonies amphigenous; stromata smaller, up to 60 µm diam; conidiophores longer and narrower, 30–70 × 2–3 µm; conidia subcylindrical or subacicular, width often irregular, base truncate to somewhat obconically truncate; on *Cyathea australis*, Australia ..... **P. cyatheicola**

**Davalliaceae**

- 1 Superficial hyphae with solitary conidiophores present ..... 2  
 Superficial hyphae lacking, if present without solitary conidiophores ..... 3
- 2 (1) Stromata large, up to 130 µm diam; on *Nephrolepis falcata*, Australia ..... **P. nephrolepidicola**  
 Stromata smaller, 10–80 µm diam; on *Nephrolepis biserrata* and *Nephrolepis* sp., Brunei, Thailand ..... **P. nephrolepidigena**
- 3 (1) Stromata lacking or small, up to 35 µm diam; conidia subcylindrical-acicular, usually 65–100 µm long, base truncate; on *Nephrolepis auriculata*, Taiwan ..... **P. nephrolepidis**  
 Stromata larger, up to 75 µm diam; conidia obclavate-subcylindrical, 12–80 µm long, base obconically truncate ..... 4
- 4 (3) Mycelium internal and external, but superficial hyphae without solitary conidiophores; conidia 3–5 µm wide, hila (1.5–)2(–2.5) µm diam; on leaves of *Davallia fejeensis*, Brazil ..... **P. davalliicola**  
 Mycelium only internal; conidia 2–3.5 µm wide, hila 1–1.5 µm diam; on *Davallia trichomanoides* and *Nephrolepis exaltata*, North America ..... **P. phyllitidis**

**Dennstadiaceae**

- On *Lonchitis hirsuta*, Venezuela ..... **P. lonchitidis**

**Dryopteridaceae**

- 1 Stromata lacking; with solitary conidiophores arising from superficial hyphae; conidia acicular, 60–120 µm long; on *Rumohra adiantiformis*, Taiwan ..... **P. rumohrae**  
 Stromata small to well-developed; solitary conidiophores lacking ..... 2
- 2 (1) Conidiophores 6.5–30 µm long; fully developed conidia acicular, short conidia sometimes obclavate; on *Arachniodes* sp., China ..... **P. arachnioidis**  
 Conidiophores 10–75 µm long; conidia always obclavate; on *Rumohra adiantiformis*, North America ..... **P. phyllitidis**

**Gleicheniaceae**

- On *Dicranopteris linearis*, Africa, Gabon ..... **P. gleicheniae**

**Lindsaeaceae**

- On leaves of *Odontosoria chinensis* [*Davallia tenuifolia*], India ..... **P. davalliae**

**Lygodiaceae**

- 1 Superficial hyphae present ..... 2  
 Mycelium only internal, superficial hyphae lacking ..... 3
- 2 (1) Stromata lacking; conidia small, 10–35 × 1.5–4 µm, 1–3-septate; on *Lygodium* spp. .... **P. lygodii**  
 Stromata present; conidia 40–115.5 µm long, pluriseptate; on *Lygodium* sp. .... **P. lygodiigena**
- 3 (1) Conidiophores short, 15–40 µm, 0–1-septate; on leaves of *Lygodium japonicum* ..... **P. lygodiicola**  
 Conidiophores much longer, 160–280 µm, pluriseptate; on *Lygodium* sp., India ..... **P. polyodiacearum**

**Marattiaceae**

- 1 Superficial mycelium with solitary conidiophores developed; stromata lacking; conidia acicular-filiform; on *Ptisana salicina*, New Zealand ..... **P. ptisanae**  
 Superficial mycelium with solitary conidiophores lacking; stromata well-developed; conidia obclavate-cylindrical ..... 2

- 2 (1) Conidia 3–5 µm wide, hila (1.5–)2(–2.5) µm wide; on *Angiopteris* spp., Asia ..... **P. angiopteridis**  
 Conidia narrower, 2–3.5 µm, hila 1–1.5 µm wide; on *Angiopteris* sp., North America ..... **P. phyllitidis**

**Osmundaceae**

- On *Osmunda regalis*, North America ..... **P. phyllitidis**

**Plagiogyriaceae**

- On *Plagiogyria euphlebia*, Taiwan ..... **P. plagiogyriae**

**Polypodiaceae**

- 1 Conidia distinctly obclavate, base distinctly obconically truncate, 20–80 × 2–3.5 µm, 3–5-septate;  
 on *Campyloneurum phyllitidis* and *Polypodium polypodioides*, North America ..... **P. phyllitidis**  
 Conidia acicular to somewhat obclavate-cylindrical, base usually truncate or only slightly  
 obconically truncate, longer, 50–110 µm, with 2–12 septa; on *Microsorium pustulatum*, Australia ..... **P. microsori**

**Pteridaceae subfam. Pteridoideae**

- 1 Mycelium internal; superficial hyphae with solitary conidiophores lacking; conidiophores only in fascicles ..... 2  
 Mycelium internal and external; superficial hyphae with solitary conidiophores present ..... 3
- 2 (1) Conidiophores up to 150 × 7 µm; conidia up to 200 µm long and 5–7.5 µm wide; on *Pityrogramma*, Ecuador  
 ..... (?) *Cercospora trismeriae* (see “Doubtful, excluded and insufficiently known species”)  
 Conidiophores up to 100 × 3–5 µm; conidia 20–80 × 2–5 µm; on *Pteris* spp., North America ..... **P. phyllitidis**
- 3 Conidiophores 10–70 µm long, pale olivaceous, olivaceous-brown to medium brown, thin-walled;  
 conidia 40–125 µm long; on *Pteris* spp., Asia ..... **P. pteridicola**  
 Conidiophores longer, 30–150 µm, medium dark brown, wall somewhat thickened; conidia longer, 40–250 µm;  
 on *Pteris* sp., Colombia ..... **P. pteridigena**

**Pteridaceae subfam. Vittarioideae (= Adiantaceae)**

- On *Adiantum* spp., Asia (India), South America (Venezuela) ..... **P. adianti**

**Tectariaceae**

- On *Tectaria zeylanica* (*Helminthostachys zeylanica*), Asia ..... **P. helminthostachydis**

**Thelypteridaceae**

- 1 Stroma lacking; superficial hyphae developed, giving rise to solitary conidiophores, fasciculate  
 conidiophores not formed; on *Abacopteris urophylla*, Singapore ..... **P. abacopteridicola**  
 Stroma developed; superficial hyphae and solitary conidiophores lacking; conidiophores fasciculate ..... 2
- 2 (1) Conidia acicular-filiform, base ± truncate ..... 3  
 Conidia obclavate, base distinctly obconically truncate ..... 4
- 3 (2) Conidia narrow, 30–70 × 1–1.5 µm, hyaline; on *Cyclosorus acuminatus*, Taiwan ..... **P. pteridophytophila**  
 Conidia longer and wider, 50–120 × 2.5–3 µm, subhyaline to pale olivaceous;  
 on *Metathelypteris laxa* (*Thelypteris laxa*), Taiwan ..... **P. thelypteridis**
- 4 (2) Caespituli epiphyllous; conidiophores very short, 9–15 µm, 0–1-septate; conidia long, 50–105 µm;  
 on leaves of *Christella parasitica*, Thailand ..... **P. christellae**  
 Caespituli hypophyllous; conidiophores longer, 10–75 µm, aseptate or with several septa;  
 conidia shorter, 20–80 µm; on *Thelypteris tetragona*, North America ..... **P. phyllitidis**

**List of Pseudocercospora species on ferns**

*Literature:* Crous & Braun (2003: 37).

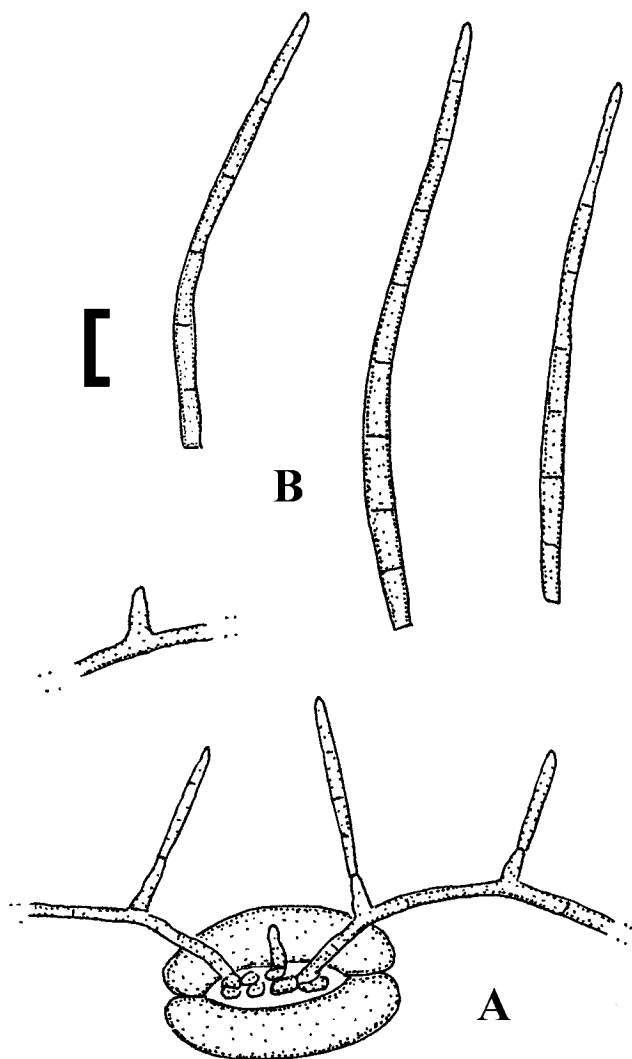
**Pseudocercospora abacopteridicola** (J.M. Yen & Lim) J.M. Yen, in Yen & Lim, *Gard. Bull., Singapore* **33**: 168 (1980).

(Fig. 27)

*Basionym:* *Cercospora abacopteridicola* J.M. Yen & Lim, *Cah. Pacifique* **17**: 97 (1973).

*Illustration:* Yen & Lim (1980: 204, fig. 7 A–B).

*Description:* *Leaf spots* amphigenous, vein-limited, brown, later confluent. *Caespituli* hypophyllous, vein-limited, brown, later confluent. *Mycelium* internal and external, superficial hyphae branched, septate, pale olivaceous-brown, 1.5–2.5 µm wide, thin-walled, smooth. *Stromata* lacking.



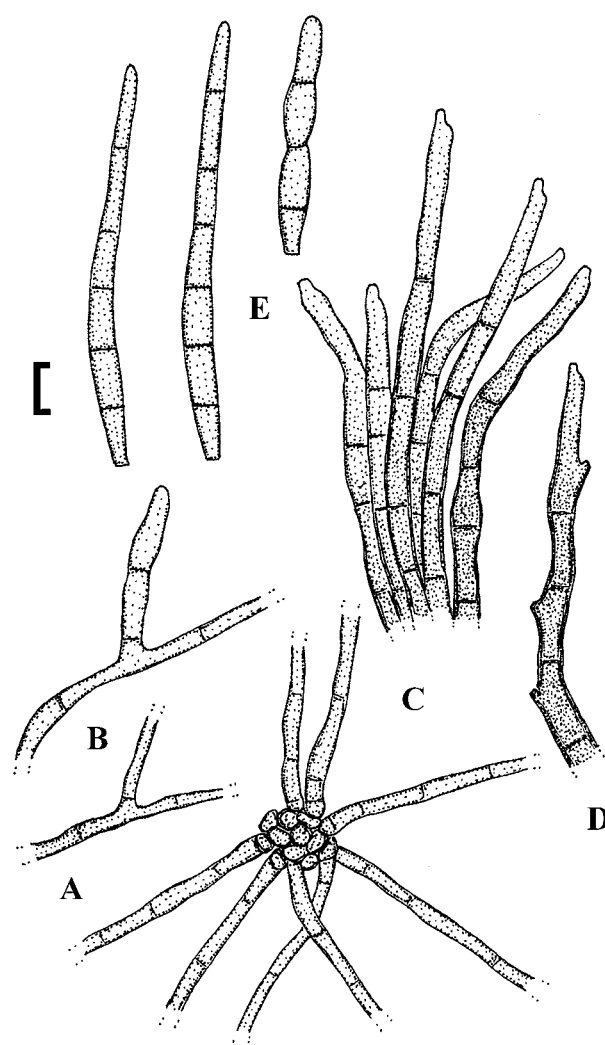
**Fig. 27.** *Pseudocercospora abacopteridicola* (PC, holotype). **A.** Solitary conidiophores arising from superficial hyphae emerging through a stoma. **B.** Conidia. Bar = 10 µm.

*Conidiophores* solitary, arising from superficial hyphae, lateral, occasionally terminal, erect, straight, subcylindrical or slightly attenuated towards the tip, unbranched, short, about  $5\text{--}15 \times 2.5\text{--}3$  µm, 0–1-septate, concolorous with the hyphae, thin-walled, smooth; conidiophores reduced to conidiogenous cells, conidiogenous loci inconspicuous, neither thickened nor darkened. *Conidia* solitary, narrowly cylindrical to obclavate-cylindrical,  $30\text{--}80 \times 2\text{--}3$  µm, 1–7(–9)-septate, pale olivaceous-brown, thin-walled, smooth, tips obtuse or subobtuse, base truncate, hilum neither thickened nor darkened.

**Holotype:** Singapore: on *Abacopteris urophylla*, *Thelypteridaceae*, 3 Mar. 1972, G. Lim (PC).

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

***Pseudocercospora adianti*** (Syd.) Deighton, *Mycol. Pap.* **140**: 135 (1976). (Fig. 28)



**Fig. 28.** *Pseudocercospora adianti* (HBG, lectotype). **A.** Superficial hyphae. **B.** Solitary conidiophore arising from a superficial hypha. **C.** Conidiophore fascicle. **D.** Conidiogenous cells. **E.** Conidia. Bar = 10 µm.

**Basionym:** *Cercospora adianti* Syd., *Ann. Mycol.* **28**: 206 (1930).

**Literature:** Chupp (1954: 453), Das (1989), Crous & Braun (2003: 44), Kamal (2010: 145).

**Exsiccatae:** Syd., *Fungi Exot. Exs.* 884.

**Description:** *Leaf spots* lacking or indistinct, diffuse brown discolorations on the upper side. *Colonies* hypophyllous, effuse, often covering the whole lower surface, dark olivaceous to blackish. Mycelium internal and external, superficial hyphae branched, septate, 1–3.5 µm wide, subhyaline to pale olivaceous-brown, thin-walled, smooth. *Stromata* lacking or only formed as small aggregations of swollen hyphal cells, about 10–20 µm diam, substomatal to intraepidermal. *Conidiophores* in small to moderately large fascicles, 2–20, loose to rather dense, erect to decumbent, arising from internal hyphae or small stromata, through stomata or erumpent, or conidiophores solitary, arising from superficial hyphae, lateral, straight, subcylindrical to usually distinctly to strongly geniculate-

sinuous, sometimes tortuous, usually unbranched, 20–150 × 4–7 µm, continuous to pluriseptate, mostly 2–8-septate, pale to medium brown, wall thin to slightly thickened, smooth; conidiogenous cells integrated, terminal to intercalary, 10–35 µm long, conidiogenous loci inconspicuous to distinctly denticle-like, but wall always unthickened and not darkened. *Conidia* solitary, obclavate to cylindrical-obclavate, occasionally broadly subacicular, straight to curved, occasionally sinuous-sigmoid, 40–120 × 4–5.5 µm, 5–15-septate, subhyaline to pale olivaceous, thin-walled, smooth, apex obtuse to subacute, base short obconically truncate, about 2–2.5 µm wide, hila neither thickened nor darkened.

**Lectotype (designated here, MycoBank, MBT176147):** **Venezuela:** El Limon, near Puerto La Cruz, on *Adiantum tetraphyllum*, 15 Jan. 1928, H. Sydow, Syd., Fungi Exot. Exs. 884 (HBG). Isolectotypes: Syd., Fungi Exot. Exs. 884 (e.g. B, BPI 432406, CUP, MICH 15252, S, UPS, etc.).

**Host range and distribution:** On *Adiantum* (*latifolium*, *lunulatum*, *tetraphyllum*, *Adiantum* sp.), *Pteridaceae* subfam. *Vittarioideae* (= *Adiantaceae*), Asia (India, Maharashtra, West Bengal), South America (Venezuela).

***Pseudocercospora angiopteridis* Goh & W.H. Hsieh, *Trans. Mycol. Soc. Republ. China* 4(2): 27 (1989).**  
(Fig. 29)

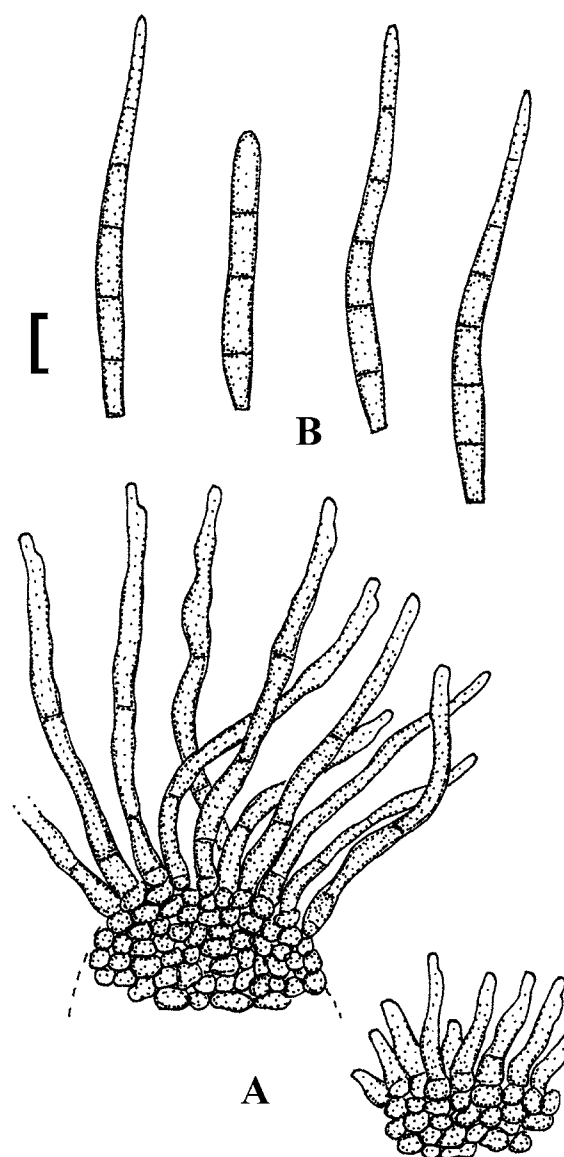
**Synonym:** *Cercospora angiopteridis* Boedijn, *Nova Hedwigia* 3: 424 (1961) [types: on *Angiopteris evecta*, Indonesia, Java, Bogor, Hortus Bogoriensis, 27 July 1953, Boedijn (L 53845 – holotype; K(M) IMI 91584 – isotype)].

**Literature:** Hsieh & Goh (1990: 222), Guo & Hsieh (1995: 15), Guo *et al.* (1998: 26–27), Braun (2001: 420), Crous & Braun (2003: 57).

**Illustration:** Boedijn (1961: Tab. 109), Hsieh & Goh (1990: 223, fig. 172), Guo & Hsieh (1995: 16, fig. 15), Guo *et al.* (1998: 27, fig. 15).

**Description:** *Leaf spots* amphigenous, subcircular to angular-irregular, often confluent, forming larger patches, up to 10 mm diam, brown, margin indefinite. *Caespituli* epiphyllous, punctiform, dark brown to blackish. *Mycelium* internal. *Stromata* immersed, well-developed, 20–70 µm diam, dark brown. *Conidiophores* in larger fascicles, loose to dense, erect, straight, subcylindrical to sinuous or somewhat geniculate, unbranched, 10–140 × 2–6 µm, continuous to pluriseptate, brown throughout or paler towards the tip, thin-walled, smooth; conidiogenous cells integrated, terminal, about 10–30 µm long, conidiogenous loci inconspicuous, neither thickened nor darkened. *Conidia* solitary, obclavate-cylindrical, straight to somewhat curved, 30–60 × 3–5 µm, 3–6-septate, subhyaline to pale olivaceous or olivaceous-brown, thin-walled, smooth, apex obtuse to subacute, base obconically truncate, (1.5–)2(–2.5) µm wide, hila neither thickened nor darkened.

**Types:** **Taiwan:** Hwalien Hsieh, Taluke, on *Angiopteris lygodifolia*, 1 Feb. 1985, T. K. Goh (NCHUPP-148a – holotype; K(M) IMI 312070 – isotype).



**Fig. 29.** *Pseudocercospora angiopteridis* (L 53845). **A.** Conidiophore fascicles. **B.** Conidia. Bar = 10 µm.

**Host range and distribution:** On *Angiopteris* (*evecta*, *lygodifolia*), *Marattiaceae*, Asia (Indonesia, Taiwan).

**Notes:** Braun (2001) re-examined type material of *Cercospora angiopteridis* and reduced this species to synonym with *Pseudocercospora angiopteridis*.

***Pseudocercospora arachnidis* Y.L. Guo, *Mycosystema* 6: 103 (1993).**  
(Fig. 30)

**Literature:** Guo & Hsieh (1995: 89), Guo *et al.* (1998: 103–104).

**Illustrations:** Guo (1993: 104, fig. 1), Guo & Hsieh (1995: 88, fig. 80), Guo *et al.* (1998: 104, fig. 84).

**Description:** *Leaf spots* amphigenous, at first elliptical to angular, 0.5–1 mm diam, later oblong, 1–4 × 0.5–1 mm, often



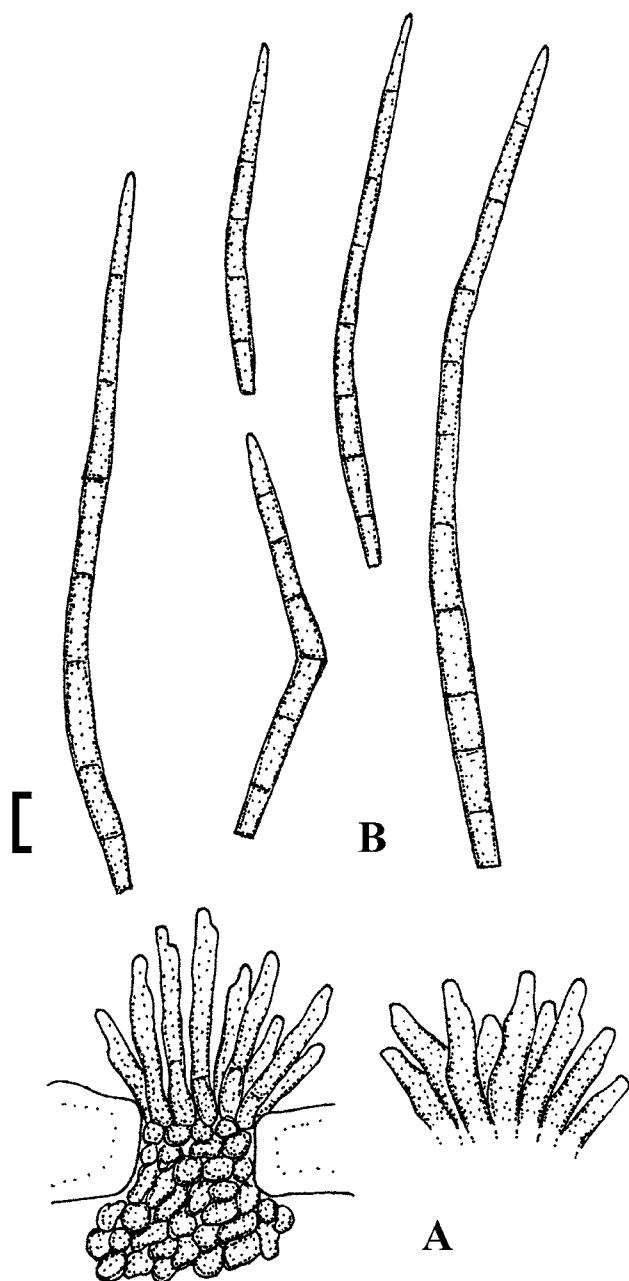


Fig. 30. *Pseudocercospora arachnidis* (HMAS 62750). A. Conidiophore fascicles. B. Conidia. Bar = 10 µm.

confluent, reddish brown, with dark brown halo on the upper side, paler brown below. *Caespituli* hypophyllous. *Mycelium* internal. *Stromata* substomatal, small, composed of a few swollen, olivaceous-brown cells or globose, 10–30 µm diam. *Conidiophores* in small to moderately large fascicles, usually dense, arising from stromata, emerging through stomata, straight to curved, subcylindrical, rarely geniculate, unbranched, 6.5–30 × 2.5–4 µm, 0(–1)-septate, uniformly pale olivaceous to olivaceous, thin-walled, smooth, apex conic to conically truncate; conidiophores usually reduced to conidiogenous cells, conidiogenous loci inconspicuous, unthickened and not darkened, sometimes visible as truncate tip. *Conidia* solitary, acicular, shorter conidia obclavate, 30–110 × 1.5–3 µm, 3–11-septate, pale olivaceous, thin-walled, smooth, apex obtuse to subacute, base truncate to short obconically truncate, about 1–2 µm wide, hila unthickened, not darkened.

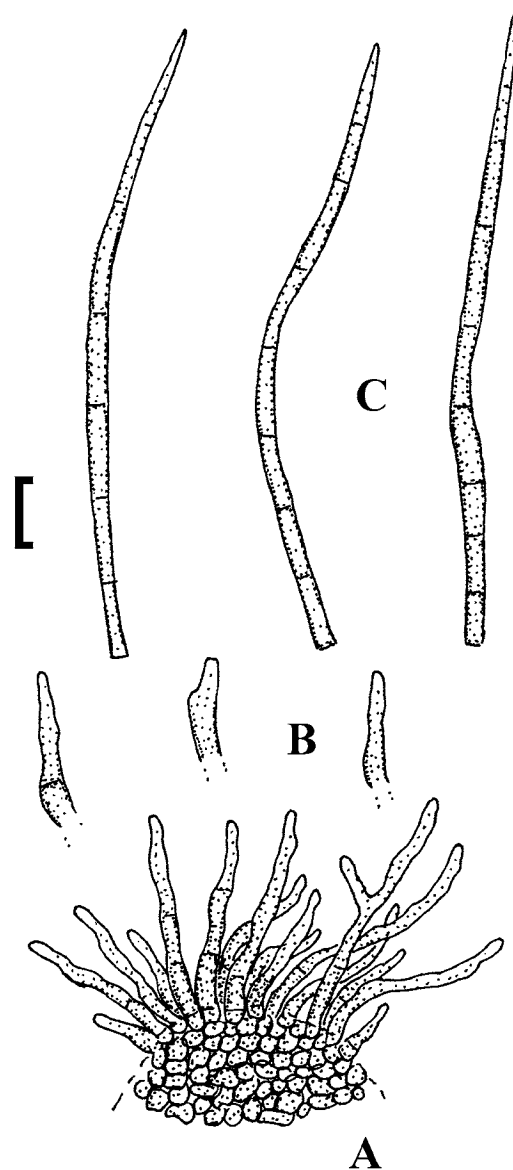


Fig. 31. *Pseudocercospora athyrii* (NCHUPP-228). A. Conidiophore fascicle. B. Conidiogenous cells. C. Conidia. Bar = 10 µm.

*Holotype*: China: Shaanxi Province: Xian, on leaves of *Arachnidodes* sp., *Dryopteridaceae*, 17 Jul. 1973, J. Y. Li & T. Y. Zhang 5046 (HMAS 62750).

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

***Pseudocercospora athyrii*** Goh & W.H. Hsieh, *Trans. Mycol. Soc. Republ. China* 4(2): 27 (1989). (Fig. 31)

*Literature*: Hsieh & Goh (1990: 38), Guo & Hsieh (1995: 32), Guo et al. (1998: 45).

*Illustrations*: Hsieh & Goh (1990: 38, fig. 23), Guo & Hsieh (1995: 34, fig. 32), Guo et al. (1998: 45, fig. 32).

*Description*: Leaf spots amphigenous, angular-irregular, up to 3 mm diam, brown, margin indefinite. *Caespituli*

epiphyllous, punctiform, dark brown to blackish. *Mycelium* internal. Stromata epiphyllous, immersed to somewhat erumpent, subcircular to irregularly shaped, 20–50 µm diam, dark brown. *Conidiophores* numerous, in dense fascicles arising from stromata, erect, subcylindrical-filiform, geniculate-sinuuous, usually simple, rarely branched, 10–70 × 2–3 µm, 0–2-septate, subhyaline to pale olivaceous, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 10–25 µm long, conidiogenous loci inconspicuous, neither thickened nor darkened. *Conidia* solitary, acicular, almost straight to usually curved-sinuuous, 60–80 × 2–3 µm, indistinctly pluriseptate, subhyaline, thin-walled, smooth, apex acute, base truncate, 2–2.5 µm wide, hila neither thickened nor darkened.

**Holotype:** Taiwan: Taipei, Yangmingshan, on *Deparia japonica* (*Athyrium japonicum*), *Athyriaceae*, 30 Aug. 1986, T. K. Goh (NCHUPP-228).

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

***Pseudocercospora christellae*** Phengsintham, McKenzie, K.D. Hyde & U. Braun, *Mycosphere* 1: 207 (2010). (Fig. 32)

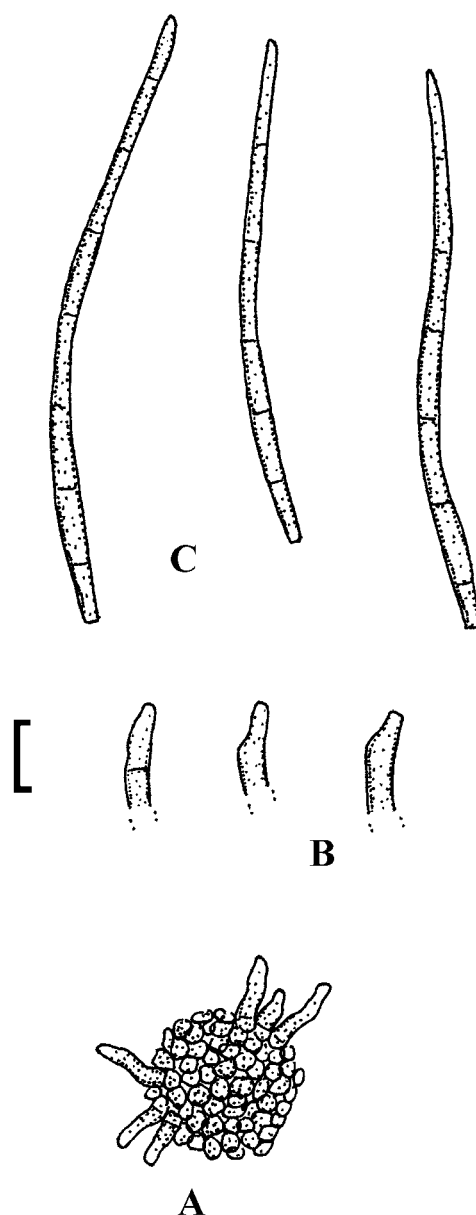
**Illustrations:** Phengsintham *et al.* (2010a: 208–209, figs 6–7; 2013a: 61–62, figs 60–61).

**Literature:** Phengsintham *et al.* (2013a: 60–61).

**Description:** Leaf spots subcircular to irregular, 3–9 mm diam, at first brownish, later becoming brown to dark yellowish brown at the margin. *Caespituli* epiphyllous, conspicuous. *Mycelium* internal; hyphae branched, 2–3 µm wide, septate, constricted at the septa, distance between septa 6–8 µm, subhyaline to brownish, wall 0.3–0.5 µm wide, smooth, forming plate-like plectenchymatous stromatic hyphal aggregations. *Stromata* oval to ellipsoidal, 20–40 µm diam, brown to dark brown, stroma cells oval, ellipsoidal and angular, 3–10 µm wide, dark brown, wall 0.5–0.8 µm wide, smooth. *Conidiophores* fasciculate, arising from stromata (3–16 per fascicle), geniculate, unbranched, 9–15 × 2–4 µm, 0–1-septate, slightly constricted at the septa, distance between septa 3–12 µm, uniformly pale to medium brown, paler and narrower towards the tip, wall 0.3–0.5 µm wide, smooth. *Conidiogenous cells* terminal, 8–12 × 2–4 µm, obtuse; conidiogenous loci inconspicuous, unthickened, not darkened. *Conidia* solitary, obclavate, straight to slightly curved, 50–105 × 2–4 µm, 3–9-septate, pale olivaceous-brown, wall 0.3–0.5 µm wide, smooth, tip subacute, base obconically truncate, hila 1–2 µm wide.

**In vitro:** Colonies on PDA after 3 wk at 25 C dark grey, reaching 10–15 mm diam, hyphae 2–7 µm wide, septate, constricted at the septa, distance between septa 9–19 µm, brownish or subhyaline, wall 0.3–0.8 µm wide, smooth. Colonies sterile.

**Holotype:** Thailand: Chiang Rai Province: Muang District, Mae Chan Village, on leaves of *Christella parasitica*,



**Fig. 32.** *Pseudocercospora christellae* (MFLU10-0405). **A.** Conidiophore fascicle. **B.** Conidiophore tips. **C.** Conidia. Bar = 10 µm.

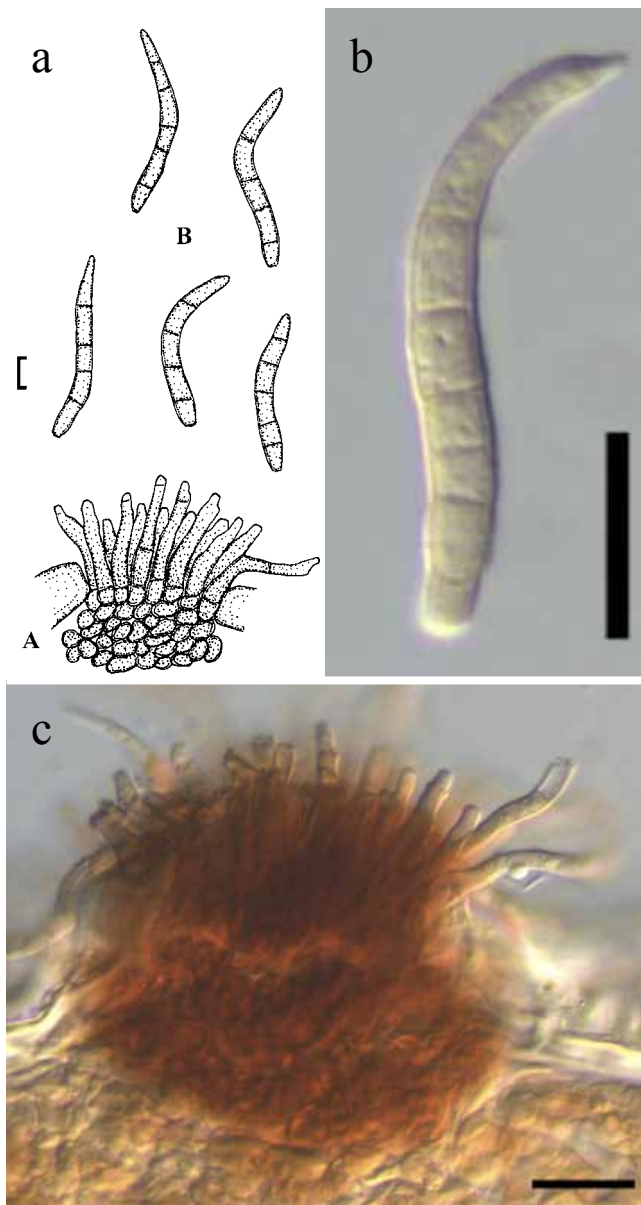
*Thelypteridaceae*, 18 July 2010, P. Phengsintham (MFLU10-0405).

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

***Pseudocercospora cyatheae*** C. Nakash. & S. Inaba, *Mycoscience* 47: 48 (2006). (Fig. 33)

**Illustration:** Nakashima *et al.* (2006: 49, fig. 1).

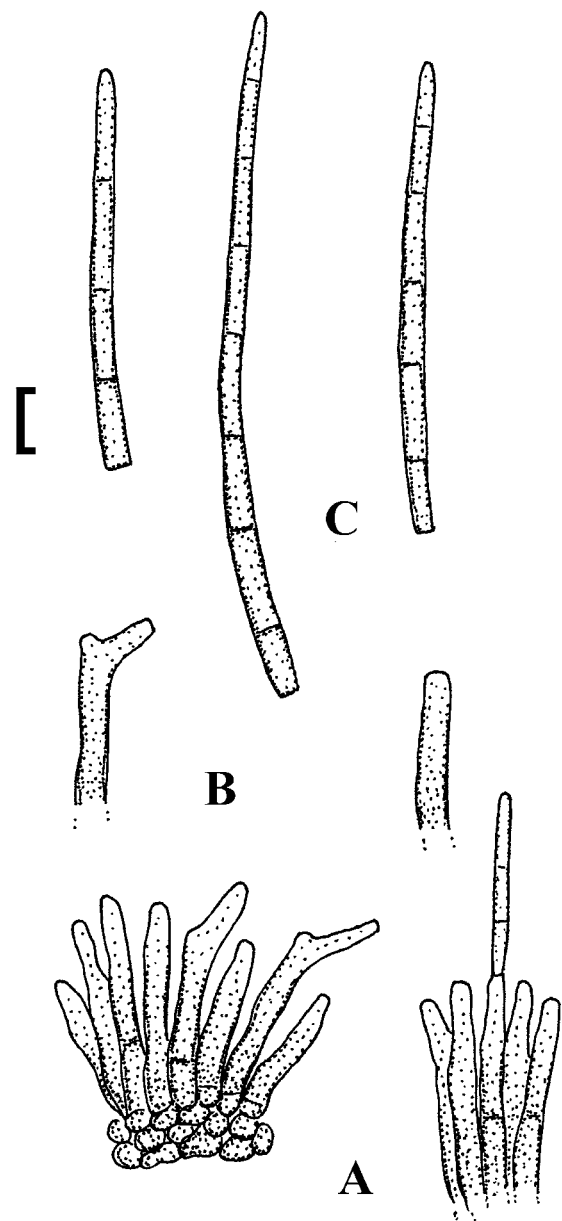
**Description:** Leaf spots distinct, irregularly shaped, brown to dark brown, 2–5 mm diam, margin indistinct or distinct. *Caespituli* epiphyllous, punctiform, dark. *Mycelium* internal. *Stromata* well-developed, immersed, globose, 60–110



**Fig. 33.** *Pseudocercospora cyatheae* (NBRC-H-12398). **a.** drawing (A. Conidiophore fascicle, B. Conidia, U. Braun del.). **b.** Conidium (light microscopy). **c.** Conidiophore fascicle (light microscopy). Bar = 10  $\mu$ m.

$\mu$ m diam, pale brown to brown. *Conidiophores* in large, dense fascicles, arising from stromata, erumpent, erect, straight to somewhat sinuous, subcylindrical or attenuated towards the tip, unbranched, 25–50  $\times$  3–5  $\mu$ m, 0–3-septate, pale brown to brown, paler towards the tip, thin-walled, smooth; conidiophores reduced to conidiogenous cells or conidiogenous cells integrated, terminal, proliferation sympodial or sometimes percurrent, conidiogenous loci inconspicuous, unthickened, not darkened or rim-like. *Conidia* solitary, cylindrical to obclavate, mildly curved to sigmoid, 30–50  $\times$  3.5–5.5  $\mu$ m, 3–8-septate, pale brown, thin-walled, smooth, apex attenuated, obtuse to subacute, base rounded to obconically truncate, hila unthickened, not darkened.

**Holotype:** Japan: Okinawa Pref.: Ishigaki, Tomigusuku, on leaves of *Cyathea* sp., *Cyatheaceae*, 28 Mar. 2003, S. Inaba



**Fig. 34.** *Pseudocercospora cyatheicola* (CBS H-20580). **A.** Conidiophore fascicles. **B.** Conidiophore tip. **C.** Conidia. Bar = 10  $\mu$ m.

(NBRC H-12398, culture ex-type: NBRC 101080).

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

***Pseudocercospora cyatheicola*** Crous & R.G. Shivas, *Persoonia* 26: 121 (2011); as “*cyathicola*”. (Fig. 34)

**Illustration:** Crous et al. (2011: 120).

**Description:** On dead fronds, associated with a mycosphaerella-like teleomorph. *Mycelium* internal; hyphae septate, branched, 2.5–3  $\mu$ m wide, pale brown, smooth, thin-walled. *Stromata* amphigenous on fronds, well-developed, erumpent, up to 60  $\mu$ m diam and 40  $\mu$ m high, brown. *Conidiophores* arising from stromata, in loose to

rather dense well-developed fascicles, erect, subcylindrical, straight to geniculate-sinuous, unbranched,  $30\text{--}70 \times 2\text{--}3 \mu\text{m}$ , 1–3-septate, pale to medium brown, smooth, thin-walled; conidiogenous cells integrated, terminal, pale brown, proliferation sympodial and percurrent, conidiogenous loci visible as truncate ends, unthickened and not darkened,  $1.5\text{--}2 \mu\text{m}$  wide. *Conidia* solitary, subcylindrical to subacicular, somewhat irregular in width, straight to irregularly curved,  $(35\text{--})60\text{--}80\text{--}(90) \times (2\text{--})3\text{--}(3.5) \mu\text{m}$ , 3–9-septate, pale brown, smooth, thin-walled, guttulate, apex obtuse to subacute, base truncate to somewhat obconically truncate, hila about  $2 \mu\text{m}$  wide, unthickened, not darkened.

*In vitro* (in the dark,  $25^\circ\text{C}$  after 1 mo): Colonies spreading, somewhat erumpent, with moderate aerial mycelium and smooth, lobate margins, reaching 35–45 mm diam. On malt extract agar surface olivaceous-grey, with patches of smoke-grey, reverse iron-grey; on potato-dextrose agar surface pale olivaceous-grey, margin olivaceous-grey, reverse iron-grey; on oatmeal agar surface pale olivaceous-grey, margin olivaceous-grey.

**Holotype:** **Australia:** *Queensland:* Brisbane, Botanical Garden, on fronds of *Cyathea australis*, *Cyatheaceae*, 14 Jul. 2009, P. W. Crous & R. G. Shivas (CBS H-20580, culture ex-type: CBS 129520).

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

***Pseudocercospora davalliae*** (A.K. Kar & M. Mandal) U. Braun & Crous, in Crous & Braun, *Mycosphaerella and Anam.* 1: 154 (2003).

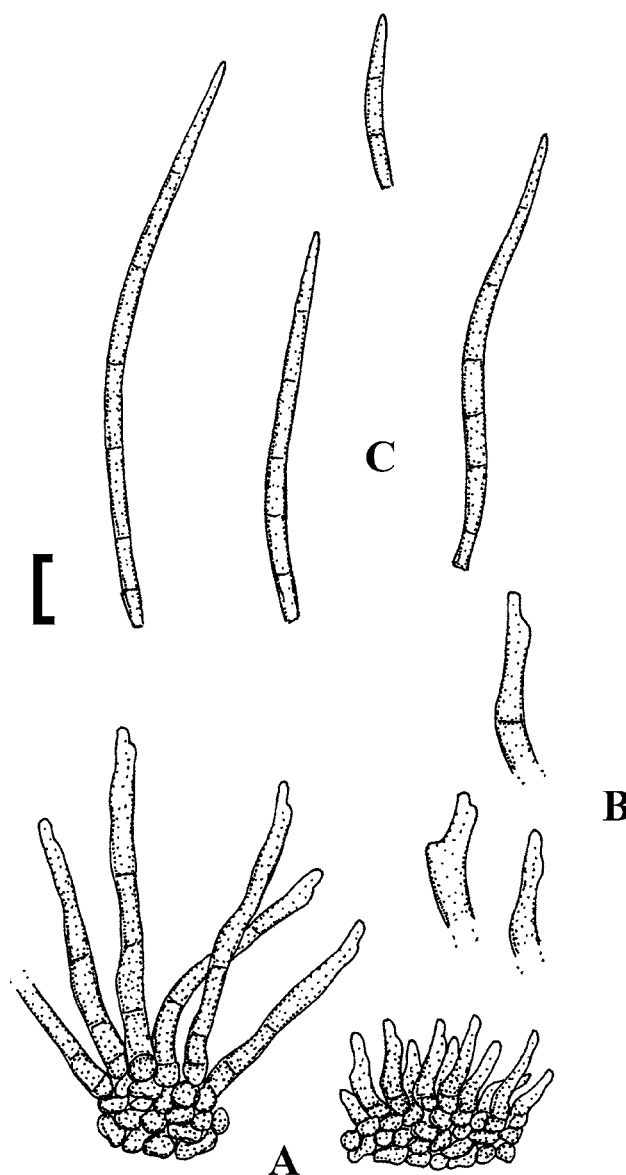
(Fig. 35)

**Basionym:** *Cercospora davalliae* A.K. Kar & M. Mandal, *Trans. Brit. Mycol. Soc.* 53: 355 (1969).

**Literature:** Crous & Braun (2003: 154), Kamal (2010: 170).

**Illustration:** Kar & Mandal (1969: 355, fig. 17).

**Description:** *Leaf spots* amphigenous, irregular in shape, 1–5 mm diam, dingy brown to darker brown, margin indefinite. *Mycelium* internal. *Stromata* substomatal, 15–50  $\mu\text{m}$  diam, dark olivaceous, composed of swollen hyphal cells, about 2–5  $\mu\text{m}$  diam. *Conidiophores* fasciculate, in small to moderately large, loose to dense fascicles, arising from stromata, emerging through stomata, erect, straight, subcylindrical to attenuated towards the tip, mostly geniculate-sinuous, unbranched, about  $5\text{--}65 \times 2.5\text{--}5.5 \mu\text{m}$ , 0–6-septate, uniformly very pale olivaceous-brown, thin-walled, smooth; conidiophores reduced to conidiogenous cells or conidiogenous cells integrated, terminal, occasionally intercalary, about 5–25  $\mu\text{m}$  long, conidiogenous loci inconspicuous or visible by being truncate or rarely subdentate. *Conidia* solitary, narrowly obclavate-subcylindrical or linear,  $20.5\text{--}105.5 \times 2\text{--}3.5 \mu\text{m}$ , 2–11-septate, pale olivaceous, thin-walled, smooth, apex obtuse to subacute, base short obconically truncate, about 1–1.5  $\mu\text{m}$  wide, hila unthickened, not darkened.



**Fig. 35.** *Pseudocercospora davalliae* (K(M) IMI 135178). **A.** Conidiophore fascicles. **B.** Conidiophore tips. **C.** Conidia. Bar = 10  $\mu\text{m}$ .

**Types:** **India:** *West Bengal:* Darjeeling, Kalimpong, 1372 m alt., on leaves of *Odontosoria chinensis* (*Davallia tenuifolia*), *Lindsaeaceae*, 8 May 1967, A. K. Kar & M. Mandal (K(M) IMI 135178 – holotype; BPI 435482 – isotype).

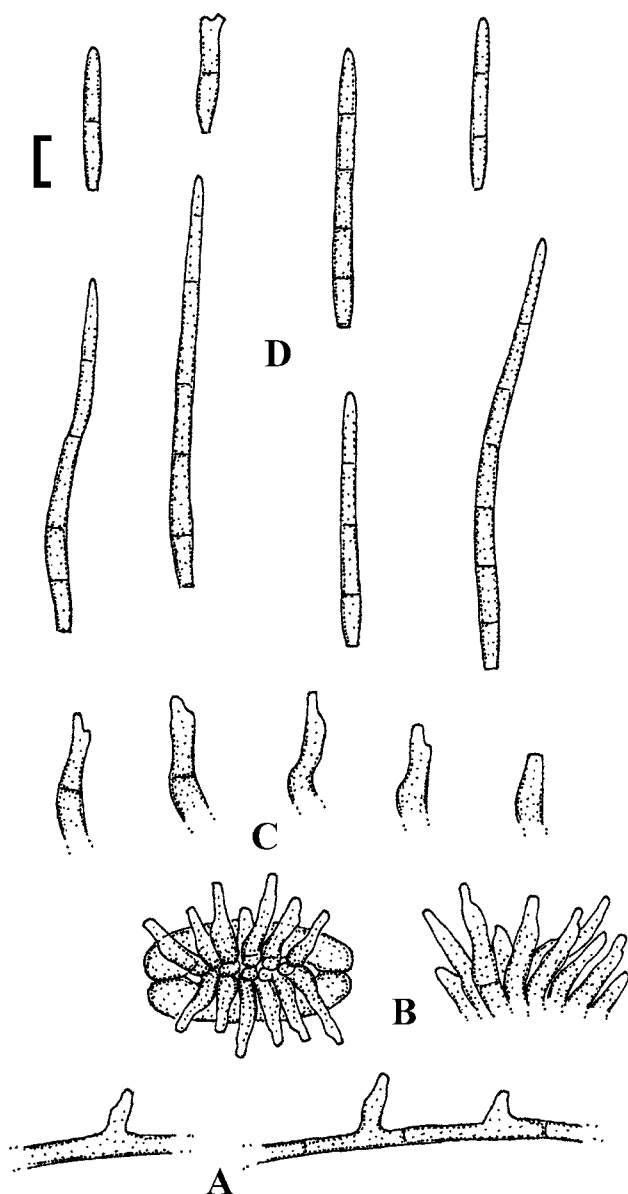
**Host range and distribution:** Only known from the type collection.

**Notes:** Braun & Freire (2004: 229–230) recorded this species on *Davallia fejeensis* from Brazil, which represents, however, a distinct species described below as *Pseudocercospora davalliicola*.

***Pseudocercospora davalliicola*** U. Braun, **sp. nov.**  
Mycobank MB805524  
(Fig. 36)

**Etymology:** Derived from its host genus (inhabitant of *Davallia*).





**Fig. 36.** *Pseudocercospora davalliicola* (HAL 2589 F). **A.** Solitary conidiophores arising from superficial hyphae. **B.** Conidiophore tips. **C.** Conidiophores. **D.** Conidia. Bar = 10 µm.

*Exsiccatae*: U. Braun, Fungi Sel. Exs. 14.

**Diagnosis:** *Pseudocercosporae davalliae* similis, sed hyphis superficialibus cum conidiophoris solitariis formantibus, conidiophoris saepe 0–1-septatis et conidiis brevioribus, 12–70 µm, solitariis vel brevicatenatis.

**Description:** *Leaf spots* absent or irregular in shape and size, formed as brown discolorations, margin indefinite, later large leaf segments or entire leaves becoming necrotic. *Caespituli* amphigenous, mostly hypophyllous, punctiform, scattered, dark greyish brown. *Mycelium* internal and external; superficial hyphae emerging through stomata, sparingly branched, septate, 1.5–3 µm wide, subhyaline to pale olivaceous, thin-walled, smooth. *Stromata* substomatal, 10–50 µm diam, olivaceous-brown, composed of swollen hyphal cells, about 2–5 µm diam. *Conidiophores* in small to

moderately large fascicles, loose to mostly dense, arising from stomata, through stomata, erect, straight, subcylindrical to distinctly geniculate-sinuous, unbranched, 5–40 × 2–4.5 µm, 0–1(–2)-septate, subhyaline to pale olivaceous or olivaceous-brown, thin-walled, smooth; conidiophores reduced to conidiogenous cells or conidiogenous cells integrated, terminal, 5–25 µm long, conidiogenous loci inconspicuous. *Conidia* solitary or in short chains, occasionally even in branched chains, short conidia subcylindrical-fusoid, longer conidia narrowly obclavate-cylindrical, 12–70 × 2–4 µm, 1–7-septate, subhyaline to pale olivaceous, thin-walled, smooth, apex obtuse to pointed, base obconically truncate, 1–1.5 µm wide, hila unthickened, not darkened.

**Types:** **Brazil:** Ceará: Ubajara city, on leaves of *Davallia fejeensis*, *Davalliaceae*, 10 Oct. 2002, F. Freire (HAL 2589 F – holotype; U. Braun, Fungi Sel. Exs. 14 (as “*Pseudocercospora davalliae*”), BPI, GZU, HMAS, K(M) IMI, KR, KUS, LE, PDD, VPIR – isotypes).

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

**Notes:** Braun & Freire (2004) recorded this collection as *Pseudocercospora davalliae*. *Davallia fejeensis* and the type host of the latter species, *Odontosoria chinensis* [*Davallia tenuifolia*] are, however, not allied and belong in different families. Furthermore, there are various morphological differences between collections on the two hosts. The conidia in *P. davalliae* are consistently formed singly and much longer, up to about 100 µm, and pluriseptate. The conidiophores are also longer and up to 6-septate, and superficial hyphae with solitary conidiophores are lacking.

***Pseudocercospora gleicheniae* (J.M. Yen) U. Braun, comb. nov.**

MycoBank MB805525

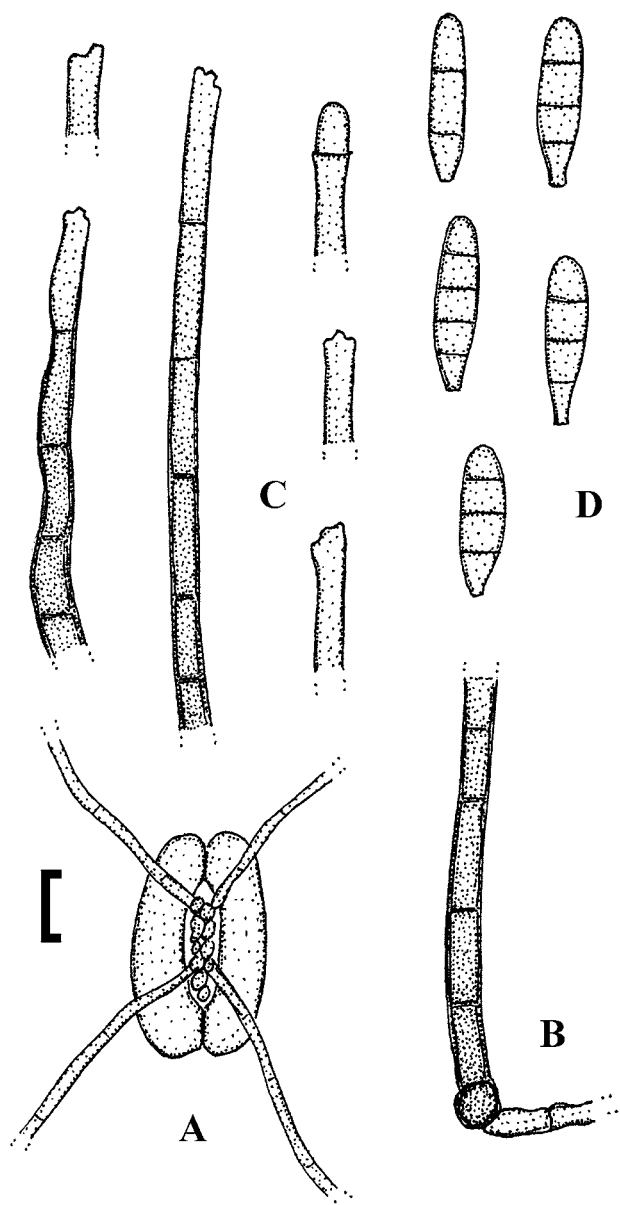
(Fig. 37)

*Basionym:* *Cercospora gleicheniae* J.M. Yen, *Bull. Trimestriel Soc. Mycol. France* **90**: 41 (1974).

*Literature:* Crous & Braun (2003: 198).

*Illustration:* Yen (1974: 42, fig. 1).

**Description:** *Lesions* lacking. *Caespituli* hypophyllous. *Mycelium* internal and external; hyphae emerging through stomata, superficial, branched, septate, pale olivaceous-brown, 1.5–2 µm wide, thin-walled, smooth. *Stromata* lacking or small, substomatal, somewhat pigmented. *Conidiophores* solitary, arising from superficial hyphae, lateral or occasionally terminal, erect, very long and filiform, straight to somewhat sinuous, unbranched or branched, about 100–300 µm long and 3.5–5 µm wide, pluriseptate throughout (about 10–30 septa), dark brown, wall thickened, smooth; conidiogenous cells integrated, terminal or intercalary, 10–30 µm long, conidiogenous loci subconspicuous to conspicuous by being ± denticle-like, but wall neither thickened nor darkened, about 1–2 µm broad. *Conidia* solitary, subcylindrical, ellipsoid, short subclavate-obovoid, 12–25 × 4.5–6 µm, (2–)3–4(–5)-septate,



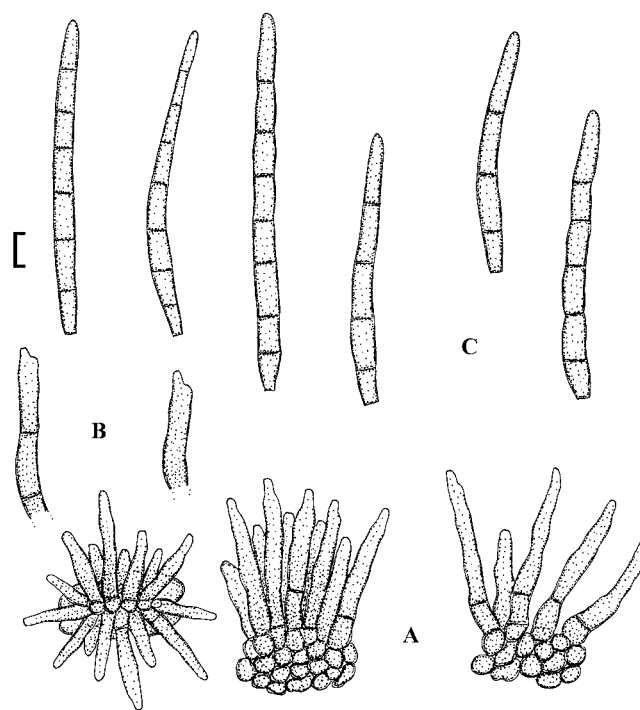
**Fig. 37.** *Pseudocercospora gleicheniae* (PC, holotype). **A.** Hyphae emerging through a stoma. **B.** Conidiophore base. **C.** Conidiophore tips. **D.** Conidia. Bar = 10 µm.

subhyaline, pale olivaceous to olivaceous-brown, thin-walled, smooth or almost so, apex rounded, base short obconically truncate to somewhat peg-like, hila neither thickened nor darkened.

**Holotype:** **Gabon:** Libreville, 16.3 km sur route de Kongo, on *Dicranopteris linearis*, *Gleicheniaceae*, 23 Feb. 1969, G. Gilles 139 (PC).

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

**Notes:** This is a very unusual species. The generic affinity is not quite clear. Crous & Braun (2003) excluded this species. Denticulate conidiogenous cells and phragmosporous conidia resemble species of the *Dactylaria* complex. However, the very long thick-walled conidiophores are not



**Fig. 38.** *Pseudocercospora helminthostachydis* (B, holotype). **A.** Conidiophore fascicles. **B.** Conidiophore tips. **C.** Conidia. Bar = 10 µm.

dactylarioid. The type of loci (neither thickened nor darkened, subdenticulate loci caused by geniculation due to sympodial proliferation to distinctly denticle-like) are within the range of *Pseudocercospora* loci. Phragmosporous conidia are unusual for the latter genus but may occur. Therefore, this species is tentatively assigned to *Pseudocercospora*.

***Pseudocercospora helminthostachydis*** (Henn.) Deighton, *Mycol. Pap.* **140**: 145 (1976). (Fig. 38)

**Basionym:** *Cercospora helminthostachydis* Henn., *Hedwigia* **47**: 265 (1908).

**Literature:** Saccardo (1913: 1424), Chupp (1954: 424), Bhurgava & Misra (1961), Thaug (1984), Crous & Braun (2003: 215), Kamal (2010: 182).

**Description:** *Leaf spots* amphigenous, small indistinct or irregular spots on the upper side, 2–5 mm diam, on the lower side dark, blackish by dense colonies. *Caespituli* hypophyllous, pustulate, dark brown to black. *Mycelium* internal. *Stromata* small to well-developed, substomatal to intraepidermal, 20–75 µm diam, brown, composed of swollen hyphal cells, 2–7 µm diam. *Conidiophores* in moderately large to large fascicles, arising from stromata, emerging through stomata or erumpent, dense, sometimes very dense, erect, unbranched, straight, subcylindrical to somewhat attenuated towards the tip, slightly geniculate-sinuose, 10–70 × 3–6 µm, 0–3-septate, pale to medium olivaceous-brown, thin-walled, smooth; conidiogenous cells integrated, terminal, 10–30 µm long, conidiogenous loci unthickened, not darkened. *Conidia* solitary, obclavate-cylindrical, straight to somewhat curved,

40–100 × 4–6 µm, 3–7-septate, olivaceous to olivaceous-brown, thin-walled, smooth, apex obtuse, rounded, base short obconically truncate, hila 1.5–2 µm wide, neither thickened nor darkened.

**Types:** **Philippines:** Mindanao, Davao, on *Tectaria zeylanica*, 15 Mar. 1904, E. B. Copeland 543 (B – holotype; BPI 437080 – isotype [date given as "15 Mar. 1906"]).

**Host range and distribution:** On *Tectaria zeylanica* (*Helminthostachys zeylanica*), *Tectariaceae*, Asia (India, Philippines, Myanmar).

***Pseudocercospora lonchitidis* (Chupp) U. Braun & Crous**, in Crous & Braun, *Mycosphaerella and Anam.* **1**: 255 (2003).

(Fig. 39)

**Basionym:** *Cercospora lonchitidis* Chupp, A monograph of the fungus genus *Cercospora*: 455 (1954).

**Literature:** Crous & Braun (2003: 255).

**Description:** *Leaf spots* amphigenous, irregularly shaped, 3–8 mm diam, dull red above, below often only with a narrow marginal line surrounding a greenish area. *Caespituli* amphigenous, punctiform on the upper side, effuse below, grey to dark brown. *Mycelium* internal and external, superficial hyphae only formed on the lower side, branched, septate, subhyaline to pale olivaceous, 1–4 µm diam, thin-walled, smooth. *Stromata* only epiphyllous, immersed, subglobose, 20–60 µm diam, brown to dark brown. *Conidiophores* on the upper side in larger fascicles, loose to mostly dense, arising from stromata, erumpent, on the lower side in small, loose fascicles and solitary, arising from superficial hyphae, lateral or occasionally terminal, conidiophores erect, straight, subcylindrical to geniculate-sinuous, unbranched or occasionally branched, 10–100 × 3–5 µm, continuous to pluriseptate throughout, subhyaline to pale olivaceous-brown throughout, thin-walled, smooth; conidiogenous cells integrated, terminal, about 10–30 µm long, conidiogenous loci inconspicuous to subdenticulate, but always unthickened and not darkened. *Conidia* solitary, acicular to obclavate, 30–160 × 3–5 µm, 3- to pluriseptate, subhyaline to pale olivaceous, thin-walled, smooth, apex obtuse to subacute, base truncate to slightly obconically truncate, about 2–3.5 µm wide, hila neither thickened nor darkened.

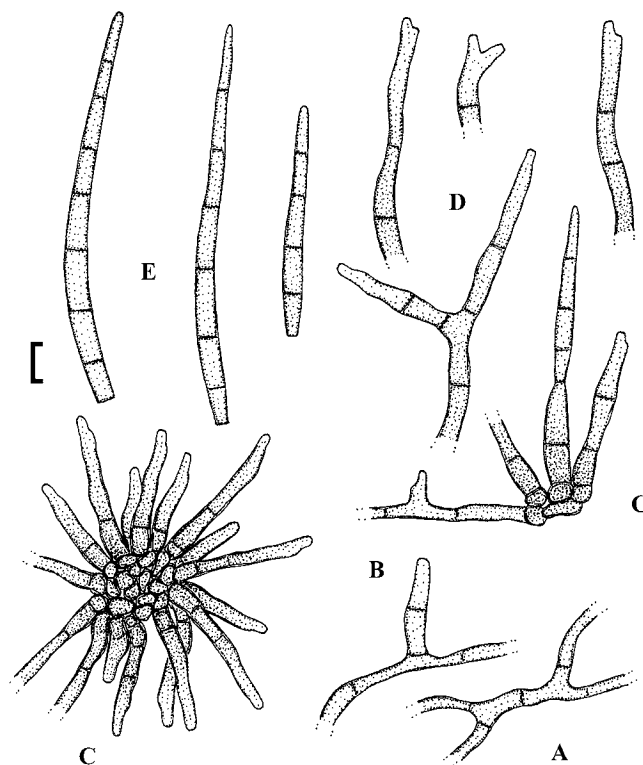
**Holotype:** **Venezuela:** Aragua, road Maracaya Choroni, on *Lonchitis hirsuta*, *Dennstadiaceae*, 9 Apr. 1939, H. H. Whetzel & A. S. Muller (CUP-VZ-3385).

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

***Pseudocercospora lygodii* Goh & W.H. Hsieh**, *Trans. Mycol. Soc. Republ. China* **2**(2): 131 (1987).

(Fig. 40)

**Synonym:** *Cercospora lygodii* Sawada, Rep. Taiwan Agric. Res. Inst. **87**: 83, 1944, *nom. inval.* (ICN, Art. 39.1).

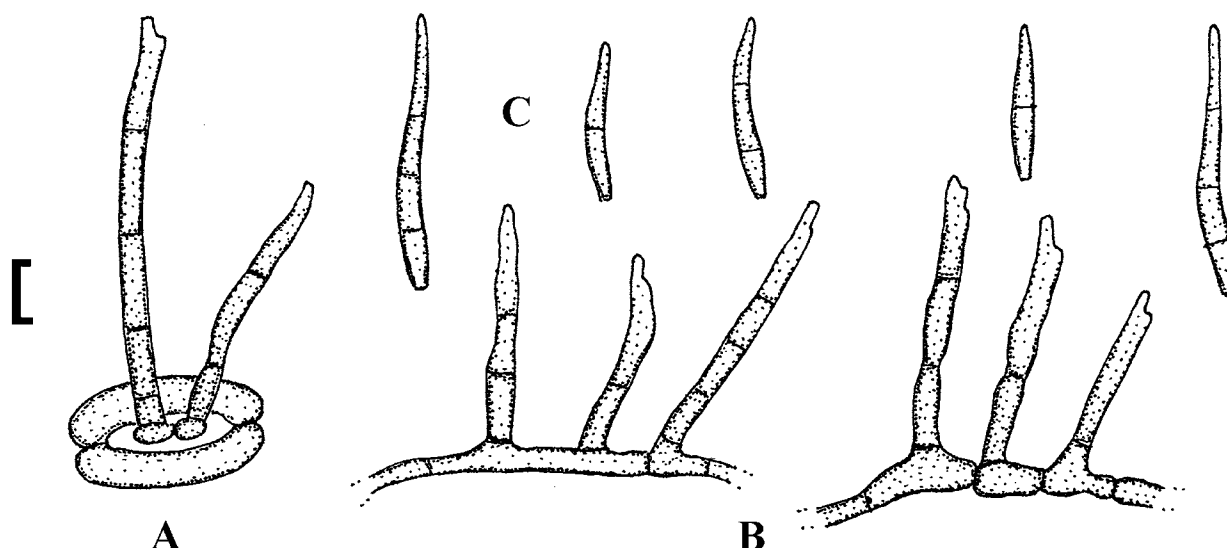


**Fig. 39.** *Pseudocercospora lonchitidis* (CUP-VZ-3385). **A.** Superficial hyphae. **B.** Solitary conidiophores arising from superficial hyphae. **C.** Conidiophore fascicle. **D.** Conidia. Bar = 10 µm.

**Literature:** Hsieh & Goh (1990: 305–306), Guo & Hsieh (1995: 187), Guo *et al.* (1998: 199), Crous & Braun (2003: 258), Phengsintham *et al.* (2013a: 66–67).

**Illustrations:** Hsieh & Goh (1990: 306, fig. 232), Guo & Hsieh (1995: 187, fig. 160), Guo *et al.* (1998: 199, fig. 165), Phengsintham *et al.* (2013a: 67, figs 70–71).

**Description:** *Leaf spots* amphigenous, circular to elliptical, scattered, 2–30 mm diam, greyish to dark brown, centre becoming paler, margin indefinite. *Colonies* amphigenous, mainly hypophyllous. *Mycelium* internal and external; superficial hyphae creeping and climbing setae of the leaf surface, branched, septate, 2–5 µm wide, olivaceous to pale brown, thin-walled, smooth. *Stromata* lacking. *Conidiophores* in small fascicles (2–10), divergent, arising from internal hyphae, emerging through stomata, or solitary, arising from superficial hyphae, lateral, erect, straight, subcylindrical to slightly geniculate-sinuous, unbranched, 20–90 × 3–4 µm, 2–7-septate, yellowish ochraceous to medium brown, thin-walled, smooth; conidiogenous cells integrated, terminal, conidiophores occasionally reduced to conidiogenous cells, about 20–35 µm long, conidiogenous loci inconspicuous to subdenticulate, but always unthickened and not darkened. *Conidia* solitary, obclavate-cylindrical, straight to somewhat curved, 10–35 × 1.5–4 µm, 1–3-septate, colourless, thin-walled, smooth, apex acute to subobtuse, base obconically truncate, about 1–2 µm wide, hila unthickened, not darkened.



**Fig. 40.** *Pseudocercospora lygodii* (NTU-PPE, holotype). **A.** Small conidiophore fascicle. **B.** Solidary conidiophores arising from superficial hyphae. **C.** Conidia. Bar = 10 µm.

**Holotype:** **Taiwan:** Hsinchu Hsien, Hsinpu, on *Lygodium japonicum*, 2 May 1920, K. Sawada (NTU-PPE).

**Host range and distribution:** On *Lygodium* (*flexuosum*, *japonicum* [*microstachyum*]), *Lygodiaceae*, Asia (Taiwan, Thailand).

***Pseudocercospora lygodiicola*** Y.L. Guo & U. Braun, **sp. nov.**

MycoBank, MB805526  
(Fig. 41)

**Pseudonym:** *Pseudocercospora polypodiacearum* sensu Guo & Liu (1992: 298), Guo & Hsieh (1995: 188) and Guo *et al.* (1998: 199–200).

**Etymology:** Epithet derived from its host genus (inhabitant of *Lygodium*).

**Illustrations:** Guo & Hsieh (1995: 189, fig. 161), Guo *et al.* (1998: 200, fig. 166).

**Diagnosis:** *Pseudocercosporae polypodiacearum* similis, sed conidiophoris brevioribus, 15–40 µm, 0–1-septatis, apice non inflatis.

**Description:** *Leaf spots* amphigenous, irregularly shaped, 1–6 mm diam, often confluent and larger, covering up to half of a leaf, greyish brown above, greyish black below. *Caespituli* amphigenous, mainly hypophyllous. *Mycelium* immersed. *Stromata* substomatal, subglobose, 10–40 µm diam, dark brown. *Conidiophores* in dense fascicles, arising from stromata, through stomata, erect, straight, subcylindrical to geniculate-sinuous, 15–40 × 2.5–5 µm, 0–1-septate, uniformly olivaceous to olivaceous-brown, thin-walled, smooth, apex obtuse to conic; conidiophores reduced to conidiogenous cells or conidiogenous cells integrated, terminal, about 10–25 µm long, conidiogenous loci inconspicuous or subdenticulate, but always unthickened

and not darkened. *Conidia* solitary, obclavate, occasionally subcylindrical, 40–115 × 3–5 µm, 3–13-septate, olivaceous-brown, thin-walled, smooth, apex obtuse to subacute, base subtruncate to usually short obconically truncate, about 1.5–2 µm wide, hila unthickened, not darkened.

**Types:** **China:** *Guangdong Province:* Guangzhou, on leaves of *Lygodium japonicum*, *Lygodiaceae*, 8 VI 1962, Q. M. Ma & X. J. Liu 1439 (HMAS 59148 – holotype; BPI 1109717 – isotype).

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

**Notes:** This species was previously recorded, described and illustrated from China as *Pseudocercospora polypodiacearum* (Guo & Hsieh 1995, Guo *et al.* 1998), but differs from the latter species in having much shorter, 0–1-septate, apically usually not inflated conidiophores, and is thus better considered a separate species.

***Pseudocercospora lygodiigena*** U. Braun, **nom. nov.**

MycoBank MB806067

(Fig. 42)

**Basionym:** *Stenella lygodii* Sarbajna, *J. Econ. Taxon. Bot.* **14:** 489 (1990), non *Pseudocercospora lygodii* Goh & W.H. Hsieh, 1987.

**Synonym:** *Zasmidium lygodii* (Sarbajna) Kamal, *Cercosporoid fungi India:* 245 (2010).

**Illustration:** Sarbajna (1990: 488, fig. 1).

**Description:** *Leaf spots* amphigenous, subcircular to angular-irregular, 1–4 mm diam., sometimes vein-limited, centre greyish, margin darker, brown. *Caespituli* amphigenous, mostly hypophyllous, punctiform, scattered to aggregated, brown or greyish by abundant sporulation. *Mycelium* internal and external; superficial hyphae emerging through



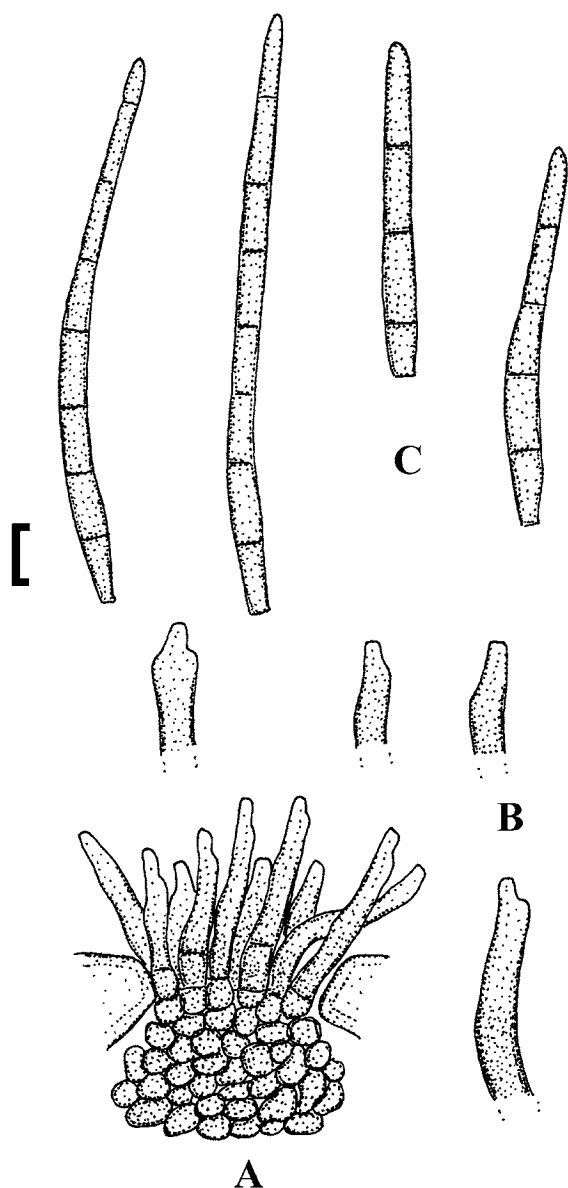


Fig. 41. *Pseudocercospora lygodiicola* (HMAS 59148). A. Conidiophore fascicle. B. Conidiophore tips. C. Conidia. Bar = 10  $\mu$ m.

stomata, branched, 1–4  $\mu$ m wide, septate, pigmented near conidiophores, otherwise hyaline, subhyaline or very pale olivaceous, thin-walled, smooth or almost so, occasionally faintly rough-walled. *Stromata* lacking to well-developed, mostly substomatal, 10–30  $\mu$ m diam., pigmented. *Conidiophores* in small to moderately large, loose fascicles, 3–30, arising from internal hyphae or stromata and solitary, arising from superficial hyphae, lateral, erect, straight, subcylindrical to somewhat sinuous or subgeniculate, unbranched, 5–55  $\times$  2–4  $\mu$ m, 0–3(–5)-septate, pale to medium brown or olivaceous-brown, wall thin to somewhat thickened, up to 0.8  $\mu$ m, smooth; conidiogenous cells integrated, terminal, 5–25  $\mu$ m long, conidiogenous loci inconspicuous, neither thickened nor darkened. *Conidia* solitary, narrowly obclavate-subcylindrical, occasionally subbacillar, straight to curved, 30–115.5  $\times$  2–4  $\mu$ m, 2–14-septate, hyaline to faintly pigmented, thin-walled, smooth or almost so to somewhat rough, apex subobtuse

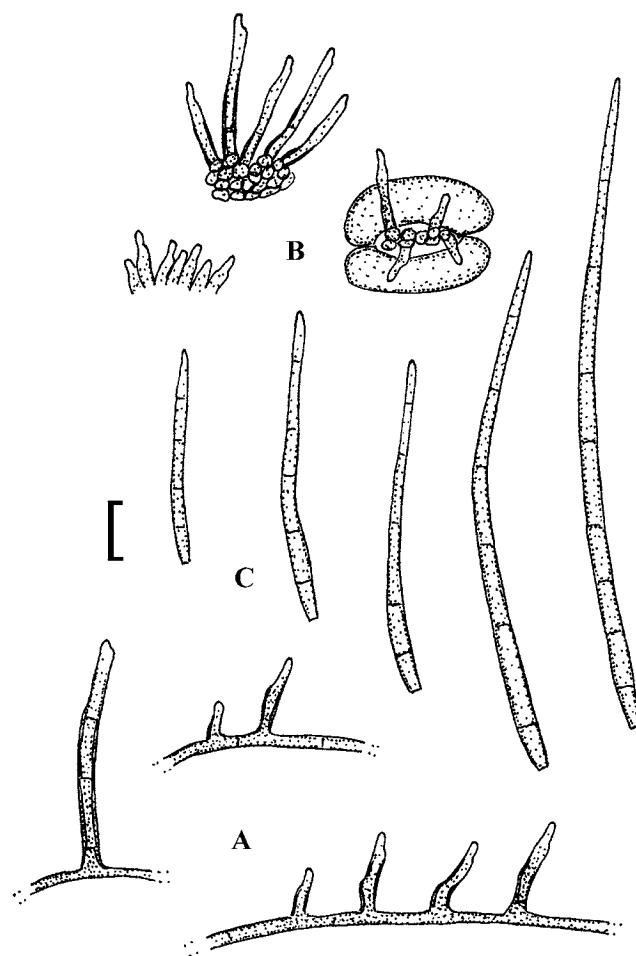


Fig. 42. *Pseudocercospora lygodiigena* (K(M) IMI 288612). A. Conidiophores arising from superficial hyphae. B. Fasciculate conidiophores. C. Conidia. Bar = 10  $\mu$ m.

to pointed, base short obconically truncate, 1–1.5  $\mu$ m wide, hila neither thickened nor darkened.

**Neotype (designated here, MycoBank, MBT176675): India: West Bengal:** Baruipur, on *Lygodium* sp., *Lygodiaceae*, 15 Jul. 1984, A.K. Das 3623 (K(M) IMI 288612).

**Host range and distribution:** On *Lygodium* sp., *Lygodiaceae*, Asia (India).

**Notes:** This species does neither belong to *Stenella* nor to *Zasmidium*. Due to inconspicuous conidiogenous loci and unthickened, non-pigmented hila of the conidia, it has to be reallocated to *Pseudocercospora*. Sarbajna (1990) cited IMI 288612 as number of the holotype, but the data (locality, collector and date) specified in the original description for the holotype do not agree with the data on the label of the material deposited at Kew (K) under this number. The search for another collection of this species (under another IMI number) corresponding to the data cited in Sarbajna (1990) failed. Thus, type material of this species is undoubtedly not preserved. The material deposited as *Stenella lygodii* under IMI 288612 agrees with Sarbajna's (1990) original description, but it cannot be considered the

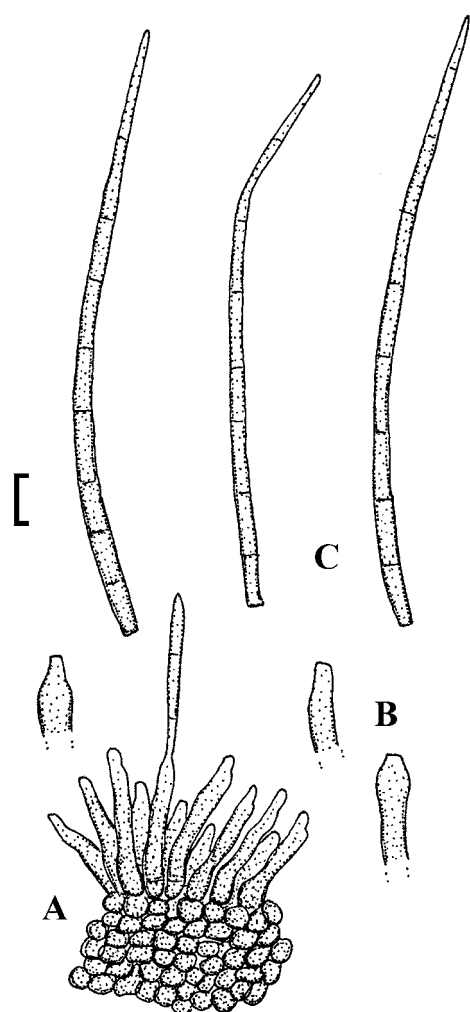


Fig. 43. *Pseudocercospora microsori* (BRISP 53617). A. Conidiophore fascicle. B. Conidiophore tips. C. Conidia. Bar = 10  $\mu$ m.

holotype. Therefore, we propose to designate this material as neotype of *S. lygodii*.

***Pseudocercospora microsori*** R.G. Shivas, A.J. Young & B.C. McNeil, *Persoonia* 25: 157 (2010). (Fig. 43)

*Illustration*: Shivas *et al.* (2010: 156).

*Description*: Leaf spots on fonds, amphigenous, scattered to confluent, often covering much of the fond surface, circular to irregular, 5–15 mm diam, dark reddish brown, centre becoming grey, margin conspicuous, uneven, with chlorotic halo, vein-limited. *Caespituli* amphigenous. *Mycelium* internal. *Stromata* well-developed, 20–60  $\mu$ m diam, substomatal, brown. *Conidiophores* in loose to dense fascicles, 5–30, arising from stomata, through stomata, forming sporodochial conidiomata, erect, unbranched, geniculate-sinuous, 30–65  $\times$  3–5  $\mu$ m, reddish brown, paler towards the apex, 1–5-septate, thin-walled, smooth; conidiogenous cells integrated, terminal, subcylindrical, 10–35  $\times$  2.5–4  $\mu$ m, conidiogenous loci inconspicuous or visible as truncate tip, unthickened, not darkened. *Conidia* solitary, acicular to narrowly obclavate-

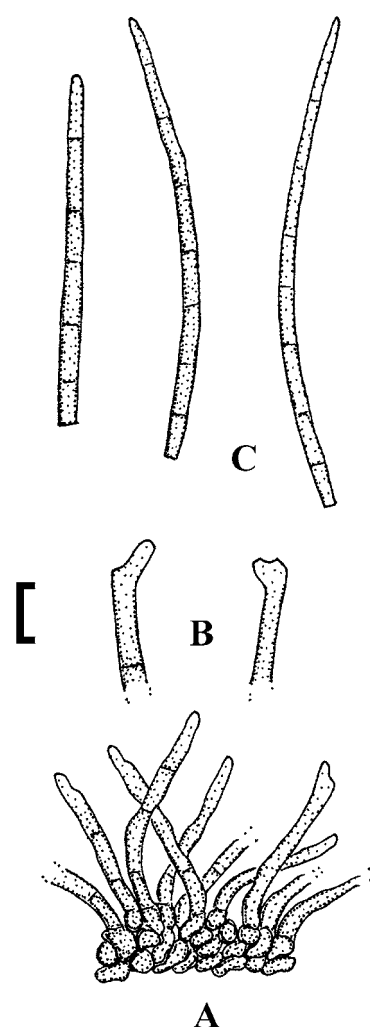


Fig. 44. *Pseudocercospora nephrolepidicola* (CBS H-20492). A. Conidiophore fascicle. B. Conidiophore tips. C. Conidia. Bar = 10  $\mu$ m.

subcylindrical, curved to flexuous, 50–110  $\times$  2.5–4  $\mu$ m, 2–12-septate, pale brown, thin-walled, smooth, apex rounded or subacute, base truncate to slightly obconically truncate, hila neither thickened nor darkened.

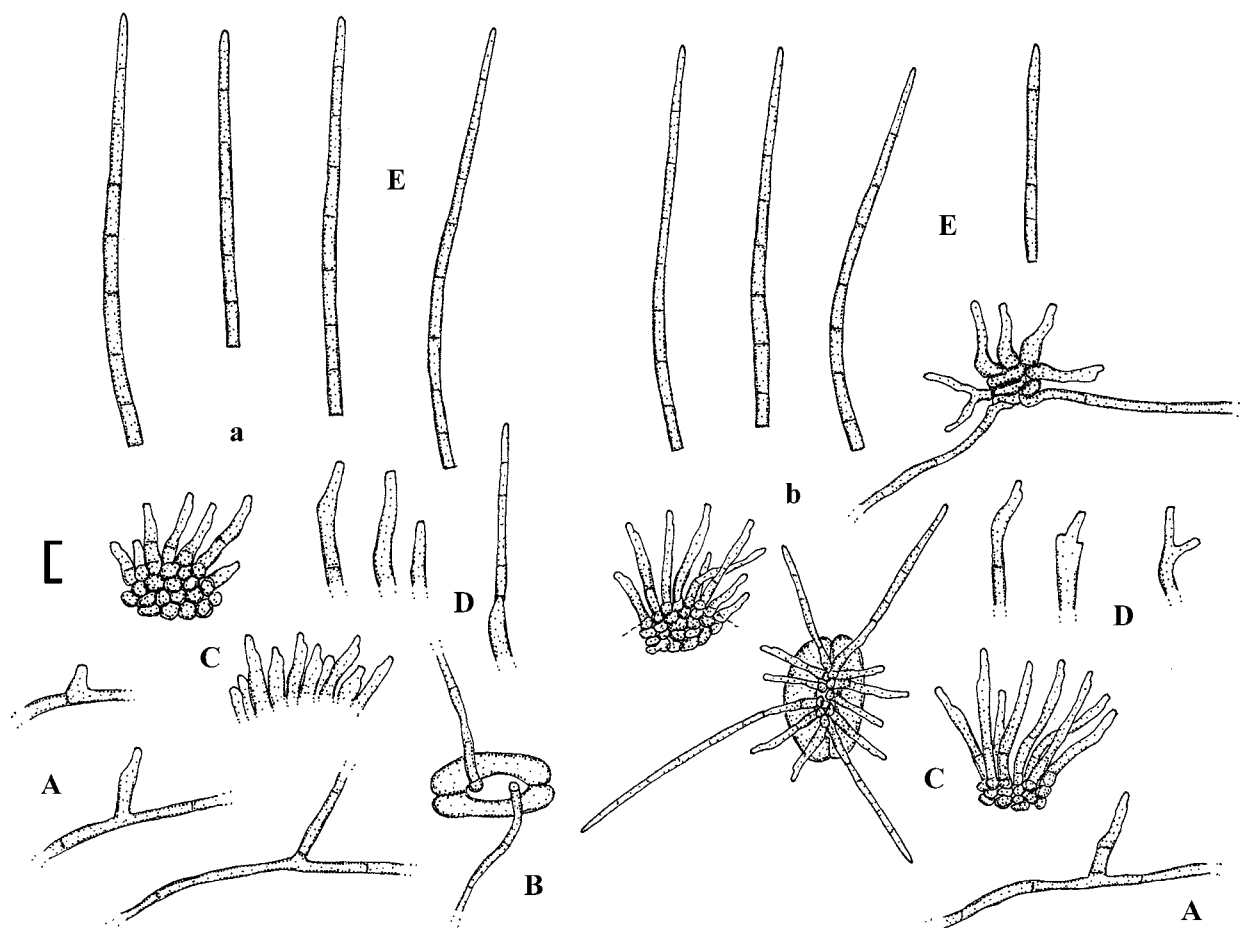
*Holotype*: Australia: Queensland: Brisbane, West End, Doris Street, on *Microsorium pustulatum* Copel., *Polypodiaceae*, 6 Aug. 2010, B. C. McNeil (BRISP 53617).

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

***Pseudocercospora nephrolepidicola*** Crous & R.G. Shivas, *Persoonia* 25: 139 (2010). (Fig. 44)

*Illustration*: Crous *et al.* (2010: 138).

*Description*: Leaf spots amphigenous, shape and size irregular, 2–12 mm diam, medium brown, margin indefinite. *Mycelium* internal and external; hyphae branched, 2–3  $\mu$ m wide, septate, brown, thin-walled, smooth. *Stromata* well-developed, subepidermal, up to 150  $\mu$ m diam and 50  $\mu$ m high,



**Fig. 45.** *Pseudocercospora nephrolepidigena* (HAL 2602 F). **a.** Based on type material. **b.** Based on material from Brunei at HAL. **A.** Solitary conidiophores arising from superficial hyphae. **B.** Superficial hyphae. **C.** Conidiophore fascicles. **D.** Conidiophores. **E.** Conidia. Bar = 10 µm.

medium brown. *Conidiophores* arising from stromata in loose fascicles, or solitary, arising from superficial hyphae, erect, subcylindrical, irregularly geniculate-sinuose, unbranched or branched below, 25–45(–90) × 2.5–3(–3.5) µm, 1–4-septate, medium brown, thin-walled, smooth; conidiogenous cells integrated, terminal, subcylindrical, 15–25(–40) × (2–)2.5(–3) µm, sympodially and 1–2 times percurrently proliferating, conidiogenous loci neither thickened nor darkened. *Conidia* solitary, subcylindrical-filiform, occasionally slightly aciculate (somewhat attenuated towards the tip), straight to irregularly flexuose, (40–)50–60(–95) × (2.5–)3.5(–4) µm, 3–6(–9)-septate, pale brown, thin-walled, smooth, apex obtuse, rounded, base truncate, hila neither thickened nor darkened. *Ascomata* globose, erumpent, up to 80 µm diam, brown, with a central ostiole; asci subcylindrical to narrowly obovoid, 35–50 × 8–10 µm. *Ascospores* fusiform-ellipsoid, widest in the middle of the apical cell, tapering towards both ends, 9–11 × 2.5–3.5 µm, colourless, apex acutely rounded, constricted at the septum.

*In vitro* (in the dark at 25 °C, after 2 wk): Colonies spreading, erumpent, with folded surface and even, lobate margins, up to 15 mm diam. On potato-dextrose agar surface smoke-grey with patches of grey-olivaceous, iron-grey in reverse; on oatmeal agar olivaceous-grey with patches of pale olivaceous-grey.

**Holotype:** **Australia:** **Queensland:** Brisbane Botanical Garden, on fronds of *Nephrolepis falcata*, Davalliaceae, 14 Jul. 2009, P. W. Crous & R. G. Shivas (CBS H-20492); ex-type culture: CBS 128211.

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

**Notes:** *Pseudocercospora nephrolepidis*, described from Taiwan on *Nephrolepis auriculata*, differs from *P. nephrolepidicola* in lacking or much smaller stromata, lacking superficial hyphae, shorter, only 0–1-septate conidiophores and shorter conidia.

***Pseudocercospora nephrolepidigena* U. Braun, Meeboon & C. Nakash., sp. nov.**

Mycobank MB805527  
(Fig. 45)

**Etymology:** Derived from its host genus, *Nephrolepis*.

**Literature:** Braun & Sivapalan (1999: 21, as "*P. thelypteridis*"), Nakashima et al. (2007: 265, as "*P. phyllitidis*"), Meeboon et al. (2007, as "*P. phyllitidis*").

**Illustration:** Braun & Sivapalan (1999: 20, fig. 12, as "*P. thelypteridis*").

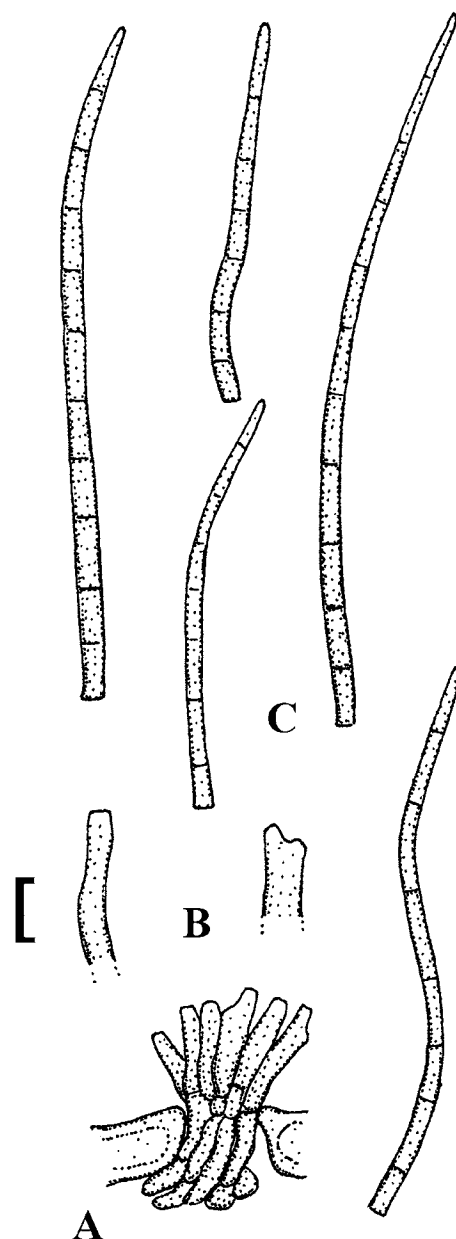
**Diagnosis:** *Pseudocercospora nephrolepidis* et *P. phyllitidis* similis, sed hyphis superficialibus cum conidiophoris solitariis crescentibus.

**Description:** *Leaf spots* amphigenous, subcircular to angular-irregular, 1–15 mm diam, or oblong, up to 20 mm, sometimes confluent, forming large blotches or entire leaf segments becoming necrotic, pale to dark brown, margin indefinite or somewhat darker, sometimes with yellowish halo, occasionally somewhat zonate. *Caespituli* amphigenous, conspicuous on the upper side, punctiform, scattered, blackish or greyish by abundant conidial formation, less conspicuous on the lower side. *Mycelium* internal and external; superficial hyphae amphigenous, abundant on the lower side, less developed but also present on the upper side, branched, 1.5–4.5 µm wide, septate, subhyaline to pale olivaceous, thin-walled, smooth. *Stromata* small to well-developed, immersed, 10–80 µm diam, pale to dark olivaceous-brown, cells 2.5–8 µm diam. *Conidiophores* in small to rather large, loose to mostly dense fascicles, arising from stromata, erumpent, or solitary, arising from superficial hyphae, lateral, erect, straight, subcylindrical or somewhat attenuated towards the tip, unbranched, occasionally somewhat geniculate, 5–50 × 1.5–4 µm (with attached persistent conidia up to about 80 µm long), 0–3-septate, subhyaline to pale olivaceous or brownish, thin-walled, smooth; conidiophores often aseptate, i.e. reduced to conidiogenous cells, or conidiogenous cells integrated, terminal, 5–25 µm long, often monoblastic, determinate, sometimes polyblastic, sympodially proliferating, conidiogenous loci inconspicuous or visible as truncate tips, about 1.5–2.5 µm wide, neither thickened nor darkened. *Conidia* solitary, persistent, i.e. attached to the conidiogenous cells for a longer time, cylindrical, long conidia filiform to subacicular, i.e. somewhat attenuated towards the tip, straight to somewhat curved, 25–115 × (1.5–)2–3.5(–4) µm, 2–10-septate, septa not very distinct, subhyaline to very pale olivaceous, thin-walled, smooth, apex obtuse to subacute, base truncate, about 1.5–2.5 µm wide, hila neither thickened nor darkened.

**Types:** **Thailand:** *Chiang Mai Province:* Suthep-Pui National Park, on *Nephrolepis biserrata*, 31 May 2013, J. Meeboon (HAL 2602 F – holotype; U. Braun, Fungi Sel Exs. 208, BPI, BRIP, GZU, HAL, HMAS, K (M), KR, KUS, LE, M, PDD – isotypes). **Paratypes:** **Thailand:** *Chiang Mai Province:* Suthep-Pui National Park, 21 Nov. 2004, C. Nakashima & J. Meeboon (CMU 27962) and 10 Dec. 2006, I. Araki & J. Meeboon (CMU 28058).

**Host range and distribution:** On *Nephrolepis* (*biserrata*, *cordifolia*, *Nephrolepis* sp.), *Davalliaceae*, Asia (Brunei, Thailand).

**Notes:** Nakashima *et al.* (2007) recorded collections on this host from Thailand as *Pseudocercospora phyllitidis*, but the latter American species differs in lacking superficial hyphae and in having much longer conidiophores. Furthermore, the type host of *P. phyllitidis*, *Campyloneurum phyllitidis*, belongs to the *Polypodiaceae*. *Pseudocercospora phyllitidis*, recorded on various ferns belonging to different families, is prob-



**Fig. 46.** *Pseudocercospora nephrolepidis* (TNM, holotype). **A.** Conidiophore fascicle. **B.** Conidiophores. **C.** Conidia. Bar = 10 µm.

ably heterogeneous. "*Pseudocercospora thelypteridis*" on *Nephrolepis* from Brunei, described and illustrated in Braun & Sivapalan (1999), agrees well with *P. nephrolepidigena*.

***Pseudocercospora nephrolepidis*** R. Kirschner, *Fungal Diversity* **26**: 223 (2007). (Fig. 46)

*Illustration:* Kirschner & Chen (2007: 224, fig. 2).

**Description:** *Leaf spots* amphigenous, on yellowing leaflets with green margin, 1–10 mm long and 3–4 mm wide, not passing the midrib of leaflets, shape irregular, medium brown. *Caespituli* hypophyllous. *Mycelium* internal; hyphae intercellular, 1–4 µm diam, pale brown, smooth. *Stromata* absent or small, within and just below stomata, shape irregular, rarely up to 35 µm diam, pale brown. *Conidiophores*



fasciculate, up to 22, arising from internal hyphae or stromata, emerging through stomata, straight, subcylindrical to slightly geniculate, unbranched (7–)13–26(–35) × 2.5–3 µm, 0–1-septate, pale brown, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores mostly aseptate, i.e. reduced to conidiogenous cells, conidiogenous loci broadly truncate, neither thickened nor darkened. *Conidia* solitary, subcylindrical to acicular, i.e. somewhat tapering from base to top, straight to curved or sinuous, about (30–)65–100(–115) × 2–3 µm, inconspicuously 2–9-septate, subhyaline to pale brown (paler than the conidiophores), thin-walled, smooth, apex subobtuse to subacute, base truncate, hila neither thickened nor darkened.

**Holotype: Taiwan:** Taipei County, Yangmingshan, ca. 800 m alt., on living leaves of *Nephrolepis auriculata*, 2 Mar. 2006, R. Kirschner 2555 (TNM).

**Host range and distribution:** on *Nephrolepis auriculata*, Davalliaceae, Asia (Taiwan).

**Note:** Differences between this species and the Australian *P. nephrolepidicola* are discussed under the latter species.

***Pseudocercospora phyllitidis* (H.H. Hume) U. Braun & Crous, in Crous & Braun, *Mycosphaerella and Anam.* 1: 321 (2003).**

(Fig. 47)

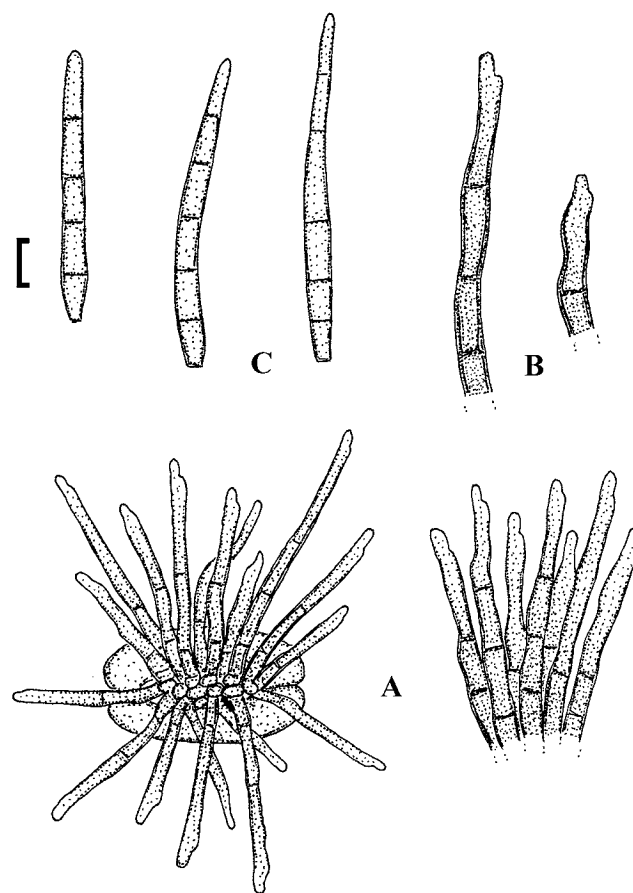
**Basionym:** *Cercospora phyllitidis* H.H. Hume, *Bull. Torrey Bot. Club* 27: 577 (1900).

**Literature:** Saccardo (1902: 1074), Chupp (1954: 456), Crous & Braun (2003: 321).

**Description:** Leaf spots amphigenous, angular-irregular, 2–18 mm diam, brown, margin usually indefinite. *Caespituli* hypophyllous. *Mycelium* internal; rarely with a few superficial hyphae, but without conidiophores. *Stromata* small to large, only filling the substomatal cavity or larger, 10–80 µm diam, subglobose, brown. *Conidiophores* in small to rather large fascicles, arising from stromata, emerging through stomata, erect, straight to somewhat curved or sinuous, subcylindrical, barely geniculate, unbranched, 10–75(–100) × 3–5 µm, continuous to pluriseptate, uniformly subhyaline, pale to medium olivaceous-brown or brown, wall thin to somewhat thickened, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, conidiogenous loci inconspicuous, neither thickened nor darkened. *Conidia* solitary, obclavate, 20–80 × 2–5 µm, 3–5-septate, subhyaline to pale olivaceous, thin-walled, smooth, apex subacute or obtuse, base obconically truncate, about 1.5–2.5 µm wide, hila neither thickened nor darkened.

**Lectotype (designated here, MycoBank, MBT176148): USA:** Florida: east coast, Hobe Sound, on *Campyloneurum phyllitidis* (*Polypodium phyllitidis*), 14 Mar. 1900, H. H. Hume (NY). Isolectotype: BPI 439635.

**Host range and distribution:** On *Angyopteris* sp., Marattiaceae; *Campyloneurum phyllitidis*, *Polypodium polypodioides*,



**Fig. 47.** *Pseudocercospora phyllitidis* (NY, lectotype). **A.** Conidiophore fascicles. **B.** Conidiophore tips. **C.** Conidia. Bar = 10 µm.

*Polypodiaceae*; *Davallia trichomanoides*, *Nephrolepis exaltata*, Davalliaceae; *Osmunda regalis*, Osmundaceae; *Pteris* (*P. biaurita*, *P. ensifolia*), Pteridaceae; *Rumohra adiantiformis*, Dryopteridaceae; *Thelypteris tetragona*, Thelypteridaceae; non-identified fern, North America (Canada; USA, Florida, Indiana), Jamaica, Panama, Puerto Rico, Europe (UK, in a botanical garden).

**Notes:** Records of this species from Asia, India (Lall et al. 1964, Kamal 2010) are doubtful and seem to belong to *P. pteridicola*. There are various records on ferns belonging to different families, suggesting that *P. phyllitidis* is probably heterogeneous.

***Pseudocercospora plagiogyriae* Goh & W.H. Hsieh, *Trans. Mycol. Soc. Republ. China* 2(2): 134 (1987).**

(Fig. 48)

**Synonym:** *Cercospora plagiogyriae* Sawada, *Rep. Taiwan Agric. Res. Inst.* 85: 119 (1943), *nom. inval.* (Art. 39.1).

**Literature:** Hsieh & Goh (1990: 263), Guo & Hsieh (1995: 251), Guo et al. (1998: 262).

**Illustrations:** Hsieh & Goh (1990: 265, fig. 204), Guo & Hsieh (1995: 251, fig. 212), Guo et al. (1998: 262, fig. 218).

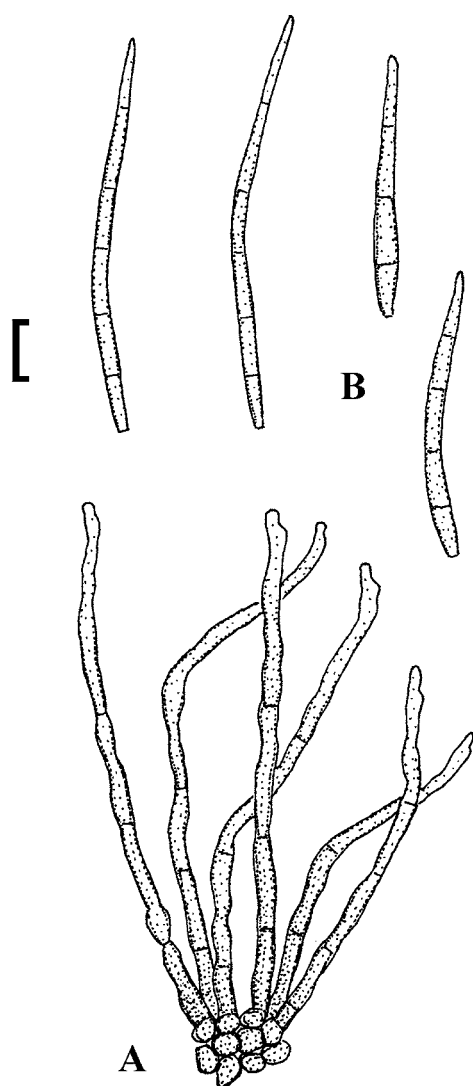


Fig. 48. *Pseudocercospora plagiogyriae* (NTU-PPE, holotype). A. Conidiophore fascicle. B. Conidia. Bar = 10  $\mu$ m.

**Description:** Leaf spots amphigenous, subcircular, 7–10 mm diam, dark brown, centre becoming grey, zonate. *Caespituli* amphigenous. *Mycelium* internal. *Stromata* lacking or only few swollen hyphal cells in the substomatal cavity. *Conidiophores* fasciculate, 3–20, loose, arising from swollen substomatal hyphal cells, emerging through stomata, erect, straight to usually geniculate-sinuuous, occasionally subnodulose, unbranched, 60–180  $\times$  4–7  $\mu$ m, indistinctly 3–8-septate, brown, paler towards the tip, almost hyaline at the apex, thin-walled, smooth; conidiogenous cells integrated, terminal and intercalary, conidiogenous loci inconspicuous to visible by being truncate or subdentate. *Conidia* solitary obclavate, straight to somewhat curved, 50–85  $\times$  3–5  $\mu$ m, 5–7-septate, pale olivaceous, thin-walled, smooth, apex pointed, base short obconically truncate, about 1.5–2  $\mu$ m wide, hila neither thickened nor darkened.

**Types:** **Taiwan:** Taipei Hsieh, Shihing, on *Plagiogyria euphlebia*, *Plagiogyriaceae*, 6 Nov. 1927, K. Sawada (NTU-PPE – holotype; HMAS 05180 – isotype).

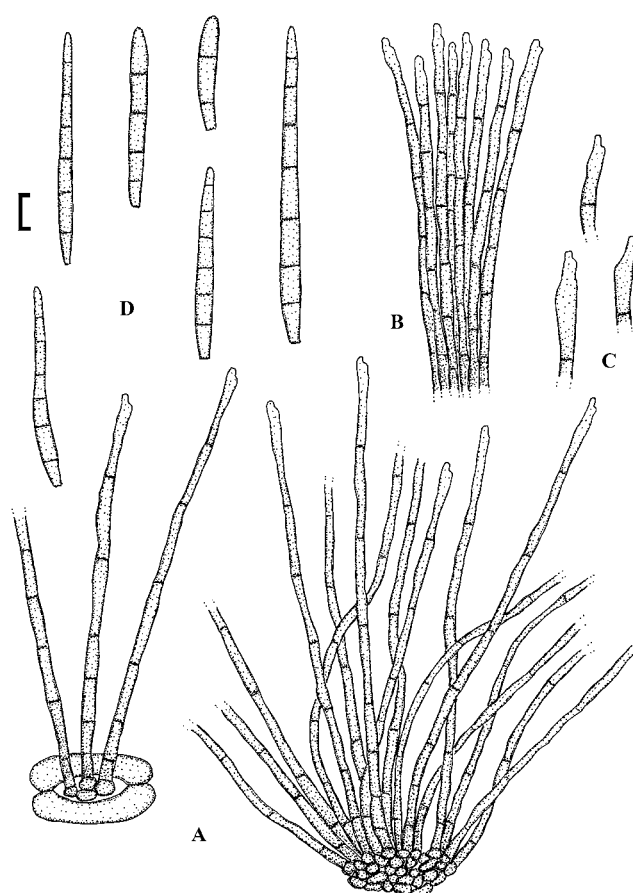


Fig. 49. *Pseudocercospora polypodiacearum* (K(M) IMI 242551). A. Conidiophore fascicle. B. Conidia. Bar = 10  $\mu$ m.

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

***Pseudocercospora polypodiacearum*** D.N. Shukla, A.K. Singh, P. Kumar & Kamal, *Indian Phytopathol.* **35**: 86 (1982). (Fig. 49)

**Synonyms:** *Cercospora dharwarensis* Rangasw., Seshadri, Chann. & Raghun., *Scheme Coll. Ident. Fungi S. India, Final Rep*: 13 (1969), *nom. inval.*, Art. 36.1 [type: on *Lygodium flexuosum*, India, Karnataka, Dandeli, 25 Nov. 1968, V.S. Seshadri].

*Phaeoisariopsis lygodii* M.K. Khan & Kamal, *Mycotaxon* **54**: 28 (1995) [holotype: on *Lygodium flexuosum*, India, South Gorakhpur Forest Division, Dec. 1990, Kamal (HCIO 30794)].

**Literature:** Zhuang (2001), Kamal (2010: 210–211).

**Illustration:** Shukla *et al.* (1982: 85, fig. 1).

**Description:** Leaf spots hypophyllous, irregularly shaped, often effuse, olivaceous-brown. *Caespituli* hypophyllous. *Mycelium* internal. *Stromata* distinct, substomatal to subepidermal, subglobose, 10–45  $\mu$ m diam, dark brown. *Conidiophores* in small to rather large, loose to sometimes dense, almost coremioid fascicles, arising from stromata,

through stomata or erumpent, erect, straight to flexuous, geniculate-sinuous, unbranched, 60–280 × 3–7 µm, sometimes swollen at the apex, pluriseptate throughout, brown, thin-walled, smooth; conidiogenous cells integrated, terminal, 10–30 µm long, mono- to polyblastic, sympodially proliferating, conidiogenous loci inconspicuous, unthickened, not darkened. *Conidia* solitary, obclavate-cylindrical, 30–130 × 3–7.5 µm, (1–)4–8(–12)-septate, pale olivaceous to light brown, thin-walled, smooth, apex obtuse to subacute, base obconically truncate, occasionally somewhat peg-like, 1.5–2.5 µm wide, hila unthickened, not darkened.

**Types:** **India:** U.P.: Gorakhpur, on leaves of *Lygodium* sp., Feb. 1980, D. N. Shukla (K(M) IMI 242551 – holotype; GPU 255 – isotype).

**Host range and distribution:** On *Lygodium (flexuosum, sp.)*, *Schizaeaceae*, Asia (India, Karnataka, U.P.).

**Notes:** A Chinese collection on *Lygodium japonicum* was described and illustrated by Guo & Hsieh (1995) and Guo et al. (1998) as *P. polypodiacearum*. However, this collection is morphologically quite distinct by its much shorter, 0–1-septate and apically unswollen conidiophores, and thus better separated and described as new species (see *P. lygodiicola*).

**Pseudocercospora pteridicola** U. Braun & Y.L. Guo, in Braun & Mel'nik, *Trudy Bot. Inst. Im. V.L. Komarova* 20: 84 (1997).

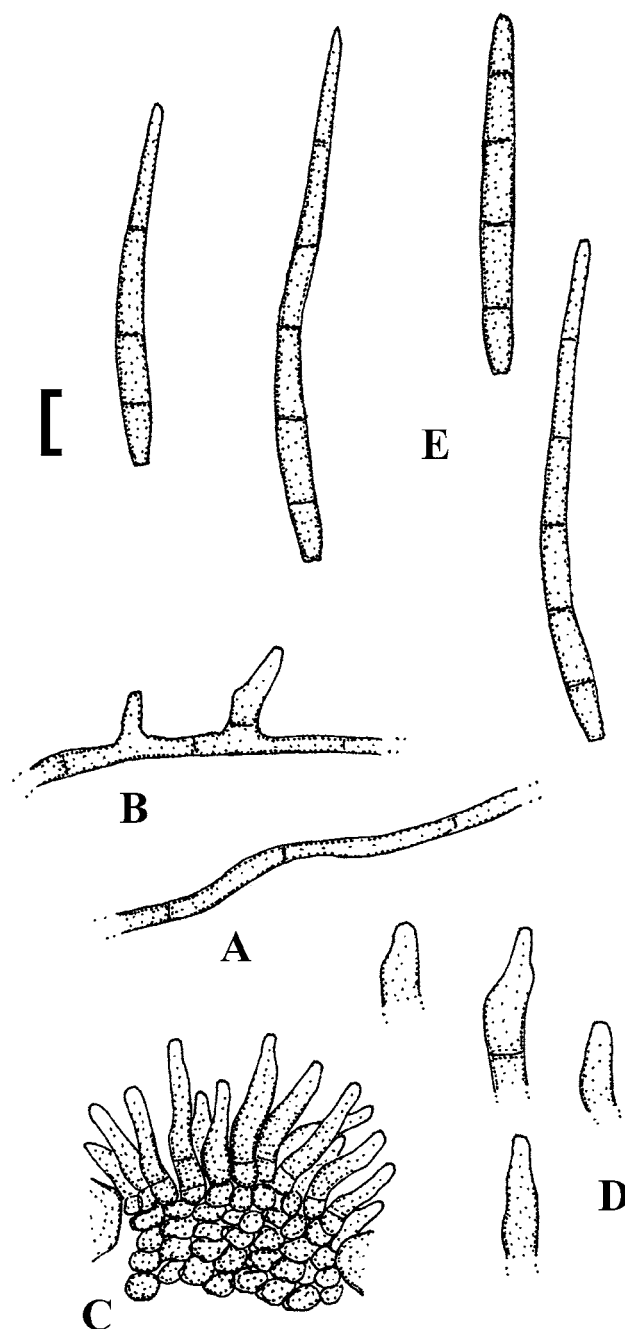
(Fig. 50)

**Pseudonym:** *Pseudocercospora pteridis sensu* Guo & Hsieh (1995: 258).

**Literature:** Guo & Hsieh (1995: 258), Guo et al. (1998: 268–269).

**Illustrations:** Guo & Hsieh (1995: 257, fig. 218), Guo et al. (1998: 268, fig. 223), Braun & Mel'nik (1997: 121, fig. 50).

**Description:** *Leaf spots* amphigenous, subcircular, 1–6 mm diam, often confluent, yellowish brown, pale brown to greyish brown, with purplish to dark brown margin. *Caespituli* amphigenous, mostly hypophyllous. *Mycelium* internal and external; superficial hyphae branched, septate, 1.5–2.5 µm, subhyaline, thin-walled, smooth. *Stromata* lacking, small or well-developed, 15–30 µm diam, substomatal, brown. *Conidiophores* in small to large fascicles, loose to dense, arising from stromata, emerging through stomata, or solitary, arising from superficial hyphae, lateral, rarely terminal, erect, straight, subcylindrical to geniculate-sinuous, usually unbranched, rarely branched, 10–70 × 2.5–4 µm, 0–7-septate, pale olivaceous, olivaceous-brown to medium brown, thin-walled, smooth; conidiogenous cells integrated, terminal, about 10–25 µm long, conidiogenous loci inconspicuous, neither thickened nor darkened. *Conidia* solitary, narrowly obclavate-subcylindrical, attenuated towards the tip, 40–125 × 2–4 µm, 2- to pluriseptate, subhyaline, thin-walled, smooth, apex subacute, base obconically truncate, 1–2 µm wide, hila neither thickened nor darkened.



**Fig. 50.** *Pseudocercospora pteridicola* (HMAS 59158). **A.** Superficial hypha. **B.** Solitary conidiophores arising from a superficial hypha. **C.** Conidiophore fascicle. **D.** Conidiophores. **E.** Conidia. Bar = 10 µm.

**Holotype:** **China:** Sichuan Province: Chongqing, on *Pteris vittata*, 31 Aug. 1962, Q. M. Ma & S. J. Han 1740 (HMAS 59158).

**Host range and distribution:** On *Pteris* (?*biaurita*, *vittata*), *Pteridaceae*, Asia (China, ?India).

**Notes:** Braun & Mel'nik (1997) assigned a collection on *Pteris* sp. from Colombia to *P. pteridicola*, which is, however, morphologically deviating, geographically isolated, and therefore described as *P. pteridigena*. "*Cercospora phyllitidis*" on *Pteris biaurita* in India (Lall et al. 1964: 182, fig. 2; Kamal 2010) and on *Pteris* sp. in India (Kakoti et al. 1998) belong

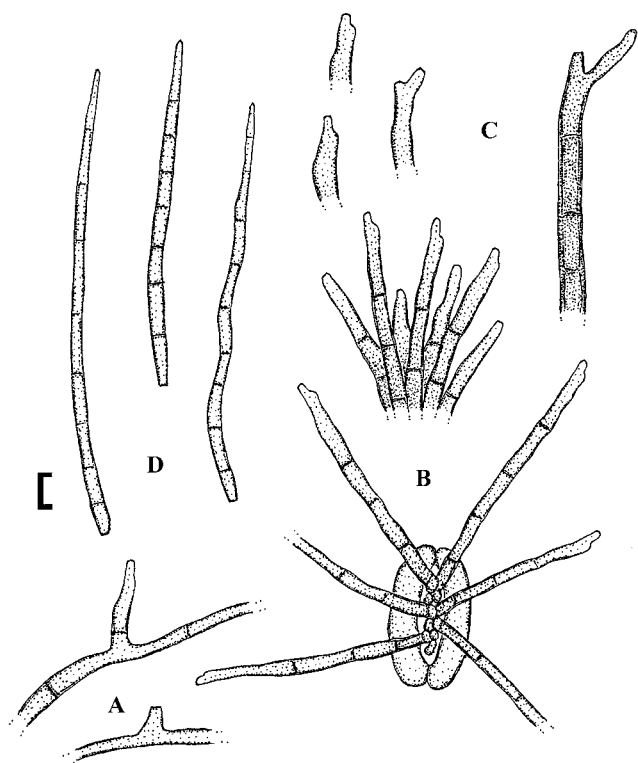


Fig. 51. *Pseudocercospora pteridigena* (CUP, holotype). A. Solitary conidiophores arising from superficial hyphae. B. Conidiophore fascicles. C. Conidiogenous cells. D. Conidia. Bar = 10 µm.

probably to *P. pteridicola*, but material was not available for a re-examination.

***Pseudocercospora pteridigena* U. Braun, sp. nov.**  
Mycobank MB805528  
(Fig. 51)

**Etymology:** Derived from its host genus, *Pteris*.

**Diagnosis:** *Pseudocercosporae pteridicolae* valde similis, sed conidiophoris longioribus, ad 150 µm, parietibus atrioribus et leviter incrassatis, conidiis longioribus, ad 250 µm longis.

**Description:** Leaf spots amphigenous, subcircular to somewhat irregular, 3–6 mm diam, yellowish brown to grey, with a wide dark reddish brown border. *Caespituli* hypophyllous, scattered, fine, brownish. Mycelium internal and external; superficial hyphae emerging through stomata, sparingly branched, 1.5–3 µm wide, subhyaline to pale olivaceous, septate, thin-walled, smooth. Stromata small, substomatal, 10–35 µm diam, brown, composed of swollen hyphal cells, 2–5 µm diam. *Conidiophores* in small fascicles, loose to moderately dense, arising from stromata, emerging through stomata or solitary, arising from superficial hyphae, erect, straight, subcylindrical to somewhat sinuous or slightly geniculate, unbranched, 30–150 × 3–5 µm, continuous to pluriseptate, medium dark brown below, paler towards the apex, wall somewhat thickened, smooth; conidiogenous cells integrated, terminal, about 10–30 µm long, conidiogenous loci unthickened, not darkened, but sometimes subdenticulate. *Conidia* solitary, acicular to narrowly obclavate, 40–250 × 2–4

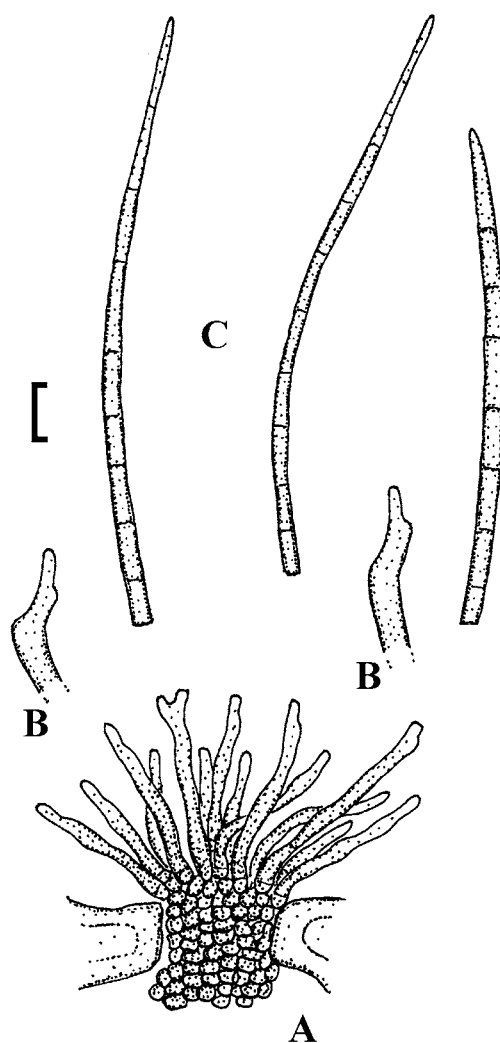


Fig. 52. *Pseudocercospora pteridophytophila* (K(M) IMI 312078). A. Conidiophore fascicle. B. Conidiophore tips. C. Conidia. A. Conidiophore fascicle. B. Conidia. Bar = 10 µm.

µm, 4-septate to pluriseptate, subhyaline to pale olivaceous, thin-walled, smooth, apex pointed, base short obconically truncate, 1–1.5 µm wide, hila neither thickened nor darkened.

**Holotype:** Colombia: Dept. Caldas, on *Pteris* sp., *Pteridaceae*, 14 Jul. 1929, C.E. Chardón (CUP).

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

**Notes:** The Asian *Pseudocercospora pteridicola* resembles *P. pteridigena* but differs in having much shorter, paler, thin-walled conidiophores, 10–70 µm, and shorter conidia, 40–125 µm. The collection from Colombia was tentatively assigned to *P. pteridicola* in Braun & Mel'nik (1987: 84), and morphological differences between this collection and the Chinese type were discussed.

***Pseudocercospora pteridophytophila* Goh & W.H. Hsieh, *Trans. Mycol. Soc. Republ. China* 4(2): 30 (1989). (Fig. 52)**



*Literature:* Hsieh & Goh (1990: 328), Guo & Hsieh (1995: 330), Guo et al. (1998: 344).

*Illustrations:* Hsieh & Goh (1990: 330, fig. 250), Guo & Hsieh (1995: 331, fig. 278), Guo et al. (1998: 345, fig. 283).

*Description:* Leaf spots amphigenous, angular-irregular, 2–4 mm diam, often confluent, dark brown, margin indefinite. *Caespituli* amphigenous. *Mycelium* internal. *Stromata* substomatal, subglobose to oblong, up to 35 µm diam, brown. *Conidiophores* numerous, in dense fascicles, arising from stromata, emerging through stomata, erect, straight to distinctly geniculate-sinuous, unbranched, 15–50 × 2–5 µm, 0–2-septate, subhyaline to very pale olivaceous, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, usually 10–25 µm long, conidiogenous loci inconspicuous to subdenticulate, unthickened, not darkened. *Conidia* solitary, narrowly acicular-filiform, straight to usually curved or somewhat sinuous, 30–70 × 1–1.5 µm, 4–8-septate, colourless, thin-walled, smooth, apex pointed, base truncate to somewhat obconically truncate, about 1 µm wide, hila neither thickened nor darkened.

*Types:* **Taiwan:** Miaoli Hsien, Cholan, on *Cyclosorus acuminatus*, *Thelypteridaceae*, 11 Aug. 1984, T. K. Goh (NCHUPP-37 – holotype); K(M) IMI 312078 – isotype).

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

***Pseudocercospora ptisanae* U. Braun, sp. nov.**

MycoBank MB805529

(Fig. 53)

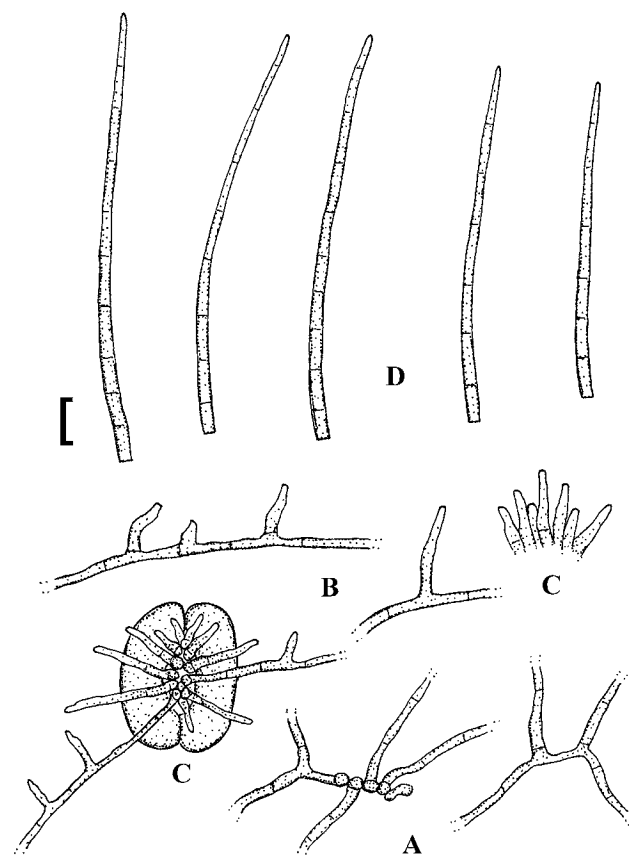
*Literature:* Braun & Hill (2002: 29, as *Pseudocercospora* cf. *rumohrae*).

*Illustration:* Braun & Hill (2002: 27, fig. 10).

*Etymology:* Epithet derived from its host genus, *Ptisana*.

*Diagnosis:* *Pseudocercosporae rumohrae* valde similis, sed hospite divergenti (*Ptisana*, *Marattiaceae*) et hilis multo angustioribus, 1.5–2 µm diam.

*Description:* Leaf spots amphigenous, shape and size variable, brown, margin indefinite. *Caespituli* hypophyllous, not very conspicuous. *Mycelium* internal and external; superficial hyphae emerging through stomata, branched, septate, 1–4 µm wide, thin-walled, subhyaline to pale olivaceous, smooth. *Stromata* lacking. *Conidiophores* usually solitary, arising from superficial hyphae, lateral, rarely terminal, occasionally in small, loose fascicles, emerging through stomata, erect, straight, subcylindrical to geniculate-sinuous, unbranched, 5–40 × 2–3 µm, 0–1-septate, subhyaline to pale olivaceous, thin-walled, smooth; conidiophores usually reduced to conidiogenous cells or conidiogenous cells sometimes integrated, terminal, conidiogenous loci inconspicuous. *Conidia* solitary, acicular to filiform, 80–100 × 2–3 µm, indistinctly pluriseptate, subhyaline to pale olivaceous, thin-



**Fig. 53.** *Pseudocercospora ptisanae* (HAL, CF Hill 185). **A.** Superficial hyphae. **B.** Solitary conidiophores arising from superficial hyphae. **C.** Conidiophore fascicle. **D.** Conidia. Bar = 10 µm.

walled, smooth, apex subacute, base truncate, 1.5–2 µm wide, hila unthickened, not darkened.

*Holotype:* **New Zealand:** Auckland, Auckland Domain, FERNZ Fernery, on leaves of *Ptisana salicina* (*Marattia salicina*), *Marattiaceae*, 6 Mar. 2005, C. F. Hill (PDD 82345), ex-type culture: ICMP 15860.

*Notes:* This species was described and illustrated by Braun & Hill (2002) as *Pseudocercospora* cf. *rumohrae*, based on a collection from 2000 (New Zealand, Auckland, Auckland University, 30 Apr. 2000, C.F. Hill 185). This collection, originally deposited at HAL, is not maintained. It was lost in June 2013 during a big flood that caused damage in the herbarium HAL. *Pseudocercospora* on *Ptisana salicina* is, indeed, morphologically very close to *P. rumohrae*, but it occurs on a fern of another family, and the conidia and hila are distinctly narrower.

***Pseudocercospora rumohrae* W.H. Hsieh & Goh,** *Trans. Mycol. Soc. Republ. China* 4(2): 29 (1989). (Fig. 54)

*Literature:* Hsieh & Goh (1990: 37), Guo & Hsieh (1995: 31), Guo et al. (1998: 44).

*Illustrations:* Hsieh & Goh (1990: 37, fig. 22), Guo & Hsieh (1995: 33, fig. 31), Guo et al. (1998: 44, fig. 31).

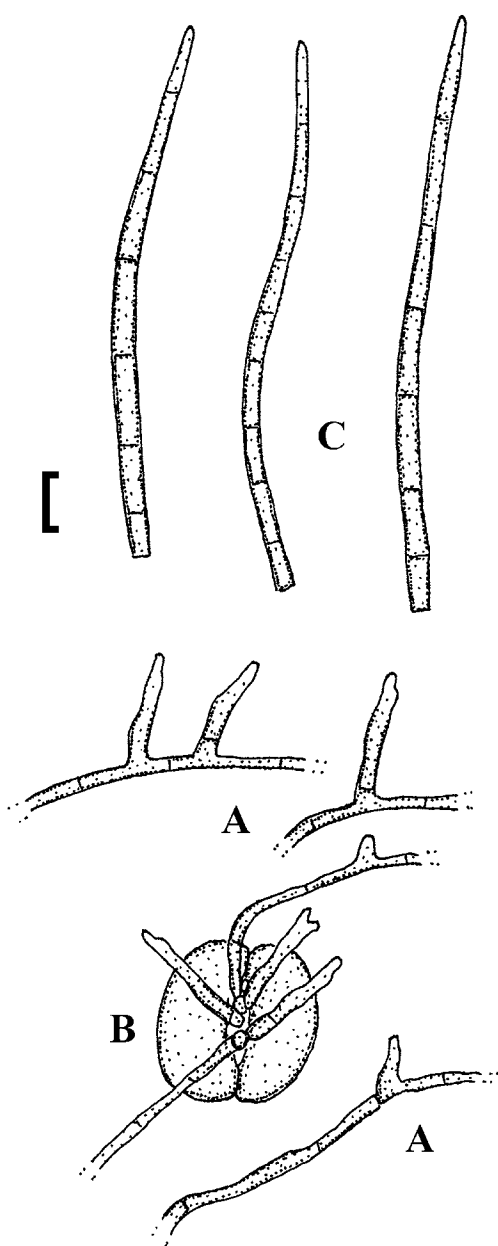


Fig. 54. *Pseudocercospora rumohrae* (K(M) IMI 312068). A. Solitary conidiophores arising from superficial hyphae. B. Conidiophores and hyphae emerging through a stoma. C. Conidia. Bar = 10  $\mu$ m.

**Description:** Leaf spots amphigenous, angular-irregular, size variable, centre brown, yellowish or paler brown towards the periphery, margin indefinite. Colonies hypophyllous, not very conspicuous. Mycelium internal and external, superficial hyphae emerging through stomata; branched, septate, very pale olivaceous, thin-walled, smooth. Stromata lacking. Conidiophores solitary, arising from superficial hyphae, occasionally a few conidiophores emerging through stomata, forming small, loose fascicles, erect, straight to slightly curved, subcylindrical to slightly clavate, at most slightly geniculate-sinuuous, 2–25  $\times$  2.5–4  $\mu$ m, 0–2-septate, subhyaline to pale brownish, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, 2–20  $\mu$ m long, conidiogenous loci inconspicuous, neither thickened nor darkened. Conidia solitary, acicular, 60–120  $\times$  3–3.5  $\mu$ m, indistinctly pluriseptate, hyaline to very pale olivaceous, thin-

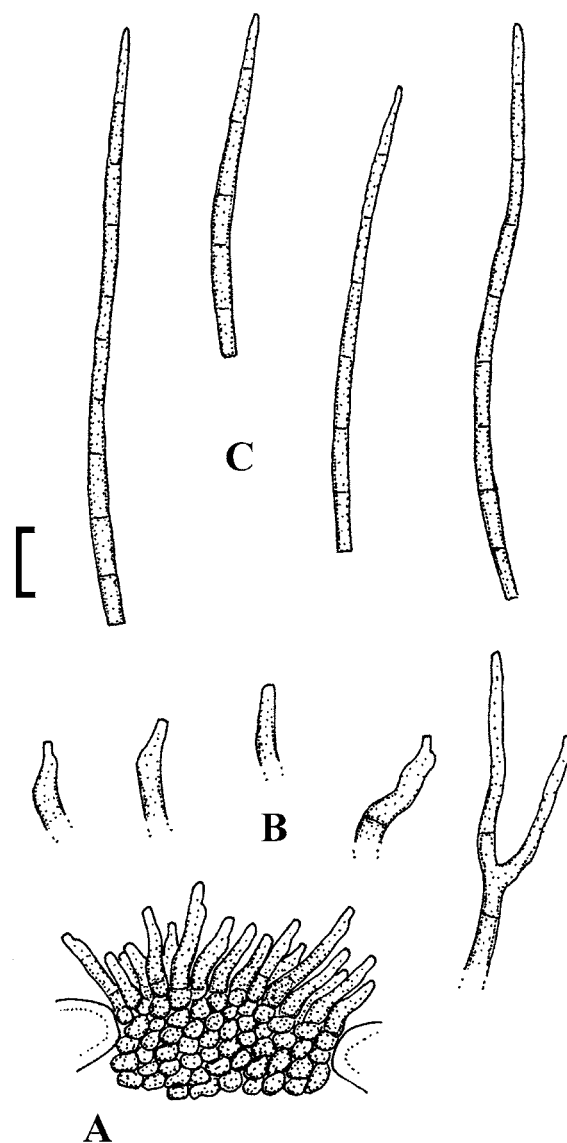


Fig. 55. *Pseudocercospora thelypteridis* (NCHUPP-227). A. Conidiophore fascicle. B. Conidiophores. C. Conidia. Bar = 10  $\mu$ m.

walled, smooth, apex acute or subacute, base truncate, about 2.5–3  $\mu$ m wide, hila neither thickened nor darkened.

**Types:** Taiwan: Yilan, on *Rumohra adiantiformis*, *Dryopteridaceae*, 4 Dec. 1985, W. H. Hsieh (NCHUPP-228 – holotype; K(M) IMI 312068 – isotype).

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

***Pseudocercospora thelypteridis*** Goh & W.H. Hsieh, *Trans. Mycol. Soc. Republ. China* 4(2): 30 (1989). (Fig. 55)

**Literature:** Hsieh & Goh (1990: 329), Guo & Hsieh (1995: 330), Guo *et al.* (1998: 345).

**Illustrations:** Hsieh & Goh (1990: 331, fig. 251), Guo & Hsieh (1995: 332, fig. 279), Guo *et al.* (1998: 345, fig. 284).

**Description:** Leaf spots amphigenous, angular-irregular, up to 3 mm diam, brown, margin indefinite. *Caespituli* epiphyllous, punctiform, dark brown to blackish. *Mycelium* internal. Stromata immersed, irregularly shaped, 20–35  $\mu\text{m}$  diam, dark brown. *Conidiophores* numerous, densely fasciculate, arising from stromata, erumpent, erect, straight to curved, cylindrical-filiform, not geniculate, simple or sometimes branched, somewhat narrowed towards the apex, 10–60  $\times$  2–3  $\mu\text{m}$ , continuous, rarely septate, subhyaline to pale olivaceous, paler towards the apex, tips rounded to truncate, thin-walled, smooth; conidiogenous cells integrated, terminal or conidiophores reduced to conidiogenous cells, conidiogenous loci inconspicuous. *Conidia* solitary, acicular-filiform, 50–120  $\times$  2.5–3  $\mu\text{m}$ , 5–12-septate, subhyaline to pale olivaceous, thin-walled, smooth, apex pointed, base truncate or subtruncate, about 1.5–2  $\mu\text{m}$  wide, hila neither thickened nor darkened.

**Holotype: Taiwan:** Taipei, Yangmingshan, on *Metathelypteris laxa* (*Thelypteris laxa*), *Thelypteridaceae*, 30 Aug. 1986, T. K. Goh (NCHUPP-227).

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

### *Zasmidium*

A single species.

***Zasmidium australiense*** (J.L. Mulder) U. Braun & Crous, **comb. nov.**

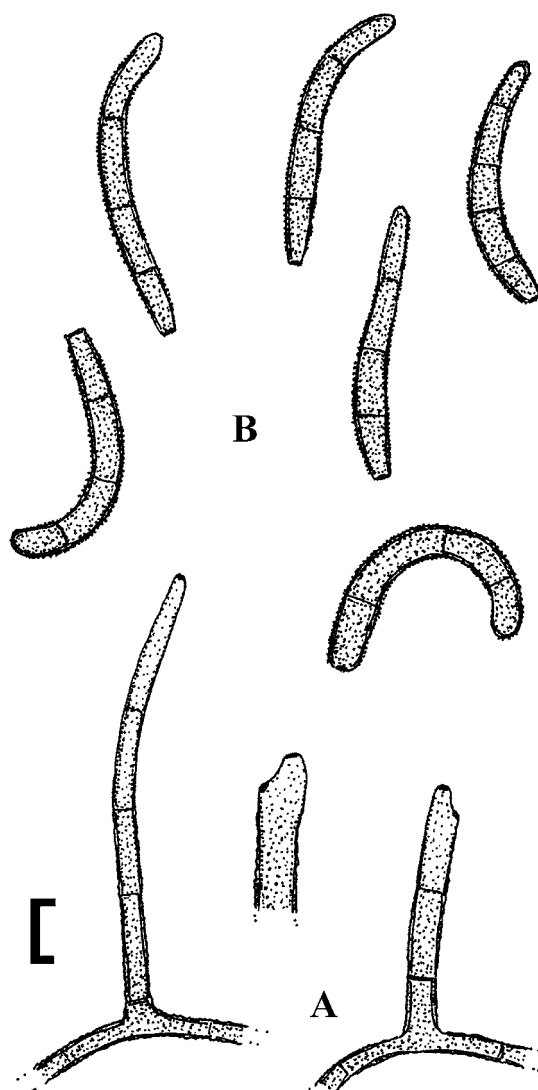
MycoBank MB805530

(Fig. 56)

**Basionym:** *Stenella australiense* J.L. Mulder, *Mycol. Res.* **92**: 119 (1989).

**Illustration:** Mulder (1989: 119–121, figs 1–6).

**Description:** Leaf spots lacking, attacked areas only chlorotic corresponding to the areas delimited by veins, similar chlorotic areas also on the upper surface. Colonies hypophyllous, effuse, forming greyish brown patches. *Mycelium* internal and external; superficial hyphae forming mycelial mats or a loose reticulum on the leaf surface, becoming darker brown with age, branched, septate, rarely constricted at septa, about 4–5  $\mu\text{m}$  wide, strongly echinulate, rarely smooth. Stromata absent. *Conidiophores* solitary, arising from superficial hyphae, lateral, rarely terminal, erect, straight, subcylindrical, usually unbranched, at most apically somewhat geniculate, up to 160  $\times$  3.5–5.5  $\mu\text{m}$ , septate, dark brown, conspicuously echinulate with crested type projections, denser than in conidia; conidiogenous cells integrated, terminal, proliferation sympodial, occasionally percurrent; conidiogenous loci distinct, non-protuberant, thickened and darkened-refractive, about 1–1.5  $\mu\text{m}$  diam. *Conidia* solitary,



**Fig. 56.** *Zasmidium australiense* (K(M) IMI 273944). **A.** Conidiophores arising from superficial hyphae. **B.** Conidia. Bar = 10  $\mu\text{m}$ .

cylindrical, straight to distinctly curved, about 30–70  $\times$  3–5.5  $\mu\text{m}$ , (1–)3–4(–5)-septate, brown, wall thin, echinulate (crested projections), less dense than in conidiophores and lacking around hila, apex obtuse, rounded, base rounded to truncate, hila slightly thickened and darkened.

**Holotype: Australia:** Peregrin beach, on leaves of *Blechnum serrulatum* (*B. indicum*), *Blechnaceae*, 3 Dec. 1982, J. L. Alcorn 8240b (K(M) IMI 273944).

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

**Notes:** Due to scolecosporous conidia formed singly and truncate scars and hila, this species is reallocated to *Zasmidium*.

## CERCOSPOROID SPECIES ON GYMNOSPERMAE

*Passalora* species on GymnospermaeKey to the species of *Passalora* on Gymnospermae

- 1      Stromata 20–80 µm diam; conidiophores fasciculate, 20–90 µm long, 2–5-septate; conidia 30–65 × 4–6 µm, 1–6-septate; on hosts of various genera of the *Cupressaceae*, including *Juniperus*, Asia, North and South America ..... **P. sequoiae**
- Stromata larger, up to 150 µm wide and 120 µm deep; conidiophores in sporodochial conidiomata, shorter, about 10–40 µm long, 0–1-septate; conidia about 15–45 × 4–5 µm, 0–4-septate; on *Juniperus communis*, Europe, North America ..... **P. juniperina**

List of *Passalora* species on Gymnospermae

**Passalora juniperina** (Georgescu & Badea) H. Solheim, *Agarica* **33**: 78 (2013).

(Fig. 57)

*Basionym*: *Cercospora juniperina* Georgescu & Badea, *Analele Inst. Cercet. Exp. Forest., Ser. 1*, **2**: 46 (1937).

*Synonyms*: *Stigmina juniperina* (Georgescu & Badea) M.B. Ellis, *Mycol. Pap.* **72**: 67 (1959).

*Asperisporium juniperinum* (Georgescu & Badea) B. Sutton & Hodges, *Mycologia* **82**: 317 (1990).

*Literature*: Jaczewski (1901), Kujala (1950), Chupp (1954: 440), Hodges (1962: 66), Ellis (1976: 119), Kurkela (1994), Sutton & Hodges (1990), Crous & Braun (2003: 233), Barklund (2006), Solheim (2013).

*Illustrations*: Ellis (1976: 120, fig. 84B), Hodges (1962: 65, fig. 2C), Sutton & Hodges (1990: 318, fig. 2), Solheim (2013: figs 2–5).

*Exsiccatae*: Sävul., *Herb. Mycol. Rom.* 1200 (“*Exosporium deflectens*”). Scheuer, *Mycoth. Graec.* 249.

*Description*: Causing needle blight, attacked hosts only partly with dead needles or needles almost completely necrotic, needles at first light brown, later greyish brown to grey. *Colonies* amphigenous, mainly epiphyllous, scattered or in lines, dark brown to blackish, punctiform to pustulate. *Mycelium* internal, usually epidermal and subepidermal; hyphae branched, septate, 2–6 µm wide, brown, thin-walled, smooth. *Stromata* substomatal, intraepidermal to deeply immersed, finally also erumpent, often expanded and large, up to 150 µm diam and 120 µm deep, medium to darker brown, composed of dense, rounded to mostly angular cells, about 2.5–8 µm diam, wall somewhat thickened. *Conidiomata* sporodochial, composed of large stromata and numerous, densely arranged conidiophores, emerging through stomata or erumpent, erect, straight to slightly curved, subcylindrical, unbranched, (5–)10–35(–40) × 3–7(–9) µm, 0–1-septate, olivaceous-brown, yellowish brown, thin-walled, smooth or almost so; conidiophores mostly reduced to conidiogenous cells or conidiogenous cells integrated, terminal, proliferation sympodial, occasionally percurrent, conidiogenous loci 1–3, rather inconspicuous to conspicuous, slightly thickened and somewhat refractive, little darkened, (1.5–)2(–2.2) µm

wide. *Conidia* solitary, cylindrical to obclavate-cylindrical of fusiform, 15–45 × (3–)4–5(–6.5) µm, 0–3(–4)-septate, without constrictions at septa, olivaceous to yellowish brown, thin-walled, delicately verruculose, apex obtuse, base rounded to short obconically truncate, 1.5–2.2 µm wide, hila barely or only slightly thickened, refractive, barely darkened.

*Types*: **Romania**: on *Juniperus communis*, Georgescu & Badea [holotype not seen, probably not maintained]; **Romania**: Sinaia, Distr. Prahova, Muntenia, on *Juniperus communis*, 10 May 1937, T. Savulescu & C. Sandu, *Herb. Mycol. Rom.* 1200, as “*Exosporium deflectens*” (K(M) IMI 84601 – **neotype designated here**, MycoBank, MBT176149).

*Host range and distribution*: on *Juniperus communis* [var. *communis*, var. *depressa* (*J. intermedia*), var. *saxatilis* (*J. nana*)], *Cupressaceae*, Europe (Finland, Norway, Romania, Sweden, Russia), North America (Canada, Ontario; USA, Iowa, Michigan, Wisconsin).

*Note*: Material recently collected in Russia, Novgorod Oblast, 2002, by V.A. Mel'nik has been distributed in Mycotheca Graecensis 249 (e.g. BPI 858449, GZU, HAL).

**Passalora sequoiae** (Ellis & Everh.) Y.L. Guo & W.H. Hsieh, *Fl. Fung. Sin.* **20**: 120 (2003).

(Fig. 58)

*Basionym*: *Cercospora sequoiae* Ellis & Everh., *J. Mycol.* **3**(2): 13 (1887).

*Synonyms*: *Asperisporium sequoiae* (Ellis & Everh.) B. Sutton & Hodges, *Mycologia* **82**: 314 (1990).

*Cercosporidium sequoiae* (Ellis & Everh.) W.A. Baker & Partr., *Mycotaxon* **76**: 250 (2000).

*Cercospora cryptomeriae* Shirai, in Kitajima, *Bot. Mag. Tokyo* **30**: 412 (1916).

*Cercospora thujina* Plakidas, *Phytopathology* **35**: 181 (1945) [*syntypes*: on *Platycladus orientalis*, USA, Louisiana, Baton Rouge, 3 June 1943, A.G. Plakidas, BPI 441926A–C, and 25 Jul. 1943, BPI 441925A–C].

*Literature*: Saccardo (1892: 653), Kitajima (1916: 412), Chupp (1954: 439), Hodges (1962: 62–63), Katsuki (1965: 51), Mulder & Gibson (1973), Hsieh & Goh (1990: 326), Sutton & Hodges (1990: 314–315), Baker *et al.* (2000: 250), Crous & Braun 2003: 373).



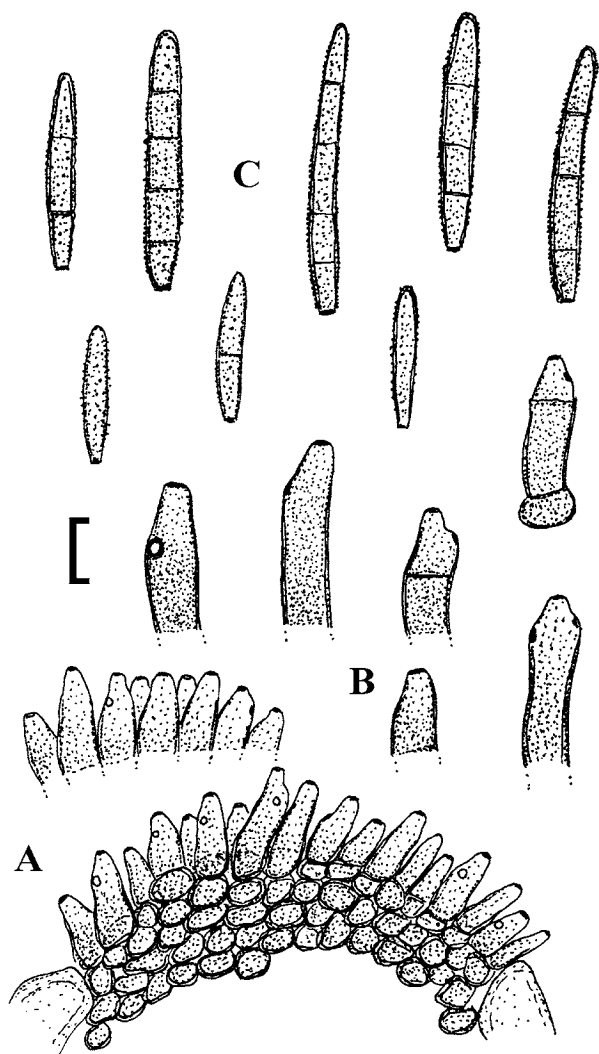


Fig. 57. *Passalora juniperina* (K(M) IMI 84601). A. Conidiophore fascicles. B. Conidiophores. C. Conidia. Bar = 10  $\mu$ m.

**Illustrations:** Hodges (1962: 63, figs. 1A, 2A), Hsieh & Goh (1990: 326, fig. 247), Sutton & Hodges (1990: 315, fig. 1), Baker et al. (2000: 251, fig. 1), Guo et al. (2003: 121, fig. 78).

**Exsiccatae:** Davis, Fungi Wiscon. Exs. 25. Ellis & Everh., North Amer. Fungi 1754.

**Description:** Leaves (needles, scale leaves) at first with small, subcircular lesions, yellowish brown to medium reddish or dark brown, scattered, later enlarged and confluent, finally entire leaves becoming necrotic, brown or greyish brown; twig symptoms visible as pale brown, irregular lesions, later enlarged and confluent, finally turning reddish brown towards the tips. *Caespituli* punctiform-pustulate, scattered, brown or visible as dark greyish masses of conidia. Mycelium internal. *Stromata* substomatal to immersed, intraepidermal to deeply immersed, erumpent, subglobose to hemispherical or somewhat irregular, 25–100  $\mu$ m diam, dark brown, composed of swollen hyphal cells, rounded to isodiametric, 2.5–8  $\mu$ m diam. *Conidiophores* in small to usually large fascicles, loose to usually dense, arising from stromata, through stomata or erumpent, erect, straight to curved or

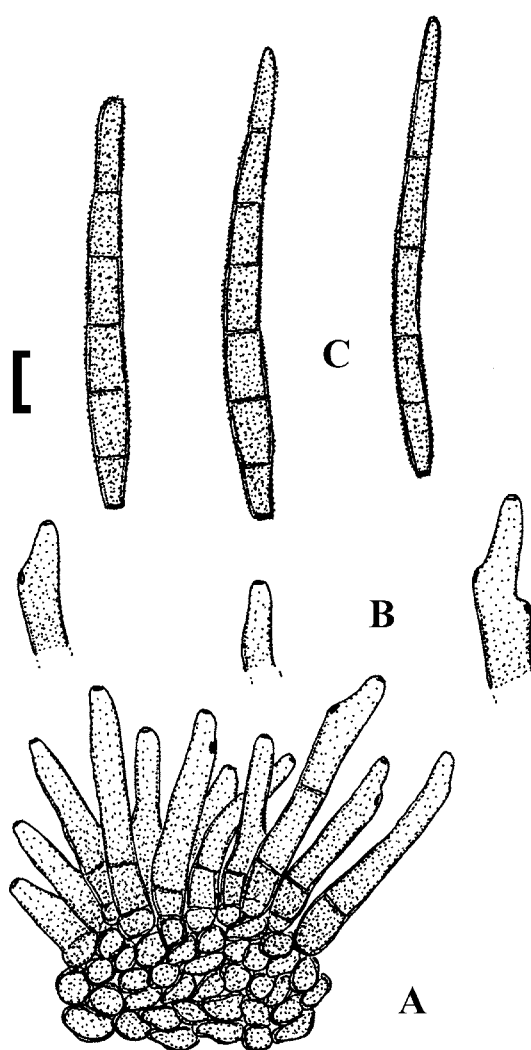


Fig. 58. *Passalora sequoia* (BPI 441133). A. Conidiophore fascicle. B. Conidiophore tips. C. Conidia. Bar = 10  $\mu$ m.

frequently geniculate-sinuuous, above all in the upper half, unbranched, 20–90  $\times$  2.5–8  $\mu$ m, 2–5-septate, medium brown to dark brown throughout or paler towards the tip, olivaceous-brown, thin-walled, smooth or almost so, occasionally somewhat verruculose; conidiogenous cells integrated, terminal, about 10–40  $\mu$ m long, polyblastic, proliferating sympodially, rarely percurrently, with 1–6 distinctly thickened and darkened conidiogenous loci, 2–2.5  $\mu$ m diam, mostly on shoulders formed by sympodial proliferation. *Conidia* solitary, obclavate-cylindrical, straight to somewhat curved, 30–80  $\times$  4–9  $\mu$ m, 1–15-septate, occasionally somewhat constricted at the septa, yellowish to pale olivaceous-brown or brown, thin-walled, verruculose-echinulate, apex obtuse, rounded, base short obconically truncate, about 2–2.5  $\mu$ m wide, hila slightly thickened and darkened.

**Lectotype (designated here, MycoBank, MBT176150):** USA, Pennsylvania: Germantown, on *Sequoiadendron giganteum*, Sep. 1886, Meehan Thomas H., Ellis & Everh., North Amer. Fungi 1754 (BPI 441133). Isolectotypes: Ellis & Everh., North Amer. Fungi 1754.

**Host range and distribution:** On *Cryptomeria japonica*, ×*Cupressocyparis leylandica*, *Cupressus* (*lusitanica*, *macrocarpa*, *sempervirens*), *Glyptostrobus pensilis*, *Hesperocyparis arizonica* (*Cupressus arizonica*), *Juniperus* (*communis*, *chinensis*, *virginiana*), *Platycladus orientalis* (*Thuja orientalis*), *Sequoiadendron giganteum*, *Sequoia sempervirens*, *Taxodium* (*distichum*, *mucronatum*), *Cupressaceae*, Asia (China, Japan), North America (Canada; USA, Alabama, North Carolina, Louisiana, Oklahoma, Pennsylvania), South America (Brazil, Guatemala), Caribbean (Jamaica), Hawaii.

**Notes:** A specimen on *Cryptomeria japonica* from Taiwan (24 Sep. 1928, K. Sawada, TNS-F220395) and various Japanese collections on *C. japonica* (IUM-FS58, IUM-FS61, MUMH10801, TFM:FPH-41, TFM:FPH-67) and *Taxodium mucronatum* (TFM:FPH-3395) have been re-

examined. Furthermore, cultures ex *Cryptomeria japonica* (MAFF237184, MAFF410035, MAFF410800, MAFF 410802, MUCC780 ex MUMH 10801) and ex *Taxodium mucronatum* (MAFF410034) exist. ITS1-5.8S-ITS2 (V9G/ITS4) & ACT (ACT512F/ACT783R) sequences obtained from these isolates are identical, suggesting that this fungus, at least in Japan, represents a uniform species. Sequences derived from cultures of *Cercospora juniperina* cluster close to *P. sequoiae* together with various other *Passalora* species, which supports the position of the two species in *Passalora*, at least tentatively as the latter genus is not monophyletic.

In Japan, the causal agent of needle blight of *Cryptomeria japonica* was described by Shirai (in Kitajima 1916) as *Cercospora cryptomeriae*, which was already reduced to synonym with *Cercospora sequoiae* by Ito *et al.* (1958, 1967) based on agreeing morphological characteristics.

## ***Pseudocercospora* species on Gymnospermae**

### **Key to the species of *Pseudocercospora* on Gymnospermae**

- |       |   |                                    |
|-------|---|------------------------------------|
| 1     | Conidia very broad, 5–8 µm .....  | 2                                  |
|       | Conidia narrower, 2–5 µm .....  | 5                                  |
| 2 (1) | Conidiophores very long, 50–120 µm; on <i>Cryptomeria</i> , Japan .....   | <b>P. cryptomeriicola</b>          |
|       | Conidiophores much shorter, 10–60 µm; on other hosts .....  | 3                                  |
| 3 (2) | Conidia very long and broad, 65–135 × 9–13 µm; on twigs of <i>Pinus</i> , Japan .....   | <b>[Scolecostigmia chibaensis]</b> |
|       | Conidia shorter and narrower, 18–55 × 2–8 µm; on leaves .....   | 4                                  |
| 4 (3) | Stromata well-developed, 150–250 µm diam and 70–130 µm deep or oblong, up to 500 µm in length; conidia smooth; on <i>Thuja plicata</i> , North America, and <i>Chaemaecyparis lawsoniana</i> , Hawaii .....       | <b>P. thujina</b>                  |
|       | Stromata lacking or small, up to 30 µm diam; conidia rough-walled; on <i>Chamaecyparis obtusa</i> , Japan .....   | <b>P. chamaecyparidis</b>          |
| 5 (1) | Stromata almost lacking or relatively small, 10–50 µm; conidiophores fasciculate .....  | 6                                  |
|       | Stromata large, 20–150(–300) µm diam; conidiomata sporodochial .....  | 9                                  |
| 6 (5) | Stromata lacking or small, up to 30 µm; conidiophores usually percurrently proliferating, with up to five fine annellations; conidia 18–50 µm long and 5–10-septate; on <i>Chamaecyparis obtusa</i> , Japan ..... | <b>P. chamaecyparidis</b>          |
|       | Stromata 20–50 µm diam; conidiophores sympodially proliferating; conidia mostly longer, exceeding 50 µm; on other hosts .....   | 7                                  |
| 7 (6) | Conidiophores often branched; conidia pale brown; leaf lesions characteristically marginal; on <i>Ginkgo biloba</i> , Taiwan .....  | <b>P. ginkgoana</b>                |
|       | Conidiophores usually unbranched; conidia subhyaline to pale olivaceous; lesions not confined to leaf margins; on other hosts .....   | 8                                  |
| 8 (7) | Stromata 20–50 µm diam; on <i>Sequoia sempervirens</i> (in inoculation experiments also on <i>Larix kaempferi</i> ), Japan .....  | <b>P. paraexosporioides</b>        |
|       | Stromata 20–150 µm diam; on <i>Pinus</i> spp., Africa, Asia, Central and South America, Caribbean .....   | <b>P. pini-densiflorae</b>         |
| 9 (5) | Conidia acicular or narrowly cylindrical, 35–93 × 2–3 µm, only 3–5-septate, base truncate; on <i>Sciadopitys verticillata</i> , Japan .....   | <b>P. sciadopityos</b>             |
|       | Conidia cylindrical or obclavate-cylindrical, shorter, (10–)20–65(–80) µm long, at least partly short obconically truncate at the base; on other hosts .....  | 10                                 |

- 10 (9) Conidiogenous cells sympodially and often also percurrently proliferating, with fine annellations; conidia more or less cylindrical, base truncate to short obconically truncate; on *Cryptomeria*, *Hesperocyparis* and *Juniperus*, *Cupressaceae*, Asia and North America ..... **P. juniperi**  
 Conidiophores sympodially proliferating, without annellations; conidia short cylindrical or obclavate-cylindrical, base short obconically truncate; on hosts of the *Pinaceae* ..... 11
- 11 (10) Conidia cylindrical, relatively short, (15–)20–40(–50) µm; on *Larix decidua*, Europe ..... **P. exosporioides**  
 Conidia obclavate-cylindrical, usually (10–)20–60(–80) µm long; on *Pinus* spp., Africa, Asia, Central and South America, Caribbean ..... **P. pini-densiflorae**

### Tabular key to the species of *Pseudocercospora* on *Gymnospermae*

#### Cupressaceae

- 1 Conidia very broad, 5–8 µm ..... 2  
 Conidia narrower, 2–5 µm ..... 4
- 2 (1) Conidiophores very long, 50–120 µm; on *Cryptomeria*, Japan ..... **P. cryptomeriicola**  
 Conidiophores much shorter, 10–60 µm; on other hosts ..... 3
- 3 (2) Stromata well-developed, 150–230 µm diam and 70–120 µm deep; conidia smooth; on *Thuja plicata*, North America ..... **P. thujina**  
 Stromata lacking or small, up to 30 µm diam; conidia rough-walled; on *Chamaecyparis obtusa*, Japan ..... **P. chamaecyparidis**
- 4 (1) Stromata lacking or small, up to 30 µm; conidiophores fasciculate, usually percurrently proliferating, with up to five fine annellations; conidia cylindrical to obclavate, 5–10-septate; on *Chamaecyparis obtusa*, Japan ..... **P. chamaecyparidis**  
 Stromata large, 30–150 µm diam; conidiomata sporodochial; conidiogenous cells sympodially and often also percurrently proliferating, with fine annellations; conidia more or less cylindrical, 3–5-septate, base truncate to short obconically truncate; on *Cryptomeria*, *Hesperocyparis* and *Juniperus*, *Cupressaceae*, Asia and North America ..... **P. juniperi**

#### Ginkgoaceae

- On *Ginkgo biloba*, Taiwan ..... **P. ginkgoana**

#### Pinaceae

- 1 Conidia very long and broad, 65–135 × 9–13 µm; on twigs of *Pinus*, Japan ..... [**Scolecostigmia chibaensis**]  
 Conidia narrower, 2–5 µm; on leaves ..... 2
- 2 (1) Conidia cylindrical, relatively short, (15–)20–40(–50); on *Larix decidua*, Europe ..... **P. exosporioides**  
 Conidia obclavate-cylindrical, longer, (10–)20–80 µm; on *Pinus* (or *Larix* but only in inoculation experiments ..... 3
- 3 (2) Stromata 20–150 µm diam; on *Pinus* spp., Africa, Asia, Central and South America, Caribbean ..... **P. pini-densiflorae**  
 Stromata 20–50 µm diam; usually on *Sequoia sempervirens*, *Cupressaceae* (in inoculation experiments also on *Larix kaempferi*), Japan ..... **P. paraexosporioides**

#### Sciadopityaceae

- On *Sciadopitys verticillata*, Japan ..... **P. sciadopityos**

### List of *Pseudocercospora* species on *Gymnospermae*

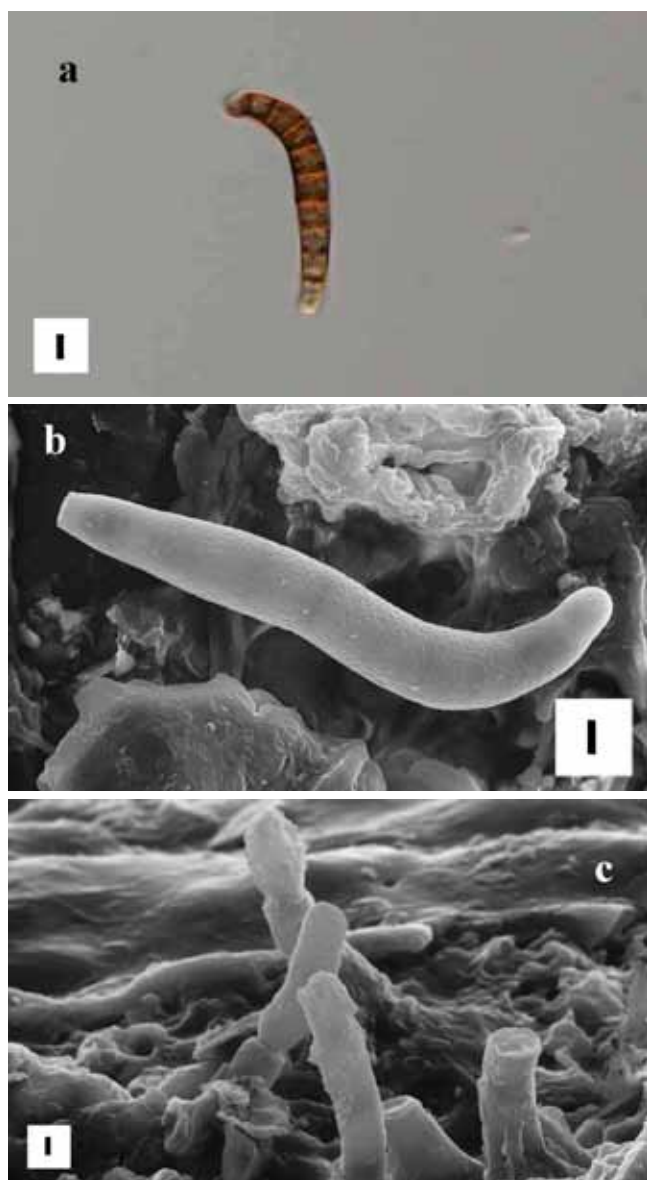
***Pseudocercospora chamaecyparidis*** (Sawada) C. Nakash. & U. Braun, **comb. nov.**

MycoBank MB805531

(Fig. 59)

*Basionym:* *Cercospora chamaecyparidis* Sawada, *Bull. Gov. Forest Exp. Sta., Meguro, Tokyo* **45**: 122 (1950).

*Description:* Leaves turning pale brown to brown, finally grey. *Caespituli* hypophyllous, formed as scattered, blackish sporodochia, erumpent. *Stromata* lacking or small, up to 30 µm, brown to blackish brown. *Conidiophores* fasciculate, arising from internal mycelium or stromata, straight, subcylindrical, 10–50 × 2.5–5 µm, aseptate or septate, brown to blackish brown, wall thin or only slightly thickened, smooth; conidiogenous cells integrated, terminal, proliferating percurrently or occasionally sympodially, often with



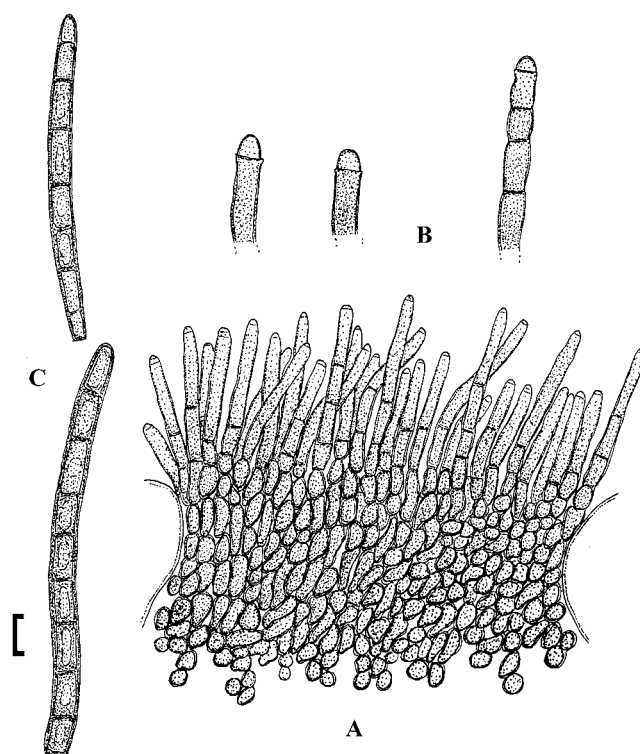
**Fig. 59.** *Pseudocercospora chamaecyparidis* (IUM-F557). **a.** Conidium (light microscopy). **b.** Conidium (SEM). **c.** Conidiophores (SEM). Bar = 10  $\mu$ m (a), 5  $\mu$ m (b) and 2  $\mu$ m (c).

annellations, loci thin, unthickened to somewhat protuberant. *Conidia* solitary, cylindrical to obclavate, straight, curved or sigmoid, 18–50  $\times$  2–8  $\mu$ m, 5–10-septate, brown to reddish brown, smooth to faintly rough-walled (light microscopy), verruculose under SEM, thin, apex obtuse, rounded, base truncate and unthickened, 2–3.8  $\mu$ m wide.

**Holotype:** **Japan:** Fukushima, on *Chamaecyparis obtusa*, 22 Dec. 1949, H. Ootomo (IUM-F557).

**Host range and distribution:** On *Chamaecyparis obtusa*, Cupressaceae, Asia (Japan).

**Notes:** *Cercospora chamaecyparidis* was described by Sawada based on Japanese material on *Chamaecyparis obtusa*. The type material, which has been re-examined, is morphologically close to the North American *Pseudocercospora thujina* (*Stigmia thujina*) on *Thuja plicata*, but



**Fig. 60.** *Pseudocercospora cryptomeriicola* (TFM:FPH-1085). **A.** Conidiophore fascicle. **B.** Conidiophores. **C.** Conidia. Bars = 10  $\mu$ m.

beside a different host it is distinguished by having much smaller or even lacking stromata. Thus it is better to retain this fungus as separate species.

***Pseudocercospora cryptomeriicola*** (Sawada) C. Nakash., Akashi & Akiba, in Nakashima *et al.*, *Mycoscience* **48**: 254 (2007).

(Fig. 60)

**Basionym:** *Cercospora cryptomeriicola* Sawada, *Bull. Gov. Forest, Exp. Sta. (Tokyo)* **45**: 53 (1950).

**Synonym:** *Distocercospora cryptomeriicola* (Sawada) Akashi, C. Nakash. & Tak. Kobay., *Abstr. Jap. Forest. Soc.*: 117 (2006), *nom. inal.* (Art. 29.1).

**Literature:** Katsuki (1965: 51), Crous & Braun (2003: 146).

**Illustrations:** Nakashima *et al.* (2007: 252, fig. 2; 253, figs 3–12).

**Description:** Causing black line needle blight of *Cryptomeria*, leaves and stems discoloured, yellowish to brown, at first with smaller spots, finally entire needles affected. *Colonies* visible as fungal masses consisting of olivaceous conidiophores and conidia in lines from base to top on necrotic needles. *Mycelium* internal. *Stromata* well-developed, immersed, later erumpent, subglobose, about 90–275  $\mu$ m diam, dark olivaceous-brown to black, composed of swollen hyphal cells, rounded to angular or oblong. *Conidiophores* in large, loose to dense fascicles, arising from stromata, forming sporodochial conidiomata, erumpent, simple or rarely branched, subcylindrical, straight to slightly sinuous, 50–120  $\times$  3–5  $\mu$ m, 1–7-septate, dark brown to blackish, wall smooth,



slightly thickened; conidiogenous cells integrated, terminal, percurrently proliferating, with conspicuous annellations, conidiogenous loci neither thickened nor darkened. *Conidia* solitary, cylindrical-obclavate, straight to slightly curved,  $50\text{--}80 \times 5\text{--}8 \mu\text{m}$ , 7–13-septate, occasionally distosepta mixed with eusepta, pale brown to brown, wall somewhat thickened, smooth or almost so, apex rounded, base truncate to obconically truncate,  $2.5\text{--}3.8 \mu\text{m}$  wide, hila neither thickened nor darkened.

**Holotype: Japan:** Yamagata, Kamabuchi, on *Cryptomeria japonica*, 8 Aug. 1949, Sato (Herbarium, Museum of Iwate University, Japan).

**Host range and distribution:** On leaves and stems of *Cryptomeria japonica*, Japan, *Cupressaceae*, Asia (Japan, endemic).

**Notes:** A culture (NBRC 102150) and several collections of this species, which is endemic in Japan, have been examined (TFM:FPH-1085, 1088, 7850 and 7851). Due to unthickened conidiogenous loci and conidial hila as well as its proven phylogenetic position in the *Pseudocercospora* clade, Nakashima *et al.* (2007) reallocated this species to *Pseudocercospora*, although the formation of well-developed sporodochia, percurrently proliferating conidiogenous cells and large, above all broad, dark and thick-walled conidia are rather *Scolecostigma*-like.

***Pseudocercospora exosporioides* (Bubák) B. Sutton & Hodges, *Mycologia* 82: 320 (1990).**

(Fig. 61)

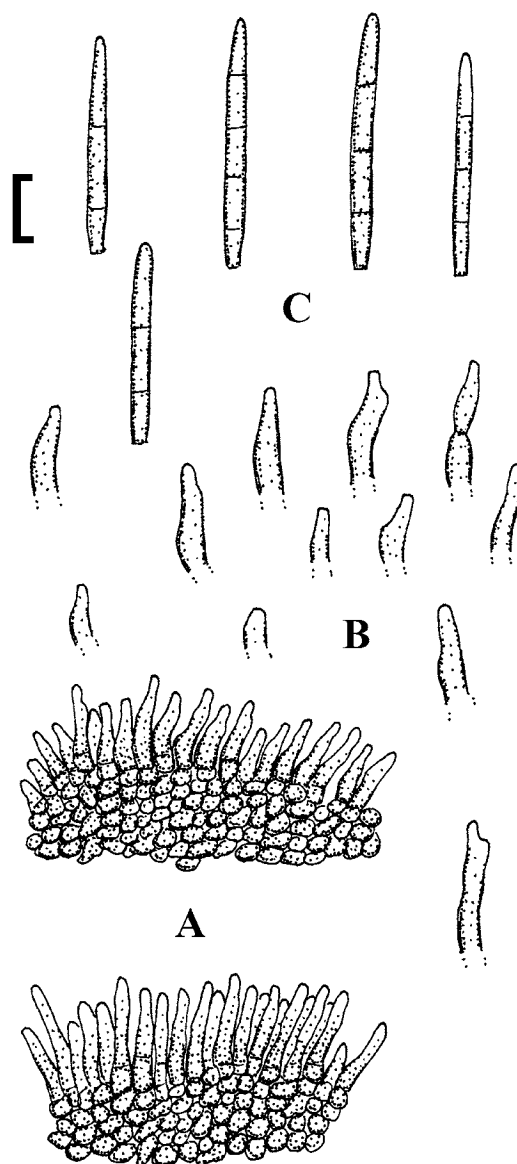
**Basionym:** *Cercospora exosporioides* Bubák, *Ann. Mycol.* 13: 33 (1915).

**Literature:** Saccardo (1931: 873), Vassiljevsky & Karakulin (1937: 252), Chupp (1954: 439), Crous & Braun (2003: 181).

**Illustration:** Sutton & Hodges (1990: 321, fig. 4).

**Exsiccatae:** Petrak, Fl. Bohem. Morav. Exs. 1351.

**Description:** Causing needle blight, at first forming small brown to reddish brown discolorations, later expanded, often at tips, finally entire needles discoloured, necrotic, dead and shed. *Colonies* amphigenous, punctiform to pustulate, dark. *Mycelium* internal; hyphae branched, septate,  $2\text{--}10 \mu\text{m}$  diam, brown, smooth or almost so. *Stromata* well-developed, immersed, large, sometimes confluent, about  $50\text{--}150 \mu\text{m}$  diam, sometimes up to  $300 \mu\text{m}$  in length, dark brown, sometimes with a reddish tinge, composed of swollen hyphal cells,  $2\text{--}8 \mu\text{m}$  diam, rounded in outline to angular. *Conidiophores* numerous to very numerous, arising from stromata, erumpent, forming large, dense sporodochial conidiomata, erect, straight to somewhat curved-sinuuous, subcylindrical to somewhat conical (attenuated towards the tip), not, barely or only slightly geniculate, unbranched,  $5\text{--}30 \times 2\text{--}4.5 \mu\text{m}$ , 0–1(–2)-septate, pale yellowish to olivaceous-brown throughout or paler towards the tip, thin-walled, smooth or almost so; conidiophores reduced to



**Fig. 61.** *Pseudocercospora exosporioides* (LEP, isolectotype). A. Conidiophore fascicle. B. Conidiophores. C. Conidia. Bar =  $10 \mu\text{m}$ .

conidiogenous cells or conidiogenous cells integrated, terminal,  $5\text{--}25 \mu\text{m}$  long, conidiogenous loci inconspicuous, neither thickened nor darkened. *Conidia* solitary, cylindrical to slightly obclavate-cylindrical, somewhat attenuated towards the tip, straight to slightly curved,  $(15\text{--})20\text{--}40\text{--}(50) \times 2\text{--}3.5 \mu\text{m}$ , (1)–3–4(–5)-septate, subhyaline to pale olivaceous, thin-walled, smooth or almost so to somewhat rough-walled, apex obtuse, base short obconically truncate,  $1.5\text{--}2 \mu\text{m}$  wide, hila neither thickened nor darkened.

**Lectotype (designated here, MycoBank, MBT176151):** **Czech Republic:** Moravia, Hranice (Mährisch Weisskirchen), Ludinabach, on needles of *Larix decidua*, 8 Oct. 1914, F. Petrak (BPI 436251); isolectotypes: K(M) IMI 24163, LEP; Petr., Fl. Bohem. Morav. Exs. 1351, e.g. HBG.

**Host range and distribution:** On needles of *Larix decidua*, *Pinaceae*, Europe (Czech Republic).

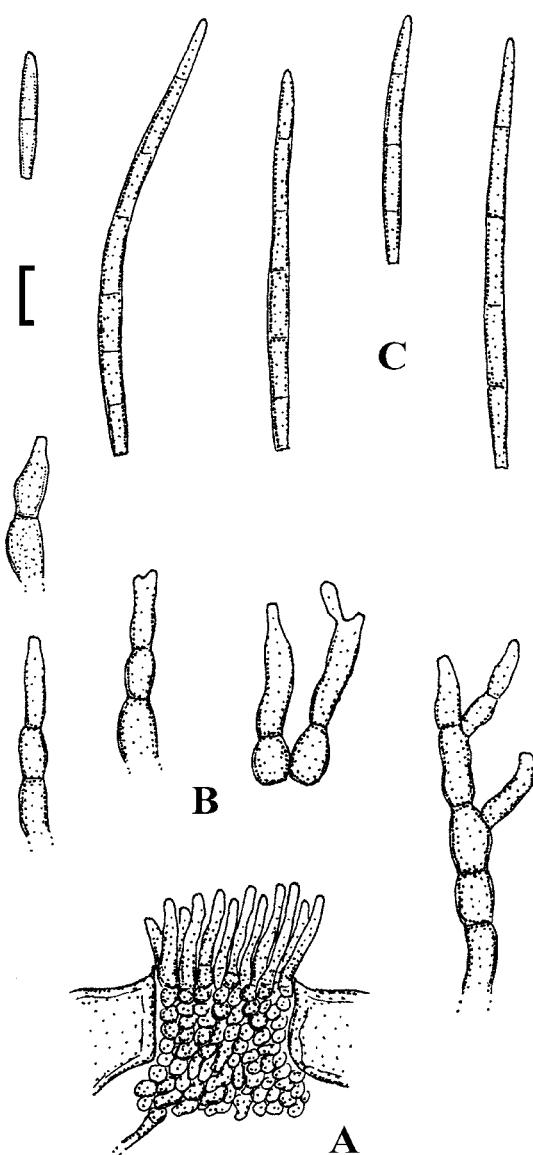


Fig. 62. *Pseudocercospora ginkgoana* (TNM, holotype). A. Conidiophore fascicle. B. Conidiophores. C. Conidia. Bar = 10  $\mu$ m.

**Notes:** The material deposited at BPI is marked as “holotype”, but there are several duplicates of the type collection (syntypes) housed in several other herbaria. Therefore, it is proposed to designate the BPI material as lectotype.

***Pseudocercospora ginkgoana*** R. Kirschner, *Mycol. Progr.* **12**: 423 (2013). (Fig. 62)

**Illustration:** Kirschner & Okuda (2013: 423, fig. 1A–E).

**Description:** Lesions marginal, visible as necrotic, brown leaf margins with yellowish border towards the healthy green leaf blade. *Caespituli* amphigenous. *Mycelium* internal; hyphae intercellular, 2–3  $\mu$ m wide, hyaline to pale brown, smooth. *Stromata* developed, amphigenous, about 30–40  $\mu$ m diam, immersed, erumpent through the epidermis, composed of brown swollen hyphal cells, 3–11  $\times$  3–5  $\mu$ m. *Conidiophores* numerous, in dense fascicles, arising from stromata, erumpent,

erect, straight, subcylindrical, somewhat curved to distinctly geniculate, simple or branched, (18–)26–57(–78)  $\times$  3–5(–7)  $\mu$ m, continuous or 1- to pluriseptate, pale to medium brown, thin-walled, smooth; conidiophores reduced to conidiogenous cells or conidiogenous cells integrated, terminal, occasionally pleurogenous, (8–)9.5–16.5(–21)  $\times$  2.5–4  $\mu$ m, conidiogenous loci inconspicuous to subdenticulate, truncate and 1–1.5  $\mu$ m wide, but always unthickened and not darkened. *Conidia* solitary, subcylindrical to narrowly obclavate, i.e. narrowed towards the apex and obconically truncate at the base, straight or occasionally curved, (11–)33–65(–75)  $\times$  2–2.5(–3)  $\mu$ m, 1–9-septate, pale brown, thin-walled, smooth, apex obtuse to subacute, base short obconically truncate, 1.5  $\mu$ m wide, hila neither thickened nor darkened.

**Holotype:** **Taiwan:** Taoyuan County, Lasashan, New Century Resort Farm with tea and fruit plantations, ca. 1,500 m alt., on leaves of *Ginkgo biloba*, 22 Oct. 2011, R. Kirschner et al. 3561 (TNM).

**Host range and distribution:** On leaves of *Ginkgo biloba*, *Ginkgoaceae*, Asia (Taiwan).

**Notes:** This is the first *Pseudocercospora* on *Ginkgo*. Kirschner & Okuda (2013) cultivated this fungus, and derived ITS DNA sequence data. A comparison showed a 99 % similarity with sequences of *Pseudocercospora chiangmaiensis*.

***Pseudocercospora juniperi*** (Ellis & Everh.) B. Sutton & Hodges, *Mycologia* **82**: 319 (1990). (Fig. 63)

**Basionym:** *Cercospora sequoiae* var. *juniperi* Ellis & Everh., *J. Mycol.* **3**: 14 (1987).

**Synonym:** *Pseudocercospora ibusukii* C. Nakash. & T. Kobay. (in Kobayashi 2007: 775), *nom. inval.* (Art. 30.8).

**Literature:** Saccardo (1892: 653), Chupp (1954: 440), Peterson & Wysong (1968), Peterson (1977), Crous & Braun (2003: 234).

**Illustration:** Sutton & Hodges (1990: 320, fig. 3).

**Description:** Causing needle blight, with discolorations and leaf spots, yellowish to brown, finally entire leaves discoloured, necrotic; often occurring in young plantations and windbreaks. *Colonies* punctiform to pustulate, paler or dark by abundant conidial formation. *Mycelium* internal; hyphae mainly intraepidermal, but also in the mesophyll, branched, septate, 2–5  $\mu$ m wide, brown. *Stromata* well-developed, substomatal to deeply immersed, about 30–150  $\mu$ m diam, medium to dark brown, composed of swollen hyphal cells, about 3–6  $\mu$ m diam, wall somewhat thickened. *Conidiophores* in small to usually larger, often almost sporodochial fascicles, loose to moderately dense, arising from stromata, through stomata or erumpent, erect, straight, subcylindrical to somewhat geniculate-sinuous, unbranched or rarely branched, 15–40  $\times$  2.5–3.5  $\mu$ m, 0–3-septate, olivaceous-brown, paler towards the tip, thin-walled, smooth; conidiogenous cells integrated, terminal, 10–25  $\mu$ m long, proliferation sympodial or percurrent, with fine annellations, conidiogenous loci

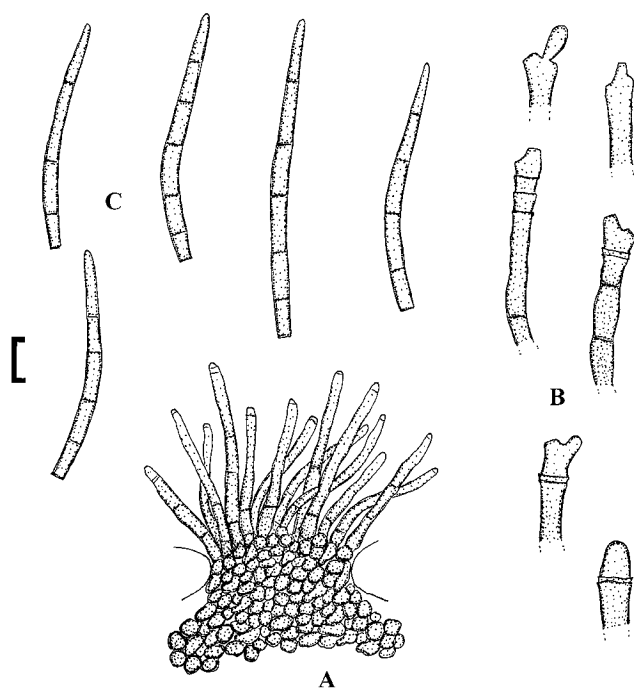


Fig. 63. *Pseudocercospora juniperi* (NY, holotype). A. Conidiophore fascicle. B. Conidiophores. C. Conidia. Bar = 10  $\mu$ m.

truncate, neither thickened nor darkened. *Conidia* solitary, cylindrical, subcylindrical to slightly obclavate-cylindrical, straight to somewhat curved, 30–60  $\times$  2.5–3  $\mu$ m, 3–5-septate, not constricted at the septa, pale olivaceous to olivaceous-brown in mass, thin-walled, almost smooth to rough-walled, apex obtuse, base truncate or slightly obconically truncate, about 2  $\mu$ m wide, hila unthickened, not darkened.

*Holotype*: USA: Wisconsin: Kenosha Co., Power's Lake, on needles of *Juniperus virginiana*, Aug. 1886, J. J. Davis (NY).

*Host range and distribution*: On *Cryptomeria japonica*, *Hesperocyparis arizonica* (*Cupressus arizonica*), *Juniperus* (*communis*, *virginiana*, *Juniperus* sp.), *Cupressaceae*, Asia (Japan), North America (Canada, Ontario; USA, Arizona, Connecticut, Florida, Georgia, Kentucky, Missouri, North Carolina, Nebraska, Oklahoma, South Carolina, Virginia, Wisconsin).

*Notes*: This species was previously confused with *Cercospora juniperina* (see Chupp 1954), but it is easily distinguishable from the latter species by having unthickened, not darkened conidiogenous loci as pointed out by Sutton & Hodges (1990).

***Pseudocercospora paraexosporioides* C. Nakash. & U. Braun, sp. nov.**  
MycoBank MB805532  
(Fig. 64)

*Etymology*: Named for its resemblance to *Pseudocercospora exosporioides*.

*Pseudonym*: *Cercospora exosporioides sensu auct.*

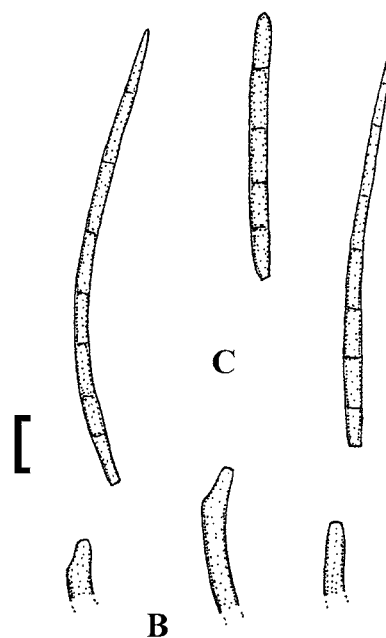


Fig. 64. *Pseudocercospora paraexosporioides* (TFM:FPH-551). A. Conidiophore fascicle. B. Conidiophore tips. C. Conidia. Bar = 10  $\mu$ m.

*Literature*: Katsuki (1965: 51).

*Diagnosis*: Differt a *P. exosporioides* stromatibus minoribus, 20–50  $\mu$ m diam, conidiophoris in fasciculis minoribus et conidiis longioribus, 25–80  $\mu$ m, pluriseptatis (3–10).

*Description*: *Leaf spot* scattered, brown, later enlarged and confluent, yellowish brown to reddish brown or dark brown. *Caespituli* hypophyllous, punctiform, dark olivaceous. *Mycelium* internal. *Stromata* hypophyllous, substomatal to immersed, pale to dark brown, 20–50  $\mu$ m diam. *Conidiophores* in small to moderately large, dense fascicles, arising from stromata, through stomata or erumpent, straight, subcylindrical or narrower towards the apex to geniculate, unbranched, 22–48  $\times$  2–3  $\mu$ m, 0–2-septate, pale to pale brown, thin-walled, smooth; conidiogenous cells integrated, terminal, proliferating sympodially, conidiogenous loci truncate, unthickened, not darkened. *Conidia* solitary, cylindrical to obclavate, straight or mildly curved, 25–80  $\times$  2–4  $\mu$ m, 3–10-septate, pale to pale olivaceous, thin-walled, smooth to rough-walled, apex obtuse to subacute, base obconically truncate, about 2–2.5  $\mu$ m wide, hila unthickened, not darkened.

*Holotype*: Japan: Tokushima Pref.: on leaves of *Sequoia sempervirens*, 4 Sept. 1959, K. Ito (TFM:FPH-551).

**Host range and distribution:** On *Larix kaempferi* (only in inoculation tests), *Pinaceae* and *Sequoia sempervirens*, *Cupressaceae*, Asia (Japan, endemic).

**Notes:** Additional material has been examined: on leaves of *Sequoia sempervirens*, Japan, Ibaraki Pref., Tsukuba, 11 Sep. 1998, T. Kobayashi & C. Nakashima (CNS 448, herb. Nakashima); Japan, Fukuoka Pref., Tanushimaru, 20 June 2000, T. Kobayashi & Y. Ono (CNS 970, herb. Nakashima); culture ex *Sequoia sempervirens* (MAFF237788, ex CNS 448).

Hashimoto (1959) observed and collected a species of *Cercospora* on *Sequoia sempervirens* in a nursery in Fukuoka Prefecture, Japan. The specimen concerned was sent to C. Chupp, who identified it as *Cercospora exosporioides*. To confirm the pathogenicity, mycelial suspensions were used to inoculate *Larix kaempferi*, *Sequoia sempervirens*, *Pinus densiflora*, *Pinus thunbergii*, and *Cryptomeria japonica*. Three weeks later, symptoms and conidial masses were observed on *L. kaempferi* and *S. sempervirens* (Hashimoto 1959). Natural infections are only known from *S. sempervirens*, which seems to be the principal host of this species. The identification of the Japanese species as *P. exosporioides* is, however, not tenable since collections from Japan on *S. sempervirens* and the type material of the latter species from Europe are morphologically rather different. True *P. exosporioides* differs from *P. paraexosporioides* in having much larger stromata, up to 300 µm diam, large sporodochial conidiomata, and much shorter, usually subcylindrical conidia with few septa. The Japanese collections of "*P. exosporioides*" represent undoubtedly a separate species described as *P. paraexosporioides*. Reports of *P. exosporioides* from Japan (e.g. Crous & Braun 2003) refer to the new species.

***Pseudocercospora pini-densiflorae*** (Hori & Nambu) Deighton, *Trans. Brit. Mycol. Soc.* **88**: 390 (1987).  
var. ***pini-densiflorae***  
(Fig. 65)

**Basionym:** *Cercospora pini-densiflorae* Hori & Nambu, in Nambu, *J. Pl. Protec. Tokyo* **4**: 354 (1917).

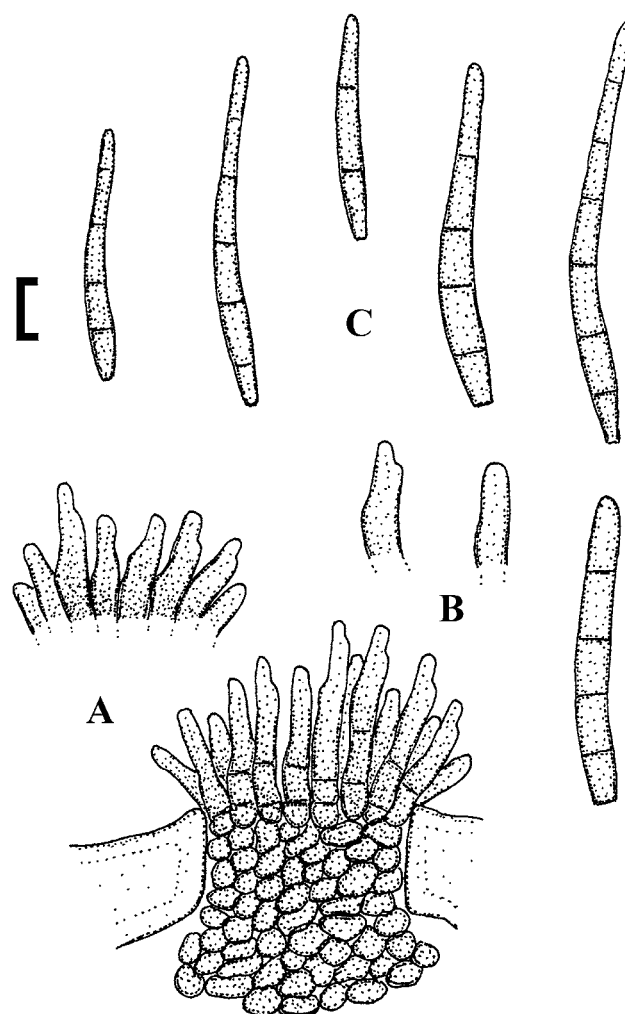
**Synonyms:** *Cercoseptoria pini-densiflorae* (Hori & Nambu) Deighton, *Mycol. Pap.* **140**: 167 (1976).

*Mycosphaerella gibsonii* H.C. Evans, *Mycol. Pap.* **153**: 61 (1984).

**Literature:** Nambu (1917), Saccardo (1931: 873), Vassiljevsky & Karakulin (1937: 252), Chupp (1954: 440), Katsuki (1965: 51), Mulder & Gibson (1972), Ellis (1976: 252), Suto (1979), CMI Distribution Maps of Plant Diseases 481, 1982, Evans (1984), Ivory & Wingfield (1986), Crous *et al.* (1990), Hsieh & Goh (1990: 261), Ivory (1994), Guo & Hsieh (1995: 248–249), Guo *et al.* (1998: 259), Crous & Braun (2004: 324), Kamal (2010: 209), Quaedvlieg *et al.* (2012: 112).

**Illustrations:** Ellis (1976: 253, fig. 190C), Hsieh & Goh (1990: 263, fig. 202), Guo & Hsieh (1995: 250, fig. 211), Guo *et al.* (1998: 259).

**Description:** Causing needle blight, i.e. needles with yellowish, yellowish brown to later greyish to blackish



**Fig. 65.** *Pseudocercospora pini-densiflorae* (BPI 1109716). **A.** Conidiophore fascicles. **B.** Conidiophore tips. **C.** Conidia. Bar = 10 µm.

brown lesions, finally becoming necrotic. *Colonies* punctiform to pustulate, greyish to greyish brown. *Mycelium* internal; hyphae branched, septate, pale olivaceous to olivaceous-brown, thin-walled, smooth. *Stromata* substomatal, subglobose, 20–150 µm diam, brown to dark brown, composed of thick-walled, swollen hyphal cells, 2–6 µm diam. *Conidiophores* in rich, dense to very dense fascicles, often forming sporodochial conidiomata, arising from stromata, through stomata or erumpent, erect, straight, subcylindrical or narrowed towards the tip to geniculate-sinuous, unbranched, 5–50 × 2.5–4 µm, subhyaline to uniformly olivaceous or olivaceous-brown, 0–3-septate, thin-walled, smooth; conidiophores reduced to conidiogenous cells or conidiogenous cells integrated, terminal, 5–25 µm long, sympodially or occasionally percurrently proliferating, with fine, not very conspicuous annellations, conidiogenous loci inconspicuous or at least neither thickened nor darkened. *Conidia* solitary, obclavate or obclavate-cylindrical, straight to somewhat curved, (10–) 20–65(–80) × 2–5 µm, (1–)3–7(–10)-septate, subhyaline to pale olivaceous, thin-walled, smooth, apex obtuse to subacute, base obconically truncate, 1.5–2.5 µm wide, hila



unthickened, not darkened; with *Asteromella* state. *Sexual morph* forming variable *ascostromata*, dark brown to black, discrete, immersed, subepidermal, globose, unilocular, (50–)70–90(–120)  $\mu\text{m}$  diam to erumpent, linear, multilocal, 150–800(–1400)  $\mu\text{m}$  long, 70–125(–160)  $\mu\text{m}$  wide and 90–150  $\mu\text{m}$  deep, occasionally laterally united in bands, stromata pseudoparenchymatous, cells 3–8(–12)  $\mu\text{m}$  diam, with thickened walls, locules globose to flask-shaped, (45–)50–75(–95)  $\times$  55–75  $\mu\text{m}$ , ostiolate, periphysate, often with an apical stromatic shield, 70–90  $\mu\text{m}$  diam, in longitudinal series, *asci* bitunicate, clavate to cylindrical, (33–)35–38  $\times$  5.5–7  $\mu\text{m}$ , with a thickened bluntly rounded apex, rarely saccate, 32–36  $\times$  6–8  $\mu\text{m}$ , 8-spored, *ascospores* ellipsoid, cuneate, (7.5–)8.5–11(–12.5)  $\times$  (1.8–)2.2–2.8  $\mu\text{m}$ , 1-septate, hyaline, guttulate.

*In vitro*: Colonies grey to greyish green or blackish, attaining 1.8–2.2 cm after 15 d on PCA-UV at 25 °C, with compact, grey mycelium in the centre, becoming pulvinate, black reverse (conidia in culture up to 90  $\mu\text{m}$  long and 1.8–2.5  $\mu\text{m}$  wide).

**Type: Japan:** Kagoshima, Magome, on needles of *Pinus densiflora*, 20 Sep. 1915 [not preserved]; **Japan:** Kagoshima, Magome, on needles of *Pinus densiflora*, 1 Oct. 1915, identified by Hara (NIAES C-511 – **neotype designated here**, MycoBank, MBT176152).

**Host range and distribution:** On needles of *Pinus* (*ayacahuite*, *canariensis*, *caribaea*, *cembra*, *clausa*, *contorta*, *contorta* var. *murreyana*, *densiflora*, *echinata*, *elliottii*, *flexilis*, *greggii*, *halepensis*, *hartwegii* [*rudis*], *jeffreyi*, *kesiya*, *lambertiana*, *luchensis*, *massoniana*, *merkusii*, *mugo*, *muricata*, *nigra*, *oocarpa*, *patula*, *parviflora*, *pentaphylla*, *pinaster*, *pinea*, *ponderosa*, *pseudostrobus*, *radiata*, *resinosa*, *rigida*, *roxburghii*, *strobus*, *sylvestris*, *taeda*, *taiwanensis*, *thunbergii*, *tubuliformis*, and *wallichiana* [*griffithii*]), *Pinaceae*. Africa (Kenya, Madagascar, Malawi, South Africa, Swaziland, Tanzania, Zambia, Zimbabwe), Asia (Bangladesh, China, India, Japan, Korea, Malaysia, Nepal, Papua New Guinea, Philippines, Sri Lanka, Thailand, Vietnam), Australia and New Zealand, Central and South America (Brazil, Nicaragua), West Indies (Jamaica, Netherlands Antilles). The following species were susceptible in inoculation experiments carried out by Suto (1979) in Japan: *Abies veitchii*, *A. sachalinensis*, *Cedrus deodara*, *Picea glehnii*, *P. jezoensis*, *Pseudotsuga menziesii*, and *Larix kaempferi* (*L. leptolepis*).

var. ***montantiana*** (M.D. Mehrotra) U. Braun, **comb. et stat. nov.**

MycoBank MB805533

**Basionym:** *Pseudocercospora montantiana* M.D. Mehrotra, *Trans. Brit. Mycol. Soc.* **88**: 577 (1987).

**Illustration:** Mehrotra (1987: 576, figs 1–6).

**Diagnosis:** Conidia narrowly obclavate-subcylindrical to subacicular, only 1.5–2.5  $\mu\text{m}$  wide, but otherwise morphologically fully agreeing with var. *pini-densiflorae*.

**Holotype: India: Assam:** on needles of *Pinus kesiya*, *Pinaceae*, Apr. 1984, M. D. Mehrotra (K(M) IMI 286975).

**Notes:** *Pseudocercospora pini-densiflorae* is the causal agent of a common, widespread disease of *Pinus* spp. causing needle blight. Type material is not preserved, but topotype material has been found in the Herbarium of the National Institute for Agro-Environmental Science, Japan, which is proposed to serve as neotype.

*Pseudocercospora montantiana* was described from India on *Pinus kesiya* and distinguished from *P. pini-densiflorae* by its narrower acicular conidia, only 1.8–2.5  $\mu\text{m}$  wide (Mehrotra 1987). However, type material of the latter species was examined and proved to be very close to *P. pini-densiflorae*. The conidia are, indeed, narrower than in common collections of *P. pini-densiflorae*, but the conidia are not consistently acicular. Shorter conidia are narrowly obclavate-subcylindrical with short obconically truncate base, which agrees with typical conidia of *P. pini-densiflorae*. Only some very long conidia may be subacicular. Otherwise *P. montantiana* on *Pinus kesiya*, which has been recorded as host species of *P. pini-densiflorae*, is morphologically indistinguishable from the latter species and barely more than a morphological variety of the common pine needle blight. Stromata are very variable, 10–80  $\mu\text{m}$  diam or oblong and up to 150  $\mu\text{m}$  in length, the conidiophores are numerous, in dense fascicles, 10–50  $\times$  2–4  $\mu\text{m}$ , and the conidia are mostly 25–70  $\mu\text{m}$  long and 3–7-septate. Mehrotra (1987) described conidiophores up to 100  $\mu\text{m}$  long, which possibly refers to conidiophores with attached conidia, and he described conidia up to 105  $\mu\text{m}$  in length.

***Pseudocercospora sciadopityos*** C. Nakash. & Tak. Kobay., **sp. nov.**

MycoBank MB805534

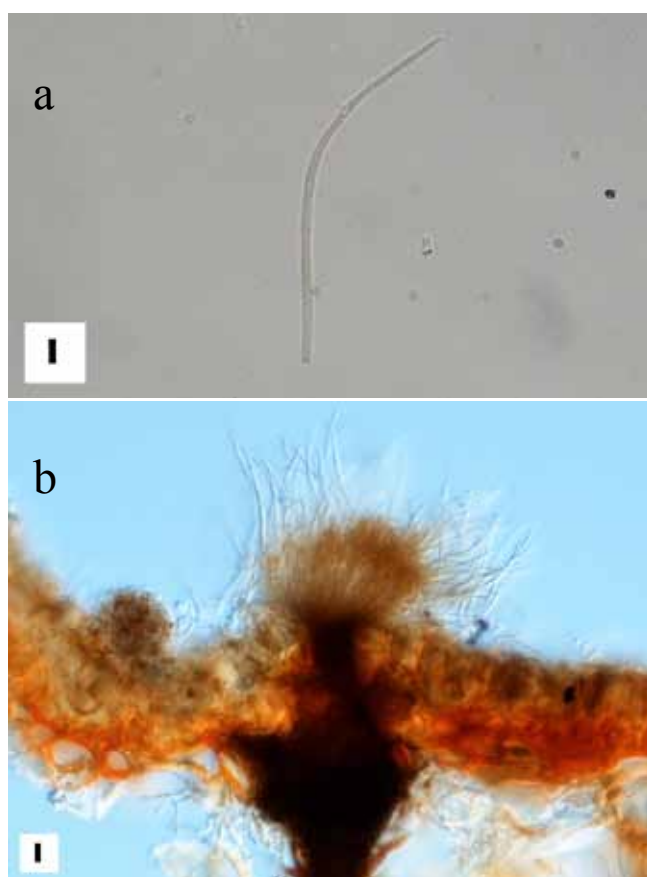
(Fig. 66)

**Etymology:** Name derived from its host genus, *Sciadopitys*. **Synonym:** *Pseudocercospora horiei* C. Nakash. & Tak. Kobay. (in Kobayashi 2007: 775), *nom. inval.* (Art.30.8).

**Literature:** Kobayashi (2007).

**Diagnosis:** *Pseudocercosporae juniperi*, *P. exosporioides* et *P. pini-densiflorae* similis, sed conidiis acicularibus vel anguste cylindraceis, ad 83  $\mu\text{m}$  longis, sed etiam 3–5-septatis, basi truncata.

**Description:** Leaf symptoms visible as brown to yellowish brown discolorations. *Caespituli* hypophyllous, punctiform, formed as olivaceous masses of conidia and conidiophores. Mycelium internal. *Stromata* immersed, intraepidermal to substomatal, erumpent, brown to dark brown, 45–75  $\mu\text{m}$  diam. *Conidiophores* arising from stromata, densely fasciculate, through stomata or erumpent, erect, straight to slightly curved, 35–85  $\times$  2–3  $\mu\text{m}$  (on average 55  $\times$  2  $\mu\text{m}$ ), pluriseptate, pale brown, thin-walled, smooth; conidiogenous cells integrated, terminal, proliferating sympodially or percurrently, with unthickened, not darkened conidiogenous loci. *Conidia* solitary, mildly curved, acicular to narrowly cylindrical, 63–83  $\times$  2–3



**Fig. 66.** *Pseudocercospora sciadopytios* (TFM:FPI-4757). **a.** Conidium (light microscopy). **b.** Conidiophore fascicle (light microscopy). Bars = 5  $\mu\text{m}$  (a) and 10  $\mu\text{m}$  (b).

$\mu\text{m}$  (on average  $71 \times 3 \mu\text{m}$ ), 3–5-septate, pale, smooth, base truncate, 2–3.8  $\mu\text{m}$  wide, hila neither thickened nor darkened.

**Holotype:** Japan: Tokyo, Chofu, on *Sciadopitys verticillata*, 16 June 1977, T. Kobayashi (TFM:FPH-4757).

**Host range and distribution:** On *Sciadopitys verticillata*, *Sciadopityaceae*, Asia (Japan, Tochigi, Tokyo, Chiba).

**Note:** A first description of this species, which caused early defoliation of *Sciadopitys* several times in Japan, has been published by Kobayashi (2007) as *Cercospora* sp.

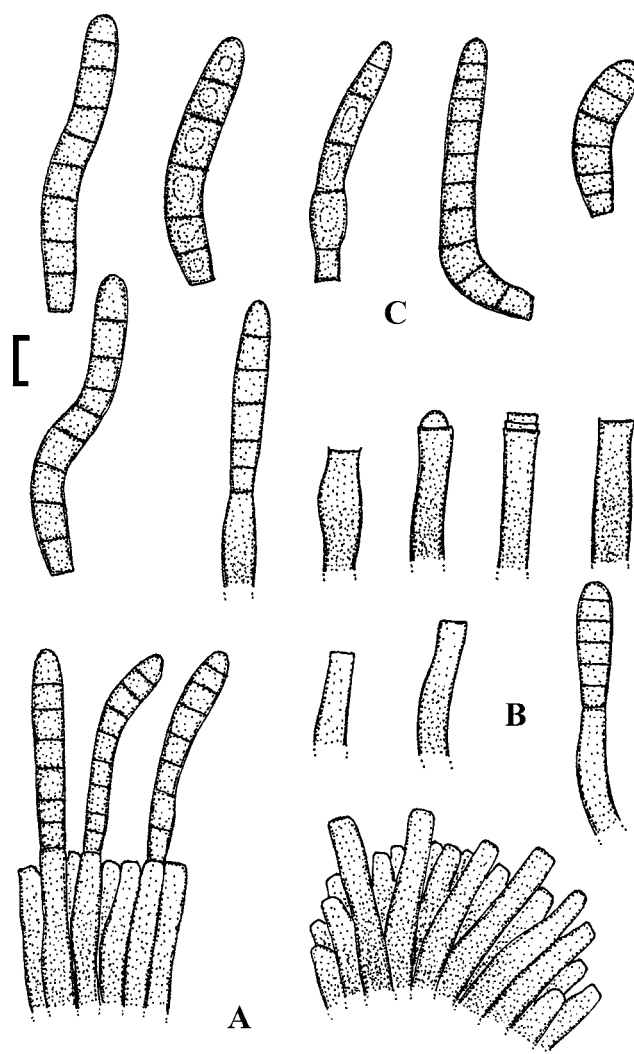
***Pseudocercospora thujina*** (Dearn.). U. Braun & C. Nakash., **comb. nov.**  
Mycobank MB805535  
(Fig. 67)

**Basionym:** *Coryneum thujinum* Dearn., *Mycologia* **16**: 171 (1924).

**Synonyms:** *Sciniatosporium thujinum* (Dearn.) Morgan-Jones, *Canad. J. Bot.* **49**: 1005 (1971).

*Stigmina thujina* (Dearn.) B. Sutton, *Trans. Brit. Mycol. Soc.* **58**: 166 (1971).

**Literature:** Sutton (1971), Hodges (1982), Dick (1998), Cech (2008), Cech & Diminić (2008).



**Fig. 67.** *Pseudocercospora thujina* (BPI 404872). **A.** Conidiophore fascicles. **B.** Conidiophores. **C.** Conidia. Bar = 10  $\mu\text{m}$ .

**Illustrations:** Morgan-Jones (1971: 1006, fig. 10), Hodges (1982: 868, fig. 1A–D).

**Description:** Leaves turning pale brown to brown, later greyish brown or grey, finally they become necrotic and die, in severe cases entire branches or twigs may die. *Conidiomata* hypophyllous, scattered, blackish, sporodochial, erumpent. *Mycelium* immersed; hyphae branched, septate, 2–4  $\mu\text{m}$  wide, brown, wall smooth. *Stromata* well-developed, at first immersed, later often rupturing the epidermis, dark brown to black, 150–270  $\mu\text{m}$  diam and 60–170  $\mu\text{m}$  deep, or oblong, up to 500  $\mu\text{m}$  in length, composed of swollen hyphal cells, rounded to angular in outline, about 2–6  $\mu\text{m}$  diam. Conidiophores numerous, in loose to usually dense fascicles, arranged in palisade-like layers, arising from stromata, forming sporodochial conidiomata, erumpent, erect, straight to curved or somewhat flexuous, subcylindrical or somewhat attenuated towards the tip, unbranched, 10–80  $\times$  3–7  $\mu\text{m}$ , aseptate to sparingly septate, light brown, yellowish brown or pale olivaceous-brown throughout or usually somewhat paler towards the tip, darker in mass, wall thin to slightly thickened, smooth or somewhat rough; conidiophores

reduced to conidiogenous cells or conidiophores septate and conidiogenous cells integrated, terminal, monoblastic, determinate or percurrently proliferating, with up to five fine annellations, sometimes also sympodially proliferating, with two loci, conidiogenous loci unthickened, not darkened, about 2–4 µm wide, sometimes with minute frill. *Conidia* solitary, straight to mostly curved or sigmoid, often abruptly curved at the apex or sometimes at the base, subcylindrical-vermiform to clavate, occasionally obclavate, 30–70 × (5–)6–9(–11) µm, 4–16-septate, usually without constrictions at the septa or only slightly constricted, cells often with distinct central lumen, medium brown to medium dark brown, wall thin to slightly thickened, up to 1 µm, smooth to faintly rough, apex obtuse, rounded, base short obconically truncate, 2–5 µm wide, hila unthickened, not darkened, often with minute frill.

**Lectotype (designated here, MycoBank, MBT176153): USA: Oregon:** Lane Co., Cascade National Forest, 12,000 ft. alt., on *Thuja plicata*, 22 Oct. 1921, J. S. Boyce 831 (BPI 404872), isolectotypes: BPI 404883, 404884, syntypes: BPI 404871, 869772 (from “Hot Springs”, Boyce 541).

**Host range and distribution:** On *Chamaecyparis lawsoniana*, *Thuja plicata*, *Cupressaceae*, North America (Canada, British Columbia; USA, Idaho, North Carolina, Oregon, Washington), introduced in Europe (Austria and Croatia), Hawaii and New Zealand.

**Notes:** Based on the phylogenetic position of its type species, Crous *et al.* (2006) reduced *Stigmina* to synonymy with *Pseudocercospora*. Therefore, the generic position of *Stigmina thujina* has to be reassessed. Due to its sporodochial conidiomata with frequently percurrently proliferating conidiogenous cells and relatively thin-walled conidia, this species is rather *Cercostigmia*-like (Braun 1993), but the latter genus was reduced to synonymy with *Pseudocercospora*. The type species of *Cercostigmia* and additional species assigned to this genus cluster within the big *Pseudocercospora* clade (Crous *et al.* 2001, 2013; Taylor *et al.* 2003). Furthermore, the conidiogenous cells of *S. thujina* are percurrent as well as sometimes sympodial. Therefore, this species is better reallocated to *Pseudocercospora*.

*Pseudocercospora thujina* is also known on *Chamaecyparis lawsoniana* and has been introduced on this host in Europe, Hawaii and New Zealand (Hodges 1982, Dick 1998, Cech 2008, Cech & Diminić (2008). Two samples from Hawaii have been re-examined (BPI 428035, 428036). The first European observation was from 2002 in Austria, Salzburg. *Cercospora chamaecyparidis*, described from Japan, is morphologically very close to *P. thujina*, but occurs on the Asian *Chamaecyparis obtusa* and differs in having much smaller or even lacking stromata and verruculose conidia. Therefore, *C. chamaecyparidis* is maintained as a separate species and reallocated to *Pseudocercospora* as well.

### Doubtful, excluded and insufficiently known species

*Cercospora filicum* Henn., *Hedwigia* **41**: 310 (1902).

**Literature:** Saccardo (1906: 611), Chupp (1954: 455).

**Holotype: Brazil:** São Paulo, Botanical Garden, on *Nephrodium* sp., *Dryopteridaceae*, A. Puttemans No. 258 [not preserved].

**Notes:** Due to rather broad, densely septate cylindrical conidia with thick walls, this species is rather helminthosporioid, but not cercosporoid (see Chupp 1954).

*Cercospora equiseti* Dobroizr., *Bolez. Rast.* **16**: 202 (1927).

**Synonyms:** *Didymaria equiseti* (Dobroizr.) Chupp, *Monogr. Cercospora*: 205 (1954).

*Ramularia dobrozrakoviana* U. Braun, *Internat. J. Mycol. Lichenol.* **3**: 281 (1988).

**Monodidymaria equiseti** (Dobroizr.) U. Braun, *Mycotaxon* **51**: 44 (1994).

**Literature:** Vassiljevsky & Karakulin (1937: 219), Braun (1998: 360).

**Illustration:** Braun (1998: 362, fig. 618).

**Holotype: Russia:** Leningrad Oblast', on *Equisetum arvense*, *Equisetaceae*, 23 Jul. 1927, Dobrozrakova (LE 40397).

*Cercospora trismeriae* Petr., *Sydowia* **2**: 379 (1948)

**Literature:** Chupp (1954: 457), Crous & Braun (2003: 411).

**Description:** Leaf spots narrow, oblong between secondary veins and often extending from the midrib to the leaf margin, in severe infections covering large portions of the leaf blade, dull yellow to greyish brown on both surfaces. *Caespituli* mainly hypophyllous. *Mycelium* internal. *Stromata* substomatal, globose, dark olivaceous. *Conidiophores* straight, curved to sinuous, 40–150 × 5–7 µm, pale olivaceous, sparingly septate. *Conidia* obclavate, straight to curved, rarely sigmoid, 25–200 × 5–7.5 µm, 2–9-septate, subhyaline to pale olivaceous-brown, base subtruncate, apex subobtuse to somewhat attenuated.

**Holotype: Ecuador:** Pichincha Province: Mindo, on living leaves of *Pityrogramma* sp. (*Trismeria* sp.), 5 Nov. 1937, H. Sydow, No. 1937.

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

**Notes:** The generic affinity of this species is unclear and could not be proven since it was not possible to trace type material, neither in Petrak's herbarium at W nor at GZU. Based on the original description, *C. trismeriae* is probably a species of *Pseudocercospora*.

*Scolecostigmia chibaensis* C. Nakash., Tak. Kobay. & Tosh. Yamada, in Nakashima *et al.* *Mycoscience* **48**: 25 (2007).



*Illustration:* Nakashina *et al.* (2007: 251, fig. 1).

*Description:* Twig symptoms visible as swellings, finally cracking. *Stromata* lacking or small, blackish brown to black, erumpent, small aggregations of swollen hyphal cells, 2–13 µm diam. *Conidiophores* solitary to densely fasciculate, straight, olivaceous-brown to blackish brown, subcylindrical, 30–90 × 4–10 µm, pluriseptate, wall thickened, up to about 2 µm, smooth or almost so, occasionally rough; conidiogenous cells integrated, terminal, determinate or percurrently proliferating, with truncate, unthickened, not darkened terminal locus with distinct, relatively large porus, up to 2 µm diam (conidiogenesis probably tetric). *Conidia* solitary, occasionally in short chains, phragmo- to scolecosporous, broadly obclavate-subcylindrical, 65–135 × 9–13 µm, 5–13-euseptate or eu- and distosepta mixed, often somewhat constricted at septa, brown to blackish brown, wall thick, up to 2 µm, smooth to somewhat verruculose, apex sometimes somewhat rostrate, tips obtuse, base obconically truncate, 4–5.5 µm wide, hila neither thickened nor darkened or entire base somewhat darker.

*Holotype:* **Japan:** Chiba, Kamogawa, on twigs of *Pinus parviflora*, 19 May 2006, T. Yamada (TFM:FPH-7858), isotype MUMH 10314 (ex-holotype culture: NBRC 102148).

*Host range and distribution:* On *Pinus* (*ayacahuite*, *parviflora* var. *parviflora*, *parviflora* var. *pentaphylla*, *peuce*, *strobiformis*, *wallichiana*, *strobus*, *Pinus* sp.), *Pinaceae*, Asia (Japan).

*Notes:* In preliminary phylogenetic analyses using rDNA ITS data, *S. chibaensis* did neither cluster with *Pseudocercospora* species (including *Stigmina* s. str. [type species: *S. platan!*]) nor *Scolecostigmia mangiferae*, the type species of *Scolecostigmia*. This species does not belong to the *Mycosphaerellaceae* at all. The conidiogenous cells possess a conspicuous, relatively large porus, and the conidiogenesis seems to be tetric. *Scolecostigmia chibaensis* is morphologically rather corynesporoid. It has to be excluded from *Scolecostigmia* in any case, but a final conclusion must be postponed as its phylogenetic affinity to a specific order and family is not yet clear.

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