First report of a foliar disease caused by *Cercospora apii* s. lat. on *Spigelia anthelmia* from Madhya Pradesh, India

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Abstract: Awasthi, N., Singh, R. & Kumar, S. 2015: First report of a foliar disease caused by *Cercospora apii* s. lat. on *Spigelia anthelmia* from Madhya Pradesh, India. Schlechtendalia **28**: 53–57.

A foliar disease caused by *Cercospora apii* s. lat. on *Spigelia anthelmia* (*Loganiaceae*) is reported from Madhya Pradesh, India, for the first time. The fungus concerned is described and symptoms as well as morphological characters of conidiophores and conidia are illustrated.

Zusammenfassung: Awasthi, N., Singh, R. & Kumar, S. 2015: Erste Angabe einer Blattfleckenkrankheit verursacht durch *Cercospora apii* s. lat. auf *Spigelia anthelmia* aus Madhya Pradesh in Indien. Schlechtendalia **28**: 53–57.

Eine Blattfleckenkrankheit verursacht durch *Cercospora apii* s. lat. auf *Spigelia anthelmia* (*Loganiaceae*) wird aus Madhya Pradesh in Indien mitgeteilt. Der ursächliche Pilz wird beschrieben und Symptome sowie morphologische Merkmale der Konidienträger und Konidien werden abgebildet.

Key words: Foliar fungi, hyphomycetes, morphotaxonomy, *Cercospora*, *Spigelia*, new record.

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Introduction

Cercosporoid fungi are one of the largest groups of plant pathogenic, leaf inhabiting hyphomycetes, comprising more than 2000 names (Crous & Braun 2003). *Cercospora*, introduced by Fresenius (in Fuckel 1863), is characterized by thickened and darkened conidiogenous loci, hyaline, mostly pluriseptate conidia and pigmented conidiophores. This genus is known from all parts of the world, but above all abundant in tropical and subtropical areas.

A large number of *Cercospora* species described as distinct entities have been found to constitute a compound species referred to as *Cercospora apii* s. lat. (Crous & Braun 2003, Braun et al. 2013, 2014, 2015). These species are morphologically indistinguishable from *Cercospora apii* s. str. which is common on *Apium graveolens*, *Apiaceae*, but also occurs on a wider range of hosts belonging to unrelated families (Groenewald et al. 2013), i.e. *C. apii* s. str. is likewise plurivorous. Numerous additional species involved in *C. apii* s. lat. are also plurivorous. Such taxa are characterized by having solitary to fasciculate, normally long, brown, septate conidiophores with conspicuously thickened and darkened conidiogenous loci and long, acicular, hyaline, pluriseptate, conidia formed singly. These *Cercospora apii*-like fungi occur on an extremely wide range of hosts and are morphologically variable and indistinguishable from one another. Based on cross inoculation experiments and morphological examinations by various workers and their own observations, Crous & Braun (2003) have concluded that *C. apii*-like fungi form a morphologically rather uniform, complicated assemblage of taxa in which the process of speciation is not yet completed. This has resulted in a complex of plurivorous as well as more or less specialized taxa with various partly wider, partly narrower host ranges, which are, however, morphologically not yet distinguishable. According to Crous & Braun (2003), molecular data also support this conclusion (Crous et al. 2001a, 2001b, Goodwin et al. 2001, Pretorius et al. 2003). Groenewald et al. (2013) showed that several species are involved, which are, however, morphologically barely distinguishable, i.e. results of molecular sequence analyses are necessary for further treatments and identification purposes.

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. (*C. apii* complex) if morphologically indistinguishable and if not proven by means of molecular sequence analyses and/or inoculation experiments that distinct species are involved. Crous & Braun (2003) and Kamal (2010) published annotated lists of names of cercosporoid genera,

including numerous *Cercospora* names, which were reduced to synonymy with *C. apii* s. lat. since they were morphologically not or barely distinguishable from *C. apii* s. str. on celery.

During our survey of foliicolous fungi in Sagar, M.P., India, in 2014, one cercosporoid collection belonging to *Cercospora apii* s. lat. was found that turned out to be a new record for this area and India in general.

Materials & Methods:

Specimens with disease symptoms of pathogenic fungi on living leaves were collected during the course of field trips in Sagar, M.P., India, in 2014. Photographs of infection spots on leaving leaves were taken with a Sony DSC-X80 camera. Specimens for microscopic observation were prepared by hand sectioning through infection spots, mounted in lactophenol cotton-blue mixture. Observations were made with a Leica light microscope. Detailed observations of morphological characters and line drawings were carried out at magnification through light microscopy (400× and 1000×). Measurements were made of 25 conidia, hila, and conidiophores and of 10 stromata, with the extremes given in parentheses. Specimens have been deposited in Ajrekar Mycological Herbarium (AMH), Agharkar Research Institute (ARI), Pune, India, and duplicates have been retained in the mycological herbarium of the Department of Botany, Dr. Harisingh Gour University (MH-DHSGU), Sagar, for further reference. Morphological determinations have been done with the help of current literature pertaining to the taxonomy of *Cercospora*.

Fig. 1: Symptoms of *Cercospora apii* s. lat. on *Spigelia anthelmia* (AMH 9669), **a –** Infected host plant, **b –** Early stage of infection (upper surface), **c –** Early stage of infection (lower surface), **d –** Late stage of infection (upper surface), **e –** Late stage of infection (lower surface), **f –** Heavily infected leaf. Bars: b–e = 20 mm.

Taxonomy

Cercospora apii Fresen., Beitr. Mykol. **3**: 91, 1863, s. lat. **Figs 1–3**

Material examined: India, M.P., Sagar, University campus (DHSGU), on living leaves of *Spigelia anthelmia* L. (*Loganiaceae*), September 2014, coll. by Neha Awasthi (AMH 9669, MH-DHSGU 1).

Leaf spots amphiphyllous, circular to subcircular, mostly 3–14 mm diam., later spots coalescent to cover the entire leaf surface, young spots white, surrounded by a dark brown to blackish brown margin, later becoming blackish brown and velvety in advanced stages of the disease. Colonies amphigenous, black. Stromata lacking to well-developed, 20–42 µm diam., substomatal to intraepidermal, globose to somewhat angular in outline, medium brown to dark brown. Conidiophores macronematous, solitary or in small fascicles of 2–15 or rarely more, loose to dense, arising from internal hyphae or stromata, usually erumpent through the cuticle, erect, unbranched, 2–8-septate, cylindrical to subcylindrical, sometimes geniculate-sinuous (geniculation mostly connected with conidiogenesis and proliferation of conidiogenous cells), light brown to mid brown, upper fertile part light brown, (42–)55–125(–135) × (3–)4–5(–7) µm, smooth, wall thin to somewhat thickened. Conidiogenous cells integrated, terminal to intercalary, sympodial, situated on small shoulders caused by sympodial proliferation of the conidiogenous cells, loci circular in outline with small central pore, planate, thickened and darkened, 2.5–4 µm wide. Conidia solitary, cylindrical, fully developed conidia always acicular (gradually attenuated from base to top), 1–12-septate, hyaline, smooth, thin-walled, tip acute, base truncate, (52–)53–160(–180) × (2–)3–4.5(–6) µm, hila thickened and darkened, 2.5–4 µm wide.

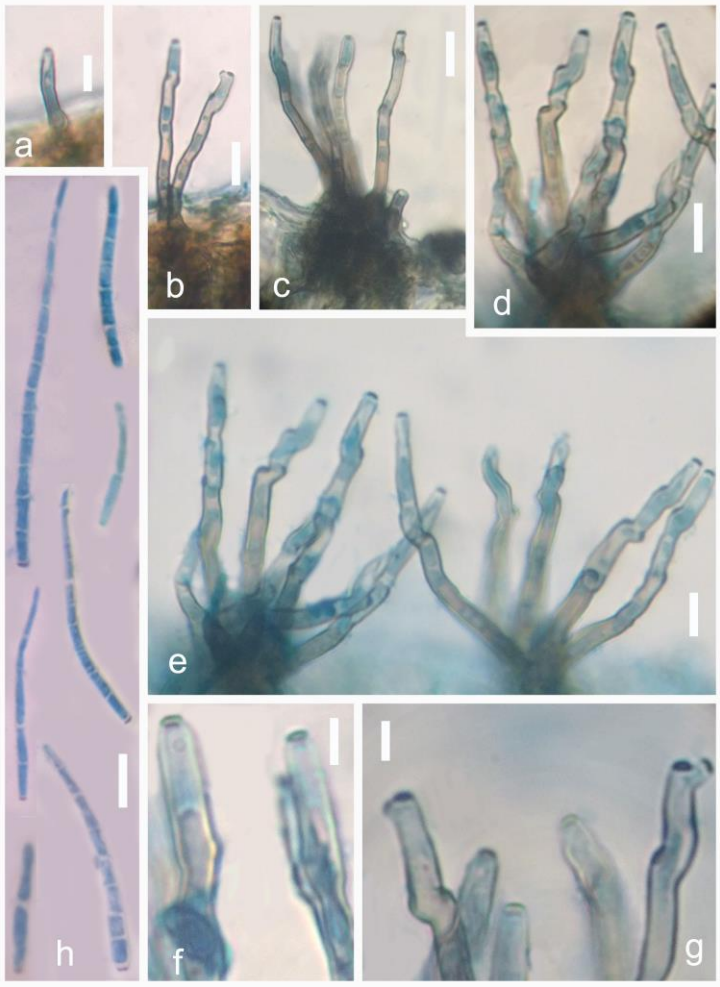

Fig. 2: Microphotograph of *Cercospora apii* s. lat. on *Spigelia anthelmia* (AMH 9669), **a –** Solitary conidiophore, **b–e –** Conidiophore in fascicles, **f–g –** Conidiogenous cells, **h –** Conidia. Bars: a–e = 20 µm, f–g = 10 µm, h = 20 µm.

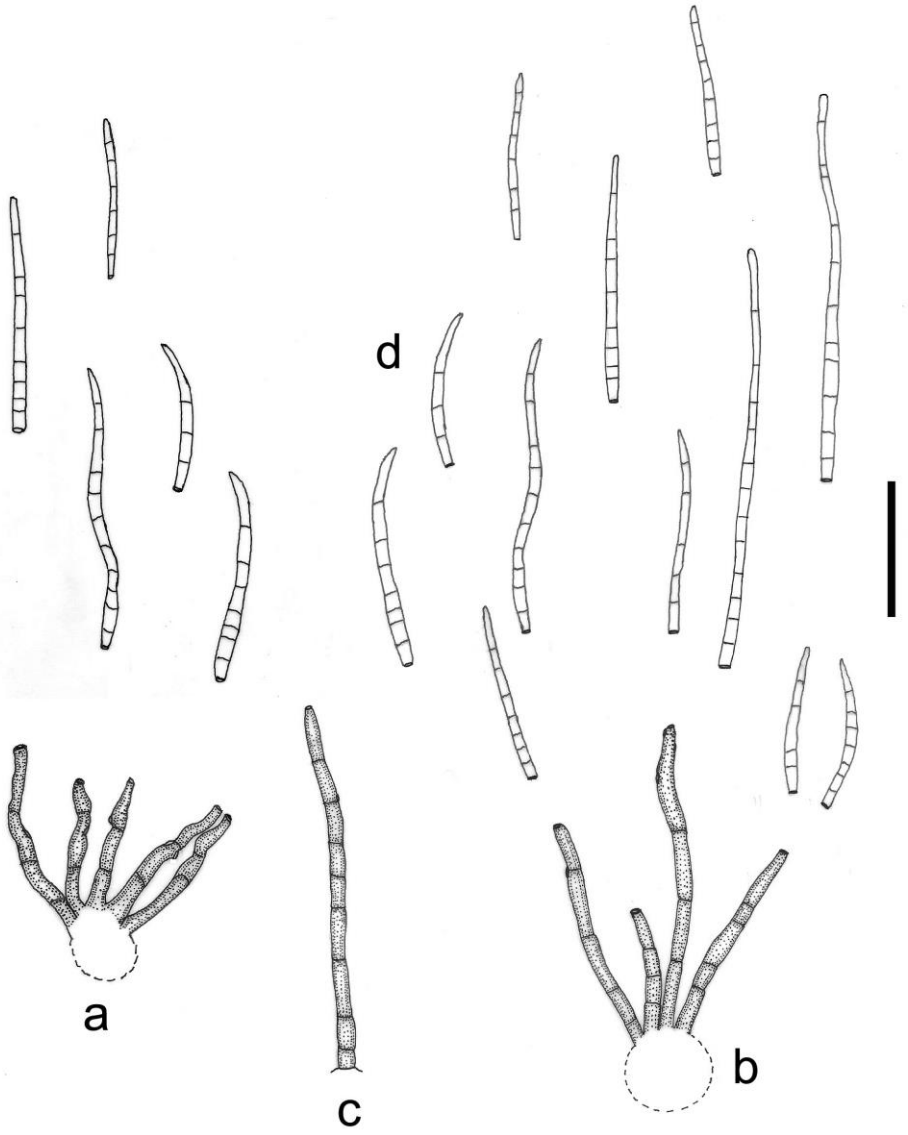

Fig. 3: Drawing of *Cercospora apii* s. lat. on *Spigelia anthelmia* (AMH 9669), **a**–**b –** Conidiophores with stromata, **c** – Solitary conidiophore, **d –** Conidia. Bar: 50 µm.

Discussion

Cercospora apii s. lat. was previously reported on *Spigelia anthelmia* from the State of Ceará, Brazil (Braun & Freire 2002, Crous & Braun 2003). The present collection represents the first report from India and probably the second record of *Cercospora* on *Spigelia anthelmia* at all. Results of morphological examinations (stromata, shape, size and orientation of conidiophores, conidiogenous loci, conidia and hila) confirmed that this species belongs to the *C. apii* complex.

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