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ADDITIONS TO MYCOSPHAERELLA IN THE FYNBOS BIOME

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The vegetation occurring in the winter rainfall region at the southern tip of Africa (fynbos biome), covers the smallest geographic area, yet has the most diverse floral kingdom (Goldblatt, 1978; Bond & Goldblatt, 1984; Takhtajan, 1986). Although plants occurring in this biome have received considerable attention, very little attention has been given to fungi associated with these plants (Knox-Davies, Van Wyk & Marasas, 1986). During routine collections of fungi causing leaf spots on plants occurring in the fynbos, two unfamiliar leaf spot diseases were observed on leaves of *Protea repens* (L.) L. and *Cussonia thyrsiflora* Thunb. respectively. A closer examination of the symptomatic leaves showed that the leaf spots on both hosts were associated with species of *Mycosphaerella* Johnson. As far as we could establish, no species of *Mycosphaerella* has previously been described from leaves of *Cussonia* Thunb. In contrast, two species of *Mycosphaerella, M. proteae* (H.P Sydow) Von Arx and *M. jonkershoekensis* Van Wyk, Marasas & Knox-Davies occur on *Protea* leaves (Van Wyk, Marasas & Knox-Davies, 1975a, 1975b). The aim of this study was to provide an identification for the two *Mycosphaerella* species associated with leaf spot symptoms on *Cussonia* and *Protea* L.

Mycosphaerella proteae has several acknowledged synonyms, and is known from numerous species of *Protea* (Van Wyk *et al.*, 1975a). This

fungus (PREM 44925) is characterised by ascospores that are widest in the middle of the upper cell as arranged in the ascus, and taper to the lower end and measure 20.0-(26.0)-33.0 x 6.0-(7.0)-8.0 μm (averages in brackets). Ascospores are bi- or triseriate in the ascus, hyaline, germinating with germ tubes parallel to the long axis of the ascospore. Ascospores are unequally septate, with longer basal cells (Fig. 1).

Van Wyk *et al.* (1975b) described a second species of *Mycosphaerella* from *Protea* leaves, and assigned the name *M. jonkershoekensis* Van Wyk, Marasas & Knox-Davies to this fungus. Ascospores of the holotype of *M. jonkershoekensis* (PREM 44830) are widest in the middle of the upper cell as arranged in ascus, frequently taper to both ends, and measure 11.0-(18.0)-23.0 x 4.0-(4.5)-6.0 μm. Ascospores are tri- or multiseriate in ascus, becoming light brown, slightly spirally twisted and elongated with age, and ranging from not constricted to prominently constricted at the median septum (Fig. 2).

The species of *Mycosphaerella* collected from *P. repens* leaves in this study was associated with similar symptoms to those found on leaves infected by *M. jonkershoekensis*. It could, however, easily be distinguished from both *M. proteae* and *M. jonkershoekensis* on the basis of its ascospores, which were much smaller than those of the other two species. Because of its distinct morphology, this fungus is described as a new species as follows:

Mycosphaerella bellula Crous & Wingf. *sp. nov.* Figs 3-4
Etym.: *bellulus*, diminutive of *bellus*, meaning pretty or elegant.

Laesiones amphigenae, circulares, depressae, pallide brunneae, cinctae margine brunneo elevato. Ascocarpi amphigeni, nigri, obpyriformi ad subglobosi, subepidermales, infra stomata immersi, 90.0-150.0 μm lati, 80.0-130.0 μm alti, parietes ex cellulis medio-brunneis constantes, 4-5 strata texturae angularis; basis ex 3-4 stratis cellularum hyalinarum constans. Asci bitunicati, aparaphysati, subsessiles, octospori, cylindrici usque ad obpyriformes, 30.0-(45.7)-58.0 x 7.0-(8.0)-10.0 μm. Ascosporae 2-3 seriatae, vel irregulariter dispositae, obliquae, imbricatae, rectae ellipsoideae, in extremitatibus obtusae, hyalinae, laeves, medi-septatae, guttulatae, ad septum constrictae, latissimae in parte media cellulae superioris, 7.0-(8.8)-11.0 x 2.0-(2.5)-3.0 μm.

Holotypus: *Protea repens* (L.) L., Stellenbosch Mountain, Stell., RSA, 30 Aug. 1991, P.W. Crous, PREM 51028.

Lesions amphigenous, circular, sunken, light brown with a raised, dark brown margin. *Ascocarps* amphigenous, black, obpyriform to subglobose, subepidermal and immersed below stomata, 90.0-150.0 μm wide, 80.0-130.0 μm high; walls consisting of medium brown cells, 4-5 layers of *textura angularis*, base consisting of 3-4 layers of hyaline cells; developing in a substomatal chamber, becoming erumpent through stomatal pore. *Asci* bitunicate, aparaphysate, subsessile, 8-spored, cylindrical to obpyriform, 30.0-(45.7)-58.0 x 7.0-(8.0)-10.0 μm, up to 20 per ascocarp. *Ascospores* bi- to triseriate or irregularly arranged, oblique, overlapping, straight, ellipsoidal, obtuse at each end, hyaline, smooth, median septate, guttulate, constricted at septum, widest in middle of upper cell as arranged in ascus, 7.0-(8.8)-11.0 x 2.0-(2.5)-3.0 μm.

Specimen examined: *Protea repens*, Stellenbosch Mountain, Stell., RSA, 30 Aug. 1991, P.W. Crous, PREM 51028, holotype.

The second species of *Mycosphaerella* collected in this study occurred on leaves of *Cussonia thyrsiflora*. Two other leaf spot fungi are commonly encountered on *Cussonia* species in South Africa. *Colletotrichum gloeosporioides* (Penz.) Penz. & Sacc., which is the cause of anthracnose lesions on several hosts (Baxter, Van der Westhuizen & Eicker, 1983), was commonly isolated from light-brown, concentric lesions on the margins of *Cussonia* leaves in this study. Another fungus, *Phyllosticta cussoniae* Cejp, has also been described from lesions occurring on leaves of *Cussonia umbellifera* Sond. in the Transvaal Province (Cejp, 1971).

Spermagonia were first observed on leaf spots of *Cussonia thyrsiflora* in 1989. The subsequent development of pseudothecia among spermagonia was mostly associated with the appearance of prominent leaf spots. To the best of our knowledge no *Mycosphaerella* sp. has yet been recorded from this host (Corlett, 1991), and this collection is therefore described as new:

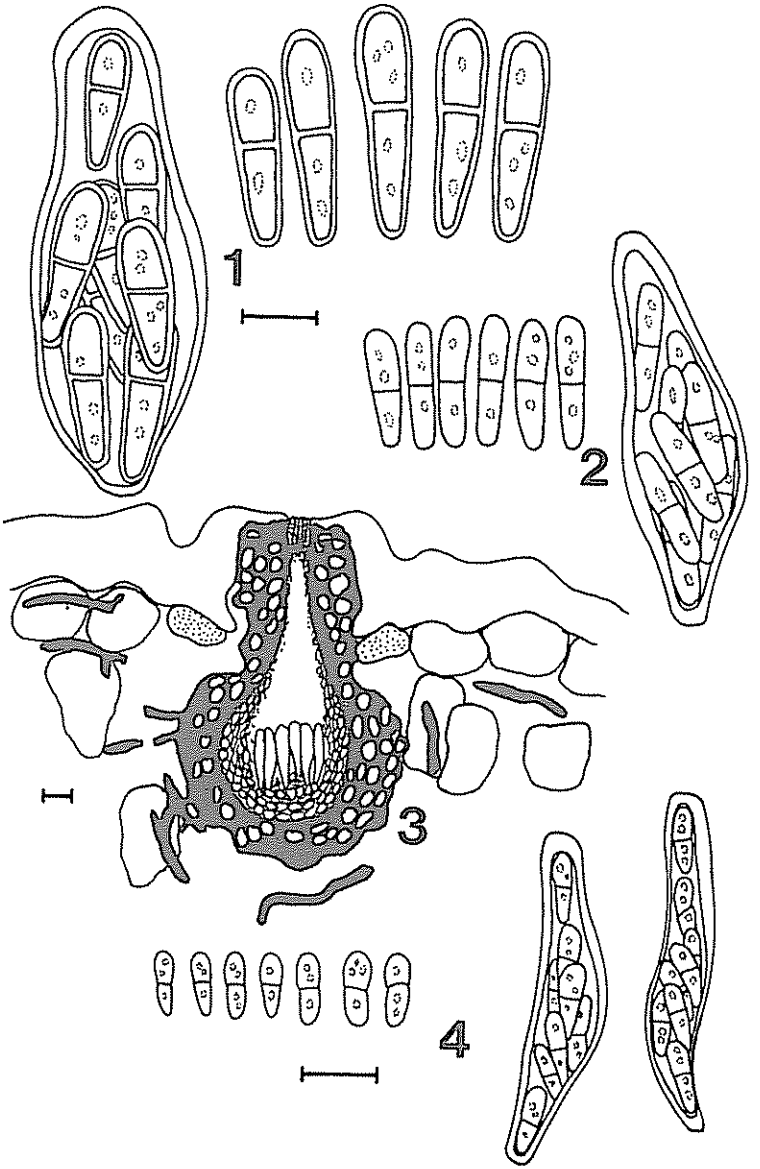
Mycosphaerella cussoniae Crous & Wingf. *sp. nov.* Figs 5-6

Laesiones amphigenae, circulares ad irregulares, depressae, pallide brunnae, cinctae margine tenui eminenti pallide brunneo elevato, 0.5-3.0 cm diam. Ascocarpi hypophylli, nigri, subglobosi, subepidermales, erumpentes, papillati, 90.0-120.0 μm lati, 80.0-100.0 μm alti, apicale papillatum ostiolum usque ad 30 μm diam., parietes ex cellulis medio-brunneis constantes, 5-6 strata texturae angularis, basis ex 3-4 stratis hyalinarum cellularum constans. Asci bitunicati, aparaphysati, subsessiles, octospori, fusiformes, numerosi, 40.0-(55.0)-65.0 x 10.0-(15.0)-17.0 μm. Ascosporae hyalinae, tri- vel multiseriatae, obliquae, imbricatae, recte ellipsoideae, obtusae in extremitatibus, hyalinae, laeves, mediano septatae, guttulatae non ad septum constrictae, latissimae in media parte ascosporae, attenuatae in extremitatibus, 26.0-(35.0)-40.0 x (4.0)-6.0 μm. Spermagonia structura pseudotheciorum similia; 70.0-110.0 x 70.0-90.0 μm diam. Parietes pseudoparenchymatici 3-4 stratis. Spermatia hyalina, bacilliformia, aseptata, 3.0-5.0 x 1.0 μm.

Holotypus: *Cussonia thyrsiflora* Thunb., Betty's Bay, RSA, Sept. 1989, P.S. Knox-Davies, PREM 51027.

Lesions amphigenous, circular to irregular, sunken, light brown with a raised, thin, light brown margin, 0.5-3.0 cm diam. *Ascocarps* hypophyllous, black, subglobose, subepidermal, erumpent, papillate, 90.0-120.0 μm wide, 80.0-100.0 μm high; apical papillate ostiole up to 30.0 μm diam.; walls consisting of medium brown cells, 5-6 layers of *textura angularis*, base consisting of 3-4 layers of hyaline cells. *Asci* bitunicate, aparaphysate, subsessile, 8-spored, fusoid, numerous, 40.0-(55.0)-65.0 x 10.0-(15.0)-17.0 μm. *Ascospores* hyaline, tri- or multiseriate, oblique, overlapping, straight, ellipsoidal, obtuse at each end, hyaline, smooth, medianly septate,

Figs 1-4. Pseudothecium, asci and ascospores of *Mycosphaerella* spp. occurring on *Protea* spp. (bar = 10 μm). Fig. 1. Ascus and ascospores of *M. proteae* (PREM 44925). Fig. 2. Ascus and ascospores of *M. jonkershoekensis* (PREM 44830, holotype). Fig. 3. Vertical section through pseudothecium of *M. bellula*. Fig. 4. Asci and ascospores of *M. bellula* (PREM 51028, holotype).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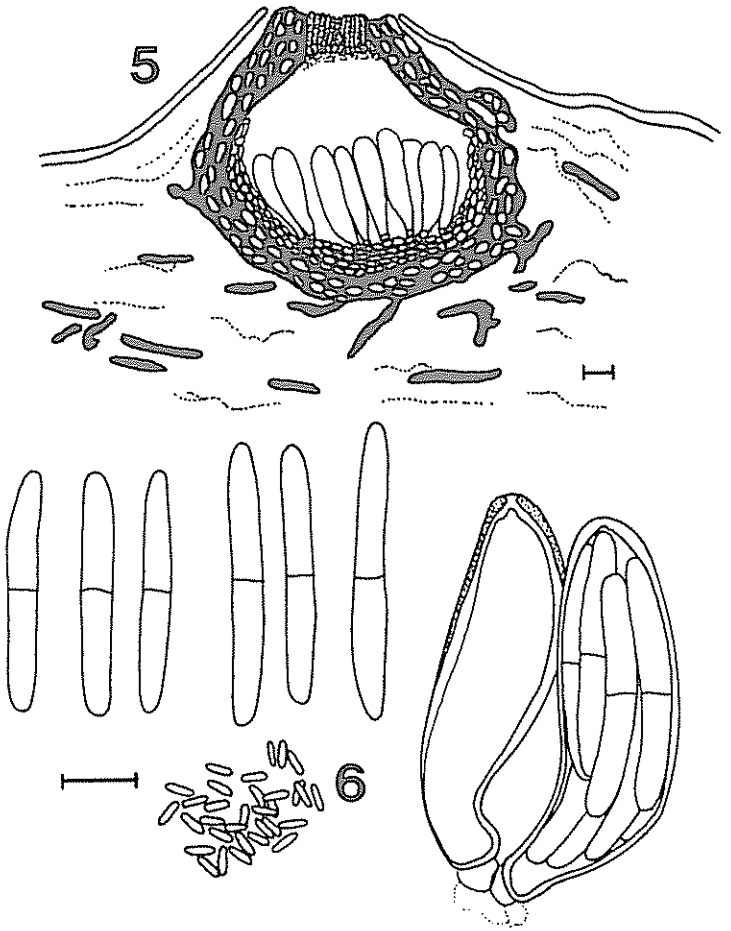

Figs 5-6. Pseudothecium, ascospores, asci and spermatia of *Mycosphaerella cussoniae* (PREM 51027, holotype) (bar = 10 μm). Fig. 5. Vertical section through pseudothecium. Fig. 6. Ascospores, asci and spermatia.

guttulate, not constricted at septum, widest in middle of spore, tapering to both ends, 26.0-(35.0)-40.0 x (4.0)-6.0 μm. Spermagonia similar to pseudothecia in structure, light brown, 70.0-110.0 x 70.0-90.0 μm diam., pseudoparenchymatous wall 3-4 layered, spermatia hyaline, rod shaped, aseptate, 3.0-5.0 x 1.0 μm.

Specimens examined: *Cussonia thyrsiflora*, Betty's Bay, RSA, Sept. 1989, P.S. Knox-Davies, PREM 51027, holotype; *C. thyrsiflora*, Betty's Bay, RSA, Sept. 1991, P.S. Knox-Davies, PREM 51030.

Cussonia spp. are common ornamental plants and *Protea* spp. are used for ornamental purposes as well as for cut flowers. Other than being of mycological interest, the description of *M. bellula* and *M. cussoniae* could also ultimately be of plant pathological significance. It is likely that many other interesting and important fungi occur on fynbos plants. Efforts are, therefore, underway to ensure that these fungi receive the attention that they deserve.

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