New species of *Mycosphaerella* occurring on *Eucalyptus* leaves in Indonesia and Africa

P.W. Crous and M.J. Wingfield

Abstract: Although Africa and Indonesia have not been particularly well surveyed for *Mycosphaerella* leaf spot fungi, several species are known to occur on *Eucalyptus* leaves in these areas. Three new species of *Mycosphaerella* with anamorph states are described from herbarium specimens and cultures in the present study. *Mycosphaerella suttoniae* and *Mycosphaerella heimioides* are described from *Eucalyptus* leaves from Indonesia. The former species is of particular interest, because its anamorph *Phaeophleospora epiceoides* is the first species of *Phaeophleospora* linked to *Mycosphaerella*. *Mycosphaerella irregulariramosa* is described from *Eucalyptus saligna* growing in the Northern Province of South Africa. Both *M. irregulariramosa* and *M. heimioides* have *Pseudocercospora* anamorphs, and these are described as *Pseudocercospora irregulariramosa* and *Pseudocercospora heimioides*. Notes are also provided on the host range and geographic distribution of previously described species of *Mycosphaerella* on *Eucalyptus* leaves in other parts of Africa and in Indonesia.

Key words: *Eucalyptus*, *Kirramyces*, *Mycosphaerella*, *Phaeophleospora*, *Pseudocercospora*, systematics.

Introduction

*Eucalyptus* L'Hér., plantations cover more than eight million hectares internationally, and thus represent a biomass resource of international importance (Turnbull 1991). In their centres of origin (primarily Australia), there are more than 600 plantations cover more than eight million hectares internationally, and thus represent a biomass resource of international importance (Turnbull 1991). In their centres of origin (primarily Australia), there are more than 600 plantations cover more than eight million hectares internationally, and thus represent a biomass resource of international importance (Turnbull 1991). In their centres of origin (primarily Australia), there are more than 600 plantations cover more than eight million hectares internationally, and thus represent a biomass resource of international importance (Turnbull 1991). In their centres of origin (primarily Australia), there are more than 600 plantations cover more than eight million hectares internationally, and thus represent a biomass resource of international importance (Turnbull 1991). In their centres of origin (primarily Australia), there are more than 600 plantations cover more than eight million hectares internationally, and thus represent a biomass resource of international importance (Turnbull 1991). In their centres of origin (primarily Australia), there are more than 600 plantations cover more than eight million hectares internationally, and thus represent a biomass resource of international importance (Turnbull 1991). In their centres of origin (primarily Australia), there are more than 600 plantations cover more than eight million hectares internationally, and thus represent a biomass resource of international importance (Turnbull 1991). In their centres of origin (primarily Australia), there are more than 600

Diseases pose a great threat to *Eucalyptus* spp., both in natural ecosystems and in plantations in various parts of the tropics and southern hemisphere.

Phytophthora *cinnamomi* Rands, appears to represent such a situation (Zentmeyer 1980). Many pathogens have been recorded on exotic *Eucalyptus* spp., of which several have caused serious disease problems (Sankaran et al. 1995) enhanced by the clonal nature of the plantations.

Species of *Mycosphaerella* Johanson are well known as important pathogens of *Eucalyptus* spp. The so-called *Mycosphaerella* leaf blotch (MLB) disease is one of the important constraints to *Eucalyptus* propagation in various parts of the world (Lundquist and Purnell 1987; Carnegie et al. 1994). More than 22 species of *Mycosphaerella* have been associated with MLB (Carnegie and Keane 1994; Crous and Wingfield 1996), although very little is known about the relative importance of most of these. Detailed studies have also shown that more than one species of *Mycosphaerella* is commonly associated with diseases previously thought to be caused by *Mycosphaerella molleriana* (Thüm.) Lindau (Crous et al. 1991; Crous and Wingfield 1996).

In recent years, new characters have been defined that have made it possible to recognize distinct taxa among *Mycosphaerella* spp. associated with MLB. Because teleomorph structures on leaves are the dominant signs associated with *Mycosphaerella* infections, morphological characteristics associated with these structures have been the primary basis...
for the circumscription of these fungi. Many of these fungi also have unique anamorphs, although these can usually only be detected in axenic culture. Characteristics associated with ascospore germination and colony growth in culture are also useful and reliable taxonomic tools (Crous and Wingfield 1996).

Recent surveys of plantation-grown Eucalyptus spp. in Indonesia and South Africa have led to the description of several new species of Mycosphaerella (Crous and Alfenas 1995; Crous and Wingfield 1996). These studies have now been intensified to survey additional sites in the two countries. A number of new taxa were collected and are described here. Furthermore, data pertaining to the host range and geographic distribution of previously described species are also updated.

Materials and methods

Eucalyptus leaves with MLB symptoms were collected from plantations in Indonesia (Lake Toba area, northern Sumatra) and Africa (Kenya, South Africa, Tanzania, and Zambia). Lesions were excised from leaves, and single ascospore cultures were established on 2% malt extract agar (Biolab) (MEA) using the technique described by Crous et al. (1991). Germinating ascospores were examined after 24 h, their germination patterns were determined, and then they were transferred to MEA. Cultures were incubated for 2 weeks at 25°C in the dark and subcultured onto divided plates with one half containing carnation leaf agar (CLA) (Fisher et al. 1982; Crous et al. 1992) and the other MEA, incubated at 25°C under continuous near-ultraviolet light. Linear growth on agar for each culture was determined after 1 month (Crous and Wingfield 1996). Colony colors (top and bottom) were scored using the color charts of Rayner (1970). Wherever possible, 30 measurements were made of structures mounted in lactophenol, and the extremes are given in parentheses. Herbarium specimens were lodged at the National Collection of Fungi, Pretoria (PREM).

Results

Material of MLB disease collected from Eucalyptus spp. from Africa and Indonesia included three undescribed Mycosphaerella spp., which are dealt with in the taxonomy section below. In addition, materials collected from Kenya, Tanzania, and Zambia were colonized by several species known to occur in South Africa. In Kenya and Zambia, leaves of Eucalyptus globulus Labill. were colonized by Mycosphaerella juvenis Crous & M.J. Wingf. (PREM 54972, PREM 54973), with the same species also occurring on Eucalyptus maidenii F. Muell. in Tanzania (PREM 54971). Furthermore, Tanzanian collections of E. maidenii leaves were also frequently colonized by Mycosphaerella markii Carnegie & Keane (PREM 54971). Other than M. juvenis, leaves of E. globulus from Zambia were also colonized by Mycosphaerella africana Crous & M.J. Wingf. and Mycosphaerella lateralis Crous & M.J. Wingf. (PREM 54973). The common species associated with the most serious leaf spotting on E. globulus in these countries was M. juvenis. This species is also the most common and serious pathogen of Eucalyptus nitens (Deane et Maid.) Maid. in South Africa. An examination of older herbarium specimens lodged at PREM led us to conclude that this species made E. globulus unsuitable for aforesation in South Africa and made it possible to plant only certain provenances of E. nitens (Lundquist and Purnell 1987).

In their study of Mycosphaerella spp. occurring on eucalypts in Indonesia, Crous and Alfenas (1995) described Mycosphaerella gracilis Crous & Alfenas (anam. Pseudocercospora gracilis Crous & Alfenas) from leaf spots on Eucalyptus urophylla S.T. Blake. They also recorded Mycosphaerella parkii Crous et al. from leaf spots on Eucalyptus grandis Hill ex Maid. The latter species is well known from Eucalyptus saligna Sm. and E. globulus in Brazil. On fresh material obtained in the present study, several collections of MLB from E. urophylla were associated with M. gracilis (PREM 54977), while collections from E. grandis were commonly associated with M. parkii (PREM 54968). Ascospore morphology and germination of M. gracilis were the same as those observed for the type collection. Agar colonies were grey with a dark grey to black submerged mycelium, smooth and even edged, with fluffy grey-white aerial mycelium, and readily produced the anamorph P. gracilis (Crous et al. 1995a). Colonies of M. parkii were generally fast growing and olive-green with abundant aerial mycelium, and readily produced the anamorph Stenella parkii Crous & Alfenas in culture. Although conidia were within the range described for the type collection, several of these also occurred in branched chains, a feature not observed in the type material. Furthermore, although pseudothecia of M. parkii are known to be amphiogenous on leaf spots, several collections had pseudothecia that were either more prominently epiphyllous or hypophyllous.

Another well-known species from Eucalyptus dunnii Maid. and E. grandis in Brazil is Mycosphaerella suberosa Crous et al., which was also collected from a Eucalyptus sp. (PREM 54970) in Indonesia during this study. This is the first record of M. suberosa from outside South America. Mycosphaerella markii was recently described from Australia, where it occurs on several Eucalyptus spp. (Carnegie and Keane 1994). This species was subsequently recorded from leaves of E. grandis and E. nitens in South Africa (Crous and Wingfield 1996). It is characterized by epiphyllous pseudothecia occurring on light brown, irregular to subcircular lesions with red-purple margins. Ascospores are in the range 11–18 × 2.5–3.5 μm, have asymmetrical apical cells, and germinate with germ tubes parallel to the long axis of the spore. In the present study, isolates corresponding to M. markii were collected from E. globulus in Indonesia (PREM 54976).

Mycosphaerella heimii Crous has previously been known only from Eucalyptus in Madagascar. In the present study, M. heimii was commonly collected on E. urophylla leaves in Indonesia. Leaf spots were either irregular or subcircular, 2–20 mm in diameter, light brown, becoming dark brown towards the raised border, with red-brown to purple margins. Ascospores were ellipsoidal, not constricted at their septa, guttulate, and widest in the middle of the apical cell, (9–)10–11(–13) × 2–2.5(–3) μm. Single-ascospore colonies readily formed Pseudocercospora heimii Crous in culture. Conidia were within the range observed for the type.
collection, being 55–200 × 2–3 μm, multisepitate, variously curved, with sub-obtuse apices and narrow obconically truncate bases with hila 1–1.5 μm in diameter.

**Taxonomy**

*Mycosphaerella suttoniae* Crous et M.J. Wingf. sp. nov.

**Figs. 1–5**


**SYNANAMORPH:** Cercostigmata sp.

**ETYMOLOGY:** named for Dr. B.C. Sutton, who contributed greatly to our knowledge of the coclodymetes.

Laesiones amphibigae, irregularae ad suborbiculares, 5–25 mm diam., pallide brunneae. Pseudothecia hypophylla, nigra, subepidermalia, globosa, 70–90 μm lata, 60–90 μm alta. Asci fasciculati, bitunicati, obovoidei ad late ellipsoidae, recti vel parum incurvati, 8-spori, 35–45 × 10–12 μm. Ascospores multisieriate, imbricatae, hyalinae, gattulae, parietibus tenuibus, rectae ad parum curvatae, obovoideae, base obtusa et apice obtuso, latissimae prope apicem, mediano l-septatae, ad septum non constrictae, (10–)11–12(–13) × (2.5–)3–3.5 μm.

Leaf spots amphibigae, subcircular to irregular, 5–25 mm in diameter, light brown, surrounded by a diffuse, red-purple margin on the upper surface, which is colorless with the leaf surface on the lower surface. Pseudothecia hypophyllous, single, up to 20 per colonized mm², black, subepidermal, globose, 70–90 μm wide, 60–90 μm high; ostioles apical, 5–10 μm diameter, becoming papillose, walls consisting of 2–3 layers of medium brown textura angularis, sub-hymenial layer at base consisting of 1–2 layers of hyaline cells. Asci fasciculati, bitunicati, obovoid to broadly ellipsoidal, straight or curved, 8-spori, 35–45 × 10–12 μm. Ascospores multisieriate, overlapping, hyaline, guttulate, thin walled, straight to curved, obovoid with obtuse ends, widest near apex, mediately 1-septate, not constricted at septum, tapering prominently towards lower end, (10–)11–12(–13) × (2.5–)3–3.5 μm. Spermogonia intermixed with pseudothecia, up to 100 μm wide and 80 μm high. Spermata rod shaped, hyaline, 5–7 × 1 μm, straight or slightly curved. Mycelium mostly internal on leaves, consisting of brown, verruculose, septate, branched hypheae, 2–4 μm diam. Phaeophleospora conidionoma pycnidial, amphilogenous, substomal, scattered, black, globose to subglobose, unicellular, up to 100 μm high and 130 μm in diameter; wall of textura angularis in surface view, consisting of 2–3 layers of brown cells, becoming light brown towards the inner layer. Ostiole single, central. Conidiophores absent. Conidigenous cells discrete, pale brown, applaniform or doliiform to subcylindrical, pale brown, verruculose, with 1–15 percurrent proliferations, 4–15 × 4.5–7 μm. Conidia holoblastic, solitary, exuding from ostiole in long cirri, subcylindrical to narrowly obclavate, apex subobtuse, tapering slightly from the basal septum to a narrowly truncate base, straight or slightly flexuous, thick walled, medium brown, verruculose, guttulate, 3–5-euseptate, (30–)45–55(–65) × (3–)3.5–4(–5) μm in vitro, (35–)45–55(–60) × (3–)3.5–4(–5) μm in vivo; lateral branches frequently present in vitro; hila thickened and sometimes refractive in vitro with a marginal frill.

*Cercostigmata* synanamorph: mycelium in some cultures giving rise to dark brown or back stromata on MEA, up to 150 μm wide and 100 μm high, composed of dark pseudoparenchymatous cells. Conidiomata sporochial, brown, up to 250 μm wide and 170 μm high (including the conidiophores). Conidiophores irregular, subcylindrical, frequently branched below, straight or geniculate–sinuous, 1–6-septate, medium brown, verruculose, arising from the upper cells of the stroma, 20–60 × 5–7 μm. Conidigenous cells terminal, subcylindrical or slightly doliform, medium to light brown, verruculose, with up to 5 enteroblastic percurrent proliferations, 7–15 × 5–6 μm. Conidia holoblastic, apical, solitary, medium brown, (15–)30–35(–55) × 4–5 μm, verruculose, 0–5 transversely euseptate, guttulate, straight to variously curved, obclavate to subcylindrical, apex rounded to obtuse, base truncate to obconically truncate with a marginal frill; primary conidia frequently forming lateral branches or secondary conidia via microcyclic conidiation.

**ASCOSPORE GERMINATION ON MEA:** germinating from both ends, becoming up to 6 μm wide, spore and germ tubes becoming uniformly olivaceous upon germination, with germ tubes parallel or almost perpendicular to the long axis of the spore, becoming coiled and distorted.

**CULTURES:** colonies 10–12 mm in diameter on MEA after 1 month at 25°C in the dark, margins smooth, regular, aerial mycelium sparse, white-grey when present, outer colony olivaceous grey, 23mm (top), with numerous spore cirri in central part; greenish black 33mmk (bottom).

**CARDINAL TEMPERATURES FOR GROWTH:** above 5°C min., 20–25°C optimum (opt.), below 35°C max.


**DISTRIBUTION:** Argentina, Australia, Bhutan, Brazil, Ethiopia, Hong Kong, India, Indonesia, Madagascar, Malawi, Myanmar, New Zealand, Philippines, South Africa, Taiwan, Tanzania, United States (Hawaii), and Zambia (Crous and Swart 1995; Sankaran et al. 1995).
Figs. 1–5. *Mycosphaerella sutoniae* and its anamorph *Phaeophleospora epicoccoides* (PREM 54963). Fig. 1. Asci and ascospores. Fig. 2. Rod-shaped spermatia. Fig. 3. Germinating ascospores on MEA. Fig. 4. Conidiogenous cells and conidia of *Phaeophleospora epicoccoides* in vitro (left) and in vivo (right). Fig. 5. *Cercostigmata* synanamorph. Scale bars = 10 μm.
Crous and Braun (1996) described many intermediate morphological forms in the Cercostigmata–Stigmina complex. This suggests that the present generic circumscription of Cercostigmata is tentative. Sutton and Crous (1997) provisionally accepted Cercostigmata for species with brown sporodochial conidiomata, and integrated conidiogenous cells that proliferate percurrently rather than sympodially and have euseptate, verrucose conidia. Based on these features, the synanamorph of M. suttoniae is accommodated in Cercostigmata.

In a recent comparison of the presently described species of Phaeophleospora (as Kirryanycetes), Palm (1996) speculated that, although no teleomorph had yet been linked to Phaeophleospora spp., it would probably be a bitunicate ascomycete in the Dothideales. The description of M. suttoniae as teleomorph of Phaeophleospora epicoccoides confirms this hypothesis. Furthermore, the Stagonospora (Sacc.) Sacc. anamorph of Mycosphaerella delegatensis R.F. Park & Keane could possibly be congeneric to the pale-spored species of Phaeophleospora, as speculated by Walker et al. (1992).

**Mycosphaerella irregulariramosa** Crous et M.J. Wingf. sp.nov. Figs. 6–8

**ANAMORPH:** Pseudocercospora irregulariramosa Crous et M.J. Wingf. sp.nov. Fig. 8.

**ETYMOLOGY:** named for the irregular swellings on lateral branches that develop after ascospore germination.

Leaf spots amphigenous, subcircular, 3–15 mm diam., glisting ad pallide brunneae. Pseudothecia amphigenea, subcircular, 3–5 mm diam., ad parum curvatæ, verruculosa, ad basim ramosa. Mycosphaerella irregulariramosa Crous et M.J. Wingf. sp.nov. Fig. 8.

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Figs. 6–8. Mycosphaerella irregulariramosa and its anamorph Pseudocercospora irregulariramosa (PREM 54964, 54965). Fig. 6. Ascii and ascospores. Fig. 7. Germinating ascospores on MEA. Fig. 8. Conidia and conidiophores in vivo (left) and in vitro (right). Scale bars = 10 μm.

hyaline, guttulate, thin walled, straight, fusoid-ellipsoidal with obtuse ends, widest in middle of apical cells, medianly 1-septate, not constricted at septum, tapering toward both apices, but with slightly more prominent taper towards lower end (7–)8–10 × (1.5–)2–2.5 μm. Spermogonia intermixed between caespituli and pseudothecia. Spermatia hyaline, rod shaped, 2–3 × 1 μm. Mycelium internal and external, consisting of septate, branched, smooth, olivaceous to light brown hyphae, 2–3.5 μm wide. Caespituli brown, amphigenous. Conidiophores fasciculate, arising from the upper cells of a well-developed brown stroma, up to 100 μm wide and 60 μm high; conidiophores subcylindrical, verruculose, light brown, 1–4-septate, straight to geniculate-sinuous, rarely branched below, 15–45 × 3.5–5.5 μm. Conidiogenous cells terminal, monoblastic to polyblastic, proliferating sympodially, light brown, verruculose, subcylindrical, terminating in truncate loci, 7–17 × 2.5–3.5 μm. Conidia solitary, light to medium brown, verruculose, guttulate, thick walled, subcylindrical with a subobtuse apex and truncate base, multisepate, irregular in width along
its length on host material (not in culture), irregularly curved, (35–)45–75(–85) × 2.5–3 μm in vivo, 70–200 × 1.5–2 μm in vitro.

ASCOSPORE GERMINATION ON MEA: germinating from both ends, not darkening upon germination, becoming constricted at the septum, 3–3.5 μm wide, distorting slightly, with germ tubes growing parallel to the long axis of the spore, and lateral branches appearing after 24 h (frequently from original ascospore); lateral branches are irregular in width, geniculate and branched.

CULTURES: colonies 43–47 mm in diameter on MEA after 1 month at 25°C in the dark, margins irregular, feathery, surface not sectored, aerial mycelium sparse, colonies iron grey, 25°K (surface), greenish black 33°K (bottom).

CARDINAL TEMPERATURES FOR GROWTH: above 5°C min., 20–25°C opt., below 35°C max.

HOST: Eucalyptus saligna.

DISTRIBUTION: South Africa.


NOTES: Ascospores of M. irregulariramosa (7–)8–10 × (1.5–)2–2.5 μm are most similar to M. heimii (8–9–11(–12) × 2–2.5(–3) μm (anam. Pseudocercospora heimii) and M. ellipsoidea Crous & M.J. Wingf. (8–10–11 × (2–)2.5–3 μm (anam. Uebruehania ellipsoidea Crous & M.J. Wingf.). Mycosphaerella irregulariramosa can be distinguished from these species by its smaller ascospores, subulate to conical, apex and base, narrowly obclavate, margin even, smooth, clearly delimited. Aerial mycelium moderate, olivaceous grey, present on zones between different circles; colonies flat, spreading.

CARDINAL TEMPERATURES FOR GROWTH: above 5°C min., 20–25°C opt., below 35°C max.

HOST: Eucalyptus sp.

DISTRIBUTION: Indonesia.


NOTES: Ascospore shape and dimensions of M. heimiioides (7.5–)8–10(–11) × (2–)2.5–3 μm are very similar to those of M. heimii (8–9–11(–12) × 2–2.5(–3) μm (PREM 51750, type), and (9–)10–11(–13) × 2–2.5(–3) μm (PREM 54969, 54975) for Indonesian collections). However, there are some clear differences between these species. The type and Indonesian collections of M. heimii have ascospores that germinate with germ tubes parallel to the long axis of the spore, whereas ascospores of M. heimiioides produce germ tubes that arise perpendicular to the long axis. Furthermore, colonies of M. heimiioides also...
Figs. 9–11. *Mycosphaerella heimioides* and its anamorph *Pseudocercospora heimioides* (PREM 54966, 54967). Fig. 9. Asci and ascospores. Fig. 10. Germinating ascospores on MEA. Fig. 11. Conidia and conidiogenous cells in vitro. Scale bar = 10 μm.

produce red crystals in MEA, have different cultural features to *M. heimii*, and have a *Pseudocercospora* anamorph with shorter conidia than those of *Pseudocercospora heimii*.


Discussion

The surveys that have given rise to the present study have led to the description of three additional species of Mycosphaerella. It is thus apparent that intensified surveys, particularly in areas where Eucalyptus leaf fungi have only been considered superficially, will lead to the discovery of more species. The large number of species of Mycosphaerella that have been described on this single host genus might be considered surprising. In this regard, various factors should be considered. The genus Eucalyptus is large and diverse, and this would presumably lead to abundant speciation events in fungi occurring on this host. Evidence also exists that some fungi on other Myrtaceous genera have become adapted to infect Eucalyptus spp. (Ferreira 1989; Sutton and Pascoe 1989a). Furthermore, the distinct anamorph form genera associated with Mycosphaerella spp. occurring on Eucalyptus suggest that Mycosphaerella could also represent a number of discrete generic entities.

Until recently, MLB disease of eucalypts in South Africa was attributed either to M. molleriana or Mycosphaerella nubilosa (Cooke) Hansf. (Doidge 1950; Lundquist and Purnell 1987; Crous et al. 1991). Other records from Africa referred to the disease as being caused by a Mycosphaerella sp. (Shakatite 1991). In a study of the species associated with MLB disease in South Africa, Crous and Wingfield (1996) found no material of either M. molleriana or M. nubilosa, but recorded six different species, five of which were new to science. The findings of the present study further suggest that most of the South African species associated with MLB also occur elsewhere on the continent. Some of these species, such as M. marksii, may prove to be heterogeneous (Crous and Wingfield 1996). Ascospores of the Indonesian collection of M. marksii showed some distortion upon germination which was not found in material obtained from Australia or South Africa.

Both M. parkii and M. suberosa, which were previously only known from Brazil, are now also known to occur in Asia. The fact that they occur on the latter continent, which has some native eucalypts and is geographically close to Australia, suggests that they may also occur on Eucalyptus spp. in Australia.

Eucalyptus leaves from Indonesia associated with M. heimi showed extensive leaf spotting, thus suggesting that it is an important leaf pathogen, as initially reported by Bouriquet (1946). Crous and Swart (1995) speculated that Calonectria quinqueseptatam Figueiredo & Namek., which is presently not known from Africa (Crous and Wingfield 1994), probably reached Madagascar via Eucalyptus material introduced from Indonesia. Similarly, M. heimi, which has hitherto been known only from Madagascar and is now also known from Indonesia, might have originated from the latter country.

In this study, we found evidence that many Mycosphaerella spp. pathogenic to Eucalyptus spp. have apparently moved between continents. Although it is difficult to determine areas of origin, distribution patterns are beginning to emerge from these surveys. Mycosphaerella cryptica, which is known from Australia and New Zealand, has recently been observed in Chile (Wingfield et al. 1995). Mycosphaerella africana, known only from Africa (Crous and Wingfield 1996), has recently been identified from E. globulus leaves from Portugal (PREM 54974) and E. grandis leaves from Colombia (PREM 54978). Mycosphaerella marksii, recently described from Australia (Carnegie and Keane 1994), also occurs in Africa and Portugal (Crous and Wingfield 1996). In the present study, it was also isolated from E. globulus leaves from Indonesia (PREM 54976).

Mycosphaerella spp. are commonly isolated as endophytes from Eucalyptus leaves (P. Crous, unpublished data), and it is possible that species could also be distributed in asymptomatic, apparently healthy plant material. Patterns pertaining to the distribution of these fungi on different continents are beginning to emerge. Evidence for species having moved between continents is also emerging, although the basis for this movement, or the time at which it occurred is unknown. Additional surveys in the many areas where eucalypts are grown, but where leaf-infesting fungi have not been studied, are required. A more complete perspective of the distribution of these fungi will contribute substantially to the taxonomy of Mycosphaerella and its anamorphs, as well as to our knowledge of these fungi as pathogens of Eucalyptus.

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