New and interesting records of South African fungi. XIII. Foliicolous microfungi

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Ten foliicolous fungi are described and illustrated. With the exception of Chaetospermum chaetosporum (Pat.) Smith & Ramsb., nine fungi are new records for South Africa, namely Dictyosporium elegans Corda, Helicosporum phragmites Hönel, Mycotorbis mirabilis Nag Raj & Kendrick, Pestalosphaeria hansenii Shoemaker & Simpson and its Pastalotriopsis Stey anamorph, Phacidium eucalypti Beaton & Weste and its anamorph Caethospora innumera Masseee, Phyllosticta eucalyptorum Crous, Wingfield, Ferreira & Allenas, Pseudocercospora handelli (Bubák) Deighton, Selendriella fertilis (Pirozynski & Hodges) Castañeda Rius & Kendrick, and Semifissispora rotundra Swart. Furthermore, two teleomorphs are described for Phyllosticta eucalyptorum and P. cussoniae Cej as Guignardia eucalyptorum Crous sp. nov. and G. cussoniae Crous sp. nov.

Tien verskillende swamme, geïsoleer vanaf blare, word beskryf en geïllustreer. Met die uitsondering van Chaetospermum chaetosporum (Pat.) Smith & Ramsb., is nege van hulle nuwe rekords vir Suid-Afrika: Dictyosporium elegans Corda, Helicosporum phragmites Hönel, Mycotorbis mirabilis Nag Raj & Kendrick, Pestalosphaeria hansenii Shoemaker & Simpson met sy Pestalotriopsis Stey anamorph, Phacidium eucalypti Beaton & Weste en sy anamorf Caethospora innumera Masseee, Phyllosticta eucalyptorum Crous, Wingfield, Ferreira & Allenas, Pseudocercospora handelli (Bubák) Deighton, Selendriella fertilis (Pirozynski & Hodges) Castañeda Rius & Kendrick, en Semifissispora rotundra Swart. Die teleomorf van twee Phyllosticta spesies, P. eucalyptorum en P. cussoniae Cej, word beskryf as Guignardia eucalyptorum Crous sp. nov. en G. cussoniae Crous sp. nov.

Keywords: Foliicolous fungi, Guignardia cussoniae, Guignardia eucalyptorum, new species.

Introduction

Studying the Earth’s biodiversity has become a central issue for scientists worldwide (Wicklow & Carrol 1981; Norton 1986). However, very little is presently known about the fungal biodiversity, and it is conservatively estimated that there could be more than 1.5 million fungi, of which only 4.6% have to date been recognized (Hawksworth 1991). Fungi are extremely valuable, with different taxa having the ability to degrade different substances (Blanchette 1991), or frequently to produce biologically active products with important commercial applications (Hawksworth 1991).

The fungi occurring on vascular plants are inadequately known. Of these, foliicolous fungi play important roles in the ecosystem as either having a pathogenic or saprophytic role with their host. Several of these fungi have been recorded once only, and little or nothing is known about their habitats, cultural characteristics and possible teleomorph/anamorph connections. In dealing with foliicolous fungi, several of these issues have been addressed (Crous et al. 1993a,c). The present study reports on a number of fungi inhabiting leaves of mainly Myrtaceous hosts. The aim of this study is to record these fungi for South Africa, to describe them in culture, and to report the undescribed states of some of these.


Conidiomata eustromatic, up to 500 µm in diam., in culture, subepidermal, becoming erumpent, separate, opening with an irregular rupture of the epidermis, sporulating with a pale cream conidial mass; wall consisting of thin-walled cells of textura angularis. Conidiophores hyaline, smooth, sparingly septate at base. Conidiogenous cells hyaline, smooth, up to 15 µm in length and 3 µm in diam., bearing single, terminal conidia. Conidia hyaline, smooth, guttulate, 21 – 30 × 4 – 6 µm, with 5 – 9 hyaline, unbranched, tubular, straight appendages, up to 25 µm in length, and 2 µm in diam., tapering to acute apices, situated on the apical and basal regions of conidia.

Cultures are whitish on 2% malt-extract agar (MEA), and appear pale yellow when sporulating after 2 weeks at 25°C under near-ultraviolet light.

The presence of C. chaetosporum in South Africa was first reported by Roux (1985), who collected the fungus during a survey of the fungal flora occurring in the Karoo. The present collection, however, was obtained from Syzygium

Figure 1 Conidia and conidiogenous cells of Chaetospermum chaetosporum (scale bar: 10 µm).
leaf litter collected in the Natal province, South Africa, indicating that the fungus occurs in dry as well as more humid climates. The isolate discussed above (PREM 51284) does not fall into the range of variation depicted by Sutton (1980) for C. chaetosporum. A revised key for Chaeto-
spermum Sacc. by Nag Raj (1993), however, shows C.
chaetosporum to be best suited for this collection because of
its larger conidial dimensions and appendages. Furthermore,
C. chaetosporum has also recently been reported by
Muntaha-Cvetkovic and Gómez-Bolea (1993) from gram-
niculous plant litter in Spain. In their accompanying
description they report conidia to be 15 – 45 × 5 – 10 μm,
thereby including the variability observed in the South
African isolate.

Natal, Kwambonambi, Syzygium cordatum Hochst. leaf

2. Dictyosporium elegans Corda, Weitenweber’s Beiträge
87 (1836), Figures 2, 14.

Sporodochia scattered, superficially to slightly immersed,
elipsoid to globose. Conidiophores micronematous,
smooth, simple or branched. Conidiogenous cells integrated,
smooth, hyaline or light brown, doliform; 3 – 15 μm long,
3 – 6 μm in diam. Conidia solitary, dry, holoblastic,
cheiroid, golden to red-brown, smooth-walled, 35 – 55 μm
long, 15 – 28 μm in diam.; basal cell 5 – 7 μm wide,
giving rise to 4 – 6 parallel, tightly appressed arms in one
plane, each being 8 – 11-septate.

Colonies are black on MEA, and sporulate well after 2 –
3 weeks at 25°C under near-ultraviolet light.

Ellis (1971) reported D. elegans to have been collected
from Europe, America and Africa. Chen et al. (1991) stated
that there are presently more than twenty species described
in Dictyosporium Corda.

Western Cape, Riviersonderend, Tygerhoek, leaves and
stubble of Hordeum vulgare, J.P.J. Louw, July 1990, PREM
51286.

3. Helicosporium phragmites Hönel, Annls mycol. 3: 338
(1905), Figures 3, 15, 16.


Synonyms listed by Barr (1980).

Conidiophores mostly unbranched, sometimes forked at the
base, hyaline, but base frequently light brown, 4 – 5 μm in
diam., tapering to an apex 1 – 1.5 μm diam., 150 – 300 μm
in length. Conidia attached to denticles in the lower half of
the conidiophore, 1 – 2 μm in length; conidia hyaline,
coiled 3 – 4 times in one plane, filaments 1.5 – 2 μm thick,
6 – 12-septate, 15 – 20 μm in diam.

Colonies are pale brown to orange and sterile on MEA.
The present collection was made from wheat litter, which
is not uncommon, as Warcup (1957) also reported isolates
of Helicosporium Nees from soil in a wheatfield in England.

Talbot (1951) reported three Helicosporium spp. from
woody hosts in South Africa, H. gracile (Morgan) Linder,
H. lumbricoides Sacc. emend Matruchot and a new species,
H. ramosum Talbot. A fourth species, H. aureum (Corda)
Linder was also later reported from wood (Talbot 1958).

Webster (1951) proved the teleomorph–anamorph connec-
tion between H. phragmites and T. heliomyces in cul-
ture. In the same year, Ellis and Ellis (1951) also reported
H. phragmites from various hosts where it occurred in asso-
ciation with T. heliomyces.

In a treatment of Tubeufia Penz. & Sacc., Rossman
(1977) reduced T. heliomyces to synonymy with the earlier
described T. paludosa (Crouan & Crouan) Rossman.

Figure 2 Conidia and conidiogenous cells of Dictyosporium
elegans (scale bar: 10 μm).

Figure 3 Setous conidiophore and conidia of Helicosporium
phragmites (scale bar: 10 μm).
Samuels et al. (1979) accepted this synonymy (based on observations of the teleomorph), but stated that there were at least two species whose ascomata were morphologically similar to that of *T. paludosum*, and that they could only be distinguished on the basis of their anamorphs. Furthermore, their illustration of the anamorph, which they reported as *Helicomyces*-like, is distinctly different from that illustrated by others (Ellis & Ellis 1951; Webster 1951; Ellis 1971). The illustration of Samuels et al. (1979) showed conidia to have less coils, a smaller diameter, and wider filaments than found by other workers for *H. phragmitis*. Conidiophores were also illustrated as being pigmented throughout, with sporulation also occurring at their tips. This is in contrast with the conidiophores described and illustrated by Webster (1951) and Ellis (1971) as hyaline, or with a light basal pigmentation, and a sterile apical elongation. In her treatment of *Tubefia* (Barr 1980), *T. helicomyces* was placed in *Tubefia* section *Tubefia*, but not listed as a synonym of *T. paludosum*. It would seem that species of *Tubefia* are morphologically conserved, and that only a detailed study of their respective anamorphs would eventually solve the delimitation of taxa in this group.


Conidiomata pycnidal, separate, globose, unilocular, up to 300 μm in diam.; wall up to 20 μm in diam., consisting of brown cells of *textura angularis*. Ostiole present. Conidiophores hyaline, straight, cylindrical, branched at base, septate, up to 17 μm in length, and 2 μm in diam. Conidiogenous cells cylindrical with slight apical taper, hyaline, smooth, up to 10 μm in length, and 2 μm in width, giving rise to apical conidia. Conidia hyaline, aseptate, navicular, with acute apex and truncate base, 12 – 18 × 2 – 3 μm; apical appendage simple, tubular, smooth, cylindrical, up to 12 μm in length; basal appendages tubular, 2 – 4, hyaline, smooth, simple, cylindrical, up to 14 μm in length.
Colonies whitish on MEA, appearing pale brown owing to sporulation after 2 – 3 weeks at 25°C under near-ultraviolet light.

Ascomata hypophyllous, scattered, immersed in host mesophyll, becoming slightly erumpent, globose, up to 200 μm in diam. and 160 μm high, unilocular; wall 15 μm thick, composed of 4 – 5 layers of light brown, thick-walled angular cells in the outer layer, with thin-walled cells in the inner layer; periphyses present, ostiole up to 30 μm in diam. Asci uniloculate, cylindrical with a short stipe, apical apparatus with an amyloid annulus, 8-spored, 60 – 80 × 6 – 7 μm; intermixed with simple, hyaline, 1 – 2-septate paraphyses, 3 – 4 μm wide. Ascospores uniseriate, ellipsoidal, 2 (– 3)-septate with unequal cells, grey brown, constricted at septa, 12 – 14 × 6 – 7 μm.
Single-ascospore isolates produced a *Pestalotiospis* Stey. anamorph in culture. Cultures sporulated readily on MEA after 2 weeks at 25°C under near-ultraviolet light.
Conidiomata pycnidial, becoming acervular, up to 160 μm in diam.; basal stroma 15 – 20 μm in diam. of *textura angularis*. Conidiogenous cells holoblastic, proliferating 1 – 3 times percurrently, cylindrical, hyaline, smooth, 8 – 13 × 2 – 3 μm. Conidia fusiform, straight, 4-septate, 22 – 36 × 6 – 7 μm; central cell dark brown, adjacent cells brown, apical cell hyaline with 2 – 3 filiform, flexuous appendages, 8 – 20 × 0.5 – 1 μm; basal cell hyaline with a central filiform appendage, 4 – 9 × 0.5 – 1 μm.
*P. hansenii* was originally described from diseased pine needles of *Pinus caribaea* Morelet var. *hondurensis* Barrett & Golifari collected in Papua New Guinea (Shoemaker & Simpson 1981).

Aphoridia black when moist, subcircular, becoming erumpent, scattered to gregarious, up to 500 μm in diam.; rupturing by 3–7 teeth to expose hymenium. Ascii unitunicate, cylindrical-clavate, 8-spored, apical mechanism bluing in Melzer's reagent, 50–75 × 7–9 μm. Ascospores hyaline, ellipsoidal-fusiform, non-septate, biseriate, 10–17 × 3–4.5 μm. Paraphyses hyaline, 1–4-septate, cylindrical, 1.5–2 μm in diam., with clamp apices up to 3 μm in diam., embedded in mucilage.

P. eucalypti is the only member of Phacidium Fr. that occurs on hosts in the Myrtaceae. Furthermore, it is the only member of the Phacididiaceae that is known to occur below 34° S (DiCosmo et al. 1984). Because this species is saprophytic, DiCosmo et al. (1984) predicted that the anamorph, when found, would be a Ceutohospora Grev. species. Single-ascospore isolations made in this study showed a Ceutohospora species to be produced in culture, thus confirming the prediction and generic concept of Phacidium Fr. as defined by DiCosmo et al. (1984). The morphology of the Ceutohospora anamorph of P. eucalypti closely matched the description of C. inumera Massee, which Swart (1988) redescribed and illustrated from Eucalyptus collections in Australia. C. inumera is characterized by having conidiophores reduced to simple, discrete conidiogenous cells, and conidia that are 16–20 × 2.5–3 μm (Swart 1988). The possibility that C. inumera is the anamorph of P. eucalypti has recently been proposed by Nag Raj (1993), and is subsequently confirmed in the present study.

Conidiomata pycnidial, stromatic, gregarious, erumpent, subglobose, irregularly multilocular, each locule having a separate ostiole, up to 400 μm in diam.; individual locules 100–200 μm in diam.; outer wall of textura globulosa, 25–30 μm in diam. Conidiophores reduced to conidiogenous cells. Conidiogenous cells phialides with minute collarettes, discrete, subcylindrical with apical taper, smooth, 10–15 × 3–5 μm, embedded in mucilage. Conidia blastic-phialidic, subcylindrical, slightly irregular, with apical taper and rounded base with a flat dehiscence scar, hyaline, smooth-walled, 15–22 × 2–2.5 μm; invested in a mucilaginous sheath that becomes everted to form an irregular funnel-shaped, hyaline apical appendage, that can be up to 20 μm in length.

Cultures sporulated well on MEA after 3 weeks at 25°C under near-ultraviolet light.


Conidiomata pycnidial, immersed, amphiogenous, up to 250 μm in diam., wall consisting of 6–9 layers of brown cells. Conidiophores reduced to conidiogenous cells, Conidiogenous cells hyaline, smooth, lageniform to ampulliform, frequently covered in mucus, 5–15 × 2–3 μm. Conidia unicellular, ellipsoid, 10–15 × 5–6.5 μm in vitro, guttulate, with persistent mucous sheaths, apical appendages 5–8 μm long, ca. 1–1.5 μm diam. at base, tapering to a blunt apex.

P. eucalyptorum was recently described from Brazil (Crous et al. 1993b), where it was found to be associated with prominent leaf spots of E. grandis seedlings. In this study, cultures were obtained from a fresh local collection. When incubated on CLA, a previously undescribed Guignardia Viála & Ravaõ teleomorph developed, with pseudothecia intermixed with pycnidia of P. eucalyptorum. The teleomorph is subsequently described below.

Guignardia eucalyptorum Crous, sp. nov.


Ascospores abundant, obpyriform, up to 150 μm in diam. and 200 μm in height, intermixed amongst pycnidia, black, solitary or in groups forming extensive stromata, unilocular

[Images of Ascus, ascospores, paraphyses, conidia and conidiogenous cells of Phacidium eucalypti (scale bar: 10 μm).] [Images of Ascus, ascospores, conidia and conidiogenous cells of Guignardia eucalyptorum (scale bar: 10 μm).]


Pycnidia separate, black, immersed, becoming erumpent, amphigenous, globose, up to 200 μm in diam. and 160 μm high; wall composed of 6 – 8 layers of brown cells of textura angularis. Conidiogenous cells lageniform to ampulliform, 5 – 11 × 3 – 5 μm. Conidia unicellular, ellipsoidal, 8 – 13 × 4 – 6 μm, guttulate, with persistent mucous coats, ca. 1 μm thick; apical appendages 6 – 8 μm long, ca. 1 – 1.5 μm diam. at base, tapering to a blunt tip.

Cejp (1971) did not mention the presence of the hyaline conidial appendages in the original description, which, according to Van der Aa (1973) and Punithalingam (1974), is characteristic for the genus. A re-examination of the holotype specimen (PREM 32831) showed these conidial appendages to be present, thus confirming it to be a true species of Phyllosticta sensu Van der Aa (1973). Furthermore, immature asci and ascospores of a Guignardia sp. were also observed. In additional collections mature material of the teleomorph was obtained, and the Guignardia state can therefore be described below.

Guignardia cussonia Crous, sp. nov.


Synonyms listed by Deighton (1987).

Fructifications amphigenous, grey in colour. Mycelium mostly internal, stroma present. Conidiophores smooth, aggregated in fascicles, subhyaline to pale olivaceous, apex rounded or irregular at point of attachment, branched or simple, 20 – 50 × 2.5 – 4 μm, 0 – 4-septate, 0 – 1-geniuculate with integrated conidiogenous cells. Conidia holoblastic, smooth, hyaline to pale olivaceous, narrowly cylindric, straight or slightly curved, base tapering slightly and gradually towards hilum, which is narrower than the widest part at the basal septum, tip narrowly rounded, subacute, conidial scars inconspicuous, indistinctly 5 – 16-septate, 90 – 160 × 2 – 2.5 μm.

Cultures sporulate well on CLA after 7 days at 25°C.

Figure 8 Asci, ascospores, conidia and conidiogenous cells of Guignardia cussonia (scale bar: 10 μm).

Figure 9 Conidia and conidiophores of Pseudocercospora handelii (scale bar: 10 μm).
under near-ultraviolet light.

Deighton (1976) placed Cercospora handelli Bubák in Cercosporiella Petr., but redispersed it in 1987 to Pseudocercospora Deighton due to the slightly olivaceous conidia, inconspicuous conidial scars, and the visable taper in the basal conidium cell.


Setae scattered, separate or in fascicles, simple, erect, straight, 80 – 200 μm long, up to 8-septate, thick-walled, dark brown at base, 6 – 12 μm diam., becoming lighter at apex, 2 – 3 μm diam. Conidiogenous cells lageniform, arranged in clusters on cells around the base of setae, or formed as extensions of setal apices; light brown at base, becoming hyaline towards apex, 9 – 14 × 3 – 5 μm; proliferating sympodially, and reaching 20 μm in length with further development. Conidia falcate, hyaline, non-septate, rounded and blunt base, 11 – 16 × 1.5 – 2 μm.

Colonies are white on MEA, becoming olivaceous. Good sporulation occurs after 2 – 3 weeks at 25°C under near-ultraviolet light.

Castañoeda Ruíz & Kendrick (1990) erected the genus Selenodriella to separate those species with a mode of conidiogenesis from those of Selensporella Arnaud ex Mac Garvie and Idariella Nelson & Wilhelm. The South African collection differs from that of the type (Pirozynski & Hodges 1973) in having slightly smaller conidia and shorter stipules. Given that the primary morphology is identical, this variation is seen as acceptable within the taxon.


Ascocarps subglobose, up to 300 μm in diam. and 250 μm high; wall up to 40 μm thick, consisting of 4 – 6 layers of dark brown cells of textura angularis. Asci cylindric-clavate, 90 – 140 × 16 – 20 μm, surrounded by septate paraphysoids with cells 22 – 12 × 3 – 4 μm. Ascospores bito triseriate, hyaline, splitting and bending at median septum, apical cells 15 – 19 × 7 – 11 μm, basal cells 17 – 20 × 5 – 7 μm.

Cultures sporulated on MEA and CLA after 4 weeks at 25°C under near-ultraviolet light.

This is the second species of Semifissispora Swart recorded from South Africa (Crous & Van der Linde 1993), and the second record of S. rotundra worldwide, the other being the type collection from Australia. Dimensions of asci and ascospores closely fit those of the type collection (Swart 1982).

Western Cape, Stellenbosch, Stellenbosch Mountain,

Figure 10 Seta, conidia, conidiogenous cells and chlamydo-spores of Selenodriella fertilis (scale bar: 10 μm).

Figure 11 Ascus, ascospores and paraphysoids of Semifissi-spora rotundra (scale bar: 10 μm).


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References


