Foliicolous dematiaceous hyphomycetes from *Syzygium cordatum*

P.W. Crous, M.J. Wingfield, and W.B. Kendrick

Abstract: During a study of foliicolous fungi on *Syzygium cordatum* in South Africa, several previously undescribed or unreported fungi were collected. Two new species of *Anungitea*, ***Anungitea caespitosa*** and ***Anungitea syzygii***, are described from leaf litter. An additional four new taxa are also described, ***Chloridium constrictospora***, ***Parasympodiella elongata***, and ***Vermiculariopsiella spiralis*** from litter, and ***Podosporium etheldoidgeae*** from living leaves. Several saprobic fungi are reported for the first time in South Africa. The morphological variation occurring in *Conoplea mangenotii* is discussed.

Key words: foliicolous fungi, Myrtaceae, systematics, *Syzygium cordatum*.

Résumé : Au cours d'une étude sur les champignons folicoles du *Syzygium cordatum* en Afrique du Sud, les auteurs ont trouvé plusieurs champignons non décrits ou jamais mentionnés. Ils décrivent deux nouvelles espèces d'*Anungitea*, l'***Anungitea caespitosa*** et l'***Anungitea syzygii***, venant dans la litière. Ils décrivent de plus quatre nouveaux taxons, le ***Chloridium constrictospora***, le ***Parasympodiella elongata*** et le ***Vermiculariopsiella spiralis*** venant dans la litière, et le ***Podosporium etheldoidgeae*** venant sur les feuilles vivantes. On rapporte plusieurs champignons saprophytes, pour la première fois en Afrique du sud. Les auteurs discutent finalement les variations morphologiques qui surviennent chez le *Conoplea mangenotii*.

Mots clés : champignons folicoles, Myrtaceae, systématique, *Syzygium cordatum*.
[Traduit par la rédaction]

Introduction

In recent years, considerable effort has been made to document the fungi, both pathogenic and apparently saprobic, that occur on the leaves of *Eucalyptus* spp. (Myrtaceae) in South Africa (Crous 1990; Crous et al. 1989, 1990; Crous and Van der Linde 1993). These studies have been motivated primarily by the fact that *Eucalyptus* spp. form an important component of exotic forest plantations in the country (Directorate National Forestry Planning 1988). In contrast, little attention has been paid to fungi that occur on native Myrtaceae in this part of the world.

Forest pathologists have recently noted that some fungi pathogenic on native Myrtaceae have become adapted to attack new hosts. For example, the rust fungus *Puccinia psidii* Winter, which occurs on native Myrtaceae in South America, has become one of the most important pathogens of *Eucalyptus* in Brazil (Ferreira 1989). Similarly, there has been speculation that the important canker pathogen of eucalypts, *Cryphonectria cubensis* (Bruner) Hodges, originated on *Syzygium aromaticum* (L.) Merr.: Perry (Myrtaceae) in Indonesia (Hodges et al. 1986). Documentation of fungi occurring on native Myrtaceae in countries where eucalypts are important exotic species is therefore of interest.

Although well represented in Australia and South America, the Myrtaceae are far less numerous in southern Africa, where there are only 34 species in 10 genera (Arnold and De Wet 1993). In southern Africa, one of the most common and widely distributed myrtaceous tree species is *Syzygium cordatum* Hochst. on which a small number of fungi have been documented (Crous and Wingfield 1991; Crous et al. 1993; Crous 1993). The aim of this study was to make additional collections and thereby extend our knowledge of foliicolous fungi occurring on this host.

Materials and methods

Leaves of *S. cordatum* were collected in the eastern Transvaal and Natal Provinces of South Africa in 1992 and the first half of 1993. Leaves were incubated in Petri dishes containing moist filter paper at 25°C for 14 d under near-ultraviolet light. Single-conidial isolations were made by removing single, germinating conidia from 2% malt extract agar (MEA) (Biolab) dilution plates. Colonized agar plugs (3 mm in diameter) were transferred to carnation leaf agar (CLA) (Crous et al. 1992) and *Syzygium* leaf agar (SLA) (autoclaved pieces of *Syzygium* leaf placed on water agar) and incubated at 25°C under near-ultraviolet light to induce sporulation.

Optimum growth temperature was determined for each of the fungi on MEA. One single-conidium isolate was selected of each species and used in the growth studies. To determine

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the maximum radial growth of species in culture, agar plugs (3 mm in diameter) from the periphery of young, actively growing colonies of each fungus were placed at the centre of MEA plates and incubated at 25°C for 1 d to promote active growth. Radial growth after 1 d was noted, and thereafter plates were placed in incubators at the temperatures under consideration. Optimum growth temperature (expressed as mean radial growth) was determined after isolates had been incubated for 10 d in the dark at temperatures ranging from 5 to 35°C at 5° intervals. Each treatment had three replications and the experiment was carried out twice. Average growth was calculated from four radial measurements from each of the three plates. Colony color was determined after growth at 25°C in the dark for 10 d, and the color designations used were those of Rayner (1970). Voucher specimens are lodged at the National Collection of Fungi, Pretoria (PREM), and reference strains are maintained in the culture collection of the Department of Plant Pathology, University of Stellenbosch, South Africa (CPC) and CBS in The Netherlands.

Results and discussion

Anungitea caespitosa Crous, Kendrick et Wingfield sp.nov. Figs. 1, 8, 9

Etymology: The tuft-like arrangement of the conidiophores.

Coloniae effusae, glabrae, stramineae. Mycelium plerumque immersum, ex hyphis septatis brunneis, glabris, 2−3 μm latis. Setae erectae, rectae parietibus crassis, demum pallide brunneae ad hyalinae ad apicem parietatibus gracilibus, glabrae, 5−17-septatae, 50−340 μm altae, 3.5−5 μm latae admodum supra basem, steriles, vel in cellula conidiogena terminantes. Conidiophora distincta, mononemata, simplicia, caespitis divergentibus ad 6, base brunnea, pallidioria ad apicem, 3−6-septata, recta, 30−65 μm alta, 3−4 μm lata admodum supra basem. Conidiogenae cellulae terminales polyblasticae, sympodiale proliferantes, pallide brunneae ad hyalinae, denticulis numerosis inconspicius truncatis in parte apicali, 10−15 × 3 μm. Primaria conidia blastica, sympodialia, denticulis apicalibus exorientia, singularia, conidia secondaria producentia, apicibus rotundatis ad basibus truncatis contracta. Secondaria conidia blasto-acropetalia, in catenatis brevibus nonramosis, clavata ad ellipsoidea, ad apicibus subtruncatis basibus contracta, nonseptata, sicca, hyalina, laevia, 11−20 × 3−3.5 μm.

Colonies effuse, smooth, straw colored (21'f) on MEA, radial growth 12 mm after 10 d at 25°C in the dark. Mycelium mostly immersed, composed of brown, smooth, septate hyphae, 2−3 μm wide. Setae erect, straight, smooth- and thick-walled, dark brown, becoming pale brown to hyaline toward a thin-walled, rounded apex, 5−17-septate, 50−340 μm high, 3.5−5 μm wide just above the base, sterile, or terminating in a conidiogenous cell. Conidiophores distinct, mononematous, unbranched, in divergent tufts of up to 6, arising from a knot of hyphal cells associated with the bases of setae, brown at the base, becoming paler toward the apex, 3−6-septate, straight, 30−65 μm high, 3−4 μm wide just above the swollen base. Conidiogenous cells terminal, integrated, polyblastic, proliferating sympodially, hyaline to pale brown, with numerous inconspicuous flattened denticles in the apical region, 10−15 × 3 μm. Primary conidia blastic, sympodial, arising from apical denticles, clavate or spindle-shaped, tapering from rounded apices to truncate bases, occurring singly, giving rise to secondary conidia. Secondary conidia blastic-acropetal, in short unbranched chains, clavate to ellipsoid, tapering to subtruncate apices and bases, nonseptate, dry, hyaline, smooth, 11−20 × 3−3.5 μm (Figs. 8, 9).

Cardinal temperatures for growth: minimum above 5°C, optimum 25°C, maximum below 35°C.

Holotype: SOUTH AFRICA: *Eastern Transvaal*: Sabie, leaf litter of *S. cordatum*, leg. M.J. Wingfield, det. P.W. Crous, Nov. 1992, PREM 51686, CPC 565.

Anungitea Sutton (1973) was introduced for *A. fragilis* Sutton, which has pale brown, mononematous, distinct conidiophores each with a terminal, closely denticulate conidiogenous cell with flattened, unthickened conidial scars. Conidia are cylindrical, smooth, hyaline to pale olivaceous, produced in unbranched chains, and have flattened, refractive, apical and basal scars.

Anungitea caespitosa is easily distinguished from other species of this genus by the tufted arrangement of its conidiophores and the presence of setae, which could also become fertile conidiophores (Fig. 1). This arrangement of conidiophores in the presence of setae was also observed in vitro on SLA. Although these criteria could also be used to defend the assignment of this fungus to a new genus, we believe that the characteristic mode of conidiogenesis is sufficient justification for placing it in *Anungitea*.

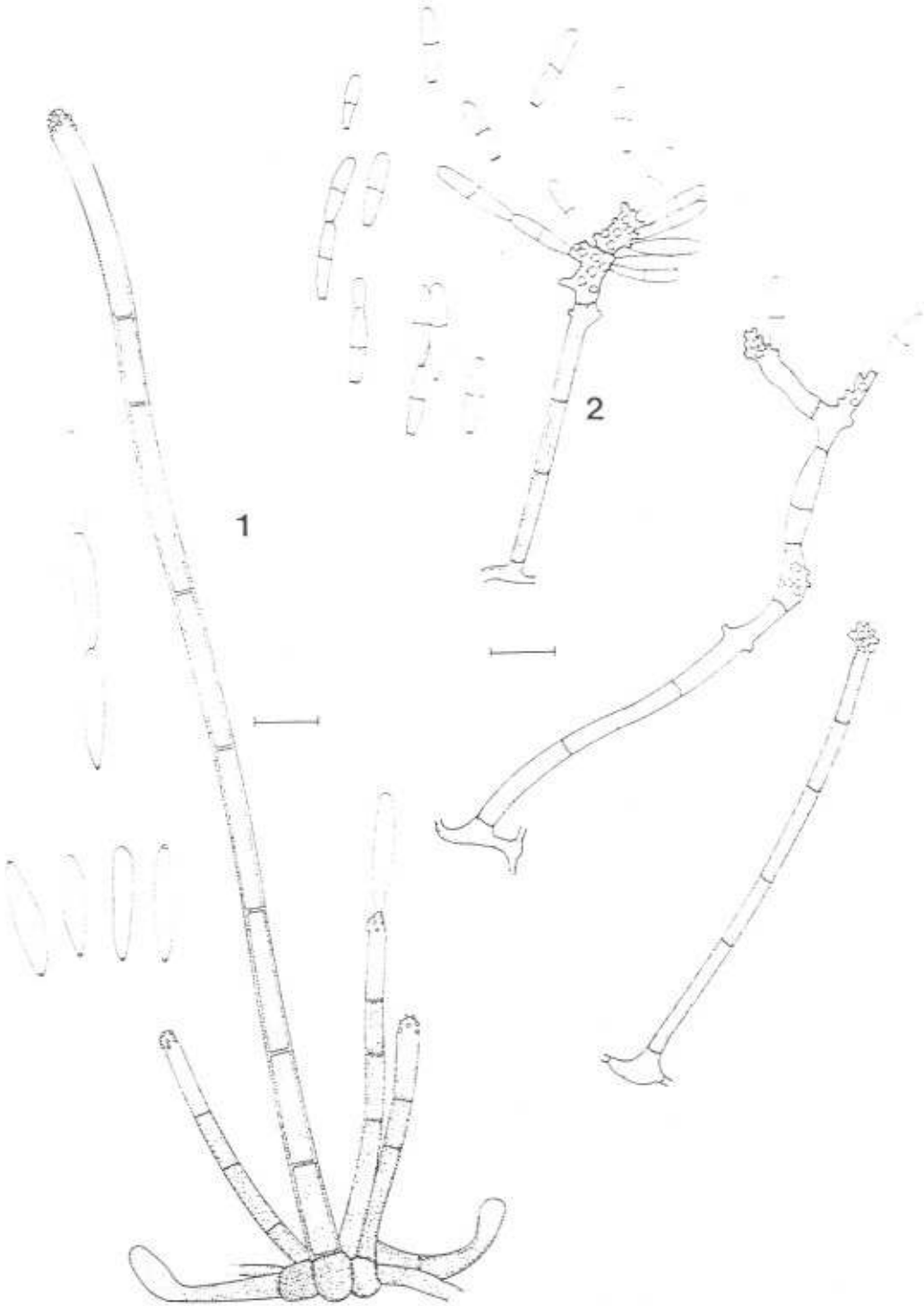
Anungitea syzygii Crous, Kendrick et Wingfield sp.nov. Figs. 2, 10, 11

Etymology: Occurring on *Syzygium*.

Coloniae effusae, irregulares, viridi-nigrae. Mycelium plerumque immersum, ex hyphis pallide brunneis, leavibus, septatis, 1−2 μm latis; hyphae superficiales brunneae septatae verruculosae, 2−3 μm latae. Conidiophora distincta, mononemata, erecta, solitaria, recta ad flexuosa, parietibus crassis, nonramosa vel ramosa in parte apicali, septata demum intercalaria, polyblastica, sympodiale proliferantia, denticulis numerosis apicale cicatrisis truncatis, laevia, recta vel bis geniculata, brunnea, parietibus, saepe tumida 10−40 × 3−5 μm. Primaria conidia blastico-sympodialia, in denticulis posita; secondaria conidia blastico-acropetala in catenatis duorum, subellipsoidea ad subcylindracea, laevia, (0−)1-septata, hyalina ad pallide brunnea, primaria apicibus tundatis et basibus truncatis; secondaria extremis truncatis; bases conidiorum refractivae, incrassatae, parum constrictae; catenatae plerumque post separatione cellulis conidiogenis persistentes; conidia 8−15 × 2−2.5 μm.

Colonies effuse, irregular, greenish-black (33""'k) on MEA, radial growth 1 mm after 10 d at 25°C in the dark. Mycelium mostly immersed, composed of pale brown, smooth, septate hyphae, 1−2 μm wide; superficial hyphae brown, septate, verruculose, 2−3 μm wide. Conidiophores distinct, mononematous, erect, solitary, straight to flexuous, smooth, thick-walled, unbranched or branched in the apical part, septate, brown, 50−130 μm high, 2−4 μm wide at basal septum (Fig. 2). Conidiogenous cells integrated, terminal, becoming intercalary, polyblastic, proliferating sympodially, with numerous apically cicatrized, flattened denticles, smooth, straight or once geniculate, brown, thick-walled,

Figs. 1 and 2. *Anungitea caespitosa* and *A. syzygii* in vivo. Fig. 1. Fasciculate conidiophores with catenulate conidia of *A. caespitosa*. Fig. 2. Macronematous conidiophores with catenulate conidia of *A. syzygii*. Scale bars = 10 μm.

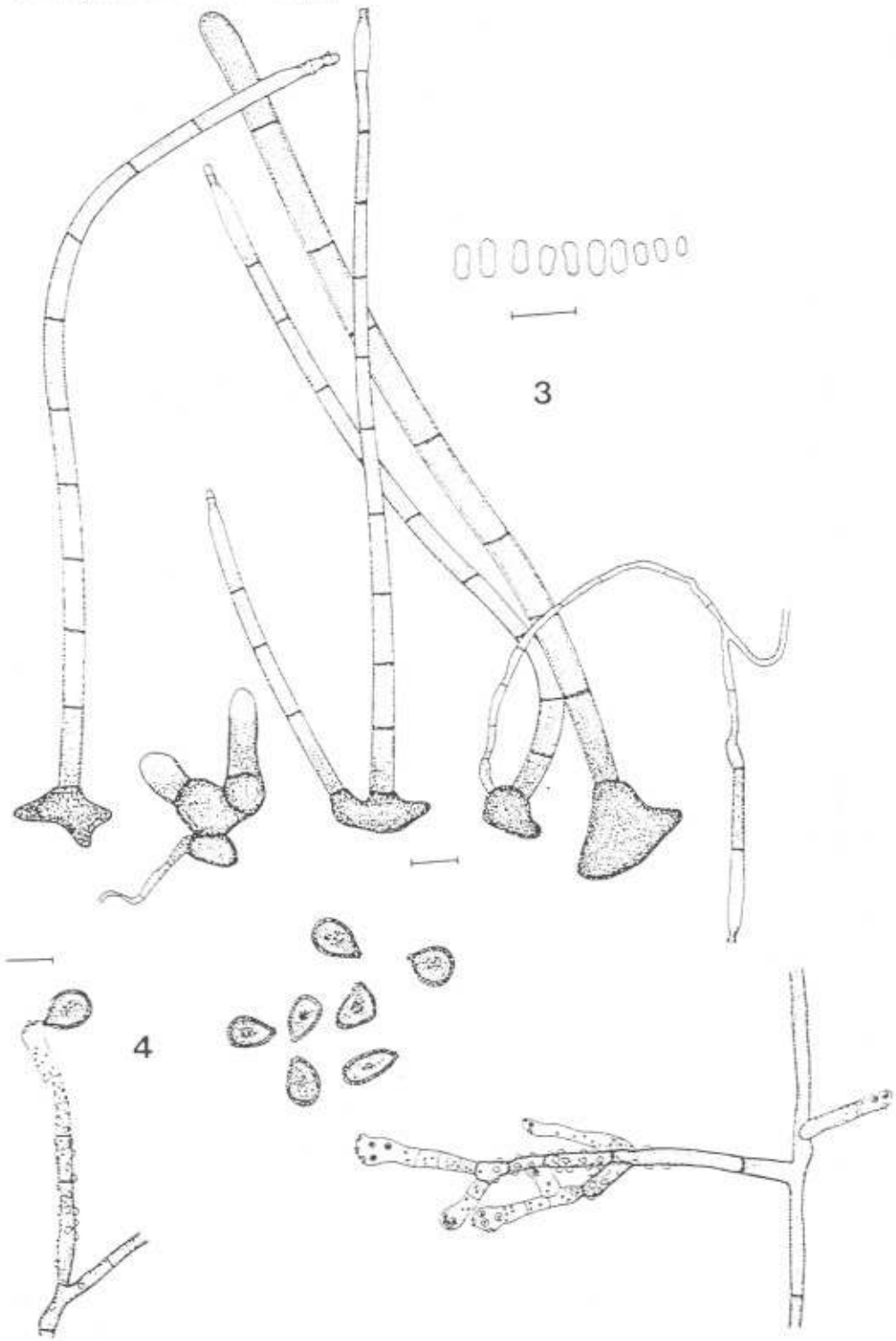


frequently swollen, 10–40 × 3–5 μm. Primary conidia blastic-sympodial, clavate or cylindric, borne on denticles, apex rounded, base truncate; secondary conidia blastic-acropetal, in chains of 2, sub-ellipsoid to sub-cylindric, smooth, (0–)1-septate, hyaline to pale brown, with truncate ends; conidial bases refractive, thickened, and slightly constricted; conidial chains frequently persisting after separation from conidiogenous cells; conidia 8–15 × 2–2.5 μm (Figs. 10, 11).

Cardinal temperatures for growth: Minimum above 15°C, optimum 25°C, maximum below 30°C.

Holotype: SOUTH AFRICA: *Eastern Transvaal*: Sabie, leaf litter of *S. cordatum*, leg. W.J. Swart, det. P.W. Crous, Mar. 1993, PREM 51687, CPC 578.

Figs. 3 and 4. *Chloridium constrictospora* and *Conoplea mangenotii* in vivo. Fig. 3. Conidiophores and conidia of *C. constrictospora*. Fig. 4. Warted conidiophores and thick-walled conidia of *C. mangenotii*. Scale bars = 10 μm.



Anungitea syzygii is most similar to *A. occidentalis* Castañeda & Kendrick (1990*b*), *A. heterospora* Kirk (1983), *A. fragilis* Sutton (1973), and *A. globosa* Sutton & Hodges (1978). *Anungitea globosa* is characterized by long apical sterile elements on its conidiophores and conidia that form longer chains than found in *A. syzygii*. *Anungitea fragilis* produces longer conidial chains and narrowly cylindric conidia, while *A. heterospora* has smaller denticles, wider conidia and unbranched conidiophores, which distinguish them from *A. syzygii*. The conidia of *A. occidentalis* are very similar to those of *A. syzygii*, but the conidiophores are distinct. Those of *A. occidentalis* are always unbranched, have

only apical denticles, and are shorter (15–50 μm) than those of *A. syzygii*.

Chloridium constrictospora Crous, Wingfield et Kendrick sp.nov. Figs. 3, 12, 13

Etymology: Named after the characteristic median conidial constriction.

Coloniae effusae, margine, irregulari, olivaceo-bubalinae, chlamydospora intercalaria. Mycelium immersum et superficiale, ex hyphis atro ad pallide brunneis, septatis ramosis, 1.5–5 μm latis. Conidiophora, erecta, recta vel flexuosa, cylindracea, parietibus crassis, cellula basali tumida, atro-brunnea, sursum pallidiora, singularia vel in caespitibus ad 4, ex gregibus gangliorum hyphosorum, 75–340 μm longa, 3–7 μm lata supra base, apicale cellula conidiogena parum tumida collo terminali. Conidiogenae cellulae monophialidicae integratae, terminales, pallide brunneae, tumidae, ad 2 μm, contractae demum in colla expansae, 3–5 μm profunda, 1.5–3.5 μm lata; percurrente proliferantes collis vetiores sub collis novis persistentibus. Conidia hyalina laevia, cylindrica, constrictione medio et apicibus obtusis, singulatim intra colla producentia, in massis mucosis aggregata, 3–6 × 1.5–2.5 μm.

Colonies effuse, with an irregular margin, olivaceous buff (23″i) on MEA, radial growth 17 mm after 10 d at 25°C in the dark. Mycelium immersed and superficial, consisting of light to dark brown, septate, branched hyphae, 1.5–5 μm wide; chlamydospores dark brown, intercalary. Conidiophores, erect, straight or flexuous, cylindrical, thick-walled, with a swollen basal cell, dark brown, becoming paler toward the apex, occurring singly, or in tufts of up to 4, arising from groups of hyphal knots, 75–340 μm long, 3–7 μm wide just above the base, ending in a slightly swollen conidiogenous cell with a terminal collarette (Fig. 3). Conidiogenous cells monophialidic, integrated, terminal, pale brown, swollen, tapering near apex to 2 μm, with flared collarettes 3–5 μm deep, 1.5–3.5 μm wide (Fig. 12); proliferating percurrently with older collarettes persisting below the new ones. Conidia hyaline, smooth, cylindric with a central constriction and rounded ends (Fig. 13), produced singly within collarettes, aggregating in slimy masses, 3–6 × 1.5–2.5 μm.

Cardinal temperatures for growth: Minimum above 5°C, optimum 25°C, maximum below 35°C.

Holotype: SOUTH AFRICA: *Natal*: Kwambonambi, leaf litter of *S. cordatum*, leg. M.J. Wingfield, det. P.W. Crous, Feb. 1992, PREM 51688, CPC 508, CBS 432.92.

Gams and Holubová-Jechová (1976) characterized the genus *Chloridium* Link as producing unbranched, darkly pigmented conidiophores with integrated, terminal phialides that proliferate enteroblastically. Species are distinguished by culture characteristics, conidium ontogeny, and general morphology of conidia and conidiophores.

Several *Chloridium* spp. resemble *Chloridium syzygii* in producing cylindric conidia (Gams and Holubová-Jechová 1976; Morgan-Jones et al. 1983). *Chloridium syzygii* can, however, easily be distinguished from these species by the central constriction of the conidia, which give the impression of conidia with swollen ends.

Conidiophores of *Chloridium syzygii* are much larger on host material (Fig. 3) than in vitro on MEA or SLA. Several conidiophores were observed to be sterile with bluntly rounded heads, giving the impression of setiform conidiophores. These occurred singly or in the same tufts with fertile conidiophores but were not observed in vitro.

Conoplea mangenotii Reisinger, Rev. Mycol. 31: 329–340. 1967 Figs. 4, 14

Colonies buff (19″f), becoming brown (17″k) with abundant aerial mycelium on MEA, radial growth 16 mm after 10 d at 25°C in the dark. Mycelium dark brown, becoming pale brown to hyaline toward apices, septate, warty, thick-walled, continually branching dichotomously (Fig. 14), septate, 1.5–6 μm wide. Conidiophores distinct, erect, terminating in apical conidiogenous cells, branching dichotomously below fertile region, brown and warty at base, becoming pale brown to hyaline and verrucose toward apex, 25–150 μm high, 1.5–5 μm wide at the base. Conidiogenous cells hyaline, integrated, proliferating sympodially, terminal, sometimes becoming intercalary, smooth to verruculose, polyblastic, 8–30 × 4–6 μm; proliferation blastic-sympodial with rhexolytic secession. Conidia dark brown, smooth, thick-walled, globose to subglobose, nonseptate, single, dry, 6.5–13 × 6–9 μm, base truncate, 1–1.5 μm wide, with a minute marginal frill (Fig. 4); germ slits absent.

Cardinal temperatures for growth: Minimum above 5°C, optimum 25°C, maximum below 35°C.

Specimen: SOUTH AFRICA: *Eastern Transvaal*: Sabie, leaf litter of *S. cordatum*, leg. M.J. Wingfield, det. W.B. Kendrick, Nov. 1992, PREM 51689, CPC 559.

Conoplea Persoon is characterized by its dematiaceous, straight or flexuous, often twisted, branched, and usually echinulate conidiophores. Conidiogenous cells are terminal, integrated, polyblastic, cylindric, usually twisted, sympodial, often indistinctly denticulate, and produce brown, dry, nonseptate, solitary, usually echinulate conidia that often have germ pores or germ slits (Ellis 1971). *Conoplea mangenotii* is easily distinguished from other species of *Conoplea* by its smooth conidia and germ slits that are rare or absent (Ellis 1976). Not mentioned in its original description is the fact that the dark brown, warty mycelium branches dichotomously below the conidiogenous cells, which give rise to dark, thick-walled, globose to subglobose conidia with truncate bases that secede rhexolytically.

We are unconvinced that *Conoplea mangenotii* is a species of *Conoplea*, because it has little in common with the type species. However, we do not feel adequately informed to revise the genus at present.

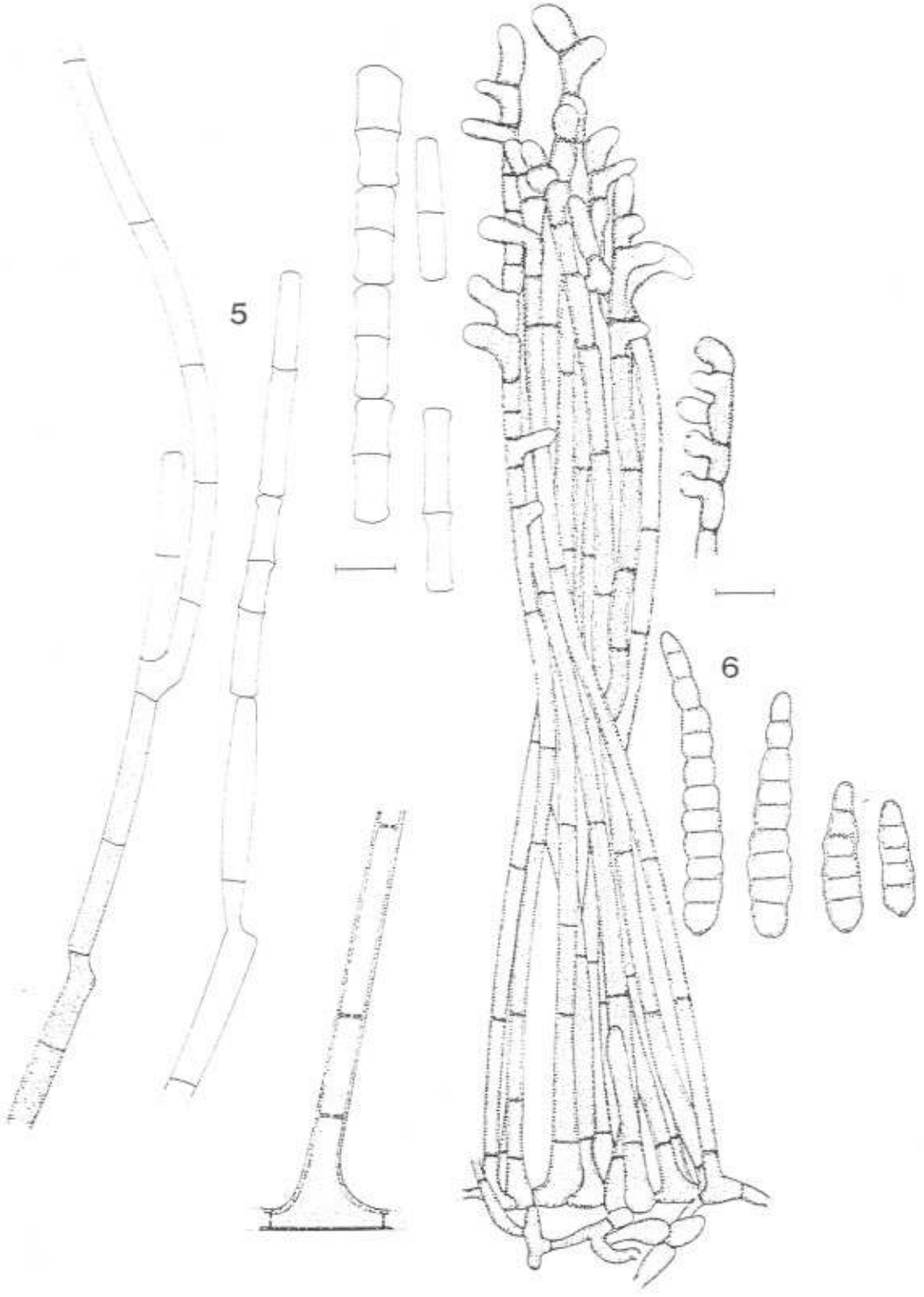
Conoplea mangenotii was isolated from leaf litter of *S. cordatum* collected in the Eastern Transvaal province of South Africa and appeared to be restricted to the woody midribs of leaves. Ellis (1976) reports a collection from branches of *Rhus cotinus* Torr. & Gray in France.

Parasympodiella elongata Crous, Wingfield et Kendrick sp.nov. Figs. 5, 15, 16

Etymology: Named for the elongated conidiophores.

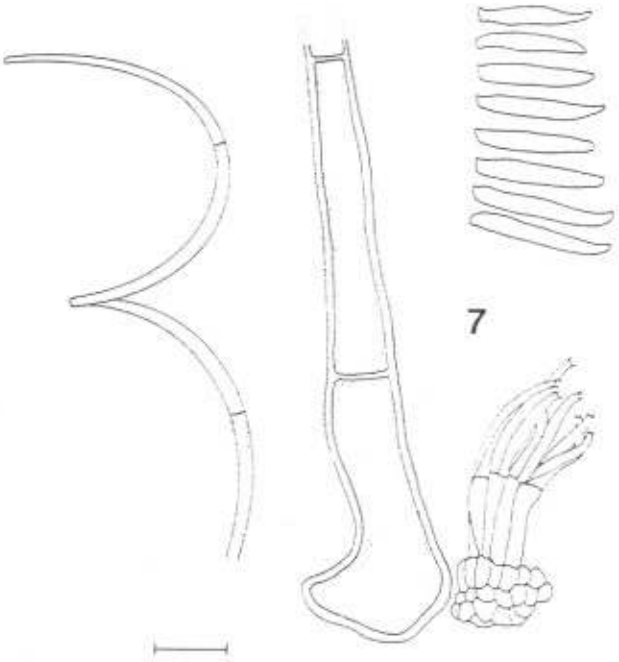
Coloniae effusae, hyphis sparse distributis. Mycelium immersum et superficiale ex hyphis ramosis, septatis, laevibus, brunneis, 5–6 μm latis. Conidiophora distincta, mononemata, non ramosa, recta, parietibus, crassis, brunnea, base ad 25 μm lata, pallidiora regionem conidiogenam versus,

Figs. 5 and 6. *Parasympodiella elongata* and *Podosporium etheldoidgeae* in vivo. Fig. 5. Elongate conidiophores and catenulate conidia of *P. elongata*. Fig. 6. Synnematous conidiophores and conidia of *P. etheldoidgeae*. Scale bars = 10 μm.



apice 5–6 μm lata, in cellulis fertilibus terminantia; pars basalis atra ad 900 × 8 μm, septis ad 40; pars apicalis hyalina ad 400 × 5 μm, septis ad 8, catenas longas formantia. Cellulae conidiogenae holothallicae, terminales, demum intercalares, integratae, indeterminatae, irregulariter sympodiales, 25–50 × 5–6 μm, laeves, atrobrunneae ad hyalinae, 20–150 μm inter locis conidiogenis, demum catenis longis nonramosis. Conidia thallico-arthrica, hyalina, sicca,

Fig. 7. Spirally twisted seta, conidiophores and conidia of *Vermiculariopsiella spiralis* in vitro. Scale bar = 10 μm.



laevia, cylindracea, apice et base conidiorum intercalariorum truncata, conidiis apicalibus, apicale obtusis, base truncatis, (0−)1(−2)-septata, 20−40 × 6−12 μm.

Colonies effuse, hyphae sparsely distributed, hyaline on MEA, radial growth 40 mm after 10 d at 25°C in the dark. Mycelium immersed and superficial, composed of branched, septate, smooth, brown hyphae, 5−6 μm wide. Conidiophores distinct, mononematous, unbranched, straight, thick-walled, brown, up to 25 μm wide at the base, becoming paler toward the thin-walled conidiogenous region (Figs. 5, 15), 5−6 μm wide at apex, terminating in fertile cells; basal, darker part of conidiophores up to 900 μm long and 8 μm wide, with up to 40 septa; apical, hyaline portion up to 400 μm long and 5 μm wide with up to 8 septa, and forming long chains of conidia (Fig. 16). Conidiogenous cells holothallic, terminal, becoming intercalary, integrated, indeterminate, irregularly sympodial, 25−50 × 5−6 μm, smooth, hyaline to dark brown, 20−150 μm between conidiogenous loci, giving rise to long, unbranched conidial chains. Conidia thallic-arthric, hyaline, dry, smooth, cylindrical, apex and base of intercalary conidia truncate, apical conidia with obtuse apex and truncate base, (0−)1(−2)-septate, 20−40 × 6−12 μm.

Cardinal temperatures for growth: Minimum above 10°C, optimum 25°C, maximum below 35°C.

Holotype: SOUTH AFRICA: *Eastern Transvaal*: Sabie, leaf litter of *S. cordatum*, leg. M.J. Wingfield, det. P.W. Crous, Nov. 1992, PREM 51690, CPC 553.

Morgan-Jones et al. (1983) extended the generic concept of *Parasympodiella* to include species without catenulate conidia and with conidiogenous loci dispersed at regular intervals, as in *Parasympodiella africana* Morgan-Jones, Sinclair & Eicker. Inclusion of species with conidia that are not catenulate makes *Parasympodiella* similar to *Subulispora* Tubaki as emended by de Hoog (1985). However, Castañeda and Kendrick (1990*a*) erected the genus *Cylindrosympodium* Kendrick and Castañeda to include species with cylindrical conidia formerly assigned to *Subulispora* by de Hoog (1985). Furthermore, *Cylindrosympodium* is characterized by having a nonseptate conidiogenous region, crowded conidiogenous cells, and hyaline conidiophores. These characteristics make *Cylindrosympodium* unsuitable to accommodate *Parasympodiella africana*. Although *Parasympodiella africana* differs from the generic concept of *Parasympodiella*, it is best retained in that genus until more collections and cultures can be obtained for detailed study. *Parasympodiella elongata*, with its dematiaceous conidiophores, irregularly dispersed conidiogenous loci, and chains of hyaline conidia, is a typical species of *Parasympodiella*.

Morphologically, *Parasympodiella elongata* is most similar to *Parasympodiella laxa* (Subramanian & Vittal) Ponnappa (1975). *Parasympodiella elongata* is distinguished from the latter species by its wider, longer conidiophores with greater distances between the conidiogenous loci. Furthermore, *Parasympodiella laxa* has 0−3-septate conidia 18−50 × 6−8 μm, with punctiform septal plugs that are absent in *Parasympodiella elongata*. *Parasympodiella clarkii* (Sutton 1978) and *Parasympodiella africana* (Morgan-Jones et al. 1983). *Parasympodiella elongata* can be distinguished from species such as *Parasympodiella minima* Crane & Schoknecht (1982) and *Parasympodiella clarkii* Sutton (1978) by its (0−)1(−2)-septate conidia; conidia of *Parasympodiella minima* and *Parasympodiella clarkii* are 3-septate.

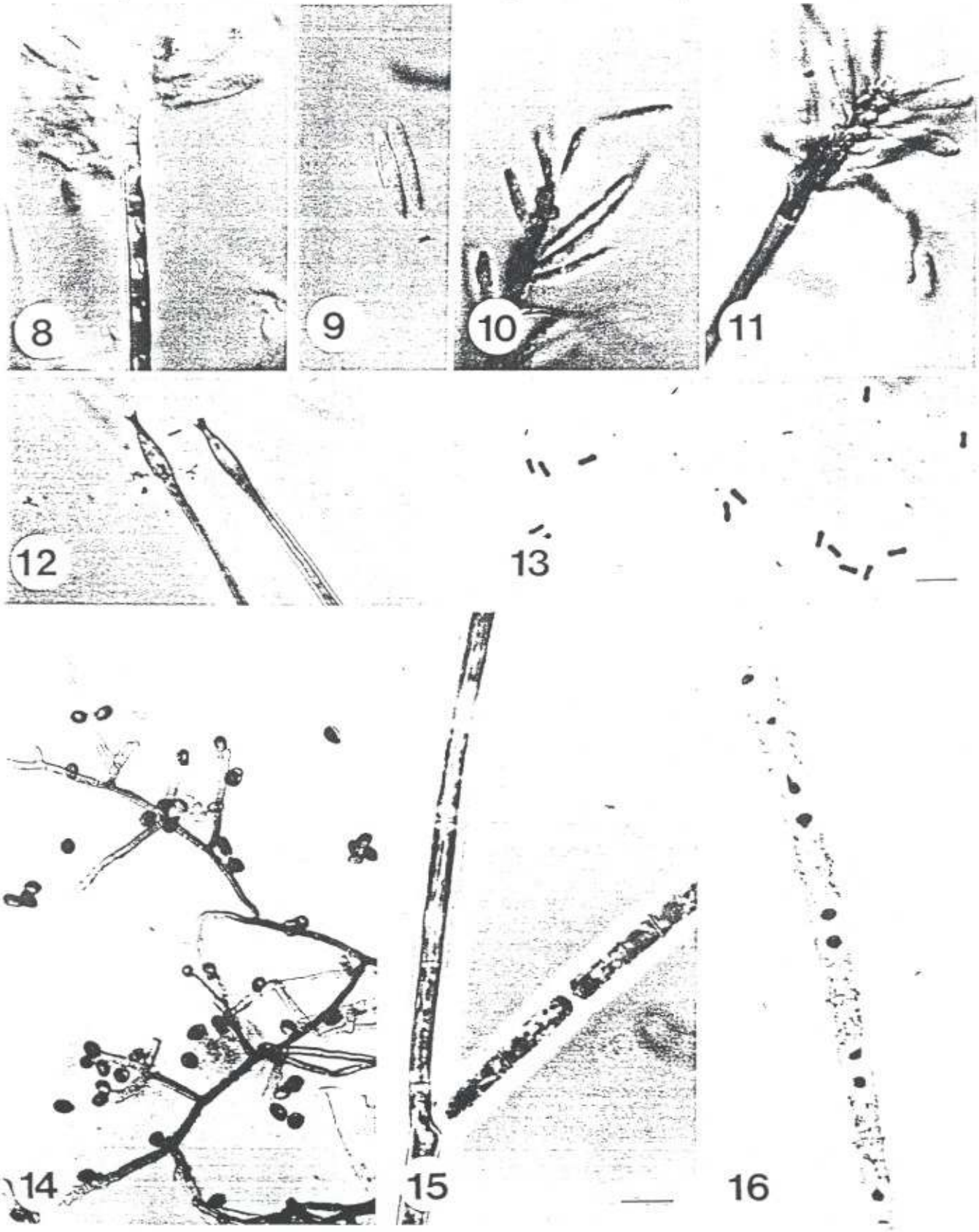
Podosporium etheldoidgeae Crous, Wingfield et Kendrick sp.nov. Figs. 6, 17−19

Etymology: Named in honour of Dr. Ethel M. Doidge, who dedicated her life to studying the South African mycota.

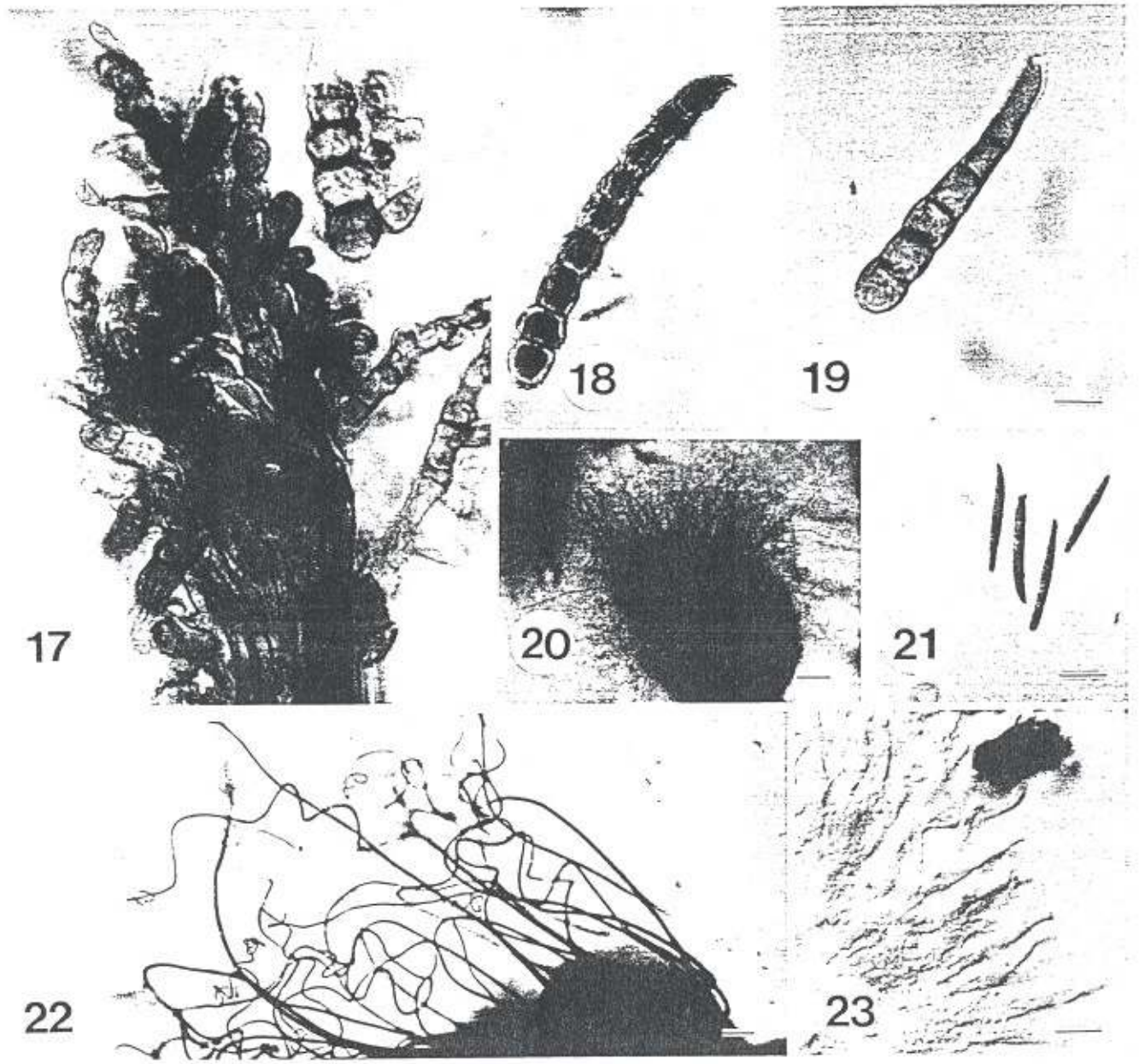
Coloniae effusae, brunneae. Mycelium fere immersum, ex hyphis pallide brunneis, verruculosis, septatis, ramosis compositum. Synnemata erecta, recta, simplicia, atrobrunnea, solitaria, circa costas in partibus basalibus, foliorum dispersa, 100−260 μm alta, 15−40 μm lata in parte apicali fertilia, 25−60 μm lata base. Conidiophora distincta septata, simplicia vel in apicibus ramosa, subtiliter verruculosa, recta vel irregulariter constricta, 4−6 μm lata, supra partem basalem tumidam; zona conidiogena septata. Conidiogenae cellulae polytreticae, simplices vel ramosae, terminales, demum intercalariae, clavatae apicibus, truncato-obtusis, 1−2 locis per cellulam, pariete crasso, mediobrunneae, subtiliter verruculosae, 7−15 μm longae, 5−7 μm latae. Conidia sicca, solitaria, obclavata, recta ad parum curvata, 4−12-septata, in septa parum ad prominente constricta, 32−85 × 6−9 μm, rugosa et verrucosa, brunnea, demum pallidiori ad apicem, cicatricibus, basalibus prominente depresois, 1.5−3 μm latis.

Colonies effuse, brown. Mycelium mostly immersed, composed of pale brown, verruculose, septate, branched hyphae. Conidiophores erect, arranged in synnemata, straight, unbranched, dark brown, solitary (Fig. 6), scattered around the midribs at the basal areas of leaves, 100−260 μm high, 15−40 μm wide at apical, fertile region, 25−60 μm wide at the base. Conidiophores distinct, septate, simple or branched at apices, dark brown, finely verruculose, straight or irregularly constricted, 4−6 μm wide above the swollen basal part; conidiogenous zone septate (Fig. 17). Conidiogenous cells polytretic, terminal becoming intercalary, bent at right

Figs. 8–16. Conidiophores, conidiogenous cells and conidia. Fig. 8. Conidiogenous region of *Anungitea caespitosa*. Fig. 9. Conidia of *A. caespitosa*. Figs. 10 and 11. Conidiogenous region and conidia of *Anungitea syzygii*. Figs. 12 and 13. Conidiogenous cells and conidia of *Chloridium constrictospora*. Fig. 14. Dichotomously branched mycelium and conidia of *Conoplea mangenotii*. Figs. 15 and 16. Conidiophore and catenulate conidia of *Parasympodiella elongata*. Scale bars = 10 μm.



Figs. 17–23. Conidiomata, conidiophores, conidiogenous cells and conidia. Figs. 17–19. Conidiogenous cells and conidia of *Podosporium etheldoidgeae*. Scale bar = 10 μm. Figs. 20–23. Sporodochia, conidia, setae and conidiogenous cells of *Vermiculariopsiella spiralis*. Fig. 20. Scale bar = 110 μm. Fig. 21. Scale bar = 10 μm. Fig. 22. Scale bar = 50 μm. Fig. 23. Scale bar = 10 μm.



angles, clavate with bluntly rounded apices, 1–2 loci (pores) per cell, thick-walled, medium brown, finely verruculose, 7–15 μm long, 5–7 μm wide. Conidia dry, solitary, obclavate, straight to slightly curved, 4–12-septate, slightly to prominently constricted at septa, 32–85 × 6–9 μm, rugose and verrucose, brown, becoming paler toward apex, with prominent basal scars, 1.5–3 μm wide (Figs. 18, 19).

Holotype: SOUTH AFRICA: *Eastern Transvaal*: Nelspruit, living leaves of *S. cordatum*, leg. M.J. Wingfield, det. P.W. Crous, Oct. 1992, PREM 51691.

The genus *Podosporium* Schweinitz is characterized by darkly pigmented synnemata consisting of distinct conidiophores terminating in mono- to poly-tretic, sympodially proliferating conidiogenous cells giving rise to brown, multiseptate, obclavate conidia (Seifert and Okada 1990; Chen and Tzean 1993).

Podosporium etheldoidgeae is morphologically most similar to *Parasympodiella elongata* Chen and Tzean (1993). It can be distinguished from that species by the shorter conidia and conidiophores and polytretic conidiogenous cells of *Podosporium etheldoidgeae*. The right angle bend, or lateral outgrowth of the conidiogenous cell apex seen in *Podosporium etheldoidgeae* is also typical of *Podosporium rigidum* Schweinitz, which is not, however, polytretic.

Vermiculariopsiella spiralis Crous, Wingfield et Kendrick sp.nov. Figs. 7, 20–23

Etymology: Named after its spirally twisted setae.

Coloniae effusae, marginibus, laevibus, primulinae, sporodochiis atris. Mycelium immersis, ex hyphis brunneis, laevibus, septatis, compositis 2–4 μm diametro, setas et conidiophora formans. Conidiomata sporodochialia, dispersa, solitaria, discreta, setosa, conidiis in massis mucosis aggregatis. Setae numerosae, erectae, parietibus crassis, atrobrunneae, curvatae ad flexuosae, circinatae ad spiraliter contortae in dimidio superiore, non ramosae, septatae, laeves, 500–1200 μm longae, 7–10 μm latae septo basale primario, ad apice 1–1.5 μm lato, rotundato decrescentes. Conidiophora fasciculata, pallido-brunnea, cylindracea, ad 30 μm longa, 2.5–4 μm lata. Cellulae conidiogenae monophialidicae, subcylindraceae ad lageniformes, hyalinae, parietibus tenuibus, laeves, 10–20 μm longae, 2–3 μm latae, collis recurvatis cylindraceis decrescentes, in collarettis expansis apicibus, 1–1.5 μm latis terminantes. Conidia hyalina, nonseptata, recta, cylindracea, apicale parum recurvata et acuminata, base obtusa ad rotundata protuberatione, subacuta laterati; conidiis 15–19 × 1.5–2.5 μm.

Colonies effuse, with smooth margins, pale yellow (primrose, 23'd) on MEA, with black sporodochial conidiomata, radial growth 13 mm after 10 d at 25°C in the dark. Mycelium immersed, composed of brown, smooth, septate hyphae, 2–4 μm in diameter, giving rise to conidiophores and setae. Conidiomata sporodochial, scattered, solitary, discrete, setose, with conidia aggregated in slimy masses. Setae numerous, erect, thick-walled, dark brown, curved to flexuous, circinate to spirally twisted in the upper half, unbranched, septate, smooth, 500–1200 μm long, 7–10 μm wide at the first basal septum, tapering to a rounded apex 1–1.5 μm wide (Figs. 7, 20, 22). Conidiophores fasciculate, pale brown, cylindric, up to 30 μm long, 2.5–4 μm wide. Conidiogenous cells monophialidic, subcylindric to lageniform, hyaline, thin-walled, smooth, 10–20 μm long, 2–3 μm wide, narrowing to recurved, cylindric necks, ending in flared collarettes with apices 1–1.5 μm wide (Figs. 7, 23). Conidia hyaline, nonseptate, straight, cylindric, apex slightly curved and pointed, base obtuse to rounded with a subacute lateral protuberance; conidial dimensions 15–19 × 1.5–2.5 μm (Figs. 7, 21).

Cardinal temperatures for growth: Minimum above 5°C, optimum 25°C, maximum below 30°C.

Holotype: SOUTH AFRICA: *Eastern Transvaal*: Barberton, Leaf litter of *S. cordatum*, leg. M.J. Wingfield, det. P.W. Crous, Nov. 1992, PREM 51693, CPC 555.

Vermiculariopsiella Bender has setose, sporodochial conidiomata with phialides producing nonseptate, hyaline, cylindric conidia with acute apices, rounded bases, and aggregated in white masses (Nawawi et al. 1990). This collection from *S. cordatum* is most similar to *V. immersa* (Desm.) Bender. Two varieties of *V. immersa* have been described, namely *V. immersa* var. *immersa* with straight setae and *V. immersa* var. *ramosa* (Sutton) Nag Raj with dichotomously branched setae (Nawawi et al. 1990). A recent re-examination of these species by Nawawi et al. (1990) led to the elevation of *V. immersa* var. *ramosa* to species level as *V. ramosa* (Sutton) Nawawi et al. based on differences in their setae and sporodochia.

Vermiculariopsiella immersa, *V. ramosa* and *V. spiralis* have similar phialides and conidia. *Vermiculariopsiella spiralis* can, however, be clearly distinguished from *V. ramosa* by the spirally twisted, unbranched setae of the former that taper to rounded apices 1–1.5 μm wide. Furthermore, sporodochia of *V. spiralis* are up to 2 mm in diameter and have numerous spirally twisted setae, whereas sporodochia of *V. immersa* are only up to 1100 μm in diameter and have 8–21 straight setae (Nawawi et al. 1990).

Although single-conidial isolates of *V. spiralis* at first sporulated profusely in vitro and produced spirally twisted setae on MEA and CLA, cultures became sterile and started producing shorter, stunted setae after subculturing.

During the course of this study numerous other dematiaceous hyphomycetes not previously known from South Africa were collected. Because the morphology of these species conformed to their published descriptions, they will not be considered further here. These include *Beltrania rhombica* O. Penzig (PREM 51696), *Curvularia comoriensis* Bouriquet & Jauffret (PREM 51697), *Dactylaria obtriangularia* Matsushima (PREM 51695), *Ellisiopsis gallesiae* Batista & Nas. (PREM 51694), and *Zygosporium gibbosum* (Sacc., Rouss. & Bomm.) Hughes (PREM 51698). The large number of new taxa collected from a single host substrate in this study is indicative of how incompletely microfungi have been collected in the past (Hawksworth 1991).

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