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**CYLINDROCLADIUM NAVICULATUM SP. NOV., AND TWO NEW VESICULATE HYPHOMYCETE GENERA, FALCOCLADIUM AND VESICLADIELLA**

P.W. CROUS

*Department of Plant Pathology, University of Stellenbosch, 7600 Stellenbosch, South Africa*

M.J. WINGFIELD

*Department of Microbiology and Biochemistry, University of the Orange Free State, P.O. Box 339, 9300 Bloemfontein, South Africa*

A.C. ALFENAS AND S.F. SILVEIRA

*Departemento de Fitopatologia, Universidade Federal de Viçosa, 36570 Viçosa, Brazil***ABSTRACT**

*Cylindrocladium naviculatum* is newly described and distinguished from other *Cylindrocladium* species based on its narrowly 1-septate conidia, naviculate vesicles, and cultural characteristics. *Falcocladium* and *Vesicladiella* are described as two new hyphomycete genera with white sporodochial conidiomata from *Eucalyptus* and *Araucaria* leaf litter respectively. Both genera are characterized by having thick-walled, non-septate stipe extensions that terminate in thin-walled vesicles. *Falcocladium* has appendaged, falcate conidia, whereas *Vesicladiella* has aseptate, cylindrical conidia. These genera are also distinguished from others such as *Cylindrodendrum*, *Cylindrocladium* and *Cylindrocladiella* by the morphology of their conidiomata and stipe extensions.

During collections of hyphomycete specimens from Brazil, a species of *Cylindrocladium* Morgan with naviculate vesicles was isolated from soil in Manaus, Amazonas, while a vesiculate hyphomycete with sporodochial conidiomata was isolated from *Eucalyptus* leaf litter at Aracruz in the State of Espírito Santo. The latter collection resembles the genera *Cylindrocladium* and *Cylindrocladiella* Boesewinkel in having hyaline stipe

extensions terminating in well differentiated vesicles. Terminal vesicles and stipe extensions are, however, also found in genera such as *Cylindrodendrum* Bonorden and *Pulvinotrichum* Gamundi, Arambarri & Giaiotti. The aim of this study was to compare the *Cylindrocladium* isolate with all other taxa presently known in this genus. A comparison was also made of the morphology of the hyphomycete from *Eucalyptus* with that of *Cylindrodendrum* and *Pulvinotrichum* in order to suitably delineate these taxa based on their general morphology and cultural characteristics.

## MATERIALS AND METHODS

### Morphology

Cultures derived from single conidia were plated onto carnation-leaf agar (CLA) (Crous, Phillips & Wingfield, 1992), incubated at 25°C under near-ultraviolet light, and examined after 7 days in the case of the *Cylindrocladium* sp., and 14 days for the hyphomycete from *Eucalyptus*. Only material occurring on carnation leaves was examined. Mounts were prepared in lactophenol cotton blue. All measurements were made under the (100x) oil-immersion objective.

The *Cylindrocladium* species (CPC 627-629) had 1-septate conidia and narrow, tapering vesicles, suggesting that it should be compared with other 1-septate species with similar vesicle morphologies such as *C. avesciculatum* Gill, Alfieri & Sobers (ATCC 38226), *C. candelabrum* Viegas (PPRI 4153), *C. clavatum* Hodges & May (PPRI 3994), *C. gracile* (Bagn.) Boesewinkel (PC 551197), *C. hawksworthii* Peerally (MUCL 30866), *C. pteridis* Wolf (PPRI 4157) and *C. scoparium* Morgan (ATCC 46300).

The fungus isolated from *Eucalyptus* leaf litter (CPC 589) produced hyaline sporodochia with several stipe extensions and terminal vesicles, suggesting a similarity to genera such as *Cylindrocladium*, *Cylindrocladiella*, *Cylindrodendrum*, *Uncigera* and *Pulvinotrichum*.

### Cultural characteristics

**Growth studies:** To determine the maximum radial growth of species in culture, agar plugs (3 mm diam) from the periphery of young actively growing colonies of each fungus were plated at the centre of malt-extract agar (MEA) (20 g Oxoid malt extract, 15 g Difco agar, 1000 ml H<sub>2</sub>O) plates, and incubated at 25°C for 1 day to ensure active growth. Growth after 1 day was noted, and thereafter, plates were placed in incubators at

the temperatures under consideration. Isolates were incubated in the dark at 5, 8, 10, 15, 20, 25, 30, 33 and 35°C with three replicate plates of each isolate at each temperature. Growth was assessed after 6 days for the *Cylindrocladium* spp., and 14 days for the hyphomycete from *Eucalyptus*. Average growth was calculated from four radial measurements from each of the three plates.

*Chlamydospores and colony colour*: Colony colour and chlamydospore formation was determined at 25°C in the dark after 6 days for the *Cylindrocladium* spp., and after 14 days for the hyphomycete from *Eucalyptus*. Colour designations used were those of Rayner (1970).

## RESULTS AND DISCUSSION

### *Cylindrocladium* sp. from soil:

The *Cylindrocladium* species (CPC 627-629) collected in Manaus had naviculate vesicles, which were similar to those of young, developing vesicles of *C. candelabrum* (Crous, 1992). These two species could, however, be distinguished by the characteristic apical taper of the vesicles, the narrower conidia, moderate chlamydospore and slight microsclerotium formation in the fungus under investigation (Table 1). Other criteria that appear to be unique to this species are the frequent multiple-stipes occurring in a conidiophore, as well as the very wide stipe diameter observed just below the vesicle (Table 1). This species can easily be distinguished from all other 1-septate species of *Cylindrocladium* (Crous, 1992), and we therefore describe it here as new.

***Cylindrocladium naviculatum* Crous & Wingfield sp. nov.** Figs 1, 5-8.

Etym.: named after its characteristic naviculate vesicles.

*Macroconidiophora*. Fibra septata, hyalina, terminata vesica naviculare, (6-)7.5(-11)  $\mu\text{m}$  diam; stipites (150-)180(-200)  $\mu\text{m}$  longi. *Rami conidiophori*: rami primarii non-septati vel raro 1-septati, (12-)18.5(-25) x (4-)4.5(-6)  $\mu\text{m}$ ; rami secundarii non-septati, (10-)12(-15) x (4-)4.5(-6)  $\mu\text{m}$ ; rami tertiani non-septati, (10-)12(-15) x (4-)4.5(-6)  $\mu\text{m}$ ; rami quartani non-septati, (10-)11(-14) x 4(-5)  $\mu\text{m}$ . *Phialides* exorientes ex extremitatibus ramorum, 2-4 congregatae; phialides doliiformes vel reniformes, hyalinae, (9-)11.5(-15) x (3-)3.5(-4)  $\mu\text{m}$ . *Conidia* cylindrica, hyalina, 1-septata utrisque extremitatibus rotundatis, (40-)43(-55) x (3-)3.5(-4)  $\mu\text{m}$ . *Microconidiophora* ignota. *Teleomorpha* ignota.

*Colonies* (bottom) tawney 13'i (Rayner, 1970) on MEA, obtaining a radius of 28 mm after 6 days at 25°C in the dark. *Chlamydo spores* in moderate numbers, forming fine chains with sparse microsclerotia. *Temperature requirements for growth*: minimum temperature above 5°C, maximum temperature above 35°C, optimum temperature 25°C.

*Macroconidiophores*. *Stipe extension* septate, hyaline, terminating in a naviculate vesicle, (6-)7.5(-11)  $\mu\text{m}$  diam; stipes (150-)180(-200)  $\mu\text{m}$  long. *Conidiophore branches*: primary branches non-septate or rarely 1-septate, (12-)18.5(-25) x (4-)4.5(-6)  $\mu\text{m}$ ; secondary branches non-septate, (10-)12(-15) x (4-)4.5(-6)  $\mu\text{m}$ ; tertiary branches non-septate, (10-)12(-15) x (4-)4.5(-6)  $\mu\text{m}$ ; quaternary branches non-septate, (10-)11(-14) x 4(-5)  $\mu\text{m}$ . *Phialides* arise from the ends of branches, in groups of 2, 3 or 4; phialides doliiiform to reniform, hyaline, (9-)11.5(-15) x (3-)3.5(-4)  $\mu\text{m}$ . *Conidia* cylindrical, hyaline, 1-septate rounded at both ends, (40-)43(-55) x (3-)3.5(-4)  $\mu\text{m}$ . *Microconidiophores* not present. *Teleomorph* not present.

Holotype: Brazil: Amazonas State, Manaus, soil, M.J. Wingfield, Apr. 1993, PREM 51542.

Cultures examined: Brazil: Amazonas State, Manaus, soil, M.J. Wingfield, Apr. 1993, CPC 627 (culture of type); other collections from the same location, CPC 628, 629.

*Hyphomycete from Eucalyptus leaf litter:*

The hyaline hyphomycete collected from *Eucalyptus* leaf litter (CPC 589) grew and sporulated profusely in culture. Numerous thick-walled, dark brown chlamydo spores were common, and were also characteristic of *Cylindrocladium*, *Cylindrocladiella*, *Cylindrodendrum* and *Pulvinotrichum*.

Conidiomata are hyaline, but frequently have light brown bases. These structures originated either from hyphae, or from stromata comprised of chlamydo spores. Conidiomata are penicillate or synnematal, but more frequently aggregated in sporodochia. Single conidiophores include several branches, terminating in a whorl of short to elongate ampulliform phialides. Each conidiophore has one to several thick-walled, non-septate stipe extensions which terminate in thin-walled, ellipsoidal vesicles. These stipe extensions originated randomly throughout the conidiomata, and are not restricted to the terminal ends of branches or phialide positions as is found in species of *Cylindrocladium*

Fig. 1. *Cylindrocladium naviculatum*. A, conidia; B, naviculate vesicles; C, conidiophore (bar = 10  $\mu\text{m}$ ).

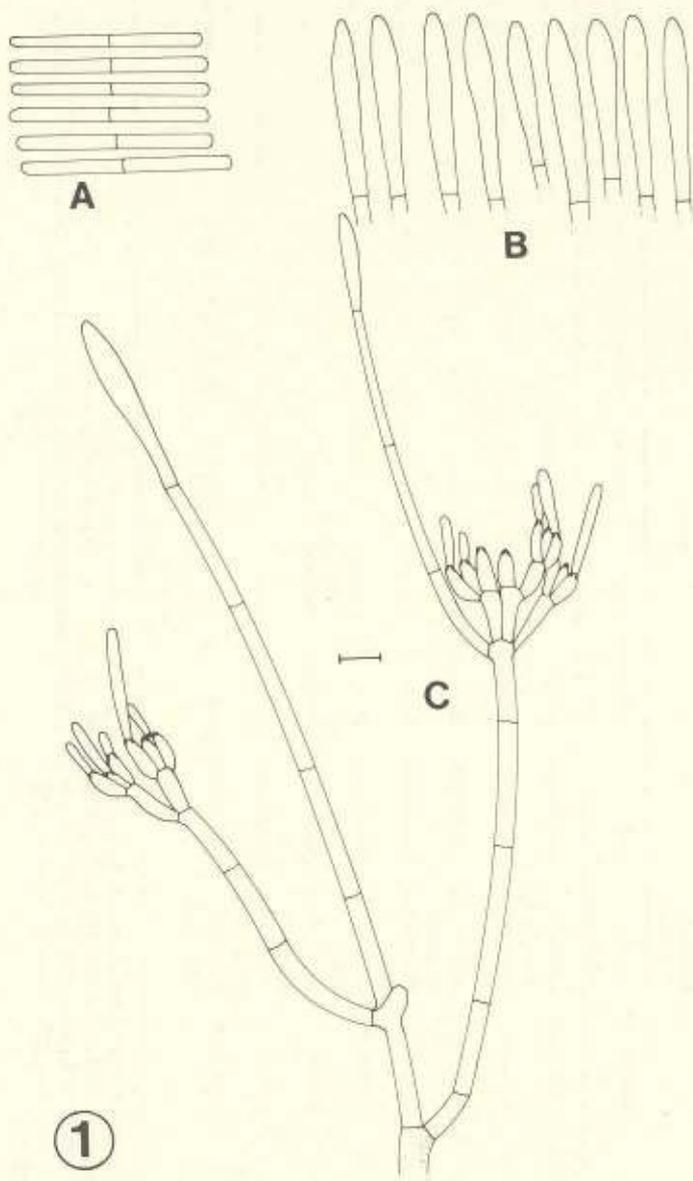


Table 1. A comparison of the morphological<sup>a</sup> and cultural characters of the 1-septate *Cylindrocladium* species studied

Species	Accession No.	Conidium Dimensions	Stipe ( $\mu\text{m}$ )		Vesicle		Temperature Requirements For Growth ( $^{\circ}\text{C}$ ) <sup>b</sup>			Colony Colour <sup>c</sup> (bottom)	Chlamydo-spores <sup>c</sup>
		(Length x Width) ( $\mu\text{m}$ )	Length	Width Below Vesicle	Shape	Width ( $\mu\text{m}$ )	Minimum	Optimum	Maximum		
<i>C. avesciculatum</i>	ATCC 38226	(57-)64(-77) x(4.5-)5(-6.5)	(190-)265(-360)	(2.5-)3	avesciculate to narrowly clavate	(1.5-)2.5(-4)	> 8	25	< 35	13k	extensive
<i>C. candelabrum</i>	PPRI 4153	(33-)45(-66) x(3.5-)4(-4.5)	(105-)180(-290)	(2.5-)3(-3.5)	ellipsoid to obpyriform	(6-)8(-10)	> 5	25-30	> 35	13k-17'i-15'i	extensive
<i>C. clavatum</i>	PPRI 3994	(38.5-)45(-52) x(4-)4.5(-6)	(140-)200(-260)	(2.5-)3(-3.5)	clavate	(3.5-)4.5(-6)	> 10	25	< 35	13k-17'k	extensive
<i>C. gracile</i>	PC 561197	(40-)56(-65) x4(-5)	(160-)220(-350)	2.5(-3.5)	clavate	(2.5-)3.5(-5)	> 10	30	> 35	13k-17'k	extensive
<i>C. hawksworthii</i>	MUCL 30866	(42-)55.5(-76) 4(-4.5)	(150-)200(-250)	(2.5-)3(-3.5)	ellipsoid to clavate	(6-)6.5(-8.5)	> 5	30	< 35	13'k	extensive
<i>C. naviculatum</i> <sup>d</sup>	CPC 627	(40-)43(-55) x(3-)3.5(-4)	(150-)180(-200)	(3.5-)4(-5)	naviculate	(6-)7.5(-11)>	> 5	25	> 35	13i	moderate
<i>C. pteridis</i>	PPRI 4157	(62.5-)82(-121) x5(-6)	(150-)240(-300)	(2.5-)3(-4)	clavate	(4-)4.5(-5.5)	> 10	30-33	> 35	13k-13m	extensive
<i>C. scoparium</i>	ATCC 46300	(40-)45(-66) x(3.5-)4(-4.5)	(150-)173(-195)	3(-4)	obovoid to pyriform or ellipsoid	(6-)6.5(-8)	> 5	25-30	> 35	13k-17'i-15'i	extensive

<sup>a</sup>Determinations made on carnation-leaf agar after 7d at 25  $^{\circ}\text{C}$  under near-ultraviolet light.

<sup>b</sup>Rated on three MEA plates after 6d, incubated at 5, 8, 10, 15, 20, 25, 30, 33 and 35  $^{\circ}\text{C}$  in the dark.

<sup>c</sup>Rated on three MEA plates after 6d at 25  $^{\circ}\text{C}$  in the dark. Colour designations according to Rayner (1970). Dark brown = extensive; medium brown = moderate; light brown to cream = slight.

<sup>d</sup>A new species.

or *Cylindrocladiella*. The most characteristic feature of this fungus is its falcate conidia. Conidia also have short basal appendages which occur at the inner, shorter curve of the conidium, and inconspicuous, short apical appendages, continuous with the rest of the conidium.

*Generic considerations:*

*Cylindrocladium* and *Cylindrocladiella*: Arguments for separating these genera have been presented elsewhere (Crous, 1992; Crous & Wingfield, 1993). The vesiculate fungus under discussion here is distinct from all *Cylindrocladium* species (Crous, 1992) in having non-septate, thick-walled stipe extensions, and falcate conidia (Figs 2, 3). Although the nature of the stipe is similar to that of *Cylindrocladiella* spp. (Fig. 4), these never form sporodochial conidiomata, or have falcate conidia (Crous & Wingfield, 1993).

*Cylindrodendrum*, *Pulvinotrichum* and *Uncigera*: Summerbell *et al.* (1989) recently compared these three genera, and concluded that they are congeneric. *Cylindrodendrum* is characterized by conidiomata composed of erect, hyaline hyphae bearing whorls of phialides. The only character distinguishing *Cylindrodendrum* from *Uncigera* (Di Cosmo *et al.*, 1983) is the strongly bent apical portions of the phialides in *Uncigera*. Summerbell *et al.* (1989), however, also observed this characteristic in *Cylindrodendrum*, and thus reduced *Uncigera* to synonymy with it. Furthermore, in an examination of the type specimen of *Pulvinotrichum*, Summerbell *et al.* (1989) found the same characteristic conidiomatal and phialide morphology to be present, thus supporting the synonymy of *Pulvinotrichum* and *Cylindrodendrum* with the latter genus having priority.

The nature of the stipe extension, the branching pattern of the conidiophore, and terminal vesicle in *Cylindrodendrum* as illustrated by Arambarri *et al.* (1981) and Summerbell *et al.* (1989) are distinct from those observed in *Cylindrocladium*, *Cylindrocladiella*, as well as from those of the hyphomycete from *Eucalyptus* under investigation here. Furthermore, the distinct falcate conidia of this fungus preclude it from being suitably accommodated in any of these genera. The new genus *Falcocladium* is therefore proposed for this fungus.

**Falcocladium** Silveira, Alfenas, Crous & Wingfield gen. nov.

Etym.: named after its falcate conidia.

*Conidiomata* hyalina, sporodochialia vel synnematalia, vel penicillata quum formata sint in mycelio aërio, reperta singulatim, sed saepius aggregata, exorientia ex mycelio ipso vel ex stromate crassitunicatarum et rufobrunnearum chlamydosporarum quum hic fungus cultus est in CLA; stipitis extensiones hyalinae, non-septatae, crassitunicatae, exorientes ex qualibet positione in ramo conidiomatali, vel in positione phialidis, et plures quam una saepe repertae sunt in penicillato conidiomate eodem.

*Rami conidiophori* hyalini, non- vel multiseptati, usque tres series ramorum per conidioma. *Phialides* hyalinae, exorientes ex extremitatibus ramorum, congregatae 2-6, ampulliformes, collariculis inconspicuis.

*Conidia* hyalina, 0(-1)-septata, falcata acutis brevibus apicalibus et basilaribus appendicibus.

*Colonies* dark brown on MEA with brown, thick-walled chlamydo-spores.

*Conidiomata* hyaline, sporodochial or synnematal, or penicillate when formed on aerial mycelium, occurring singly, but more frequently aggregated, arising directly from the mycelium, or from a stroma of thick-walled, red-brown chlamydo-spores when cultured on CLA; stipe extensions hyaline, non-septate, thick-walled, originating from any position on a conidiomatal branch, or in the position of a phialide, frequently with more than one occurring in the same penicillate conidioma. *Conidiophore branches*, hyaline, non- to multi-septate, up to three series of branches per conidioma. *Phialides* hyaline, arising from ends of branches, in groups of 2-6, ampulliform, with inconspicuous collarettes. *Conidia* hyaline, 0(-1)-septate, falcate with acute, short apical and basal appendages.

Sp. typ. *F. multivesiculatum*

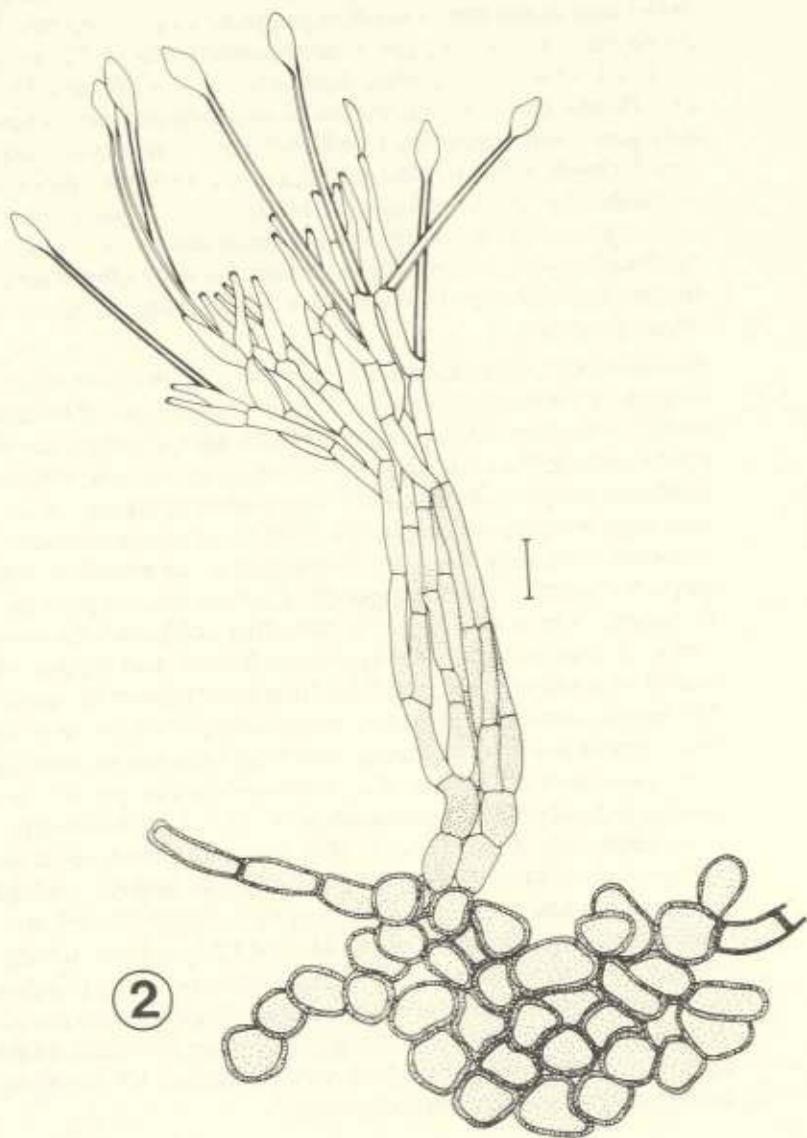
***Falcocladium multivesiculatum*** Silveira, Alfenas, Crous & Wingfield sp. nov. Figs 2, 3,

9-11, 14-19.

Etym.: named after the numerous vesicles occurring on conidiomata.

*Conidiomata* sporodochialia vel synnematalia, vel penicillata quum formata sint in mycelio aërio, reperta singulatim, sed saepius aggregata, exorientia ex mycelio ipso vel ex stromate crassitunicatarum rufobrunnearum chlamydosporarum quum hic fungus cultus sit in CLA; stipitis extensiones hyalinae, non-septatae, crassitunicatae, (45-)60(-80)  $\mu\text{m}$  (mensurae a septo basilari usque ad acumen vesicae),

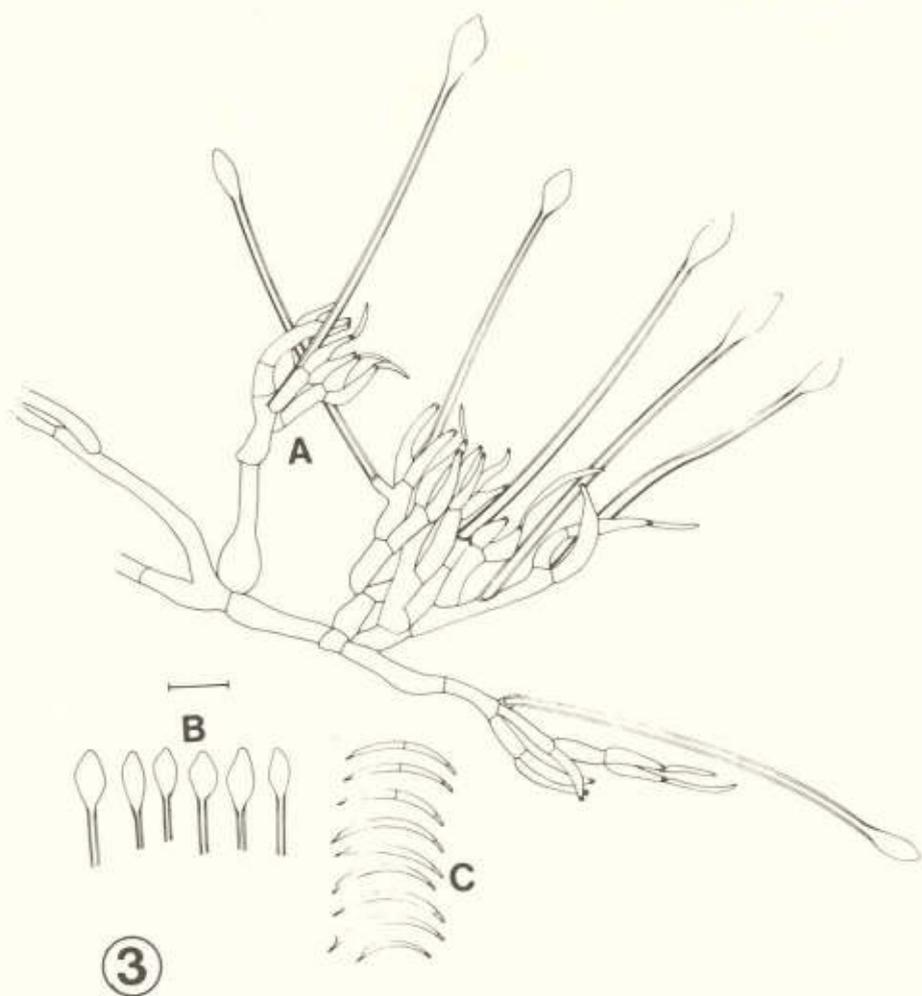
Fig. 2. Synnematal conidioma of *Falcocladium multivesiculatum* arising from a stroma of chlamydo-spores (bar = 10  $\mu\text{m}$ ).



exorientes ex positione qualibet in ramo conidiomatali, vel in positione phialidis, plures quam una saepe repertae sunt in conidiomate eodem penicillato. *Rami conidiophori*, rami primarii hyalini vel pallide brunnei, 0-4-septati, 11-95 x 3.5-5  $\mu\text{m}$ ; rami secundarii hyalini, 0-2-septati, 10-80 x 3.5-5  $\mu\text{m}$ ; rami tertiani hyalini, 0-2-septati, 10-50 x 3.5-5  $\mu\text{m}$ . *Phialides* hyalinae, exorientes ex extremitatibus ramorum, 2-6 aggregatae, ampulliformes, 13-60 x 4-7  $\mu\text{m}$ ; collaricula inconspicua. *Conidia* hyalina, 0(-1)-septata, falcata, acutis brevibus apicalibus basilaribusque appendicibus, (12-)14(-20) x 1.5(-2)  $\mu\text{m}$  (appendicibus exclusis); appendices basillares sitae in interiore brevioris convexa conidica flexione, 1-3  $\mu\text{m}$  longae, terminatae apice obtuse rotundato; appendix apicalis continua conidio, 1.5-2  $\mu\text{m}$  longa, terminata apice obtuse rotundato.

*Colonies* (bottom) 13'k verona brown (Rayner, 1970) on MEA, attaining a radius of 7 mm after 14 days at 25°C in the dark; aerial mycelium sparse, margins irregular. *Chlamydospores* dark brown, arranged in chains, 10-20  $\mu\text{m}$  long, 5-11  $\mu\text{m}$  wide. *Temperature requirements for growth*, minimum temperature above 10°, optimum temperature 20-25°, maximum temperature below 35°. *Conidiomata* sporodochial or synnematal, or penicillate when formed on aerial mycelium, occurring singly, but more frequently aggregated, arising directly from the mycelium, or from a stroma of thick-walled, red-brown chlamydospores when cultured on CLA; stipe extensions hyaline, non-septate, thick-walled, (45-)60(-80)  $\mu\text{m}$  (measured from basal septum to vesicle tip), originating from any position on a conidiomatal branch, or in the position of a phialide, frequently with more than one occurring in the same penicillate conidioma. *Conidiophore branches*, primary branches hyaline to light brown, 0-4-septate, 11-95 x 3.5-5  $\mu\text{m}$ ; secondary branches hyaline, 0-2-septate, 10-80 x 3.5-5  $\mu\text{m}$ ; tertiary branches hyaline, 0-2-septate, 10-50 x 3.5-5  $\mu\text{m}$ . *Phialides* hyaline, arising from ends of branches, in groups of 2-6, ampulliform, 13-60 x 4-7  $\mu\text{m}$ ; collarettes inconspicuous. *Conidia* hyaline, 0(-1)-septate, falcate with acute, short apical and basal appendages, (12-)14(-20) x 1.5(-2)  $\mu\text{m}$  (excluding appendages); basal appendages situated on the inner, shorter, convex, conidial curve, 1-3  $\mu\text{m}$  long, terminating in bluntly rounded apices; apical appendages continuous with conidia, 1.5-2  $\mu\text{m}$  long, terminating in bluntly rounded apices.

Fig. 3. Penicillate conidiomata of *Falcocladium multivesiculatum* arising from aerial mycelium (bar = 10  $\mu\text{m}$ ).

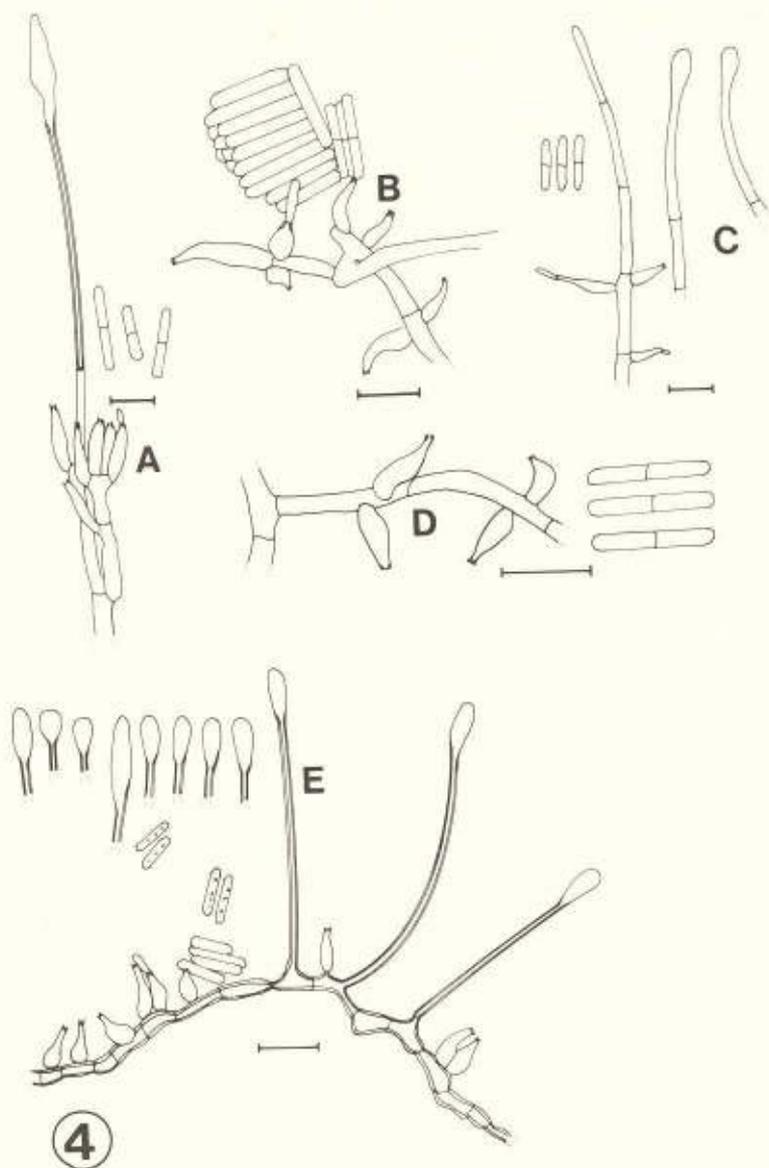


Holotype: Brazil, Espirito Santo, Aracruz, *Eucalyptus grandis* leaf litter, Silvaldo F. Silveira, Jan. 1993, PREM 51541.

*Additional specimens and cultures examined:* *Cylindrodendrum album* Bonorden, Australia, NSW, Bellangry forest, Wilson River Reserve, on a dead grass blade in middle of Wilson River, leg. R.V. Bandoni, det. K. Seifert, 18 Aug. 1981, CBS 3484; *Pseudomicrodochium candidum* (Bres.) de Hoog, Belgium, near Eupen, decaying leaf of *Ilex aquifolium*, Leg. & det. W. Gams, 17 Oct. 1981, Netherlands, Callantsoog, dead leaf of *Quercus*, leg. W. Gams, Oct. 1979, CBS (no number assigned); *Pulvinotrichum album* Gamundi, Arambarri & Giaiotti, Argentina, Pla. Quetrihue, leaves of *Nothofagus dombeyi*, leg. P. Benavente, 19 Oct. 1977, LPS 40140; *Pulvinotrichum capitatum* Sutton, Australia, Queensland, Boombana, M.P., leaf litter of *Araucaria bidwillii*, leg. B.C. Sutton & J.L. Alcorn, 27 Aug. 1981, IMI 263277a; *Cylindrocladiella elegans* Crous & Wingfield, RSA, Natal, Seven Oaks, leaf litter, leg. I. Rong, 11 Oct. 1989, PPRI 4050 (culture); *Cylindrocladium colhounii* Peerally var. *colhounii*, Brazil, unknown host, leg. A.C. Alfenas, 1991, PPRI 4183 (culture).

When synonymizing *Uncigera* and *Pulvinotrichum* with *Cylindrodendron* Summerbell *et al.* (1989), noted that further collections, cultural, as well as type specimen studies would be required to consider possible synonymies among the species previously described in these three genera. Unfortunately Sutton (1989) described a new species, *Pulvinotrichum capitatum* Sutton in the same year. The latter collection was placed in *Pulvinotrichum* due to its sporodochial conidiomata, as well as the presence of stipe extensions with terminal vesicles as illustrated by Arambarri *et al.* (1981). An examination of *P. capitatum* (IMI 263277a) however, showed that in spite of several similar characteristics, this species cannot be accommodated in *Cylindrodendrum*. The conidia of *P. capitatum* are cylindrical, aseptate, and carried in cylindrical packets. The same was also found to be true for several collections of *Cylindrodendrum* that we examined. Furthermore, phialides of *P. capitatum* could also be

Fig. 4. *Falcocladium* and morphologically similar genera. A, Penicillate conidiophore of *Cylindrocladiella camelliae* (CPC 395); B, phialides and conidia of *Cylindrodendrum album* (CBS 3484); C, phialides, conidia and vesicles of *Cylindrodendrum album* var. *paralion* (redrawn from Summerbell *et al.*, 1989); D, curved phialides and conidia of *Cylindrodendrum album* (type of *Pulvinotrichum album*, LPS 40140); E, conidiophores with phialides, conidia and vesicles of *Vesicliadiella capitatum* (IMI 263277a) (bar = 10  $\mu$ m).



accommodated within the range of variation described for *Cylindrodendrum*, with some also having the characteristically abrupt apical bend to the upper part of the phialide (Fig. 4).

*Pulvinotrichum capitatum* and *Cylindrodendrum* differ in the nature of the stipe extension and the phialide bearing hyphae (Fig. 4). In *P. capitatum*, stipe extensions are thick-walled, non-septate, with several occurring in every conidioma, and branched at 90° to the basal hyphae. This was never the case in *Cylindrodendrum*, where stipe extensions were rare, septate, thin-walled, and rather extensions of fertile developing hyphae with indeterminate growth. Colonies are also not as floccose as those of *Cylindrodendrum*. Furthermore, in contrast to *Cylindrodendrum* where the phialide bearing hyphae are erect, thin-walled, and carry whorls of phialides, hyphae of *P. capitatum* are thick-walled, occur on the substrate surface, with the phialides not arranged in whorls. Although the morphology of the stipe extension in *P. capitatum* is similar to that in *F. multivesiculatum*, the conidiomata and conidia are distinct, also making *Falcocladium* unsuitable for this fungus.

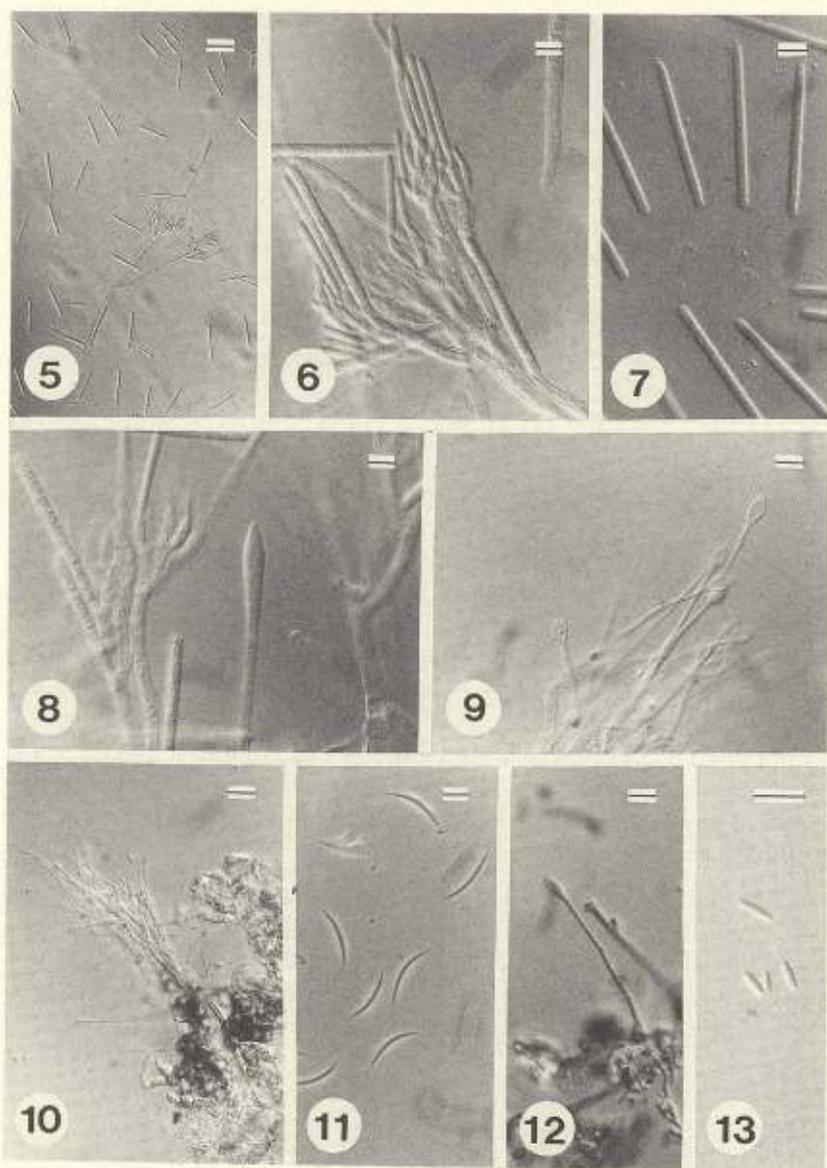
Because *P. capitatum* cannot be suitably accommodated in any of the genera discussed above, we herewith propose a new genus, *Vesicladiella* for this fungus.

**Vesicladiella** Crous & Wingfield gen. nov.

Etym.: Named after the characteristic vesicles resembling those of the hyphomycete genus *Cylindrocladiella*.

*Coloniae* sparsae, albae. *Mycelium* hyalinum, crassitunicatum, leve, septatum. *Conidiomata* sporodochialia, disseminata vel gregaria, alba; extensiones stipitis erectae, crassitunicatae, irramosae, terminatae vesicis tenuitunicatis. *Conidiophora* reducta in cellas conidiogenas. *Phialides*

Figs 5-13. Conidiophores, conidia and vesicles of *Cylindrocladium naviculatum*, *Falcocladium multivesiculatum* and *Vesicladiella capitatum*. Figs 5-8. *Cylindrocladium naviculatum*. Fig. 5. Conidiophore (bar = 45 µm). Fig. 6. Conidiophore branches with phialides (bar = 9 µm). Fig. 7. One septate conidia (bar = 9 µm). Fig. 8. Conidiophore branches and a naviculate vesicle (bar = 9 µm). Figs 9-11. *Falcocladium multivesiculatum* (bars = 9 µm). Fig. 9. Multivesiculate synnematal conidiophore. Fig. 10. Synnematal conidiophore on a stroma of chlamydo spores. Fig. 11. Falcate conidia with apical and basal appendages. Figs 12, 13 (bars = 9 µm). *Vesicladiella capitatum*. Fig. 12. Stipe extension with terminal vesicle. Fig. 13. Cylindrical conidia.



discretatae, determinatae, intercalares vel laterales, ampulliformes; collaricula praesentia. *Conidia* hyalina, non-septata, levia, cylindrica extremitatibus rotundatis, guttulata.

*Colonies* sparse, white. *Mycelium* hyaline, thick-walled, smooth, septate. *Conidiomata* sporodochial, scattered to gregarious, white; stipe extensions erect, thick-walled, unbranched, terminating in a thin-walled vesicle. *Conidiophores* reduced to conidiogenous cells. *Phialides* discrete, determinate, intercalary or lateral, ampulliform; collarettes present. *Conidia* hyaline, non-septate, smooth, cylindrical with rounded ends, guttulate.

Holotype: Australia, Queensland, Boombana, M.P., leaf litter of *Araucaria bidwillii*, leg. B.C. Sutton & J.L. Alcorn, 27 Aug. 1981, IMI 263277a

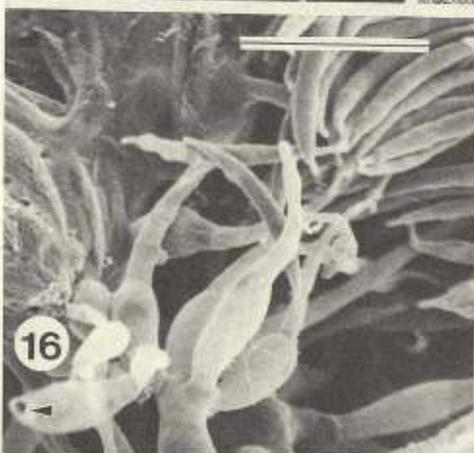
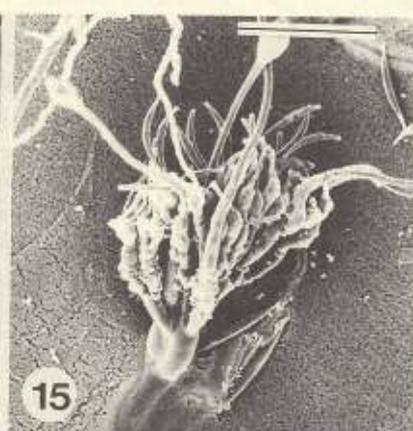
Sp. typ. *V. capitatum*

**Vesicliadiella capitatum** (Sutton) Crous & Wingfield comb. nov. Figs 4, 12, 13.

*Pulvinotrichum capitatum* Sutton, *Sydowia* 41: 338 (1989) (basionym). *Colonies* sparse, white. *Mycelium* hyaline, thick-walled, smooth, septate. *Conidiomata* sporodochial, scattered to gregarious, white; stipe extensions erect, thick-walled, unbranched, up to 160  $\mu\text{m}$  long (from basal septum to vesicle tip), 2-3  $\mu\text{m}$  wide at the base, terminating in a thin-walled clavate to ellipsoid vesicle, 3-5  $\mu\text{m}$  wide. *Conidiophores* reduced to conidiogenous cells. *Phialides* discrete, determinate, intercalary or lateral, ampulliform, 2.5-4  $\mu\text{m}$  wide at base, up to 1  $\mu\text{m}$  wide at apex; collarettes present. *Conidia* hyaline, non-septate, smooth, cylindrical with rounded ends, guttulate, 6-9 x 1.5  $\mu\text{m}$ .

The description of two new vesiculate hyphomycete genera from *Eucalyptus* and *Araucaria* leaf litter suggests that there are many genera on these substrates yet to be discovered and described. Additional collections and cultural studies with the possibility of new teleomorph connections would suitably strengthen these arguments, and also provide

Figs 14-19. *Falcocladium multivesiculatum* (bars = 10  $\mu\text{m}$ ). Fig. 14. Multivesiculate synnematal conidiophore. Fig. 15. Penicillate conidiophore with several stipe extensions. Figs 16, 17. Whorls of tapering, ampulliform phialides (apices arrowed), forming flaccate conidia. Fig. 18. Falcate conidia with apical and basal appendages. Fig. 19. Conidiophore with falcate conidia arranged in a round packet.



additional clues as to their possible relationships with other, morphologically similar genera discussed in this study.

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