

Pseudocercospora eucalyptorum sp. nov. on *Eucalyptus* leaves

P. W. CROUS

Plant Protection Research Institute, D.R. De Wet Forest Research Station, P.O. Box 520, Sabie 1260, South Africa

M. J. WINGFIELD

Department of Microbiology, University of the OFS, Bloemfontein 9300, South Africa

W. F. O. MARASAS

Research Institute for Nutritional Diseases, P.O. Box 75, Tygerberg 7505, South Africa

B. C. SUTTON

CAB International Mycological Institute, Kew, Surrey TW9 3AF, U.K.

Pseudocercospora eucalyptorum sp. nov. on *Eucalyptus* leaves. *Mycological Research* 93 (3): 394–398 (1989).

Although two *Cercospora* spp., *C. eucalypti* and *C. epicoccoides* have been reported to occur on *Eucalyptus*, these have not previously been found in South Africa. Holotypes of *C. eucalypti* and *C. epicoccoides* do not represent *Cercospora* or allied genera, but probably two different species of what is at present known as *Phaeoseptoria*. Examination of the South African collections and overseas herbarium specimens annotated and misidentified as *C. eucalypti* and *C. epicoccoides* bear a *Cercospora*-like species in which points of conidial attachment are not thickened and conidia are olivaceous in colour. The fungus would thus be more appropriately placed in *Pseudocercospora* and is formally described as a new species.

Key words: *Pseudocercospora eucalyptorum*, *Eucalyptus*, *Cercospora*.

During a survey of *Eucalyptus* leaf diseases in South Africa, a *Cercospora*-like fungus was found on diseased leaves of *E. bridgesiana* R. T. Bak, *E. deanei* Maid., *E. globulus* Labill., *E. nitens* (Deane & Maid.) Maid., *E. nova-anglica* Deane & Maid., *E. pellita* F. Muell., *E. saligna* Sm. and *E. viminalis* Labill. Two *Cercospora* spp., *C. eucalypti* Cke & Mass. and *C. epicoccoides* Cke & Mass. have previously been recorded on leaves of *Eucalyptus* (Cooke & Massee, 1889, 1891; Chupp, 1953). An attempt was therefore made to identify the material collected during the South African survey.

Cercospora eucalypti and *C. epicoccoides* were described from Australian material, collected by J. M. Martin, from types No. 436 (Cooke & Massee, 1889) and No. 600 (Cooke & Massee, 1891), respectively. This original material was also examined by Chupp (1953), and referred to in his monograph of *Cercospora*. He subsequently treated other collections available to him as *C. eucalypti* (CUP 778, 39774, 39776, 40824, 40825, 40826, 41009) and *C. epicoccoides*.

A re-examination of the holotype collections of *C. eucalypti* (No. 436) and *C. epicoccoides* (No. 600) by BCS showed that these represented two different pycnidial fungi, one conspecific with *Phaeoseptoria eucalypti* Hansf. emend. Walker, and the other probably congeneric with it. The status of *Phaeoseptoria* is currently under review (Walker, Sutton & Pascoe, in prep.). Examination of South African collections and other material lodged at CUP under the names *C. epicoccoides* and *C. eucalypti* revealed the presence of a *Cercospora*-like hyphomycete, as opposed to the *Phaeoseptoria*-like coelomycete represented by the types of *C. eucalypti* and *C. epicoccoides*.

Collections of the *Cercospora*-like hyphomycete from different parts of South Africa (PREM 49111, 49112) varied considerably in the symptoms which they caused and in the morphology of conidiophores and conidia. For example, on *E.*

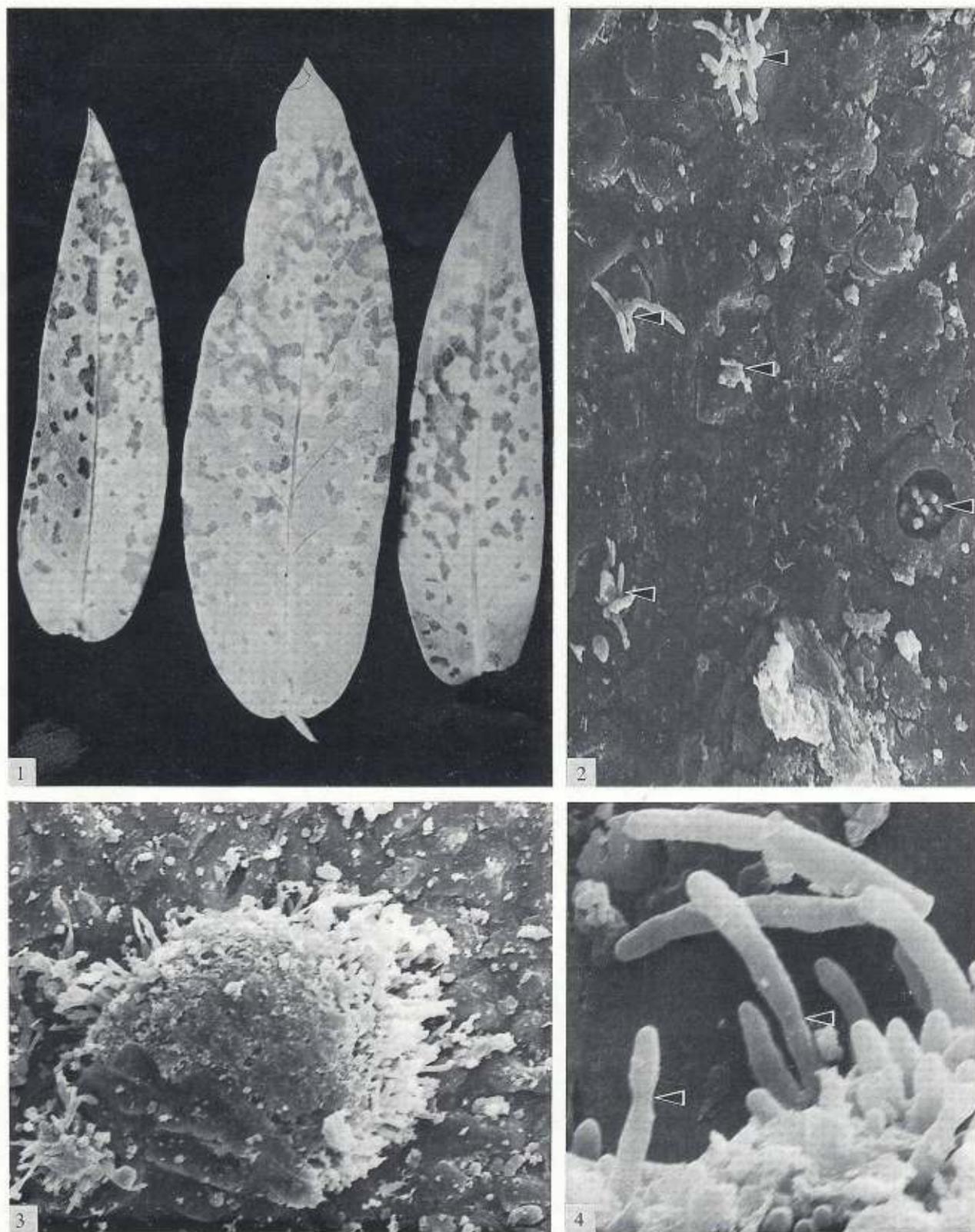
nitens leaves from the Knysna area, Southern Cape, some leaves showed black, compact conidiomata, whereas others were grey and less dense. The two forms of conidiomata also occurred on both sides of the same leaf.

Conidia from different *Eucalyptus* spp. in the Stellenbosch area, South-Western Cape were 30–56(40) × 3–4(3·7) µm and 1–3 septate, whereas those on *E. nitens* from Knysna were 23–65(43·5) × 2·5–4(3) µm and 1–3 septate. Conidial dimensions for the misdetermined *C. eucalypti* reported by previous authors (Salerno, 1957; Magnani, 1965; Dick, 1982) were similar to those of the South African material and collections in CUP. The dimensions of material of misdetermined *C. epicoccoides* (CUP 53458) overlapped those of the misdetermined *C. eucalypti*. On the basis of these observations, we consider all the material examined to represent a single species. Furthermore, a detailed examination of material from South Africa led F. C. Deighton (pers. comm.) to suggest that the fungus would be more appropriately accommodated in the genus *Pseudocercospora* Speg. This suggestion is based on the fact that scars on the conidiogenous cells are not thickened, but are confined to less obvious rings which also appear on the hilum of the conidia. Furthermore, the conidia and conidiophores are coloured, which is typical of *Pseudocercospora* (Deighton, 1976, 1979, 1987). Therefore, the cercosporoid fungus on *Eucalyptus* leaves lodged at PREM and CUP is described as a new species.

***Pseudocercospora eucalyptorum* Crous, Wingfield, Marasas & Sutton, sp. nov.**

Maculae suborbiculares vel angulares, discretæ vel confluentes, chloroticae vel pallido- ad cinereo-brunneae, subinde purpureo-marginatae. *Conidiomata* amphigena, cinerea ad nigra. *Mycelium* plerumque immersum, stroma adest. *Conidiophora* in fasciculis

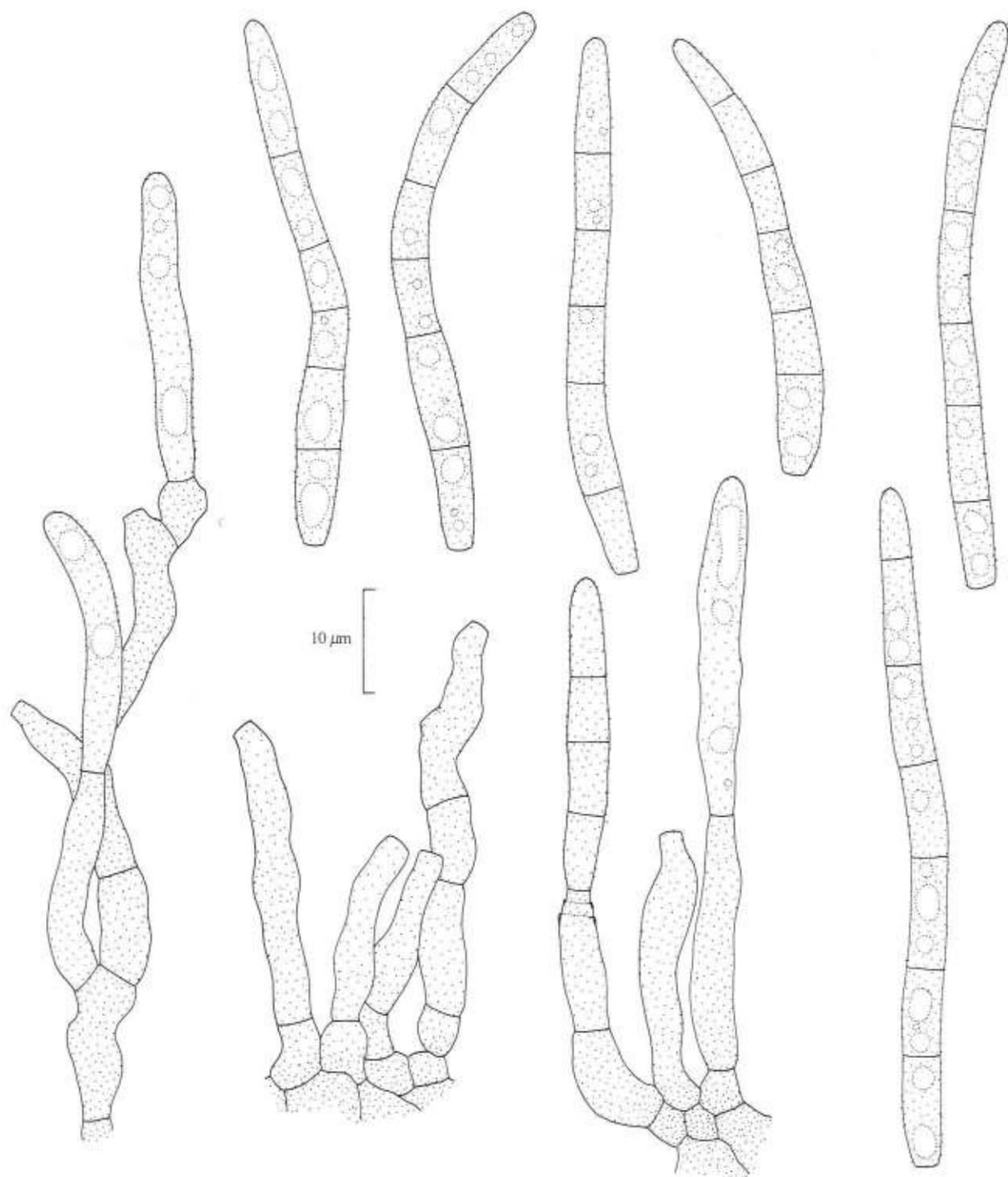
Figs 1–4. *Pseudocercospora eucalyptorum*. **Fig. 1.** Angular lesions on older leaves of *E. nitens*. **Fig. 2.** Conidiophores breaking through stomata ($\times 260$). **Fig. 3.** Fascicle of conidiophores ($\times 260$). **Fig. 4.** Conidia (arrows) forming on conidiophores ($\times 1333$).



aggregata per stomatis emergentia, brunnea ad fusca, 0–2-septata, erecta vel curvata ad geniculata, raro 1–2 percurrentia, simplicia vel ramosa, vel ad basim, raro septata, ad apicem obtusa, $10\text{--}50 \times 3\text{--}6$ μm . Cicatrices conidiales inconspicuae. *Conidia* holoblastica, olivacea,

anguste cylindrica, recta vel leniter curvata, indistincta 1–6-septata in foliis, 1–10-septata in cultura, $23\text{--}110 \times 2.5\text{--}4.0$ μm .

In foliis vivis *Eucalypti nitentis* (Deane & Maid.) Maid., Stellenbosch, Africa australi, Aug. 1988, P. W. Crous, PREM 49112, holotypus.

Fig. 5. Conidia and conidiophores of *P. eucalypti* from leaves, IMI 331472.

Leaf spots vary in appearance on different hosts, from subcircular to angular, discrete or confluent, chlorotic to light brown or grey-brown in colour, occasionally with a purple border (Fig. 1). Conidiomata amphigenous, grey to black in colour. Mycelium mostly internal, stroma present. Conidiophores smooth, aggregated in fascicles emerging through stomata (Figs 2, 3), medium to dark brown, 0–2 septate, straight to variously curved or once geniculate, more rarely 1–2 percurrent, simple or rarely branched at the base, bluntly

rounded at apex, $10\text{--}50 \times 3\text{--}6 \mu\text{m}$ (Figs 4, 5). Conidia holoblastic, smooth, olivaceous, narrowly cylindrical or slightly attenuated at the base, straight to slightly curved, base subtruncate to long obconically truncate, tip conical to obtuse, conidial scars inconspicuous, indistinctly 1–6 septate on leaves, 1–10 septate in culture, $23\text{--}110 \times 2.5\text{--}4.0 \mu\text{m}$ (Figs 4, 5).

Specimens examined: On living leaves of *Eucalyptus nitens*, Stellenbosch, Cape Province, South Africa, Aug. 1988, P. W. Crous, PREM 49112, holotype; Knysna, Cape Province, South Africa, Apr. 1988, M. J. Wingfield, PREM 49111; Stellenbosch, Cape Province, South Africa, Feb. 1988, P. W. Crous, CUP 62013; Stellenbosch, Cape Province, South Africa, Aug. 1988, comm. M. J. Wingfield, IMI 331472; Stellenbosch, Cape Province, South Africa, Jan. 1987, comm. M. J. Wingfield, IMI 331473; *E. globulus* Labill., Brazil, 1934, A. S. Muller, CUP 778; Taihoku, Formosa, 1934, W. Yamamoto, CUP 39776; Suita City, Osaka Pref., Japan, 30 July 1971, T. Yokoyama, IFO 9478, IMI 159920; Sicily, Italy, 1956, M. Salerno, CUP 41009, IMI 68295; *E. cinerea* F. Muell. ex Benth., Gainesville, Florida, U.S.A., 1975, H. H. Lyon, CUP 53458; *E. maidonii* F. Muell., Limbe, Malawi, 27 Apr. 1976, C. Z. Mzila SIB 2753, IMI 203041b; *E. deglupta* Blume, Garaina, Papua New Guinea, 10 Oct. 1957, D. Shaw 1787, IMI 74171; *E. morrisii* R. T. Bak., Kenmore, Queensland, Australia, 12 Apr. 1970, J. L. Alcorn 18827, IMI 151657; Cooper's Plains, Queensland, Australia, 29 May 1967, J. L. Alcorn 17526, IMI 151656; *E. saligna* Sm., Venezuela, 3 Dec. 1976, R. Urriaga 1760, IMI 209837; *E. sp.*, Buenos Aires, Argentina, 1931, J. B. Marchionatto, CUP 41634; Buenos Aires, Argentina, 1934, J. B. Marchionatto, CUP 41635; Argentina, 1928, CUP 40824, 40825, 40826; Bayamo, Cuba, 18 Aug. 1966, R. V. Martinez, IMI 121688; Bayamo, Cuba, 26 Mar. 1966, R. V. Martinez, IMI 118049; Mulungu, Zaire, 1944, F. L. Hendricks, CUP 39774; Woretta, Ethiopia, 5 Nov. 1978, IMI 241870; Ilam, Nepal, 15 Aug. 1967, D. L. Shrestha 692, IMI 130326; Gladstone, Wairarapa, New Zealand, 12 Nov. 1974, J. E. Sheridan, IMI 189775d.

After examination of CUP 778, 39774 and 41009, we concluded that conidia can be up to (or slightly more) than 100 µm in length. However, this variation was less prominent in South African collections. Although conidia from summer collections have one to three distinct septa on leaves, exceptions were observed where up to three additional developing septa could occur (Fig. 5). However, conidia with up to ten distinct septa have been observed in cultures made from summer collections. Conidia with up to six distinct septa have been found on winter collections. Conidia produced in culture from summer and winter collections compared satisfactorily regarding size and septation. The variation observed in size and septation of conidia produced on leaves, appears to be due to prevailing environmental conditions.

Pseudocercospora eucalyptorum has a wide distribution and has been found in Africa (Zaire), Asia (Taiwan, India, Sabah), Australia (New South Wales), Europe (Italy), New Zealand, Papua New Guinea and South America (Argentina, Brazil, Peru, Venezuela) (Chupp, 1953; Magnani, 1965; Dick, 1982; I. A. S. Gibson, pers. comm.). Unpublished records in herb. IMI include Africa (Ethiopia, Malawi), Asia (Japan, Nepal), Australasia (New Zealand) and South America (Cuba). In Italy, *P. eucalyptorum* has been found on 45 *Eucalyptus* spp. The most seriously affected were *E. botryoides* Sm., *E. camaldulensis* Dehnh., *E. globulus* Labill. and *E. trabutii* Vilh. (Magnani, 1965). In South Africa, *E. nitens* was the most susceptible species. The older, less active leaves at the bottom of the crown were the most seriously affected. Magnani (1965) reports that this pathogen can cause a leaf and stem infection on eucalypts in Italy, but that it does not infect young seedlings in the nursery.

Leaf spots caused by *P. eucalyptorum* vary in shape

according to the host. On most species they are subcircular, and discrete or confluent. On *E. nitens* they are always angular and confined by the veins. On older leaves, the angular lesions are necrotic and create a checkered pattern over the leaf surface. Lesions range from chlorotic to light brown or grey-brown in colour. Amphigenous conidiomata are mostly greyish. Conidia germinate after 20 h at 25 °C on water agar. Colonies are solid, thick and grey, turning brown with age. Growth is slow in culture. Sporulation did not occur on malt-extract agar, potato-dextrose agar, water agar, *Eucalyptus* agar (Swart & Williamson, 1983) or carrot-decoction agar (Kilpatrick & Johnson, 1956). However, cultures sporulated on leaf decoction agar using fresh leaves of *E. nitens* (Morris, 1984) and carnation-leaf agar (Fisher *et al.*, 1982) after 3 d incubation at 25 °C under white light.

Pseudocercospora eucalyptorum occurs widely in South Africa and has the potential to be an important pathogen on *E. nitens*. Research is required to establish the extent of losses caused by this fungus in plantations. Furthermore, variation in susceptibility of the various *E. nitens* progenies available for commercial afforestation should be evaluated.

We acknowledge the invaluable advice of Mr F. C. Deighton and Dr I. A. S. Gibson. We also thank Dr M. J. Morris, for assisting us with culturing *P. eucalyptorum*, and Prof. P. S. Knox-Davies for assistance with the manuscript. The curators of the herbaria mentioned are thanked for the loan of specimens.

REFERENCES

- CHUPP, C. (1953). *A Monograph of the Fungus Genus Cercospora*. Ithaca, New York: Published by the author.
- COOKE, M. C. & MASSEE, G. E. (1889). *Cercospora eucalypti*. New Australian fungi. *Grevillea* **18**, 7.
- COOKE, M. C. & MASSEE, G. E. (1891). *Cercospora epicoccoides*. Australian fungi. *Grevillea* **19**, 91.
- DEIGHTON, F. C. (1976). Studies on *Cercospora* and allied genera. 6. *Pseudocercospora* Speg., *Pantospora* Cif. and *Cercoseptoria* Petr. *Mycological Papers (CMI)* **140**, 1-168.
- DEIGHTON, F. C. (1979). Studies on *Cercospora* and allied genera. 7. New species and redispositions. *Mycological Papers (CMI)* **144**, 1-56.
- DEIGHTON, F. C. (1987). New species of *Pseudocercospora* and *Mycovellosiella*, and new combinations into *Pseudocercospora* and *Mycovellosiella*. *Transactions of the British Mycological Society* **88**, 365-391.
- DICK, M. (1982). Leaf-inhabiting fungi of eucalypts in New Zealand. *New Zealand Forest Service Report* **1594**, 525-537.
- FISHER, N. L., BURGESS, L. W., TOUSSOUN, T. A. & NELSON, P. E. (1982). Carnation leaves as a substrate and for preserving cultures of *Fusarium* species. *Phytopathology* **72**, 151-153.
- KILPATRICK, R. A. & JOHNSON, H. W. (1956). Sporulation of *Cercospora* species on carrot leaf decoction agar. *Phytopathology* **46**, 180-181.
- MAGNANI, G. (1965). Leaf and twig spots of *Eucalyptus* caused by *Cercospora eucalypti*. *Phytopatologia Mediterranea* **4**, 6-11.
- MORRIS, M. J. (1984). Additional diseases of *Emex australis* in South Africa. *Phytophylactica* **16**, 171-175.

- SALERNO, M. (1957). Un parassita fogliare di *Eucalyptus* spp. (*Cercospora eucalypti* Cooke & Masee) nuovo per L'Italia. *Estratto da L'Italia Forestale e Montana* **12**, 112-114.
- SWART, H. J. & WILLIAMSON, M. A. (1983). Australian leaf-

inhabiting fungi. 16. *Vermisporium*, a new genus of Coelomycetes on *Eucalyptus* leaves. *Transactions of the British Mycological Society* **81**, 491-502.

(Received for publication 15 November 1988)

A new *Stenella* species from India

A. N. RAI

Department of Botany, Dr H. S. Gour University, Sagar, M.P., India

KAMAL

Department of Botany, University of Gorakhpur, Gorakhpur, U.P., India

A new *Stenella* species from India. *Mycological Research* **93** (3): 398-399 (1989).

Stenella embeliae sp. nov. is described and illustrated from leaves of *Embelia tejeriam-cottam*. It is compared with published accounts of similar species, although none have been described from Myrsinaceae.

Key words: *Stenella embeliae*, *Embelia*, New species.

Table 1. Comparison between *Stenella embeliae* and similar species

	Conidiophores				Conidia		
	Stromata	Structure	Colour	Size (μm)	Structure	Colour & septation	Size (μm)
<i>S. cassiae</i>	Rarely present	Usually arising from superficial hyphae but sometimes in fascicles, unbranched	Brown, paler along the apex	85.5-150 (usually 55-90) \times 4.5-7	Solitary, cylindrical to occasionally obclavate, verruculose	Brown, 1-22 (usually 3-12)	12-153 \times 3.5-8
<i>S. elaeodendri</i>	—	Arising usually singly either terminally or laterally from hyphae, often loosely branched, closely septate	Olivaceous brown, paler towards the apex	up to 126 long \times 4.5-6	Mostly solitary, rarely catenate with lateral branches, cylindrical or narrowly obclavate, smooth with conspicuous scar at the base	Usually colourless, 1-17	45-132 (usually 70-110) \times 3.5-7
<i>S. embeliae</i>	Absent	Mostly solitary or rarely in loose groups of 2 or 3 arising from repent hyphae, sometimes apical part closely septate, often proliferating, rarely branched	Mid- to dark olivaceous	41.5-193 \times 3.5-4.5	Simple, solitary to catenate (in unbranched chains), obclavato-cylindrical to clavato-cylindrical, smooth to mostly verruculose or sometimes smooth; hila slightly thickened and dark	Dark olivaceous, 1-19	14-145 \times 3.5-7

Stenella embeliae A. N. Rai & Kamal, sp. nov. (Fig. 1)

Maculae hypogaeae, parvae irregulares, coalescentes et partem majorem laminae tegentes, fusco-brunneae; coloniae hypogaeae, effusae, fusco-brunneae; hyphae simul immersae simul superficiales, hyphae repentes septatae, ramosae, glabrae, medio-olivaceae. *Stromata* carentia. *Conidiophora* plerumque solitaria ex hyphis repentibus raro 2-3 caespitosa, interdum ex hyphis basilariibus statim enata, macronematosa, mononematosa, plerumque erecta, flexuosa interdum ad apices septis dense confertis praedita, glabra, non ramosa

vel rare ramosa, saepe prolificantia et conidiophora secundaria gigantia, medio-vel fusco-olivacea, 41.5-193 \times 3.5-4.5 μm . *Cellulae conidiogae* in conidiophoris incorporatae, terminales, polyblasticae, sympodiales, plus minusve capitatae, e cicatricibus subincrassatis fuscis cicatricosae. *Conidia* holoblastica, simplicia, solitaria vel catenata (catenis eramosis), sicca, acropleurogena, fusco-olivacea, obclavato-cylindrica vel clavato-cylindrica, glabra vel plerumque verruculosa, ad apices obtusa ad bases plus minusve obconico-truncata 14-145 \times 3.5-7 μm ; hilo leniter incrassato fusco donata.