

## A new species of *Phaeoramularia* (Fungi Imperfecti: Dematiaceae) from South Africa

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### ABSTRACT

A dematiaceous Hyphomycete isolated from wheat and oat straw, as well as lucerne seed in South Africa, is described as *Phaeoramularia kellermaniana* Marasas & Bredell, sp. nov. The relationships of *P. kellermaniana* to *Cladosporium resinae* (Lindau) de Vries and other species of *Phaeoramularia* are discussed.

During an investigation of the litter mycoflora in cultivated lands where outbreaks of photosensitivity in sheep occurred, an undescribed dematiaceous Hyphomycete was isolated from wheat (*Triticum aestivum* L.) and oat (*Avena sativa* L.) straw. This fungus was also isolated from South African lucerne (*Medicago sativa* L.) seed (Marasas & Bredell, 1973). Isolation and cultural methods were similar to those described previously (Marasas & Schumann, 1972).

A culture of the undescribed Hyphomycete was examined by Dr M. B. Ellis of the Commonwealth Mycological Institute, Kew, England. He identified it as a new species of *Phaeoramularia* Muntanola.

*Phaeoramularia kellermaniana* Marasas & Bredell, sp. nov.

Figures: 1–8.

*Hyphae* ramosae, septatae, hyalinae vel brunneae, leves vel verrucosae, 2–7 $\mu$  lat. *Chlamydosporae* intercalares vel terminales, globosae, unicellulares, laeves vel verrucosae, crassitunicatae, fuscae, 6–18 $\mu$  in diametro. *Conidiophora* singula ex apicibus lateribusque hypharum oriunda, simplicia vel raro ramosa, continua vel parce septata, glabro-tunicata, cylindrica vel clavata, recta vel flexuosa, olivacea vel brunnea, 10–50 $\times$ 2–7 $\mu$ . *Cellulae conidiogenae* terminales, cylindricae vel clavatae, ad et prope apicem 1–4 cicatricibus in denticulis gerentes. *Conidia* ex apicibus lateribusque cellularum conidiogenarum in catenis longis simplicibus aut plerumque ramosis producta, olivacea vel brunnea, laevia, ellipsoidea vel fusioidea, ad basim rotundata vel truncata, ad apicem rotundata, obtusa vel 1–4 cicatricibus praedita, continua vel 1–4 septata, 6–30 $\times$ 2–6 $\mu$ .

Habitat in caulibus emortuis *Tritici aestivi* L., Kappat, Calvinia, Cape Province, Africa australi (PRE 44703, holotypus).

*Colonies* on potato-carrot agar at 25° C growing rapidly (8–9 mm/day), covering the surface of a 85 mm diam. petri dish within 10 days and sporulating well within 3 days, effuse, velvety, grayish-olive (Ridgway, Plate XLVI). Colonies on 1.5% malt extract agar at 25° C growing rapidly (6–7 mm/day), covering the surface of a 85 mm diam. petri dish within 10 days and sporulating well within 3–5 days, woolly, olive green (Ridgway, Plate IV) to dark ivy green (Ridgway, Plate XLVII), approaching medal bronze (Ridgway Plate IV) in highly sporulating sectors, reverse olive green becoming black in age. *Mycelium* composed of hyaline to olivaceous or brown branched, septate smooth or encrusted hyphae, 2–7 $\mu$  diam. *Hyphae* often forming strands and the olivaceous or brown aerial hyphae composed of cylindrical or ellipsoidal cells, 8–26 $\times$ 4–7 $\mu$ , each of which can give rise to a lateral conidiophore. In old cultures these hyphal cells often become swollen,

thick-walled, dark brown, globose, intercalary or terminal chlamydospores, 6–18 $\mu$  diam. *Conidiophores* semi-macronematous or macronematous, mononematous, acroauxic, arising at right angles to the aerial hyphae as lateral outgrowths of the hyphal cells, occasionally terminal on the hyphae, simple or rarely sympodially branched, aseptate to multiseptate, usually with a septum at the base, not constricted or swollen at the septa, smooth-walled, olivaceous to brown, straight or flexuous, cylindrical but frequently swollen and truncate at the apex, 10–50 $\times$ 2–7 $\mu$ , rarely 100 $\mu$  or longer. *Conidiogenous cells* polyblastic, giving rise to 1–4 conidial chains on terminal or lateral protuberances, integrated, terminal, sympodial, cylindrical to clavate or truncate at the apex, cicatriced. *Conidia* blastospores that give rise to long simple or repeatedly branched persistent chains of up to 30 or more spores by successive budding in an acropetal sequence, dry, at first hyaline becoming olivaceous to brown, smooth-walled, ellipsoid or fusoid with rounded or truncate ends, without a protuberant scar at each end, mostly 0-septate, sometimes 1–4-septate and then slightly or not constricted at the septa, 6–30 $\times$ 2–6 $\mu$ . Any single conidium can also function as a polyblastic conidiogenous cell, giving rise by budding to 1–4 chains of conidia. Conidia borne in positions where branching of chains occur, are often clavate or “boot-shaped” with 1–4 terminal, and sometimes also lateral, protuberant points of attachment for conidia. These conidia resemble ramo-conidia, but since they also secede easily, they are best considered conidia.

*Specimens examined*.—Cultures on 1.5% malt extract agar and potato carrot agar: Cape-Kappat, Calvinia, isolated from wheat (*Triticum aestivum* L.) straw, February, 1972, Marasas OP-76, PRE 44703 (PRE, holotype); Oudtshoorn, isolated from lucerne (*Medicago sativa* L.) seed, July, 1970, Marasas 325, PRE 44704 (PRE, paratype).

*P. kellermaniana* has also been isolated from oat (*Avena sativa* L.) straw, Swinburne, Harrismith distr., Orange Free State, and from a number of samples of lucerne seed produced in the Cape Province.

Type specimens in the form of dried-down cultures on agar have been deposited in the National Herbarium, PRE (Mycological Herbarium), Department of Agricultural Technical Services, Private Bag X134, Pretoria. Cultures of the type strain (PRE 44703) have also been deposited in the Commonwealth Mycological Institute, Kew, England (IMI 165252); Centraalbureau voor Schimmelcultures, Baarn Netherlands; and American Type Culture Collection, Rockville, Maryland.

The genus *Phaeoramularia* Muntanola is similar to *Ramularia* Unger except for the olivaceous or brown colour of the spores and conidiophores (Muntanola, 1960). The generic relationships of *Phaeoramularia* have been discussed by Muntanola (1960) and Sutton (1970). The genus is rather difficult to distinguish from

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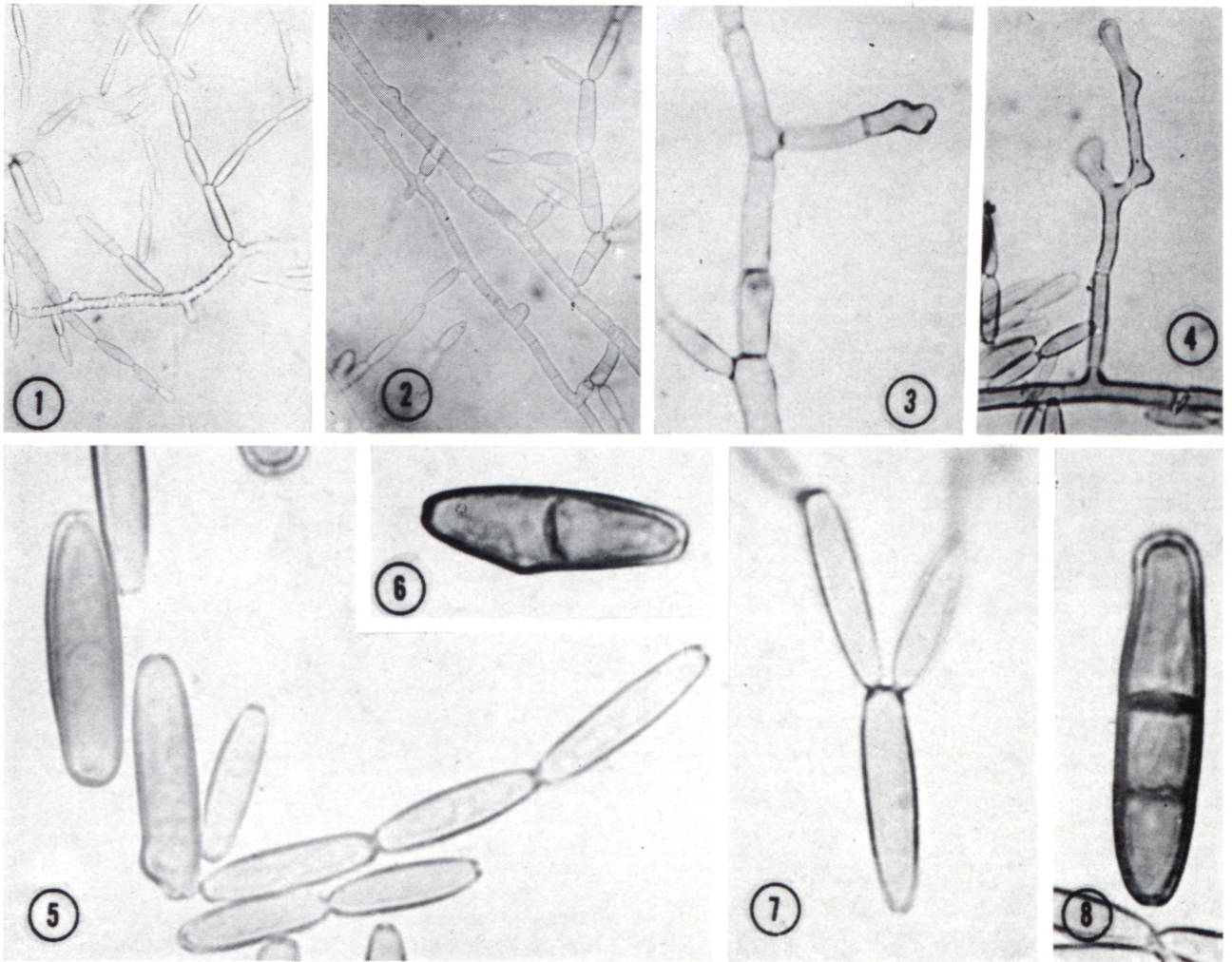


FIG. 1-8.—*Phaeoramularia kellermaniana*. Fig. 1, encrusted vegetative hypha, short conidiophores, polyblastic conidiogenous cell, and conidial chains (slide culture,  $\times 1000$ ). Fig. 2, lateral protuberances (= short conidiophores) on vegetative hyphae. Note the terminal and lateral budding by the two-septate conidium (slide culture,  $\times 1000$ ). Fig. 3, cicatrised, two-septate conidiophore ( $\times 1000$ ). Fig. 4, sympodially-branched conidiophore ( $\times 1000$ ). Fig. 5, conidia ( $\times 2000$ ). Fig. 6, one-septate, thick-walled conidium with lateral protuberance ( $\times 2000$ ). Fig. 7, polyblastic conidiogenous cell ( $\times 2000$ ). Fig. 8, two-septate, thick-walled, brown conidium ( $\times 2000$ ).

certain dematiaceous genera with catenate spores such as *Polyscytalum* Ries, *Septonema* Corda and particularly *Cladosporium* Link ex Fr., as defined by De Vries (1952). According to the keys of Ellis (1971), the determinate or percurrent conidiogenous cells of *Polyscytalum* and *Septonema* distinguish these two genera from *Phaeoramularia* and *Cladosporium* with sympodial conidiogenous cells. The latter two genera are distinguished by the presence of a small, distinctly protuberant scar at each end of the spore in *Cladosporium* and the absence of these scars in *Phaeoramularia* (Ellis, 1971). It should be pointed out, however, that in at least one species of *Cladosporium*, *C. resiniae* (Lindau) de Vries, the conidial scars are not prominent. The new species described here is placed in *Phaeoramularia* because of the lack of distinctly protuberant conidial scars. It is, however, closely related to and somewhat difficult to distinguish from *C. resiniae* as described by De Vries (1955) and Parberry (1969).

In *C. resiniae* the long conidiophores often bear irregularly scattered warts and are almost always of two kinds—some bearing long chains of conidia and others solitary conidia (or very short chains) on swollen branches of conidiogenous cells which secede with difficulty (M. B. Ellis, 1972, personal communication). These characteristic conidiophores are not found in *P. kellermaniana* which also has slightly longer, more elongated-ellipsoidal spores that tend to become septate.

Within the genus *Phaeoramularia*, *P. kellermaniana* differs from the five described species (Muntanola, 1960; Sutton 1970) in the following respects:

1. All the other known species are leaf parasites of higher plants. *P. kellermaniana* is apparently a saprophyte which has been isolated from decomposing wheat and oat straw and from the external surface of lucerne seeds. According to Dr M. B. Ellis (personal communication, 1972) this fungus also occurs on *Hordeum* and stored grain in Turkey and Pakistan.

2. The conidial chains of *P. kellermaniana* are much longer (up to 30 or more spores/chain) than those described for the other species of *Phaeoramularia*. The conidial chains of *P. kellermaniana* are identical to those of *Cladosporium* in method of development, tend to be persistent and are true chains as defined by Subramanian (1972).

3. *P. kellermaniana* grows rapidly in culture, the growth rate being 6-9 mm/day depending on the medium. In contrast, very slow growth rates have been reported for the two other species of *Phaeoramularia* that have been grown in culture:—2-3 mm diam. after 16 days in *P. paradoxa* Muntanola (Muntanola, 1960) and 2.5-3 mm diam. after 20 days to 20 mm after 60 days in *P. unamunoi* (Castell.) Muntanola (Muntanola, 1954; Kovachevsky, 1938). In this respect, *P. kellermaniana* also appears to be more closely related to the saprophytic *Cladosporium* spp. than the phytopathogenic members of the genus *Phaeoramularia*.

*P. kellermaniana* is named after Dr T. S. Kellerman of the Veterinary Research Institute, Onderstepoort, who collected the sample of wheat straw from which the type strain was isolated.

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#### OPSOMMING

'n Hifomiseet wat geïsoleer is uit koring- en hawerstrooi sowel as lusernseed in Suid-Afrika, word beskryf as *Phaeoramularia kellermaniana* Marasas & Bredell sp. nov. Die verwantskappe van *P. kellermaniana* met *Cladosporium resinae* (Lindau) de Vries en ander spesies van *Phaeoramularia* word bespreek.

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