

Two new *Phaeophleospora* species associated with leaf spots of Proteaceae

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Two new foliicolous species of *Phaeophleospora* Rangel are described from Proteaceae in Africa. *Phaeophleospora concentrica* sp. nov., which causes a distinctive leaf spot disease of *Protea caffra* Meisn. is

described from Kenya. A further species, *P. capensis* sp. nov. is described from leaf spots on a species of *Protea* L. collected in South Africa.

Introduction

The genus *Phaeophleospora* Rangel was recently resurrected as an older name for *Kirramyces* J Walker, B Sutton and I Pascoe (Crous *et al.* 1997). Species of *Phaeophleospora* are known anamorphs of *Mycosphaerella* Johanson (Dothideales) (Crous and Wingfield 1997). A discussion of the morphological characteristics, and a key to the species of *Phaeophleospora* was provided by Taylor and Crous (1999).

All *Phaeophleospora* species known to date have been associated with leaf spot diseases of plants (Taylor and Crous 1999). Surveys for foliicolous pathogens of Proteaceae have yielded several *Phaeophleospora* spp. (Crous and Palm 1999, Taylor and Crous 1999). Of the 12 known species of *Phaeophleospora*, four have been described from Proteaceae. It is interesting that these four taxa have only been recorded from African Proteaceae, ranging from the south (South Africa) to the north (Ethiopia) of the continent. Little is known about the pathogenicity of *Phaeophleospora* spp. on Proteaceae, although several taxa have been reported as severe pathogens of *Eucalyptus* L'Hérit. (Crous *et al.* 1988, Wingfield *et al.* 1996). In the present paper we describe two new *Phaeophleospora* species from *Protea* spp. in Kenya and South Africa.

Taxonomy

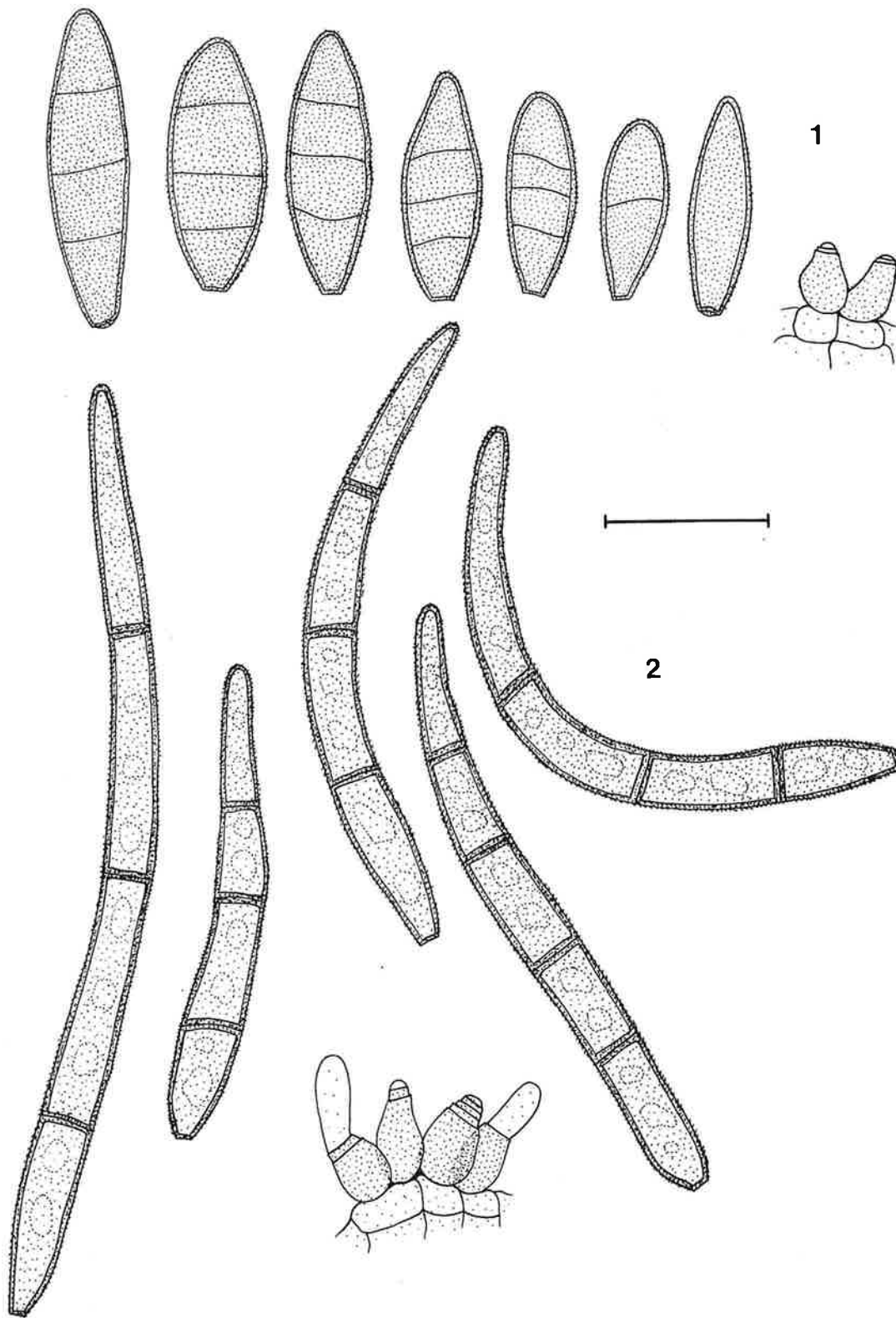
Phaeophleospora capensis JE Taylor and Crous, sp. nov. (Figures 1, 3–8)

Maculae amphigenae, ad 4mm diam, circulares, coalescentes, enecantes, pergamaceae, griseofuscae, margine brunneo elevato circumdatae. Stromata sparsa, immersa. Conidiomata pycnidialia, hyphophylla, dispersa vel aggregata, atra, immersa, non erumpentia, ad 160µm diam, sub-

globosa, unilocularia, epapillata sed ostiolata. Peridium texturae intricatae compositum, 12–16µm diam. Conidiophora absentia. Cellulae conidiogenae ampulliformes, pallidobrunneae, verruculosae, percurrentes, 4–5 x 2.5–3µm. Conidia solitaria, fusiformia, recta, ad basim truncata, ad apicem anguste obtusa, pallide fulva, subtiliter verruculosa, (0–)3(–4)-septata, (12–)15–16.5(–19) x (4–)4.5–5(–6)µm.

Etymology: Named after the Cape Province in South Africa where it was collected.

Leaf spots amphigenous, approximately 4mm diam., circular, or larger and coalescing, necrotic, parchment-like, grey-brown, with a raised medium brown margin (Figure 3). **Mycelium** internal, forming a sparse stroma surrounding the conidiomata, consisting of host cells and branched, septate, pale brown, smooth hyphae, 2–3µm diam. (Figure 8). **Conidiomata** pycnidial, hypophyllous, singular, scattered to aggregated, black, immersed, raising the host surface, but not becoming erumpent, up to 160µm diam. (Figure 4); in section subglobose, unilocular, subepidermal, substomatal, non-papillate, with an ostiolar pore, approximately 140µm high x 155µm wide (Figure 8). **Peridium** consisting of 1–2 strata of cells arranged in a *textura intricata*, the outer stratum dark-brown, thick-walled, becoming thinner-walled and hyaline inwardly, 12–16µm thick (Figure 5). **Conidiophores** reduced to conidiogenous cells. **Conidiogenous cells** ampulliform, pale brown, finely verruculose, with 1–3 percurrent proliferations, 4–5 x 2.5–3µm (Figure 1). **Conidia** solitary, narrowly fusiform, tapering slightly to a truncate, often slightly extended base, straight with a narrowly rounded apex, pale to medium yellow-brown, finely verruculose (more pronounced in lactophenol), (0–)3(–4)-septate, (12–)15–16.5(–19) x (4–)4.5–5(–6)µm (Figures 1, 6, 7).



Figures 1 and 2: Conidia and conidiogenous cells of *Phaeophleospora* spp. *in vivo*; Figure 1: *P. capensis* (PREM 56617, holotype); Figure 2: *P. concentrica* (IMI 376626, holotype). Scale Bar = 10µm

Specimen examined: SOUTH AFRICA, Western Cape, Helderberg Nature Reserve, on a living leaf of *Protea* sp. (19th Jan. 1998), JE Taylor and PW Crous, 19th Jan. 1998, JT115, PREM 56617 (holotype).

Teleomorph: Unknown.

Known distribution: Western Cape, South Africa.

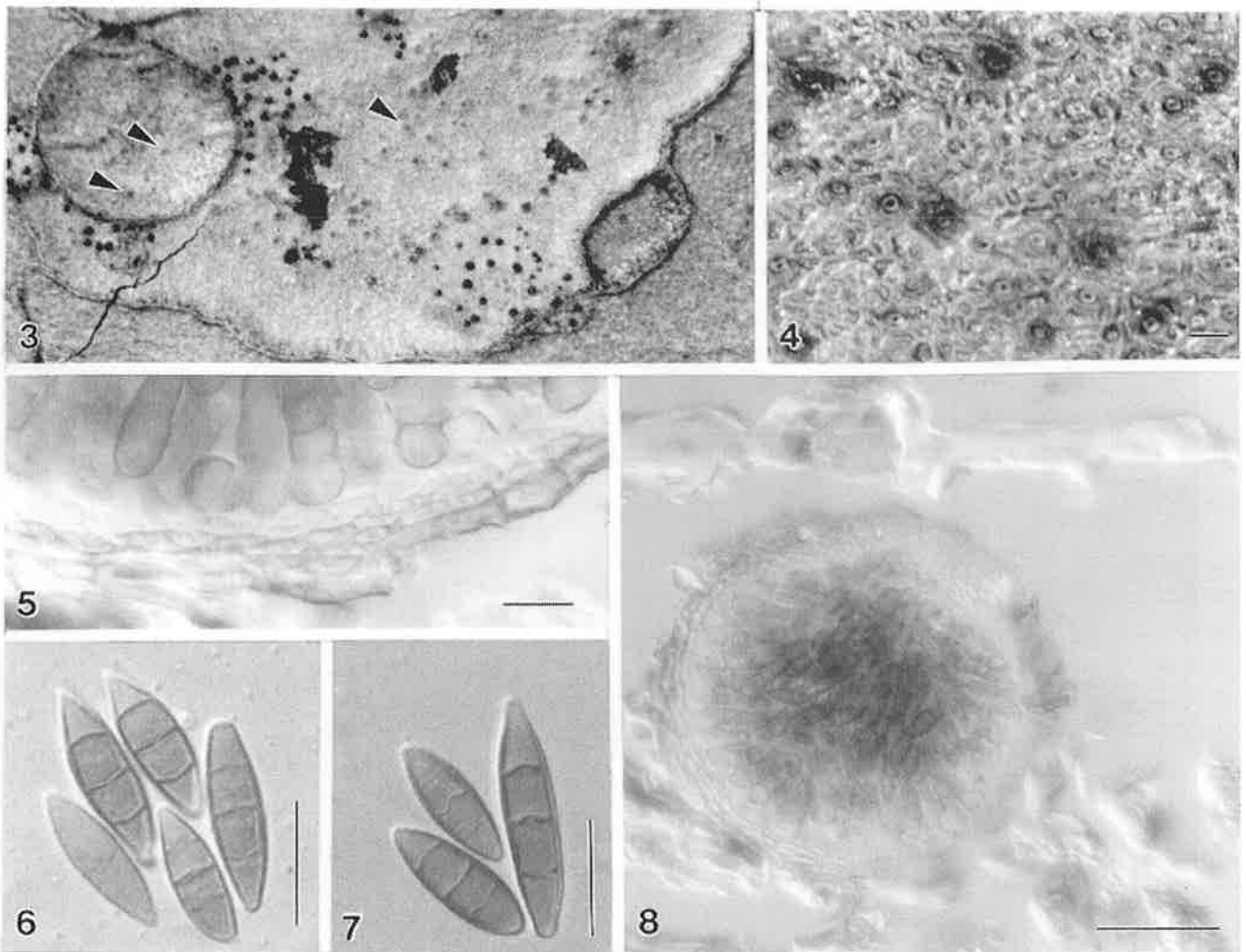
Host range: *Protea* sp. (Proteaceae).

Considering the number of species of *Phaeophleospora* associated with Proteaceae surprisingly few have been recorded in the Western Cape, where Proteaceae in Africa is best represented. This is despite the fact that the pathogens of Proteaceae in this area have been widely studied. It is possible that the Mediterranean climate of the Western Cape is unsuitable for most species of *Phaeophleospora* occurring on Proteaceae, which seem to favour the warmer climate found in the rest of Africa.

Phaeophleospora capensis is considered new as it does not correspond to any previously described species in the key provided by Taylor and Crous (1999). Of the species that have similar sized conidia, *P. capensis* differs from *P. fau-reae* (Syd. and P Syd.) JE Taylor and Crous, which produces cylindrical conidia which are larger overall, (13–)18.5–20.5 (–26) x (4–)5–5.5(–6)µm; Taylor and Crous 1999); *P. congestum* (Syd.) Crous and ME Palm has predominantly 1-septate, cylindrical conidia (Crous and Palm 1999); and *P. abyssinicae* Crous and ME Palm (Crous and Palm 1999) has conidia with very similar morphology, but which are longer and narrower, (17–)22–32(–38) x (2.5–)3–3.5µm.

Phaeophleospora concentrica PF Cannon and JC David, sp. nov. (Figures 2, 9–15)

Maculae amphigenae, 2–15mm diam, circulares vel irregulares, concentricae. Stromata sparsa, immersa. Conidiomata pycnidialia, amphigena, in summis liris concentricis macularum exorientia, dispersa vel aggregata, viri-



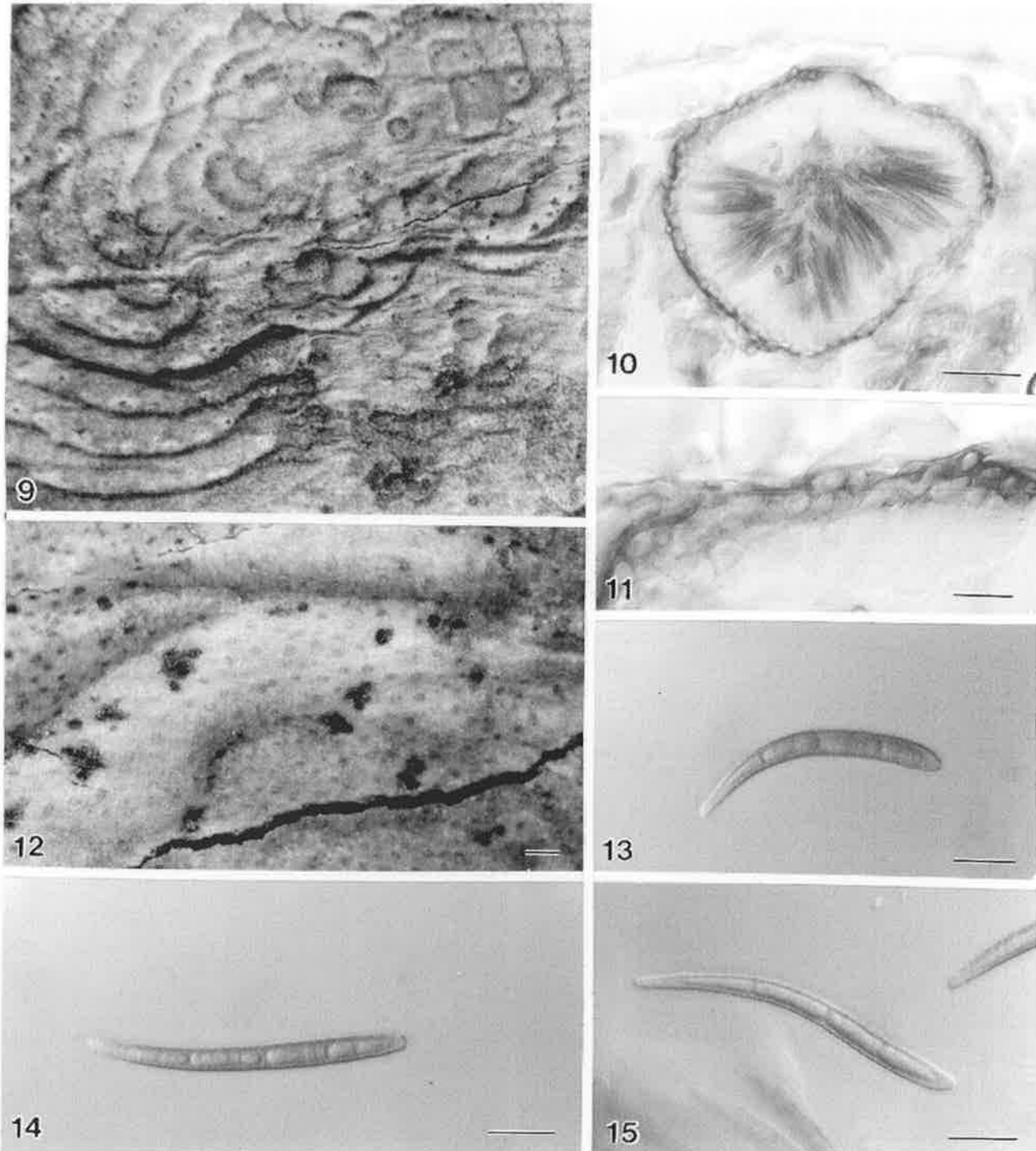
Figures 3-8: *Phaeophleospora capensis* (PREM 56617, holotype); Figure 3: Leaf spot on *Protea* sp. (conidiomata arrowed); Figure 4: Conidiomata on leaf surface; Figure 5: Peridium; Figures 6 and 7: Conidia; Figure 8: Vertical section through a conidioma. Scale bars: 4 = 100µm, 5-7 = 10µm, 8 = 50µm.

di-atra, immersa, 90–170µm diam, subglobosa, unilocularia, ostiolata. Peridium e duobus stratis consistum, pars exterior cellularum crassiparietum brunnearum, in textura angulari, pars interior intus pallescens; 8–20µm crasso. Conidiophora absentia. Cellulae conidiogae ampulliformes vel doliiformes, pallidobrunneae, verrucosae, percurrentes, 5–7 x 4–5µm. Conidia solitaria, obclavata, recta vel curvulata, ad basim truncata, ad apicem acuta, fulva, verruculosa,

(0–3(–4)-septata, (32–)39–42(–52) x (3.5–)4(–4.5) µm.

Etymology: Named after the characteristic concentric leaf spots associated with this pathogen.

Leaf spots amphigenous, approximately 2–15mm diam., circular or slightly irregularly shaped, necrotic, with concentric rings of development which alternate in colour from pale to



Figures 9-15: *Phaeophleospora concentrica* (PREM 56617, holotype); Figure 9: Leaf spot on *Protea caddra*; Figure 10: Vertical section through a conidioma; Figure 11: Peridium; Figure 12: Conidiomata on leaf surface; Figures 13-15: Conidia. Scale bars: 10 = 30µm, 11, 13-15: 10µm, 12 = 100µm

dark yellow-brown, conidiomata visible as greenish black dots (Figure 9). *Mycelium* internal, forming a very sparse stroma surrounding the conidiomata, consisting of host cells and branched, septate, pale brown, smooth hyphae, 3–4 µm diam. (Figure 10). *Conidiomata* pycnidial, amphigenous, singular, scattered or aggregated, dark greenish black, immersed, raising host surface and causing bleaching of the adjacent host tissue, forming on the tops of the ridges of the concentric rings, 90–170 µm diam. (Figure 12); in section subglobose to irregular, unilocular, subepidermal, substomatal, non-papillate, with an ostiolar pore, 90–130 µm high x 80–155 µm diam. (Figure 10). *Peridium* consisting of 2 strata, an outer stratum of thick-walled, medium-brown cells of compressed *textura angularis*, becoming paler inwardly, 8–20 µm wide (Figure 11). *Conidiophores* reduced to conidiogenous cells. *Conidiogenous cells* ampulliform to doliform, pale brown, finely verruculose, with 1–4 percurrent proliferations, 5–7 x 4–5 µm (Figure 2). *Conidia* solitary, scolecosporous, subcylindrical to narrowly obclavate, narrowing slightly to a truncate base and tapering gradually to a narrowly rounded apex, straight or curved to flexuous, medium yellow-brown, verruculose, (0–)3(–4) euseptate, (32–)39–42(–52) x (3.5–)4(–4.5) µm (Figures 2, 13–15).

Culture characteristics: Colonies circular with fimbriate margins; mycelium of medium density, woolly, with a buff (19" d) centre and margins, and sepia (13" k) in between; brown vinaceous (84" m) in reverse (Rayner 1970). Sterile colonies, relatively slow growing, reaching 13 mm in 45 days on PCA (Simmons and Roberts 1993) at 25°C.

Specimens examined: KENYA, Mount Kenya, on Sirimon track close to park gates (0°01'N, 37°18'E, 2800m alt), on recently fallen leaves of *Protea caffra* Meisn., 14th Oct. 1998, PF Cannon, IMI 376626 (holotype), PREM 56793 (isotype); same locality and host, by park gate, 13th Oct. 1998, P.F. Cannon, IMI 376636; Cherangani Hills, slopes below road 1 km N of Kaibichich, on recently fallen leaves of *Protea caffra*, 5th Oct. 1999, PF Cannon and PM Kirk 437, IMI 376763, STE-U 3614-3616.

Teleomorph: Unknown

Known distribution: Kenya

Host range: *Protea caffra* (Proteaceae)

Phaeophleospora concentrica resembles no other species described in the key of *Phaeophleospora* species provided by Taylor and Crous (1999). *Phaeophleospora hebes* (W

Wu, B Sutton and AC Gange) Crous, FA Ferreira and B Sutton is the most similar species, but in *P. hebes* the conidia are pale brown and slightly narrower (29–42 x 2.5–3 µm), and conidiogenous cells are also narrower (5–10 x 2.5–3.5 µm) (Wu *et al.* 1996). These differences, in addition to the different host substrate suggest that it is unlikely that *P. hebes* and *P. concentrica* are conspecific. *Phaeophleospora destructans* (MJ Wingf and Crous) Crous, FA Ferreira and B Sutton is also similar to *P. concentrica*, but the conidia in the former are pale brown, narrow, cylindrical and are longer overall, (30–)50–65(–70) x 2.5(–3) µm (Wingfield *et al.* 1996). *Protea caffra* is not uncommon at high altitudes in Kenya, and has a wide distribution throughout eastern and southern Africa. However, in Kenya its bark is used for medicinal purposes and it is vulnerable to fire in the dry seasons, which is impacting on its overall distribution. *Phaeophleospora concentrica* has not previously been detected on *Protea caffra*, suggesting that it is not commonly distributed with this host plant.

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