

## SHORT RESEARCH NOTES

***Oidiopsis* (Erysiphaceae) on *Euphorbia* spp. in Australia and Vanuatu**

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**Abstract.** One specimen of powdery mildew on *Euphorbia cyathophora* from Vanuatu and 11 specimens on *E. cyathophora*, *E. dentata*, *E. heterophylla* and *E. leucocephala* from Australia were studied. All were shown to represent the *Oidiopsis* anamorph of *Leveillula taurica*, which is described. This is the first record of *Oidiopsis* in Vanuatu. *E. leucocephala* is a new host record for this powdery mildew.

A sample of powdery mildew (Ascomycota: Erysiphales) on painted spurge, *Euphorbia cyathophora* (Euphorbiaceae), collected in Vanuatu in 2003, was identified initially as belonging to subfamily Phyllactinioideae (Erysiphaceae). A search of the powdery mildews on *Euphorbia* in the Australian Plant Disease Database (<http://npdd.nre.vic.gov.au/ihd/nre/research.htm>, 26 Oct. 2004) found nine specimens identified as either *Oidiopsis* or *Leveillula*. All of these specimens from Australia and Vanuatu were examined along with two further specimens of powdery mildew on *Euphorbia* held in herbarium BRIP.

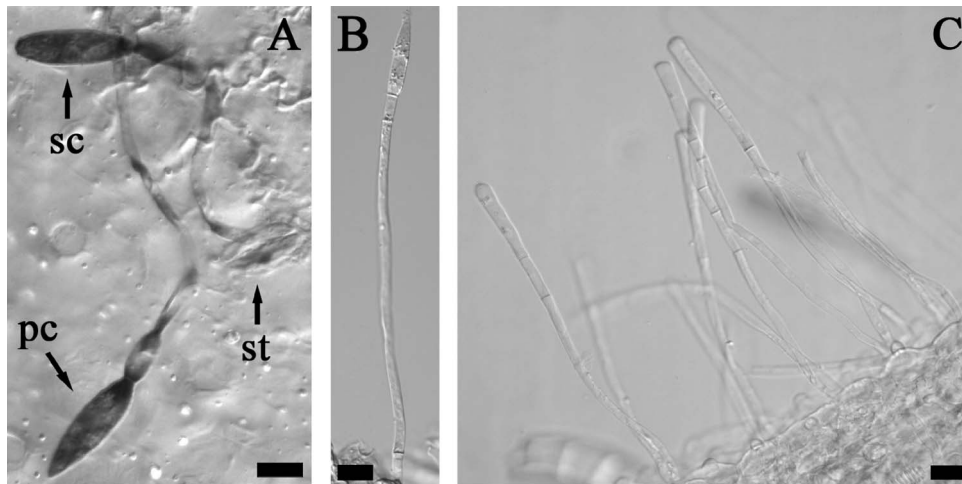
The origin of conidiophores is an important feature that distinguishes genera in the subfamily Phyllactinioideae. A whole-leaf clearing and staining technique, modified from Bruzesse and Hasan (1983) by excluding phenol from solution A (Liberato *et al.* 2005), was used to show that conidiophores arose through stomata in all of the specimens. This is an exclusive characteristic of the anamorphic genus *Oidiopsis* (Braun 1987).

The specimens were further identified as the anamorph of *Leveillula taurica* (Lév.) Arnaud, with keys constructed for *Leveillula* species by Braun (1987). The name *Oidiopsis haplophylli* (Magnus) Rulamort has priority for the anamorph of *L. taurica*. The basionym of *Oidiopsis haplophylli* is *Oidium haplophylli* Magnus, which was originally collected in the Middle East on *Haplophyllum buxbaumii* (Poir.) G. Don (*Rutaceae*) (Magnus 1900). Braun (1987) recognised *L. taurica* as a collective species, for which a clear morphological separation of species

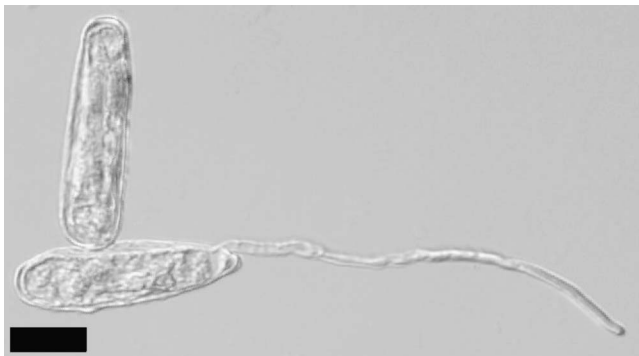
is impracticable. The aggregate nature of *L. taurica* is demonstrated by the many anamorphic names that have been applied to it (Braun 1987) as well as by molecular studies which show that *L. taurica* is a complex of more or less genetically divergent isolates, comprising several biological species (Khodaparast *et al.* 2001). Therefore, we refer to the powdery mildew we examined on *Euphorbia* as the *Oidiopsis* anamorph of *L. taurica*. The following description is based on the specimens we examined from *Euphorbia*. Only turgid and mature conidia (those unattached to conidiophores) were measured after mounting in lacto-glycerol using adhesive tape.

***Oidiopsis* anamorph of *Leveillula taurica* (Lév.) G. Arnaud, Anns Épiphyt. 7: 94 (1921) on *Euphorbia* (Figs 1 and 2).**

*Mycelium* hypophyllous, hemiendophytic (partly external and partly internal). *Superficial hyphae* entering the leaves through stomata, branched, septate, hyaline, smooth. *Conidiophores* hypophyllous, produced from the internal mycelium, arising through the stomata, cylindrical, hyaline, smooth, up to 320 × 5–7 µm. *Conidia* single, dimorphic: primary conidia lanceolate, apically pointed, base rounded, 48–98 × 12–25 µm, L/W ratio 2.6–7.5; secondary conidia cylindrical to ± subcylindrical with rounded ends, 48–120 × 12–25 µm, L/W ratio 2.5–7.1, aseptate, hyaline, smooth; single germ tube at the end of conidium with indistinct appressorium. *Teleomorph* not found. (Note: the specimen BRIP 13824 has a few branched conidiophores and DAR 28940 has some coral-like germ tubes).



**Fig. 1.** *Oidiopsis* anamorph of *Leveillula taurica* on *Euphorbia* spp. (A). Two conidiophores arising through stomata (st) with stained primary (pc) and secondary (sc) conidia (BRIP 16890). (B) Conidiophore and immature primary conidium (BRIP 26529). (C) Conidiophores and immature secondary conidia (BRIP 26529) (Bar = 20  $\mu$ m).



**Fig. 2.** *Oidiopsis* anamorph of *Leveillula taurica* on *Euphorbia cyathophora*. Secondary conidium and germinating primary conidium (BRIP 20064) (Bar = 20  $\mu$ m).

**Material examined:** **Australia** — on *Euphorbia cyathophora*, Peregian Beach, Qld, 5 Sept. 1982, J.L. Alcorn, BRIP 13824; 31 Dec. 1989, J.L. Alcorn, BRIP 16890; 3 May 1992, J.L. Alcorn, BRIP 20064, VPRI 17917; Cocos Island, July 1981, S. Navaratnam, DAR 38017; on *Euphorbia dentata* Michx., Darwin, NT, 4 July 1975, S.J. Aldrick, DAR 28940; on *Euphorbia heterophylla* L., Yanungbi, NT, 15 Dec. 1998, R.G. Shivas, BRIP 25568; Millingimbi, NT, 17 Aug. 1999, A.A. Mitchell, BRIP 26529; South Goulburn Island, NT, 8 Dec. 1999, M.P. Weinert, BRIP 26732; Kununurra, WA, 26 July 1994, A.A. Mitchell, VPRI 20208; on *Euphorbia leucocephala* Lotsy, Crabbes Creek, Qld, 11 June 1996, R. Foster, BRIP 23464.

**Vanuatu** — on *E. cyathophora*, Lenakel, Tanna Island, 17 June 2003, J.G. Wright, BRIP 44907.

The length of conidiophores as well as the minimum conidial length of the specimens from Australia and Vanuatu is similar. There was some variation in the maximum conidia length from 70 to 120  $\mu$ m (Table 1). These dimensions correspond to those given for *L. taurica* by Boesewinkel (1980) and Braun (1987). There are few papers citing conidial dimensions for the *Oidiopsis* anamorph of *Leveillula* on *Euphorbia*. Reddy and Reddi (1980) and Pasini *et al.* (1981) reported conidial size as 41–52  $\times$  13–16  $\mu$ m and 67  $\times$  17  $\mu$ m, respectively, and Nour (1958) measured 40–95  $\mu$ m as the conidial length. According to Palti (1988), the size of conidia may vary appreciably even when derived from the same host species. Somewhat more constant is the length to width (L/W) ratio of conidia derived from specific hosts, which has been used to distinguish between taxa (Palti 1988). The L/W of the specimens examined in this study (Table 1) varied much more than those cited by Palti (1988; L/W = 2.1–4.5) and by Braun (1987; L/W = 2.5–4.5).

The Australian Plant Disease Database (<http://npdd.nre.vic.gov.au/ihd/nre/research.htm>) contains records of specimens of *Leveillula* and *Oidiopsis* on *Euphorbia* spp. from Australia, although there are no published reports in the State plant disease lists (Simmonds 1966; Pitkethley 1970; Chambers 1982; Sampson and Walker 1982; Cook and Dube 1989; Shivas 1989) or in the literature. There are no records of either *Oidiopsis* or any other powdery mildew of the subfamily Phyllactinioideae (Erysiphaceae) in Vanuatu according to McKenzie (1989) or The Pacific Pest List Database (Vernon 2003; [http://www.spc.org.nc/pps/pacific\\_pestlists\\_database.htm](http://www.spc.org.nc/pps/pacific_pestlists_database.htm)). The specimen of *Oidiopsis* on *E. cyathophora* from Vanuatu represents a new plant disease record.

**Table 1. Characteristics of specimens of *Oidiopsis* on *Euphorbia* spp.**

Accession number	Host	Conidiophore length (µm)	Primary conidia		Secondary conidia <sup>A</sup>	
			Size (µm)	L/W ratio <sup>B</sup>	Size (µm)	L/W ratio
BRIP 13824	<i>E. cyathophora</i>	Up to 228	58–94 × 14–24	2.8–5.6	50–120 × 12–20	3.0–7.1
BRIP 16890	<i>E. cyathophora</i>	Up to 224	60–82 × 13–22	3.0–5.1	52–96 × 12–22	2.5–5.0
BRIP 20064	<i>E. cyathophora</i>	Up to 210	54–92 × 16–22	3.0–5.7	52–92 × 14–22	3.0–4.6
BRIP 44907	<i>E. cyathophora</i>	Up to 250	52–74 × 14–22	2.4–5.3	54–82 × 14–21	3.1–5.9
DAR 38017	<i>E. cyathophora</i>	Up to 206	50–80 × 13–20	2.6–5.7	50–70 × 14–19	2.7–5.0
DAR 28940	<i>E. dentata</i>	Up to 224	52–80 × 14–22	2.6–5.7	50–86 × 14–20	3.3–6.1
BRIP 25568	<i>E. heterophylla</i>	Up to 200	56–90 × 14–20	2.8–6.4	56–90 × 14–25	2.9–4.7
BRIP 26529	<i>E. heterophylla</i>	Up to 230	60–90 × 12–20	3.2–7.5	50–98 × 14–22	3.0–4.9
BRIP 26732	<i>E. heterophylla</i>	Up to 200	50–98 × 12–25	3.3–7.0	50–72 × 14–20	2.5–5.1
VPRI 20208	<i>E. heterophylla</i>	Up to 220	48–80 × 14–20	2.6–5.3	48–78 × 12–20	2.5–5.2
BRIP 23464	<i>E. leucocephala</i>	Up to 320	50–78 × 12–20	3.2–5.6	48–80 × 13–20	2.4–5.7

<sup>A</sup>All examined specimens have subcylindric to cylindrical secondary conidia.

<sup>B</sup>Length/width ratio.

Palti (1988) and Amano (1986) listed 19 species of *Euphorbia* (including *E. cyathophora*, *E. dentata* and *E. heterophylla*) as hosts of *Leveillula*, although most of their records do not have links to the literature. It appears that the specimen of *Oidiopsis* on *E. leucocephala* from Queensland represents a new host record for the anamorph of *Leveillula taurica*. There is one other powdery mildew reported from *Euphorbia*. Nour (1957) described *Leveillula clavata* on *E. pulcherrima* from Kenya but this specimen is known only from the type collection (Braun 1987) and it has conidia that are clavate, never lanceolate.

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