A new species of *Leiorreuma* Eschw. (lichenized Ascomycota, Graphidaceae) from Christmas Island, Indian Ocean

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Abstract

Leiorreuma norsticticum sp. nov. (Graphidaceae) is described from the bark of a rainforest tree in Christmas Island, an Australian territory in the north-eastern Indian Ocean. The pale olive-green thallus contains norstictic acid, and the simple, adnate to subsessile lirellae have a strikingly pruinose disc and a thin thalline margin. The proper excipulum is brown-black and thickest at the ascomatal base, and the heavily granule-inspersed hymenium contains simple paraphyses, 8-spored asci and brownish, 6-locular, non-amyloid ascospores, 19–28 × 5.5–9 µm.

Introduction

Leiorreuma Eschw. (Graphidaceae), a genus of at least 21 corticolous and mainly tropical species, is characterized by its pale corticate thallus, adnate to sessile lirellae with an open and often pruinose disc, a carbonized excipulum base that becomes thinner and divergent laterally, predominantly simple paraphyses in a heavily inspersed hymenium and pale brown, non-amyloid and mostly transversely loculate ascospores (Staiger 2002; Archer 2009). Four mainly pantropical and Palaeotropical species are known from eastern Australia (Archer 2009); in this paper a fifth is documented from the bark of a rainforest tree in the Australian territory of Christmas Island in the Indian Ocean.

Leiorreuma norsticticum P.M.McCarthy, sp. nov. Figs 1 & 2
MycoBank No.: **MB 840854**

Thallus corticolous, pale olive-green, continuous, corticate and containing norstictic acid, with unbranched, adnate to subsessile lirellae 0.9–4.8 mm long and 0.40–0.64 mm wide, each with an open and persistently pruinose disc and a thin thalline margin. Proper excipulum brown-black and 50–120 µm thick at the base, ± concolorous, divergent and 25–40 µm thick laterally; hymenium 80–120 µm thick, heavily inspersed with granules and with simple paraphyses. Ascospores 8 per ascus, pale brown or pale greyish brown, 6-locular, non-amyloid, 19–28 × 5.5–9 µm.

Type: Australia. Christmas Island, Murray Road, 3.5 km NNE of 'Central Area Workshop', 10°27.26'S, 105°39.34'E, 210 m alt., on a centimetre-wide branch in moderately dense primary forest, *P.M. McCarthy 1611*, 26.vii.2000 (CANB — holotype).

Thallus crustose, epiphloeodal, pale olive-green, to 2 cm wide, 80–120 µm thick, smooth, dull to slightly glossy and with a waxy appearance, continuous or very sparingly cracked, corticate. *Cortex* hyaline to pale straw-yellow, 25–35 µm thick; cells very thick-walled, with rounded, polygonal, periclinally elongate or interconnecting stellate lumina. *Algae* trentepohlioid, occupying a layer 30–80 µm thick; cells ± ellipsoid, 6–13 µm in maximum extent; interstitial hyphae short-celled, 2–3 µm wide. *Medulla* with indistinct hyphae, I–, dominated by small and large crystals of calcium oxalate, 10–40 µm wide (H_2SO_4+). *Prothallus* not apparent. *Apothecia* moderately numerous, lirelliform, scattered or contiguous, adnate to subsessile and then slightly constricted at the base, short and rounded to oblong or elongate, straight, curved, uncinate or sinuous, not branched and with rounded, non-tapering ends, (0.9–)3.1(–4.8) mm long, (0.40–)0.51(–0.64) mm wide [n = 30]; disc open, slightly concave to plane or low-convex, smooth, not cracked or furrowed, thinly whitish to pale bluish grey-pruinose at all stages of development, or the pruina becoming eroded to expose the dark olive-brown or dull dark brown disc surface. *Thalline margin* dull whitish green, entire, divergent, not or only slightly prominent, or flush with the disc, 80–120(–150) µm thick; in thin section with dense

concentrations of plate-like or more irregular crystals of calcium oxalate (H_2SO_4+), these 30–80 µm in maximum extent; thalline cortex and algal layer fading distally. *Proper excipulum* brown-black at the ascomatal base, melanized rather than carbonized, (50–)80–100(–120) µm thick, 25–40 µm thick lateral to the hymenium and dark red-brown to brown-black; uppermost, basal excipular cells, i.e. those adjacent to the hypothecium, somewhat paler than those below, elongate, thick-walled, ± periclinal, 8–16 × 2–3.5 µm. *Epihymenium* usually obscured by the pruina layer which is 15–30(–50) µm thick; if treated with N or H_2SO_4 the pruina dissolves, exposing the brownish upper region of the hymenium. *Hymenium* 80–100(–120) µm thick, heavily inspersed with minute granules, I+ orange-brown, KI+ very pale lilac (soon fading); granules not dissolving in K, N or H_2SO_4. *Hypothecium* hyaline, 15–20(–25) µm thick, not inspersed with granules, with or without sparse, oily globules, I+ orange-brown, KI+ pale lilac to medium blue, this latter colour persisting; cells rounded, thin-walled, 2–3 µm wide, forming a compact paraplectenchyma. *Paraphyses* predominantly simple, strongly conglutinate in water, not separating in K or N, long-celled, not constricted at the septa, 1–1.8(–2.2) µm thick, heavily encrusted with granules that are 0.5–1.5 µm wide; apices neither swollen nor pigmented, with or without sparse branches. *Asci* narrowly to broadly clavate, 8-spored, 70–85 × 16–20 µm [n = 10], with a short, tapering stalk; apex broadly rounded and moderately thick; wall KI–. *Ascospores* pale brown or pale greyish brown and 6-locular at maturity, oblong-ellipsoid or cylindrical, straight, with rounded ends, I+ deep red-brown, KI–, (19–)24(–28) × (5.5–)7(–9) µm [n = 30]; epispore initially *c.* 2–3 µm thick, *c.* 0.5 µm thick or not apparent at maturity; locules lentiform or more irregular, the end locules often hemispherical; contents clear; post-mature ascospores darker, the locules collapsing, and almost appearing to have true septa. *Pycnidia* not seen.
Chemistry: Thallus containing norstictic acid (major, by TLC, but not producing needle-like crystals in K; Elix 2020).

Etymology: The epithet refers to the diagnostic occurrence of norstictic acid in the thallus.

Remarks

The new species is distinguished from others in the genus by the thallus containing only norstictic acid, lirellae with an unbranched, open disc, an excipulum base (50–)80–100(–120) µm thick, and 6-locular ascospores measuring 19–28 × 5.5–9 µm. Other taxa with 6-locular ascospores include *L. nornotaticum* (A.W.Archer & Elix) A.W.Archer, from north-eastern Australia and the Solomon Islands, with a thallus containing nornotatic acid and hypoprotocetraric acid and a carbonized excipulum base that is *c.* 250 µm thick (Archer 2009). *Leiorreuma taiwanense* M.Nakan., Kashiw. & K.H.Moon, from Taiwan, has a chemistry similar to that of *L. nornotaticum*, the lirellae have a black, canaliculate disc with tapering ends, a much thicker, carbonized proper excipulum, and shorter ascospores than in *L. norstictcum* (Moon *et al.* 2008). Finally, *L. nicobarense* Pushpi Singh, Jagadeesh & Kr.P.Singh, from the Nicobar Islands, to the east of the Bay of Bengal, is certainly most similar to the newly described lichen in terms of morphology and ascomatal anatomy, but it has more prominent ascomata with a considerably thicker thalline margin, a thicker excipular base (100–180 µm), and it contains constictic and stictic acids as major substances in place of norstictic acid (Singh *et al.* 2017). Incidentally, the only other *Leiorreuma* known to contain norstictic acid, *L. explicans* (Fink) Lendemer from south-eastern U.S.A., has submuriform ascospores that are 24–31 × 9–12 µm (Lendemer & Knudsen 2008).

Leiorreuma norsticticum is known only from the type locality in Christmas Island. It occurs on a narrow tree branch in primary forest where it is associated with species of *Letrouitia*, *Physcia*, *Porina*, *Pyrenula* and other genera of Graphidaceae.

Acknowledgement
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Figure 1. *Leiorreuma norsticticum* (holotype). Scale: 5 mm.

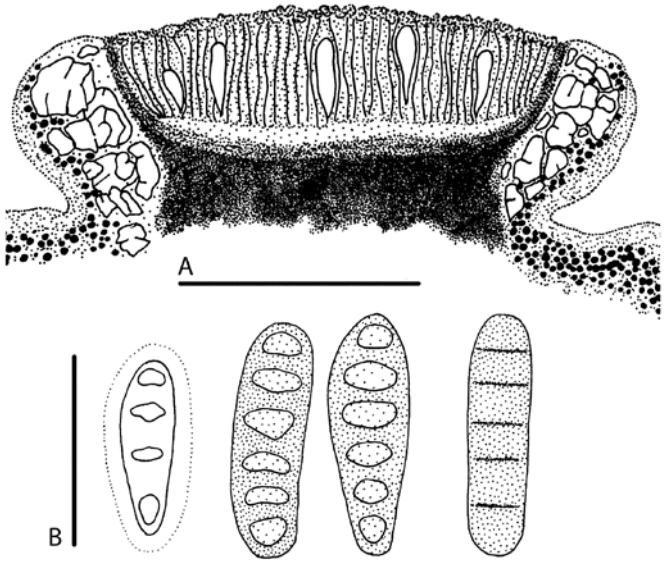

Figure 2. *Leiorreuma norsticticum* (holotype). A, Section of an ascoma (semi-schematic). B, Ascospores (left to right: immature, two mature, post-mature). Scales: A = 0.2 mm; B = 20 µm.