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A new saxicolous *Arthothelium* from the Namib desert

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Abstract: The new species *Arthothelium desertorum* is described from the Namib desert. It is characterized by its saxicolous habit and areolate thallus containing divaricatic acid.

Key words: *Arthoniaceae*, Namibia, new species, divaricatic acid

Introduction

The lichen genus *Arthothelium* A. Massal. is a large (*c.* 80 species, Kirk *et al.* 2001), probably heterogeneous assemblage of predominantly tropical corticolous species. Traditionally, it is mainly distinguished from the genus *Arthonia* by the muriform versus transversely septate ascospores, a character that is increasingly found to be of little phylogenetic value. The phylogenetic position of the genus, as determined by its type, seems to be distinct (Tehler 1990).

So far, only seven saxicolous species are known in the genus. Three species are known only from coastal rocks in Chile (Follmann 1968), where they are locally common, and one is abundant on coastal cliffs on the Galapagos (Huneck & Follmann 1969). The other species are inland: one is known from shaded basalt in the Western Ghats mountains in India (Makhija & Patwardhan 1997), and most recently, a species was described from an exposed granite outcrop on top of a low mountain on the Seychelles (Seaward & Aptroot 2004). A further saxicolous *Arthothelium* species has been described from coastal rocks (in the splash zone) in the Antarctic Marion Island (Øvstedal & Gremmen 2001), but its affinity is uncertain.

Most corticolous *Arthothelium* species have a thin, smooth thallus, usually without secondary substances. Saxicolous *Arthothelium* species, however, usually have a rather thick, and often chalky white thallus, containing lichen substances. This might be an adaptation to the substratum, but it suggests that they are more closely related to each other than to the bulk of the corticolous species. The internal apothecial structures characteristic of corticolous species of *Arthothelium*, such as globose asci, hyaline to pale brown ascospores with a muriform septation and the regular presence of a black hypothecium, can also be observed in the saxicolous species. All saxicolous species are characterized by one or more positive characters (e.g. thallus chemistry) distinguishing them from each other and from the corticolous species, which is an indication that they are not simply saxicolous individuals of otherwise predominantly corticolous species.

During several excursions in the Namib desert, a saxicolous lichen was noticed which superficially resembled *Diplotomma alboatrum* (Hoffm.) Flot., but with the older apothecia lobate, reminiscent of *Arthonia leucopellaea* (Ach.) Almq. The specimens were found to have rather soft apothecia with an anastomosing hamathecium tissue, and to contain thick-walled asci typical of the *Arthoniaceae*, and muriform ascospores.

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FIG. 1. *Arthothelium desertorum*, habitus (part of the holotype), showing areolate thallus and pruinose apothecia that become divided. Scale = 1 mm.

It is described below as new to science as a further new saxicolous species of *Arthothelium*, differing from all other known saxicolous species by the regularly areolate thallus, the pruinose apothecia which become divided at maturity and by containing divaricatic acid.

Material and Methods

Specimens were studied with a Olympus BX 50 compound microscope using Differential Interference Contrast. Measurements were made on specimens mounted in tap water and in the case of the ascospores are based on 50 measurements. Secondary compounds were detected by standard TLC methods following White & James (1985) using solvent A (toluene/dioxane/acetic acid).

Arthothelium desertorum Aptroot & Wirth sp. nov.

Arthothelium saxatilis thallo rimoso-areolato, acidum divaricaticum continens, cum apotheciis pruinosis, lobatis vel divisis, ascosporis hyalinis deinde pallido-fuscis, muriformibus.

Typus: Namibia, District Omaruru, Central Namib desert, Laguneberg, 21°49′43″S, 14°04′59″E, 125–135 m alt., 14 May 2002, *V. Wirth* 43062 *& M. Heklau* (KR—holotypus; ABL—isotypus).

(Figs 1–3)

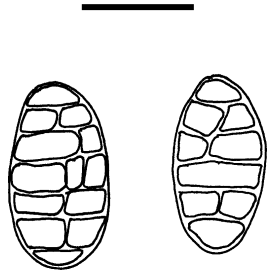


FIG. 2. *Arthothelium desertorum*, ascospores showing muriform septation. Scale = 10 μm.

Thallus rimose to rimose-areolate, dull, ivory grey, sometimes with a brownish tinge (by incorporated sand dust), up to 8 cm in diam., and *c*. 0·4 mm thick, upper 10–20 μm without alga; thallus ecorticate. *Algae* filling most of the medulla, chlorococcoid, globose, *c*. 10–18 μm.

Apothecia immersed, initially sometimes sessile, regularly dispersed, single, but sometimes grouped in twos; disc blackish brown, of a soft texture, distinctly grey-pruinose, mostly flat, initially round, becoming irregular in outline, lobate to eventually divided, *c*. 0·2–1·0(–1·4) mm diam.; *apothecia* immarginate or sometimes surrounded by a small thallus margin, but without distinct

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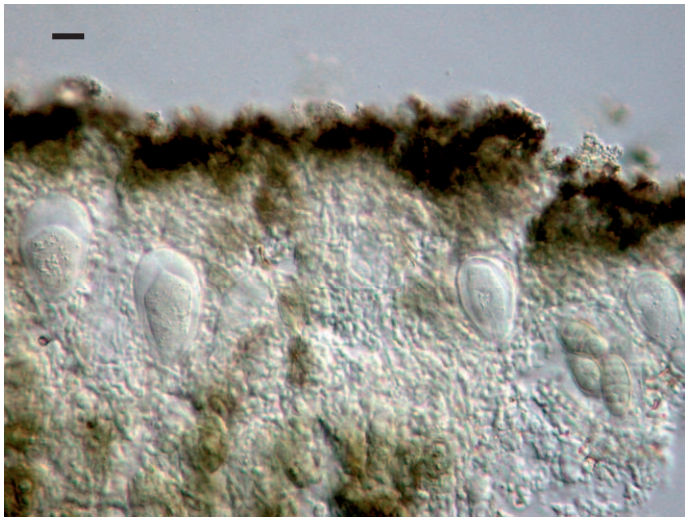


FIG. 3. *Arthothelium desertorum*, section through the hymenium, showing the anastomosing hamathecium, globose, thick-walled asci and a cluster of brown ascospores (in 10% KOH). Scale = 10 µm.

proper excipulum. *Epihymenium* dark brown, densely cellular, KOH+ green, IKI+ red, *c.* 10–20 µm high. *Hymenium* mottled brown from above and below, not inspersed, KOH −, IKI+ blue, *c.* 50–60 (–80) µm high. *Hypothecium* brownish to reddish brown, *c.* 40–80 µm high, IKI+ orange. *Paraphysoids* densely anastomosing, 1·5–2·0 µm wide in KOH, apical cells up to 3 µm wide. *Asci* ellipsoid to nearly globose on a basal stalk, 40–75 × 20–30 µm, wall thick, especially at the top, up to 7 µm thick; asci containing 4–8 ascospores, ascoplasma IKI+ yellow; wall 5–8 µm wide. *Ascospores* hyaline to pale or rather dark brown, ellipsoid, muriform, with generally 5(–6) transverse and 2–4(–5) longitudinal septa, 17–21 × 9–11 µm, wall *c.* 1 µm, not ornamented, without conspicuous gelatinous sheath.

Pycnidia blackish, immersed in the thallus. *Conidia* bacilliform, 6–8 × 0·8–1 µm.

Chemistry. Thallus containing divaricatic acid (TLC!), medulla C −, K −, KC −, UV+ white, IKI+ blue.

Ecology. The new species has been found on neutral rocks at sites which are frequently moistened by heavy fogs. It grows mostly on steep faces, for example in the vicinity of *Combea mollusca* (Ach.) De Not. Sometimes it was observed to grow parasitically on *Lecanographa subcaesioides* Torrente & Egea.

Discussion. The new species resembles *Arthonia leucopellaea*, but differs from it by the thallus colour, the saxicolous growth, the chemistry and the muriform ascospores. The species is also morphologically close to the Galapagos endemic *Arthothelium galapagoense* Huneck & Follmann, which has similar ascocarps and ascospores, and also a UV+white thallus reaction. However, this species clearly differs, for example, by the presence of a dark excipulum surrounding the hymenium, and by the rather smooth, thinner and white thallus, which is always surrounded by a black hypothallus.

Saxicolous *Arthothelium* species seem to be characteristic of lichen vegetations rich in (often locally endemic) *Roccellaceae* on coastal rocks in desert regions with regular fogs. Personal observations of the authors respectively in the Galapagos and the Namib desert show that they are quite abundant in such environments.

Additional specimens examined. **Namibia:** Laguneberg, N vom Gipfel, 150 m, 2002, *V. Wirth* 43061, 43063 & *M. Heklau* (KR); Southern Namib

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Desert, Kara region, Lüderitz, Lüderitz-Halbinsel, bei der Großen Bucht, *c*. 25–30 m, 2004, *V. & R. Wirth* 43064 (KR); Lüderitz, Lüderitz-Halbinsel, kleiner Fjord, *c*. 15–30 m, *V. & R. Wirth* 43065 (KR).

Leo Spier is warmly thanked for performing the TLC.

References

Follmann, G. (1968) Felsbewohnende Arthoniaceen der chilenischen Pazifikküste. *Willdenowia* **4:** 365–382.

Huneck, S. & Follmann, G. (1969) Mitteilungen über Flechteninhaltsstoffe. LXIX. Zur Phytochemie und Chemotaxonomie der Arthoniaceae. *Österreichische Botanisches Zeitschrift* **117:** 163–175.

Kirk, P. M., Cannon, P. F., David, J. C. & Stalpers, J. A. (2001) *Dictionary of the Fungi*. 9th edition. Egham: CABI Publishing.

Makhija, U. & Patwardhan, P. G. (1997) A new saxicolous species of *Arthothelium*. *Lichenologist* **29:** 169–172.

Øvstedal, D. O. & Gremmen, N. J. M. (2001) The lichens of Marion and Prince Edward Islands. *South African Journal of Botany* **67:** 552–572.

Seaward, M. R. D. & Aptroot, A. (2004) Four Seychelles lichens new to science. *Lichenologist* **36:** 119–124.

Tehler, A. (1990) A new approach to the phylogeny of Euascomycetes with a cladistic outline of *Arthoniales* focussing on *Roccellaceae*. *Canadian Journal of Botany* **68:** 2458–2492.

White, F. J. & James, P. W. (1985) A new guide to microchemical techniques for the identification of lichen substances. *British Lichen Society Bulletin, Suppl.* **57:** 1–41.

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