Cryptogam Biodiversity and Assessment
Vol 6, No. 1 (2022), 11-13, e-ISSN : 2456-0251 | Dr. D.D. Awasthi birth centenary issue

Bunodophoron awasthii, a new lichen species from India

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Publication Info

Article history:
Received : 11 September 2022
Accepted : 14 September 2022
DOI: 10.21756/cab.v6i1.02

Keywords:
Eastern Himalaya, Lecanoromycetes, Neora Valley National Park, Sphaerophoraceae.

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ABSTRACT

Bunodophoron awasthii, a new lichen species is described from the Eastern Himalaya, India. It is characterized by the solid, erect, non-isidiate, crowded, richly branched and anastomosing thallus with mostly ± flattened main branches and subterete to terete lateral branches, terminal to subterminal apothecia, hyaline to brownish grey, globose, 6.3–9.4 µm diam. ascospores, sphaerosphorin and stictic acid complex as lichen substances.

INTRODUCTION

Bunodophoron A. Massal. (*Sphaerophoraceae*), a genus of 28 species restricted to wet-temperate areas and to montane rainforest in tropical and subtropical areas (Wedin 2001). The genus is characterized by more or less flattened thallus, globose ascospores with an irregular ornamentation consisting of an amorphous material adhering to the spore wall after the spores are released from the asci, β-orcinol depsidone-based chemistry and rod-shaped conidia (Wedin 1993, 1995a; Lumbsch *et al*. 2011). Wedin (1993, 1995a, b) discussed the circumscription, reinstated the genus, and included 23 species formerly in *Sphaerophorus.* Since then, Lumbsch *et al*. (2011) added another species from Papua New Guinea. Soto Medina *et al*. (2018) added two more species from the Neotropics. *Bunodophoron diplotypum* (Vain.) Wedin, *B. formosanum* (Zahlbr.) Wedin, *B. macrocarpum* (Ohlsson) Wedin are the three species so far reported from the Eastern Himalaya and Western Ghats of India (Singh and Sinha 2010; Jagadeesh Ram and Sinha 2018). In the publication on the lichens of Neora Valley National Park (Jagadeesh Ram and Sinha 2018), it was reported one interesting unidentified species as '*Bunodophoron* species'. Further investigations revealed that the species is new to science, which is described as *Bunodophoron awasthii*.

MATERIALS AND METHODS

Specimens collected by one of the authors (T. A. M. Jagadeesh Ram) from the Neora Valley National Park, Eastern Himalaya and deposited in BSA and MH were examined. External morphological features were observed with an Olympus SZ61 stereomicroscope. Thin hand-cut sections of thalli, ascomata and pycnidia were mounted in water and examined with a Nikon Eclipse 50i light transmission microscope. Spot tests were carried out by 10% aqueous potassium hydroxide solution (K), aqueous calcium hypochlorite solution (C), and para-phenylenediamine in Steiner's solution (P). Lichen substances were studied by thin layer chromatography using solvent A (Orange *et al*. 2001).

THE SPECIES

Bunodophoron awasthii G.P. Sinha & Jagad. Ram sp. nov. Fig 1 & 2.

MycoBank No.: MB 845625

Similar to *Bunodophoron formosanum* (Zahlbr.) Wedin, but with subterminal apothecia, large ascospores and lacking isidioid outgrowths on thalline surface.

Type: India, West Bengal, Darjeeling District, Neora Valley National Park, Neora riverine forest, elev. 2223 m, 15 May 2008, on fallen tree trunk, *T.A.M. Jagadeesh Ram* 4316 (Holotype: BSA, Isotype: MH).

Thallus erect, forming extensive colonies or small patches of numerous crowded, richly branched and anastomosing thalli of mostly ± flattened main branches and subterete

to terete lateral branches, (40–)50–80 mm long; main branches 2–3 mm wide and lateral branches 1–2 mm wide. *Fertile branches* (main branches) ± flattened to sub terete, 25–40 mm long and 2–3 mm wide, branch dichotomously to palmately profusely branched, apically with 2–4 short branchlets. *Upper surface* pale green to pale grey-green, smooth, epruinose, lacking isidia and isidioid branchlets. *Lower surface* whitish to pale brown, becoming pale brown to brownish when dried. *Upper cortex* yellowish to yellowish brown in section, 32–60 µm thick. *Photobiont layer* 25–60 µm thick, photobiont a unicellular chlorococcoid. *Medulla* solid, white, composed of loosely arranged hyphae, hyphae 5–6 µm wide. *Lower cortex* pale brown, 14–30 µm thick. *Apothecia* sparse, terminal to subterminal on the fertile branches, if subterminal further branching observed, usually slightly bent downwards, 2–3 mm diam. *Thalline receptacle* ruptured early, persistent and slightly widened at maturity. *Mazaedia* subapically exposed, pointing slightly downward, conspicuous, strongly sooty, becoming exposed very early. *Ascospores* hyaline to brownish grey, dark grey, globose, (6.33–) 7.28–7.87–8.46 (–9.35) µm (n=100) diam. *Pycnidia* black, common, along the sides and in the apices of terminal branchlets. *Conidia* colourless, oblong to oblong-obovoid, (3.28–)3.65–4.2–4.75(–4.96) × (1.03–)1.2–1.32–1.44(–1.54) µm (n=25).

Chemistry: Medulla K+ yellow, C–, P+ orange; Sphaerosphorin (major), constictic acid (minor/trace), stictic acid (minor/trace) observed in TLC using Solvent A.

Remarks: *Bunodophoron awasthii* is characterized by the solid, erect, non-isidiate, crowded, richly branched and anastomosing thallus with mostly ± flattened main branches and subterete to terete lateral branches, terminal to subterminal apothecia, hyaline to brownish grey, globose, 6.3–9.4 µm diam. ascospores, sphaerosphorin and stictic acid complex as lichen substances. It is very close to *Bunodophoron formosanum* (Zahlbr.) Wedin which also has profusely branched solid thallus and stictic acid complex as lichen substances. But, *Bunodophoron formosanum* has short terete isidioid outgrowths on the *upper surface*, terminal apothecia, slightly small ascospores and additionally with norstictic acid. *Bunodophoron awasthii* externally resembles *B. australe* (Laurer) A. Massal., but that has slightly small ascospores, large conidia and also with placodiolic and norstictic acids (Wedin 2001).

Ecology and Distribution: The new species is so far known only from the type locality, which is a pristine primary rainforest in the Eastern Himalaya where it was found on a fallen tree trunk growing along with leafy bryophytes.

Fig. 1. Dorsal view of fresh collection of *Bunodophoron awasthii* (holotype). Scale = 10 mm.

Fig. 2. *Bunodophoron awasthii* (holotype). A & B. Dorsal view of thallus, C–E. Ventral view of thallus and apothecia, F. Ascospores. Scales: A–E=10 mm, F=10 µm.

Etymology: The species is named in honour of legendry lichenologist of Indian subcontinent, Dr. Dharani Dhar Awasthi, at the appropriate time of his Birth Centenary Celebrations.

Additional specimen examined: India, West Bengal, Darjeeling District, Neora Valley National Park, Neora riverine forest, fallen on ground, elev. 2223m, 14 May 2010, Jagadeesh Ram 6086 (BSA).

ACKNOWLEDGEMENTS

The authors are thankful to Dr. A.A. Mao, Director, Botanical Survey of India, Kolkata; Dr. M.U. Sharief, Head, Botanical Survey of India, Southern Regional Centre, Coimbatore for facilities; Dr Siljo Joseph, Kerala Forest Research Institute, Peechi for assistance with literature. The authors also express their sincere gratitude to the Divisional Forest Officer, Jalpaiguri Wildlife Division II and the Range Officer, Lava Range for necessary support during field visit.

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