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FOUR NEW REPORTS OF WOOD-ROTTING CORTICIOID FUNGI FROM INDIA

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ABSTRACT

Four corticioid species, *Botryohypochnus verrucisporus* Burds. & Gilb., *Corticium meridioroseum* Boidin & Lanq., *Odontium flabelliradiatum* (J. Erikss. & Hjortstam) Zmitr., and *Rhizoctonia amygdalispora* (Hauerslev, P. Roberts & Å. Strid) Oberw., R. Bauer, Garnica & R. Kirschner, new to India are described and illustrated. These species are recorded based on the material collected from the Kullu district of Himachal Pradesh (India).

Keywords – Agaricomycetes – Basidiomycota – Himachal Pradesh – Himalaya – wood decaying fungi

INTRODUCTION

Wood-rotting fungi are characteristic in using wood constituents as the carbon source. These fungi are capable of utilizing wood by means of their unique enzymatic secretions that chiefly decay lignin and cellulose. Hence these fungi play key role in the recycling of carbon in different ecosystems. Most of the wood decaying fungi belong to class *Agaricomycetes* of phylum *Basidiomycota*. Among these fungi, the corticioid fungi form a significant group of wood decayers in the forest ecosystem. The corticioids are characteristic in having annual to perennial, resupinate to effused-reflexed basidiocarps with unilateral hymenium usually organised in the form of a sheet on the substrate. During the fungal forays conducted in different localities of district Kullu in Himachal Pradesh in the monsoon season of the years 2016–2018, some interesting specimens of the corticioid fungi were collected. On the basis of morphotaxonomic details and comparison with the literature, (Eriksson *et al.*, 1981; Rattan 1977; Bernicchia & Gorjón 2010; Dhingra *et al.*, 2014; Kaur *et al.*, 2019; Mycobank 2021) these specimens were identified as *Botryohypochnus verrucisporus* Burds. & Gilb., *Corticium meridioroseum* Boidin & Lanq., *Odontium flabelliradiatum* (J. Erikss. & Hjortstam) Zmitr., and *Rhizoctonia amygdalispora* (Hauerslev, P. Roberts & Å. Strid) Oberw., R. Bauer, Garnica & R. Kirschner. It is pertinent to mention here that all the four species are being described for the first time from India. The aim of the present studies is to describe and illustrate these four species.

MATERIALS AND METHODS

The specimens of wood rotting fungi were collected during the field trips made in various localities of Kullu district (Himachal Pradesh, India) in the monsoon season of the years 2016–2018. Macroscopic features related to basidiocarp colour, nature of hymenophore, colour and type of margin were recorded. The colour standards used were

according to Kornerup & Wanscher (1978). The collected specimens were dried and deposited at the Herbarium, Department of Botany, Punjabi University, Patiala (PUN).

The micromorphological features were studied through crush mounts and freehand cut sections in water, 3%, 5%, and 10% KOH solutions, cotton blue (1% in lactophenol), congo red (1% in distilled water), phloxine (1% in distilled water), sulphovanillin (0.5 gm vanillin + 4.0 ml conc. Sulphuric acid + 2.0 ml distilled water) and Melzer's reagent (0.5 gm iodine + 1.5 gm KI + 20 gm chloral hydrate + 20 ml distilled water). The outline of microscopic features was drawn with the help of a camera lucida at 100X, 400X, and 1000X magnifications of the compound microscope. The data were compiled in the form of a description and was compared with the published literature for identification.

RESULTS

Botryohypochnus verrucisporus Burds. & Gilb., Mycotaxon 15: 334 (1982). (Fig. 1) Basidiocarp annual, resupinate, adnate, easily separable, up to 100 µm in thickness. Hymenial surface smooth, byssoid to hypochnoid, brownish orange when fresh, orange white after drying. Margin filamentous, paler concolorous. Hyphal system monomitic. Generative hyphae simple-septate, branched, up to 9 µm wide; basal hyphae parallel to the substrate, sparsely branched, long-celled, sometimes encrusted with granules; subhymenial hyphae vertical, richly branched, branches diverging at right angle, loosely arranged. Basidia 17.5–22.5×7–9 µm, subclavate, without basal clamp, 4–sterigimate; sterigmata up to 6 µm. Basidiospores 6.8–8×5–7 µm, broadly ellipsoid to subglobose, warted to somewhat spinose, brown, thick-walled, cynophilous, inamyloid.

Host – On *Pinus excelsa* log

Collection examined – India, Himachal Pradesh, Kullu district, Banjar sub-division, Sharchi village 2200 m, 31° 37'

4.494" N – 77° 25' 18.6384" E, on *Pinus excelsa* log, 27 October 2017, Ellu (PUN 11163, new record for India).

Notes – This species is marked by the byssoid to hypochnoid basidiocarp, long-celled, simple-septate basal hyphae and broadly ellipsoid to subglobose, warted to somewhat spinose, brown, cyanophilous basidiospores. Previously this species is reported from Europe (Mycobank 2021).

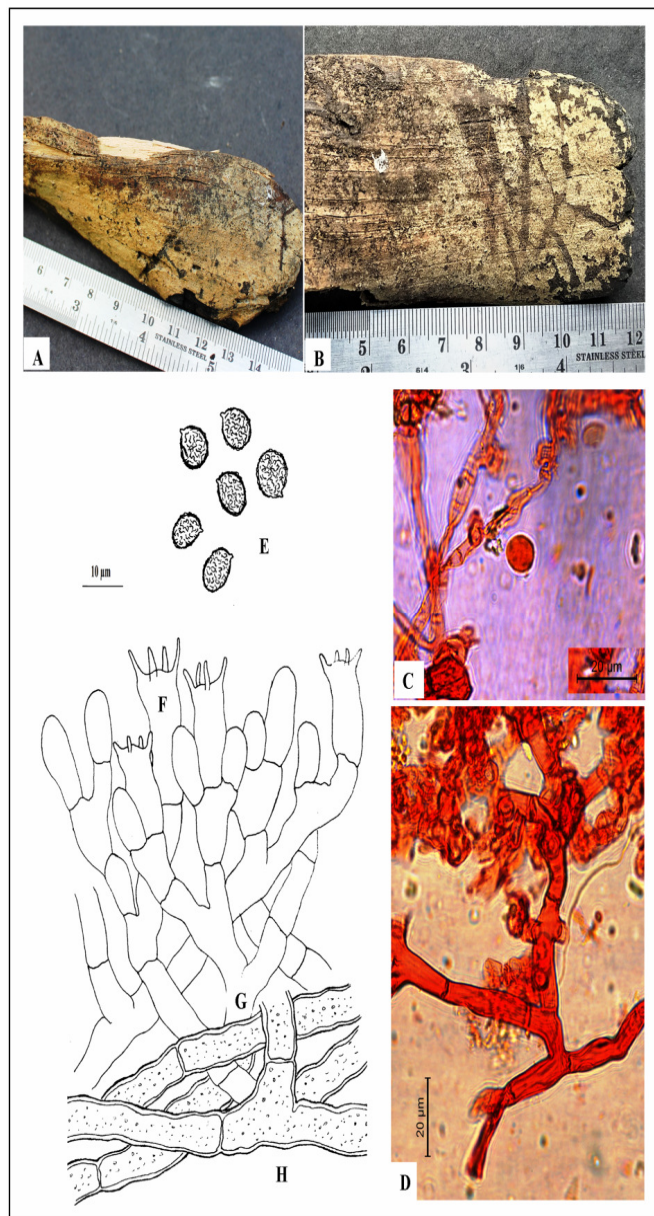


Fig. 1 : *Botryohypochnus verrucisporus* (PUN 11163, new record for India). A – basidiocarp showing fresh hymenial surface; B – basidiocarp showing dried hymenial surface; C – photomicrograph showing basidiospore; D – photomicrograph showing hyphal system; E – basidiospores; F – basidium; G – subhymenial generative hyphae; H – basal generative hyphae. – Bars = 10 µm.

Corticium meridioroseum Boidin & Lanq., Bulletin de la Société Mycologique de France 99: 276 (1983). (Fig. 2) Basidiocarp annual, resupinate, adnate, confluent, up to 120 µm in thickness. Hymenial surface smooth, pale red when fresh, pinkish white after drying. Margin thinning, concolorous to paler concolorous. Hyphal system monomitic. Generative hyphae branched, septate, clamped, up to 4 µm

wide; basal hyphae parallel to the substrate, sparsely branched, thin- to somewhat thick-walled; sub-hymenial hyphae vertical richly branched, thin-walled. Dendrohyphidia upto 3 µm wide. Basidia 60–80× 7–8 µm, tubular, sinous or somewhat constricted with thick walled base, with basal clamp, 4-sterigmate; sterigmata up to 4 µm. Basidiospores 8–14 × 7.5–9, ellipsoid, thin-walled, smooth, acynophilous, inamyloid.

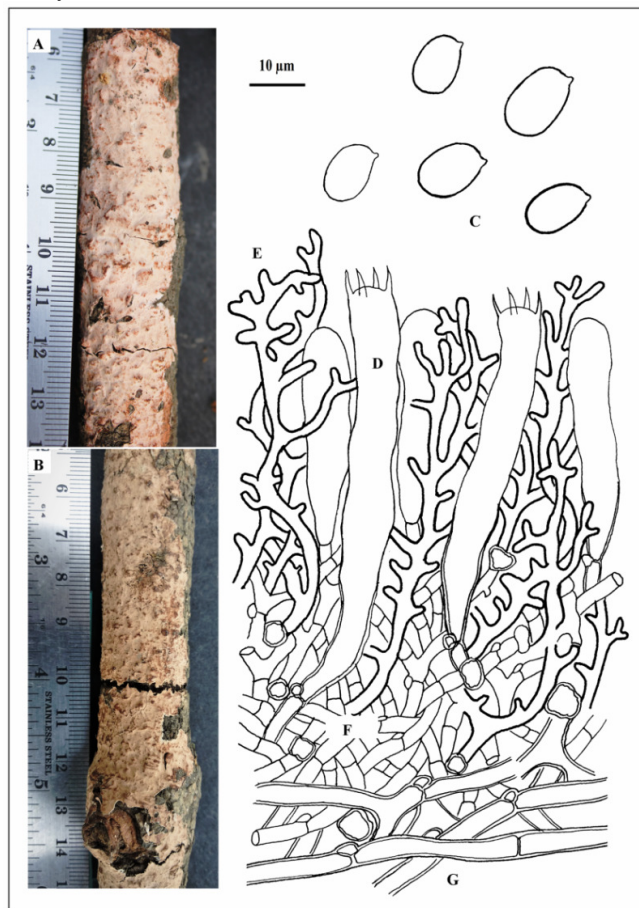


Fig. 2 : *Corticium meridioroseum* (PUN 11167, new record for India). A – basidiocarp showing fresh hymenial surface; B – basidiocarp showing dried hymenial surface; C – basidiospores; D – basidium; E – dendrohyphidia; F – subhymenial generative hyphae; G – basal generative hyphae. – Bars = 10 µm.

Host – On angiospermous sticks

Collection examined – India, Himachal Pradesh, Kullu district, Banjar sub-division, Jalori Paas village 3223 m, 31°31'60" N – 77°22'0" E, on angiospermous sticks, 4 September 2018, Ellu & A.P. Singh (PUN 11167, new record for India).

Notes – *Corticium meridioroseum* has pinkish white basidiocarp, monomitic hyphal system, numerous dendrohyphidia, basidia with thick walled base and ellipsoid basidiospores. Formerly the species is reported from Europe (Bernicchia & Gorjón 2010).

Odontium flabelliradiatum (J. Erikss. & Hjortstam) Zmitr., Mikologiya I Fitopatologiya 35: 18 (2001) – *Phanerochaete flabelliradiata* J. Erikss. & Hjortstam, The *Corticiaceae* of North Europe 6: 1073, 1981. (Fig. 3)

Basidiocarp resupinate, adnate, effused, easily detachable from the substrate, up to 130 in thickness. Hymenial surface sub-odontioid, white when fresh, becoming

pale yellowish on drying. Margin irregular, concolorous. Hyphal system monomitic. Generative hyphae branched, simple-septate, up to 3 µm wide; basal hyphae parallel to the substrate, sparsely branched, thin- to thick-walled; subhymenial hyphae vertically oriented, richly branched, thin-walled. Cystidia 60–120 × 5–7 µm, tubular to acute, thick-walled, sometimes apex shrunken or invaginated with adhering basidiospores, without basal clamp; projecting up to 10 µm out of hymenium. Basidia 18–24 × 5–5.6 µm, clavate, without basal clamp, 4 sterigmata; sterigmata up to 3 µm long. Basidiospores 5–6 × 2.5–3 µm, ellipsoid, somewhat concave, smooth, thin-walled, inamyloid, acyanophilous.

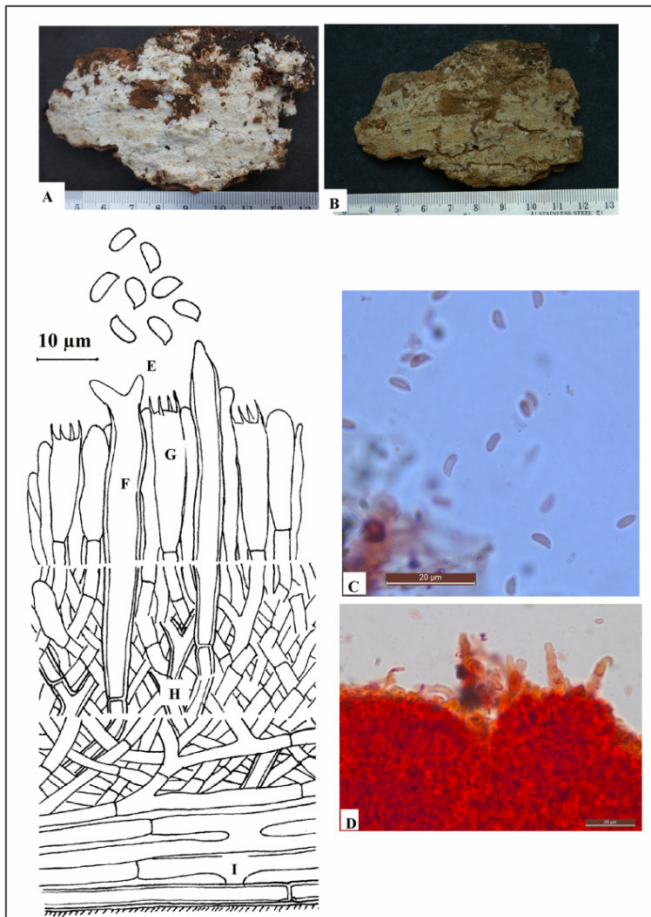


Fig. 3 : *Odonticum flabelliradiatum* (PUN 9563, new record for India). A – basidiocarp showing fresh hymenial surface; B – basidiocarp showing dried hymenial surface; C – photomicrograph showing basidiospores; D – photomicrograph showing cystidia; E – basidiospores; F – cystidium; G – basidium; H – subhymenial generative hyphae; I – basal generative hyphae. – Bars = 10 µm.

Host – On *Taxus baccata* log

Collection examined – India, Himachal Pradesh, Kullu district, Banjar sub-division, Jalori Pass village 3223 m, 31°31'60" N – 77°22'0" E, on *Taxus baccata* log, September 2016, Ellu (PUN 9563, new record for India).

Notes – *Odonticum flabelliradiatum* is unique in having sub-odontioid hymenial surface, simple-septate generative hyphae, tubular cystidia and ellipsoid to somewhat concave basidiospores. Earlier it has been reported by Eriksson et al. (1981) as *Phanerochaete flabelliradiata* from Norway and Sweden. Zmitrovich (2001) shifted it to the genus *Odonticum*.

Rhizoctonia amygdalispora (Hauerslev, P. Roberts & Å. Strid) Oberw., R. Bauer, Garnica, & R. Kirschner, *Mycological Progress* 12: 774 (2013) – *Thanatephorus amygdalisporus* Hauerslev, P. Roberts & Å. Strid, *Nordic Journal of Botany* 16 (2): 217 (1996). (Fig. 4) Basidiocarp resupinate, adnate, hypochnoid, up to 110 µm in thickness. Hymenial surface pruinose, porulose, golden yellow when fresh, brownish orange to light brown after drying. Margin thinning, paler concolorous, almost indeterminate. Hyphal system monomitic. Generative hyphae branched, simple-septate, up to 9 µm wide; basal hyphae parallel to the substrate, sparsely branched, thin- to somewhat thick-walled; sub-hymenial hyphae vertical, richly branched, thin-walled. Basidia 17–20 × 8–9 µm, cymose to subclavate, 4–sterigmate; sterigmata up to 4 µm. Basidiospores 10–18 × 5–8.6 µm, fusiform to amygdaliform, repetitive, thin-walled, smooth, acyanophilous, inamyloid.

Host – On *Cedrus deodara* stump

Collection examined – India, Himachal Pradesh state, Kullu district, Banjar sub-division, Sairopa village 2400 m, 31° 38' 23.0712" N – 77° 23' 16.4148" E, on *Cedrus deodara* stump, 7 October 2016, Ellu (PUN 11169, new record for India).

Notes – The fusiform to amygdaliform shape of basidiospores is typical for the species. Previously this species is reported from Europe as *Thanatephorus amygdalisporus* (Bernicchia and Gorjón 2010).

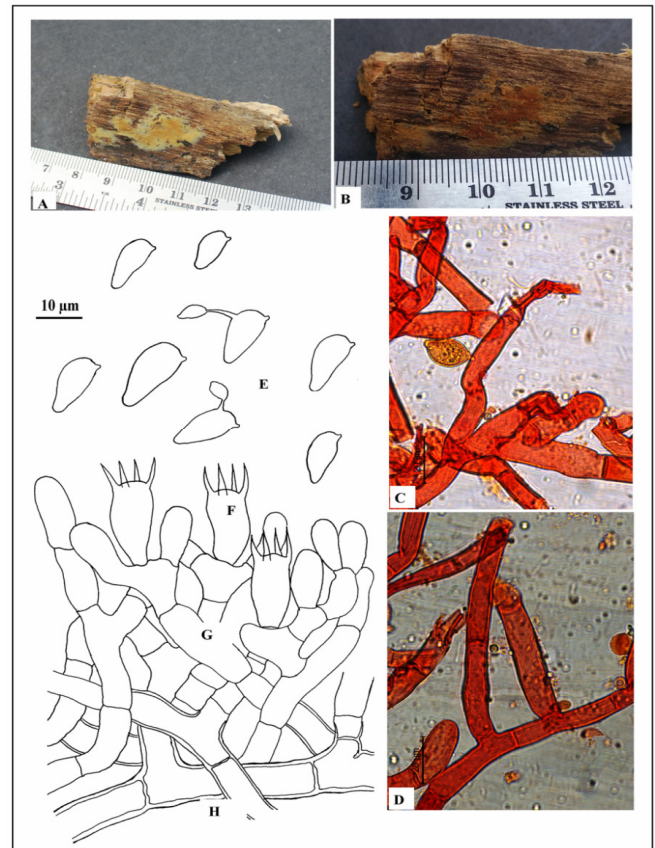


Fig. 4 : *Rhizoctonia amygdalispora* (PUN 11169, new record for India). A – basidiocarp showing fresh hymenial surface; B – basidiocarp showing dried hymenial surface; C – photomicrograph showing basidiospore; D – photomicrograph showing hyphal system; E – basidiospores; F – basidium; G – subhymenial generative hyphae; H – basal generative hyphae. – Bars = 10 µm.

DISCUSSION

Among the four genera, whose species are being described and illustrated as new to India, genus *Botryohypochnus* is known earlier on the basis of only one species i.e. *B. isabellinus* from Arunachal Pradesh, Himachal Pradesh, Jammu and Kashmir, Maharashtra and Punjab (Rattan 1977; Ranadive *et al.*, 2011; Dhingra *et al.*, 2011; Kaur 2012; Dhingra 2014; Dhingra *et al.*, 2014; Kaur 2017; Kaur *et al.*, 2019). The genus *Corticium* was reported for the first time from India based on *Corticium albidocremeum* by Rehill and Bakshi (1965) from south India. It was followed by addition of *C. roseum* from Himachal Pradesh (Dhingra *et al.*, 2014), *C. polygonioides* from Punjab (Kaur 2017) and *C. lombardiae* from Himachal Pradesh (Kaur *et al.* 2019). Genus *Odonticium* is known earlier only from Uttarakhand with *O. flavicans* (Dhingra 2014). The earlier account of genus *Rhizoctonia* from India includes *R. obscura* (Dhingra *et al.*, 2014) and *R. cf. sphaerosporum* from Himachal Pradesh (Kaur *et al.* 2019). The present account has added one species each to the list of species of these genera from India.

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Accessibility of data

The specimens of all the four described species have been deposited at Herbarium, Department of Botany, Punjabi University, Patiala, India (PUN).

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