ADDITIONS TO THE WOOD ROTTING AGARICOMYCETES OF NORTH WESTERN HIMALAYAS

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ABSTRACT
A detailed illustrated account of six species of Amyloxenasma (Oberw.) Hjortstam and Ryvarden, Hyphodontia Erikss., Postia Fr., Phlebia Fr., Phlebiopsis Jülich, and Scytinostroma Donk., based on the collections made from Uttarakhand are provided. Amyloxenasma grisellum and Hyphodontia nespori are being reported for the first time from North Western Himalayas whereas Postia ceasia, Phlebia segregata, Phlebiopsis flavidoalba and Scytinostroma crassa are reported first time from Uttarakhand.

Keywords: Agaricomycetes, Wood Rotting Fungi, North Western Himalayas

INTRODUCTION
During the fungal foray conducted around the different localities of Uttarakhand for the collection of wood rotting fungi, six species were collected. Out of these Amyloxenasma grisellum and Hyphodontia nespori are being reported for the first time from North Western Himalayas whereas four species are new records for Uttarakhand.

MATERIALS AND METHODS
Macroscopic Study: The live specimens have been studied for macroscopic characters in the field after Lodge et al., (2004). Macrochemicals tests and the measurements of the specimen have been done in the field. Standard procedures were adopted to study the specimens after Prasher (1997, 1999), Prasher and Chander (2006).

Methods of Taxonomic Study: The specimens have been taxonomically described using the following mountants/stains (Kirk et al., 2008):
Amann’s Lactophenol: for mounting of microscopic structures., 2% Glycerine: for mounting of microscopic structures, 5% Potassium hydroxide: for microchemical tests and softening of the materials, Melzer’s Iodine: to check amyloidity of the sporulating structures, Distilled water: for observing the natural colour of the microscopic structures, Erythrosin B in ammonia: for observing seption in spores and mycelium, 1% Phloxine: used to stain and observe septation in spores and mycelium, Cotton blue: used to stain the cytoplasm of the fungal cells and also to observe cyanophilly of the microscopic structures. Congo red: Ascus wall, paraphyses, ascospores and excipular tissues were stained, Sulfobenzaldehyde used for staining gloeocystidia. The specimens have been revived in 2% KOH. All the measurements have been recorded in this reagent.
The drawings of various structures like hyphae, basidia, setae and basidiospores were made with the help of Camera Lucida manufactured by “Irma” from thin sections or crush mounts.
The collections were critically examined macro and microscopically for different characters. The fungi recorded in this paper are classified after Kirk et al., (2008), Index Fungorum and Mycobank. The specimens were deposited in the herbarium of Panjab University Chandigarh India (PAN).

RESULT AND DISCUSSION
Taxonomy
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Figure 1 (1-4); Figure A
Fructification resupinate, closely adnate, effused, thin, membranous- ceraceous to ceraceous, waxy-gelatinous; hymenial surface smooth, yellowish- white when fresh, grayish orange to brownish orange on drying; margin undifferentiated.
Hyphal system monomitic; generative hyphae branched, septate clamped, narrow, 1-2.5 μm wide, indistinct to gelatinized. Cystidia absent, hyphoid structures with broadened base present. Basidia 6-10 (-16) × 4-5 μm, uniform to short cylindrical, pleurobasidiate, 4- sterigate; sterigmata up to 5 μm long. Basidiospores 3.5-4.7 × 1.8-2.6 μm, ellipsoid to suballantoid, smooth, thin-walled, amyloid, acyanophilous.

Collection examined: Karanprayag-Chakrata (U.K.), on decaying angiospermic stump, Lalita 37005(PAN), July 14, 2011.

Remarks: The species is characterised by annual

Hyphal system monomitic; generative hyphae branched, septate clamped, somewhat thick-walled, irregularly interwoven; subhymenial hyphae thinner and densely packed; projecting hyphae in the aculei enlarged, somewhat thick-walled. Cystidia not clearly differentiated. Basidia 10-18 × 3.5-4.0 μm, subcylindrical, 4-sterigate, with a basal clamp. Basidiospores 4.4-5.3 × 2.2-3.2 μm, ellipsoid to subcylindrical, smooth, thin-walled, non-amyloid, acyanophilous.


Remarks: The species is characterised in having odontioid hymenophores with small, dense aculei, wider, somewhat thick-walled projecting hyphae of the aculei, few capitates hyphae, subcylindrical with a suburniform constriction basidia and ellipsoid to subcylindrical basidiospores.The collection resemble closely the description given by Eriksson and Hjortstam (1976). This is a new report from North Western Himalayas.


Figure 1 (9-12), Figure I, C
Fructification annual, effused-reflexed, adnate, reflexed part from a small pileus along the margin, soft when fresh, brittle on drying, effused, usually adjacent pilei laterally fused to form a long fructification. Pileus when present, small, effused-reflexed, pore layer decurrent along the upper edge of reflexed part; upper surface white to cream, darken on drying, smooth, glabrous, azonate, irregularly wrinkled, shrink on drying; margin thin, acute, smooth, wavy, incurved on drying. Pore surface white when fresh, cream on drying; pores angular, 3-4 per mm; pores mouth velutinate; dissepiments entire; tubes in one layer, concolorous with upper surface. Context white, soft, homogenous, non-xanthochroic.

Hyphal system monomitic; generative hyphae hyaline, thin to thick-walled, branched, septate, clamps present, thin-walled dissepiments, cyanophilous, 2.1-4μm in diameter. Context hyphae thin to thick-walled, faintly cyanophilous, 2.5-7.0 μm in diameter. Cystidia and cystidioles absent. Basidia hyaline, thin-walled, clavate, 4-spored, cyanophilous, 14.6-17.6×6-7.8μm. Basidiospores hyaline, thin-walled, smooth, cylindric-ellipsoid to ellipsoid, non-amyloid, 5.5-7.0×1.5-2.7μm.


Remarks: This species was described as Tyromyces caesius from N.W. Himalayas by Harsh and Bisht (1984). It seems to be uncommon in the study area. The species is characterised by annual, effused-
reflexed, soft fructification; white, smooth, azonate upper surface; white pore surface; large, 3-4 pores per mm; monomitic hyphal system with thin to thick-walled, clamped generative hyphae; and hyaline, cylindrical-ellipsoid to ellipsoid basidiospores. This is a new report for Uttarakhand. *Phlebia segregata* (Bourdot and Galzin) Parmasto, Eesti NSV Tead. Akad. Toim., Biot. Seer 16 (4): 393, 1967 = *Peniophora segregata* Bourdot and Galzin, Hyménomyc . De France: 284, 1928.

Figure 1 (13-16); Figure I, D
Fructification resupinate, adnate, ceraceous; hymenial surface smooth whitish brownish orange to grayish brown when fresh, becoming light orange to grayish brown to orange brown on drying; margins indeterminate to abrupt.

Hyphal system monomitic; generative hyphae up to 3.4 µm wide, branched, septate, clamped, basal hyphae thick-walled, less branched, long-celled, horizontal; subhymenial hyphae thin-walled, much branched, short-celled. Cystidia 45-60×6-7.2 µm, numerous, subfusiform to subulate with tapering apex, thick-walled, few cystidia branched near the base; projecting out of the hymenium. Basidia 20.0-26.0×4.5-5.0 µm, clavate to subclavate, 4-sterigate, with basal clamp. Basidiospores 4.8-6.0×2.4-3.0 µm, subellipsoid to suballantoid, apiculate, smooth, thin-walled, non-amyloïd, acyanophilous.

**Collection examined:** Karanprayag-Chamoli, on a decaying angiospermic log, on gymnospermic wood. Lalita 38014(PAN), July 20, 2011; Bhatwari-Uttarkashi (U.K.), on a decaying angiospermic log, on gymnospermic wood. Lalita 38014(PAN), August 24, 2011.

**Remarks:** This species is marked by the presence of smooth to finely tuberculate fructification, projecting subfusiform to subulate cystidia, clavate, clavate to subclavate basidia and subellipsoid to suballantoid thin-walled basidiospores. This is a new report for Uttarakhand.


Figure 1 (17-20); Figure I, E
Fructification resupinate, adnate, widely effused, ceraceous when fresh, membranous after drying up to 240 µm thick in section; hymenial surface cream to pale yellow, smooth to somewhat tuberculate, often becoming areolately cracked at maturity; margin thinning to more or less abrupt, adnate, concolorous.

Hyphal system monomitic; generative hyphae branched, thin to somewhat thick-walled, with clamps, basal zone of repent hyphae and an upper zone of partly erect hyphae. Cystidia 75.2-100.2 × 12.0-14.3 µm, conical to subcylindrical, thick-walled, encrusted, immersed to somewhat projecting. Basidia 20.8-25.2 × 6.5-7.2 µm, clavate, 4-sterigate. Basidiospores 5.2-7.1 × 3.8-4.6 µm, ellipsoid, smooth, thin-walled, non-amyloïd, acyanophilous.

**Collection examined:** Rudarprayag (U.K.), On bark of *Dalbergia sisso*, Lalita 37348 (PAN), July 20, 2011; NDBR, on *Mangifera indica*, Hem 28224(PAN).

**Remarks:** The species is rarely found in the Himalayas. Earlier, Thind and Rattan (1973) reported it from the Shiwaliks as *Peniophora flavidialba*. Rattan(1977) shifted this species to *Phanerochaete*. It resembles well the description of *P. flavidialba* as given by Rattan (1977). It is being recorded first time from Uttarakhand.


Figure 1 (21-25); Figure I, E
Fructification resupinate, coriaceous, stratose, adnate, widely effused, membranous; hymenial surface cream brown to yellow brown to pinkish brown, smooth or pruinose; margin thinning to determinate, adnate, paler concolorous to concolorous.

Hyphal system dimitic; generative hyphae branched, septate, clamps are absent, walls thin, acyanophilous, basal hyphae parallel to the substrate, less branched; subhyaline hyphae vertical, more branched, 1-2.4 µm wide; skeletal hyphae 1.5-2.5 µm wide, dichotomously branched with branches more profusely in the hymenium branched, aseptate, thick-walled, dextrinoid, cyanophilous. Gloeocystidia 45-92×6.5-9 µm subfusiform to cylindrical, with subhyaline granular contents staining deeply with phloxine, becoming glassy in mature fructification, aseptate or rarely with retraction septa immersed and just
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reaching the hymenial surface, thin-walled. Basidia utriform, 4-spored, 24.8-40×3-3.9 μm. Basidiospores broadly ellipsoid, shortly apiculate, smooth, 6.8-9×5-5.8 μ, non-amyloid.


Remarks: It is characterised by thick, coriaceous, widely effused fructification, presence of gloecystidia and larger non amyloid basidiospores. The species is confined to coniferous forests of North western Himalayas. This is a new report for Uttarakhand.

Figure I

A *Amyloxenasma grisellum*  
B *Hyphodontia nespori*  
C *Postia caesia*  
D *Phlebia segregate*  
E *Phlebiopsis flavidoalba*  
F *Scytinostroma crassum*
Figure 1: Amyloexasma grisellum (1-5) 1 Basidiospores, 2 Basidia, 3 Generative hyphae, 4 Hyphoid structure; Hyphodontia nespori (5-8) 5 Basidiospores, 6 Basidia, 7 Cystidia, 8 Generative hyphae; Postia ceasia (9-12) 9 Basidiospores, 10 Basidia, 11 Thin-walled generative hyphae, 12 Thick-walled generative hyphae; Phlebia segregata (13-16) 13 Basidiospores, 14 Basidia, 15 Generative hyphae, 16 Cystidia; Phelbiopsis flavidoalba (17-20) 17 Basidiospores, 18 Basidia, 19 Generative hyphae, 20 Encrusted cystidia; Scytnostroma crassa (21-25) 21 Basidiospores, 22 Basidia, 23 Cystidia, 24 Generative hyphae, Skeletal hyphae. (Scale-10µm)
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REFERENCES
Ashok D and Prasher IB (2014). Wood rotting non-gilled agaricomycetes new to India. Journal on New Biological Reports 3(1) 04-08.
Sharma JR (2000). Genera of Indian Polypores, Botanical Survey of India. 1-188.