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ADDITIONS TO THE WOOD ROTTING AGARICOMYCETES OF NORTH WESTERN HIMALAYAS

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ABSTRACT

A detailed illustrated account of six species of *Amyloxyasma* (Oberw.) Hjortstam and Ryvarden, *Hyphodontia* Erikss., *Postia* Fr., *Phlebia* Fr., *Phlebiopsis* Jülich, and *Scytinostroma* Donk., based on the collections made from Uttarakhand are provided. *Amyloxyasma 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 *Amyloxyasma grisellum* and *Hyphodontia nespori* are being reported for the first time from North Western Himalayas where as 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 septation 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, Sulfo benzaldehyde 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

Amyloxyasma grisellum (Bourdot) Hjortstam and Ryvarden, Syn. Fung. (Oslo) 20: 34 (2005) = *Xenasmataella grisella* (Bourd.) Oberw., Syd. Ann. Mycol. 19(1-6): 35, 1965= *Corticium grisellum* Bourd., Add. aux Cort. Rev. Sci. Bourd. Centr. Fr. 35(1) 17, 1922.

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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) $\times$ 4-5 μm , uniform to short cylindrical, pleurobasidiate, 4- sterigmate; sterigmata up to 5 μm long. Basidiospores 3.5-4.7 $\times$ 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 small- sized basidia and ellipsoid to suballantoid, thin-walled, amyloid basidiospores. The present collection resembles closely the description of the species as given by Oberwinkler (1965). It is a new record for North western himalayas.

Hyphodontia nespori (Bres.) J.Eriksson and Hjortst., in Eriksson and Ryv., Cort. N.Europe 4: 665, 1976. =*Odontia nespori* Bres., Ann. mycol. 18(1/2): 43, 1920.

Figure 1(5-8); Figure B

Fructification resupinate, adnate, effused, submembranous to subcrustaceous; hymenial surface odontoid, with small, conical aculei, apically fimbriate by projecting hyphae, creamish white to pale ochraceous; margin somewhat determinate.

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 $\times$ 3.5-4.0 μm , subcylindrical, 4-sterigmate, with a basal clamp. Basidiospores 4.4-5.3 $\times$ 2.2-3.2 μm , ellipsoid to subcylindrical, smooth, thin-walled, non-amyloid, acyanophilous.

Collection examined: Rudarprayag(U.K.), on decaying angiospermic twig.Lalita 37006, July 20, 2011.

Remarks: The species is characterised in having odontoid hymenophores with small, dense aculei, wider, somewhat thick-walled projecting hyphae of the aculei, few capitates hyphae, subcylindrical with a subuniform 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.

Postia caesia (Schr.) P. Karst., Revue mycol., Toulouse 3: 360 (1881) =*Tyromyces caesius* (Schr.) Murr., North Am. Flora 9: 34, 1907.

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, 2.1-4 μm 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 $\times$ 6-7.8 μm . Basidiospores hyaline, thin-walled, smooth, cylindric-ellipsoid to ellipsoid, non-amyloid, 5.5-7.0 $\times$ 1.5-2.7 μm .

Collection examined: Rudraprayag, (U.K.) on decaying angiospermic stump, Lalita 37328(PAN), July 20, 2011.

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-

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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 new a report for Uttarakhand.

Phlebia segregata (Bourdote and Galzin) Parmasto, Eesti NSV Tead. Akad. Toim., Biot. Seer 16 (4): 393, 1967 = *Peniophora segregata* Bourdote and Galzin, Hymenomyces. 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 orange to brownish orange 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 $\times$ 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 $\times$ 4.5-5.0 μm , clavate to subclavate, 4-sterigmate, with basal clamp. Basidiospores 4.8-6.0 $\times$ 2.4-3.0 μm , subellipsoid to suballantoid, apiculate, smooth, thin-walled, non-amyloid, 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.

Phlebiopsis flavidoalba (Cooke) Hjortstam, Windahlia 17: 58 (1987) = *Phanerochaete flavidoalba* (Cooke) Rattan, Bibliotheca mycol. 60: 262, 1977 = *Peniophora flavidialba* Cooke, Grevillea 8: 21.

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 $\times$ 12.0-14.3 μm , conical to subcylindrical, thick-walled, encrusted, immersed to somewhat projecting. Basidia 20.8-25.2 $\times$ 6.5-7.2 μm , clavate, 4-sterigmate. Basidiospores 5.2-7.1 $\times$ 3.8-4.6 μm , ellipsoid, smooth, thin-walled, non-amyloid, 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 flavidoalba*. Rattan(1977) shifted this species to *Phanerochaete*. It resembles well the description of *P. flavidoalba* as given by Rattan (1977). It is being recorded first time from Uttarakhand.

Scytinostroma crassum (S.S. Rattan) Hjortstam, Mycotaxon 54: 192 (1995) = *Scytinostroma odoratum* forma crassum Rattan, Trans. Brit. Mycol. Soc. 63: 6. 1974.

Figure 1 (21-25); Figure I, E

Fructification resupinate, coriaceous, stratosed, 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 $\times$ 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, $24.8-40 \times 3-3.9 \mu\text{m}$. Basidiospores broadly ellipsoid, shortly apiculate, smooth, $6.8-9 \times 5-5.8 \mu$, non-amyloid.

Collection examined: Rudarprayag (U.K.), on wood of *Picea smithiana*, *Cedrus deodara*, Coniferous stump, logs of *Abies pindrow*. Lalita 38052(PAN), July 21, 2011.

Remarks: It is characterised by thick, coriaceous, widely effused fructification, presence of gloeocystidia 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 *Amyloxyasma grisellum*

C *Postia caesia*

E *Phlebiopsis flavidoalba*

B *Hyphodontia nespori*

D *Phlebia segregate*

F *Scytinostroma crassum*

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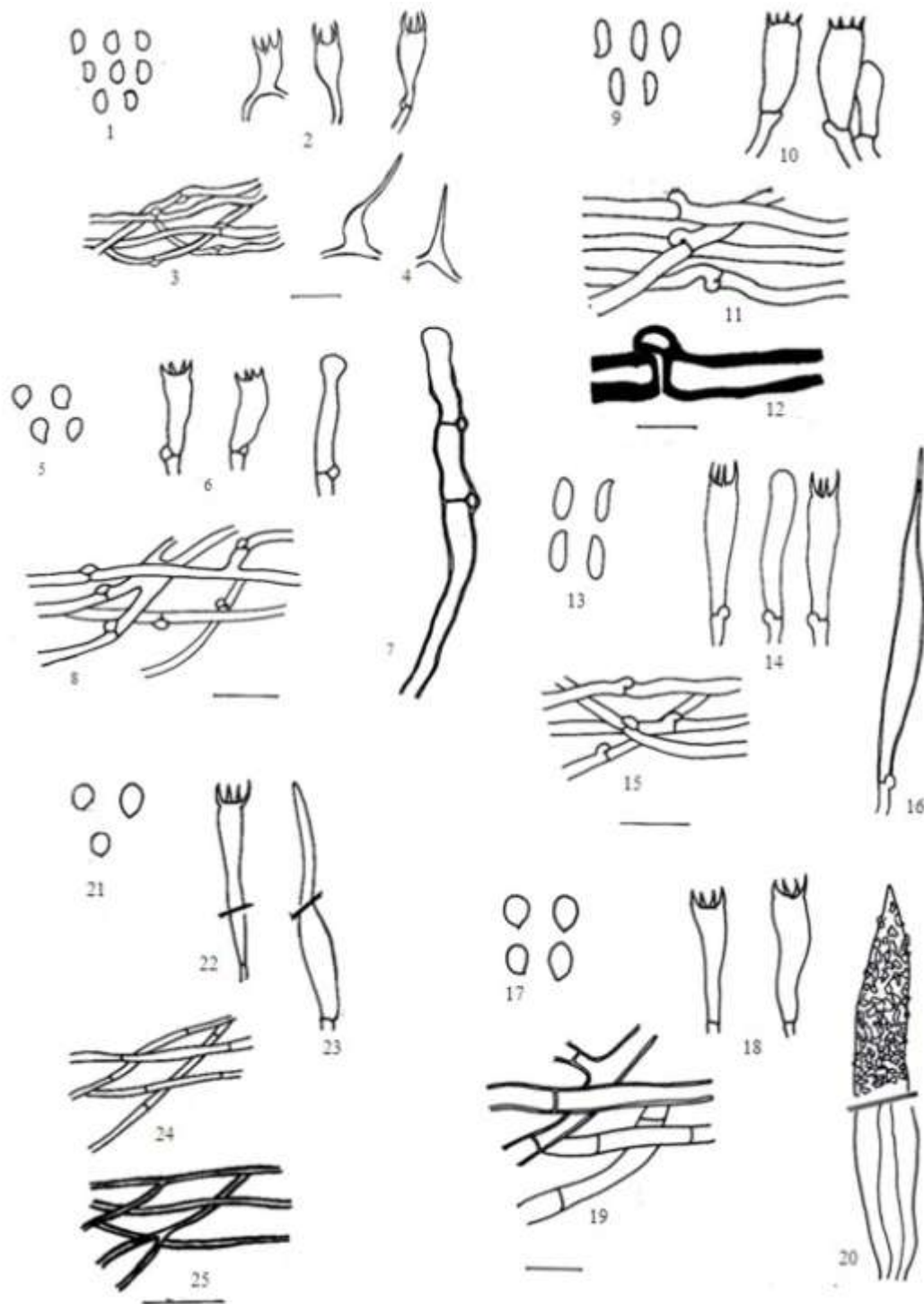


Figure 1: *Amyloxenasma grisellum* (1-5) 1 Basidiospores, 2 Basidia, 3 Generative hyphae, 4 Hyphoid structure; *Hyphodontia nespori* (5-8) 5 Basidiospores, 6 Basidia, 7 Cystidia, 8 Generative hyphae; *Postia ceasia* (9-12) 9 Basidiospores, 10 Basidia, 11 Thin-walled generative hyphae, 12 Thick-walled 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; *Scytinostroma 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.
- Bakshi BK (1971).** *Indian Polyporaceae (On trees and timbers)* (ICAR Publication, New Delhi).
- Bakshi BK, Puri YN and Singh B (1955).** Two decay fungi on conifers in the Himalayas. *Indian Journal of Mycological Research* 1 75-80.
- Dhingra GS and Priyanka (2011).** *Hallenbergia* (Agaricomycetes), a new corticoid genus. *Mycotaxon* 118 289-292.
- Dhingra GS, Priyanka and Kaur J (2012).** *Radulomycetopsis* (Agaricomycetes), a new corticoid genus. *Mycotaxon* 119 133-136.
- Lalita and Prasher IB (2014).** Wood rotting agaricomycetes from Uttarakhand-new to India. *Journal on New Biological Reports* 3(1) 29-37.
- Prasher IB (1997).** Professor G. S. Rawla- Biographic Sketch and list of publications. In: *Achievements and Prospects in Mycology and Plant Pathology* edited by Chahal *et al.*, (I.B.D. Dehra Dun) 1-12.
- Prasher IB and Chander H (2006).** Polyporoid fungi of Nanda Devi Biosphere Reserve. *Panjab University Research Journal [Science]* 56 103-123.
- Prasher IB and Lalita (2012).** Four new records of Agaricomycetous Fungi from Uttarakhand (Himalayas). *Journal on New Biological Reports* 1(1) 06-08.
- Prasher IB, Lalita and Ashok D (2011).** Polyporoid fungi of District Bilaspur (Himachal Pradesh). *Journal of the Indian Botanical Society* 90(3and4) 268-273.
- Prasher IB, Lalita and Ashok D (2012).** Polyporoid Fungi of District Mandi (Himachal Pradesh). *Journal of the Indian Botanical Society* 91(1and2) 384-386.
- Prasher IB, Sharma P and Chander H (2007).** Edible and Medicinal Macrofungi of Chandigarh. In: *Advances in Mycology and Plant Pathology* edited by Prasher IB and Sharma MP (Bishen Singh Mahendra Pal Singh, Dehra Dun) 295-310.
- Puri YN (1956).** Studies on Indian *Poria*. *Journal of the Indian Botanical Society* 35(3) 277-283.
- Rattan SS (1977).** Resupinate Aphyllophorales of North Western Himalayas. *Bibliotheca Mycologica* 60 1-427.
- Sharma JR (1995).** Hymenochaetaceae of India. Calcutta, India, *Botanical Survey of India*. 1-219.
- Sharma JR (2000).** Genera of Indian Polypores, *Botanical Survey of India*. 1-188.
- Sharma JR (2012).** Aphyllophorales of Himalaya. *Botanical Survey of India*. Ministry of Environment and Forests. 1-590.
- Thind KS (1961a).** Indian Clavariaceae. *I.C.A.R.*, New Delhi.
- Thind KS (1961b).** The Clavariaceae of India. *I.C.A.R.*, New Delhi. 197 p.
- Thind KS (1973).** The aphyllophorales of India. *Indian phytopathology* 26 2-23.
- Thind KS and Dhanda RS (1980).** The polyporaceae of India-X. *Kavaka* 8 59-67.
- Thind KS and Dhingra GS (1985).** Thelephoroid fungi of the Eastern Himalayas - I. *Res. Bull. P.U. Sci.* 36(3-4): 165-174.
- Thind KS and Sharda RM (1984).** Three new species of clavarioid fungi from Himalayas. *Indian Phytopathology* 37(2) 234-240.