

Diversity of Genus *Gloeophyllum* P. Karst in Jammu and Kashmir, India

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The present paper deals with the taxonomic study of genus *Gloeophyllum* P. Karst. in Jammu and Kashmir, India. During the fungal forays conducted in Jammu Division, eight species were collected from different districts of Jammu Division. Of these eight species, two species are new record for Jammu Division, four are new records for Jammu and Kashmir, one new to India (*G. odoratum*), one new to science (*G. longisporum*). All the species are found on the gymnospermic wood except *Gloeophyllum carbonarium* which was found on the angiospermous wood.

Keywords: *Basidiomycetes*, North Western Himalayas, Polypores, Wood Rotting fungi

INTRODUCTION

Genus *Gloeophyllum* P. Karst. (Gloeophyllaceae, Gloeophyllales, Agaricomycetes, Basidiomycota) is characterized by annual to perennial, resupinate to pileate; dimidiate to flabelliform to elongate to rosette-shaped, coriaceous to tough to woody; smooth to tomentose to scrupeous, azonate to zonate; poroid to lamellate basidiocarp. The unique topography, climate and vegetation provides the favourable conditions for the growth of polypores in Jammu and Kashmir.

Presently, eight species [*Gloeophyllum abietinum* (Bull.) P. Karst., *G. carbonarium* (Berk. & M.A. Curtis) Ryvarden, *G. longisporum* Brij Bala, Avn. P. Singh, Dhingra, Singh S.K., Rana S. & Maurya D.K. sp. nov., *G. odoratum* (Wulfen) Imazeki, *G. sepiarium* (Wulfen) P. Karst, *G. striatum* (Fr.) Murrill, *G. subferrugineum* (Berk.) Bondartsev & Singer, *G. trabeum* (Pers.) Murrill] are described and illustrated on the basis of morphotaxonomy details that were compared to the published literature and monographs. *G. longisporum* (Mattoo et al., 2022) new to Science and *G. odoratum* (Bala et al. 2020) described is already published by authors. *G. abietinum*, *G. carbonarium*, *G.*

striatum and *G. trabeum* are described first time from Jammu and Kashmir, whereas *G. subferrugineum* and *G. sepiarium* are described as first time from Jammu Division.

MATERIALS AND METHODS

The polypore basidiomes were collected during the excursions carried out in various parts of district Doda of Jammu Division in the rainy months (July–September) of years 2014-2017. These basidiomes were separated carefully from their substratum using a hammer and chisel. The macromorphological details i.e. nature of the basidiocarp, mode of attachment, hymenial and abhymenial surface, margins, etc. were recorded. A piece of the fertile portion of the basidiome was used for getting the spore print on a micro slide. After drying (in sun or on an electric drier), the collected basidiomes were packed in ziplock airtight bags. The micro morphological characters were studied by making preparations in water, 3%/5%/10% KOH, 1% phloxine, 1% Congo red and 1% cotton blue (in distilled water/lactophenol). The cyanophilous and amyloid reaction of different microscopic structures were studied in 1% cotton blue and Melzer's reagent (Iodine 0.5 g, Potassium Iodide 1.5 g, Chloral hydrate 20.0 g and distilled water 20.0 ml) respectively. The line diagrams of the microscopic structures were drawn with the help of a camera lucida mounted

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on a compound microscope at 100X, 400X, and 1000X magnification. Finally the specimens were identified on the basis of comparison of the description with the literature and online repository (Roy and De, 1996; Leelavathy and Ganesh, 2000; Sharma, 2012; Ryvarden and Melo, 2014; Mycobank, 2022). The identified specimens were finally submitted to the Herbarium, Department of Botany, Punjabi University, Patiala (PUN) using standard packing protocol.

RESULTS

Key to the species of genus *Gloeophyllum*

1. Basidiome resupinate	<i>G. carbonarium</i>
1. Basidiome pileate	2
2. Hyphal system dimitic	3
2. Hyphal system trimitic	5
3. Basidiome with velvety abhymenial surface; basidiospores ellipsoid to broadly ellipsoid	... <i>G. subferruginum</i>
3. Basidiome and basidiospores not as above	4
4. Basidiome with anise odour	<i>G. odoratum</i>
4. Basidiome without any odour	<i>G. striatum</i>
5. Cystidia/cystidioles present; basidiospores subcylindrical to cylindrical	6
6. Cystidia clavate, basidiospores larger (14.5-20.5 × 5.2-7.5 µm)	<i>G. longisporum</i>
6. Cystidia other than clavate, basidiospores smaller	7
7. Abhymenial surface finely tomentose; lamellae wavy	<i>G. abietinum</i>
7. Abhymenial surface and lamellae not as above	8
8. Lamellae 2-4 per cm tangentially; Cystidia fusoid	<i>G. trabeum</i>
8. Lamellae 6-7 per cm tangentially; Cystidia subulate to obtuse	<i>G. sepiarium</i>

Gloeophyllum abietinum (Bull.) P. Karst., Bidrag till Kännedom av Finlands Naturoch Folk 32: 80 (1879). a” *Agaricus abietinus* Bull., Herbarium de la France 10: t. 442:2 (1790) (Fig. 1)

Basidiome annual, pileate, solitary, sessile, broadly attached; pilei dimidiate, up to 1.4 × 1 × 0.5 cm.

Abhymenial surface sulcate, finely tomentose, concentrically zonate towards margins, greyish brown to dark brown when fresh, not changing much on drying; margin pale yellowish when

fresh, not changing much on drying, obtuse, entire.

Hymenial surface poroid, dark brown when fresh, not changing much on drying, margin sterile up to 2 mm.

Pores lamellate, 7-8 per cm tangentially; dissepiments entire, up to 450 µm in thickness.

Tube layer brown, up to 2 mm deep.

Context homogenous, brownish orange, up to 3 mm in thickness.

Hyphal system trimitic. Generative hyphae hyaline, thin- to thick-walled, clamped, branched, up to 5 µm in width. Binding hyphae subhyaline to pale yellowish, thick-walled, aseptate, branched, up to 6.3 µm in width. Skeletal hyphae pale yellowish to brown, thick-walled, aseptate, unbranched, up to 8.8 µm in width.

Hyphal arrangement: subhymenium dominated with thin- to thick-walled, irregularly arranged generative hyphae. Trama distributed equally with interwoven and irregular generative, binding and skeletal hyphae. Context dominated with loosely interwoven, skeletal hyphae and generative hyphae.

Cystidia subulate, thick-walled, originate in the hymenium, 25-50 × 5-6 µm; projecting up to 15 µm from the hymenium.

Basidia clavate to sub-clavate, thin-walled, clamped at the base, tetrasterigmate, 25.5- 44 × 5-8.5 µm; sterigmata up to 3.5 µm in length.

Basidiospores cylindrical, hyaline, thin-walled, smooth, no reaction in Melzer’s reagent and cotton blue, 7.6-12 × 3.5-5.2 µm.

Material examined: Jammu and Kashmir, Doda Bhaderwah, Jai, on *Cedrus deodara* stump, Brij Bala 11291 (PUN), September 26, 2014; Jai, on *C. deodara* stump, Brij Bala 11301 (PUN), September 27, 2015; Shunushir, on *C. deodara* stump, Brij Bala 11304 (PUN), September 28, 2015; Doda, on *C. deodara* stump, Brij Bala 11345 (PUN), August 21, 2017.

Notes: *Gloeophyllum abietinum* is characterized by greyish brown to dark brown basidiomes with pale yellowish margin and its unique association with the coniferous species. It is a new record for Jammu and Kashmir and is earlier reported from different parts of India.

Gloeophyllum carbonarium (Berk. & M.A. Curtis) Ryvarden, Mycotaxon 20 (2): 334 (1984). *a* "Hexagoniacarbonaria Berk. & M.A. Curtis, Grevillea 1 (5): 68 (1872) (Fig.2).

Basidiome annual, resupinate, effused, soft when fresh, becomes corky after drying; up to 2 mm thick in cross section.

Hymenial surface poroid, brown when fresh, not changing much on drying; margin concolorous, not changing much on drying, adnate, entire, sterile up to 2 mm.

Pores angular, 1-2 per mm; dissepiments entire, up to 350 µm in thickness.

Tube layer dark brown, up to 1 mm deep.

Subiculum homogenous, brown, up to 1 mm thick.

Hyphal system dimitic. Generative hyphae hyaline, thin-walled, clamped, branched, up to 4.1 µm in width. Skeletal hyphae rusty brown, thick-walled, aseptate, unbranched, to 5 µm in width.

Hyphal arrangement: subiculum dominated with irregularly arranged skeletal hyphae and interwoven, branched generative hyphae. Subhymenium dominated with thin-walled generative hyphae.

Cystidia absent.

Basidia clavate, thin-walled, clamped at the base, tetrasterigmate, 20-32 x 6-8 µm; sterigmata up to 3.5 µm in length.

Basidiospores cylindrical to suballantoid, hyaline, thin-walled, smooth, no reaction in Melzer's reagent and cotton blue, 7-9 x 3-4 µm.

Material examined: Jammu and Kashmir, Kathua, Billawar, Dyalachak, on angiospermous stump, Brij Bala 11282 (PUN),

September 30, 2015; Kathua, Billawar, Sukrala Mata, on *Pinus* stump, Brij Bala 11323 (PUN), October 4, 2017.

Notes: *Gloeophyllum carbonarium* is unique in having resupinate, effused basidiome and cylindrical to suballantoid basidiospores. Earlier it has been recorded only from Uttarakhand (Sharma, 2012). It is a new addition to the mycoflora of Jammu and Kashmir.

Gloeophyllum longisporum Brij Bala, Avn. P. Singh, Dhingra, Singh S.K., Rana S. & Maurya D.K. sp. nov. (Fig.3)

Mycobank Number:— MB835608

GenBank Numbers: — ITS: MN788684, LSU: MT651610

Diagnosis: — It differs from *G. sepiarium* in having comparatively smaller basidiocarps and larger basidiospores.

Etymology: — The specific epithet refers to larger basidiospores

Holotype:— India, Jammu and Kashmir: Attalgarh village of Bhaderwah subdivision in Doda district, on an angiospermous fencing pole, Brij Bala 10772 (PUN), 8 September 2018.

Basidiome annual, pileate, sessile, broadly attached, soft when fresh, becomes brittle on drying; pilei flabelliform, up to 1 x 0.4 x 0.2 cm.

Abhymenial surface sulcate, faintly concentrically zonate, glabrous, greyish brown to greyish red towards distal end and greyish brown to violet brown towards proximal end when fresh, changing to dark brown to brown on drying; margin wavy, white to yellowish white when fresh, changing to brown on drying.

Hymenial surface lamellate, white when fresh, changing to brown on drying; margin fairly curved on drying, fertile.

Pores lamellate, 0.5 to 1 per cm tangentially; dissepiments entire, up to 120 µm in thickness

Tube layer brownish orange to greyish brown, not changing much on drying, up to 1 mm deep.

Context homogenous, azonate, dark brown, up to 1 mm deep.

Hyphal system trimitic. Generative hyphae hyaline, thin- to thick-walled, branched, clamped, up to 5.8 µm in width. Binding hyphae pale yellowish, thick-walled, irregularly branched, aseptate, up to 4 µm in width. Skeleto-binding hyphae yellow, thick-walled, repeatedly branched, aseptate, up to 7 µm in width.

Hyphal arrangement: subhymenium dominated with branched, hyaline, thin-walled interwoven to

irregular generative hyphae. Trama consists of binding and skeletal hyphae. Context dominated with interwoven skeleto-binding hyphae with mostly binding hyphae and rarely with generative hyphae.

Cystidia clavate, thin- to thick-walled, smooth, originate in the subhymenium, 11.5-30 × 7.5 -13.4 µm; projecting up to 25 µm from the hymenium.

Basidia clavate, clamped at the base, tetrasterigmate, 33-75 × 8-17 µm; sterigmata up to 3.5 µm in length.

Basidiospores cylindrical, hyaline, thin-walled, smooth, no reaction in Melzer's reagent and cotton blue, 14.5-20 × 5.2-7.5 µm.

Additional Material examined: Jammu and Kashmir, Bhaderwah, Haripura, on an angiospermous pole, Brij Bala 11153 (PUN), September 8, 2018; Jai, on an angiospermous stump, Brij Bala 11152 (PUN), August 29, 2018; Shunushir, on *Quercus* sp. fallen branch, Brij Bala 11151 (PUN), August 29, 2018.

Notes: The newly described species *G. longisporum* unique in having greyish brown basidiocarps with lamellate hymenial surface, trimitic hyphal system and cylindrical, hyaline, inamyloid basidiospores. This species is close to *G. separium*, which differs in having comparatively larger, dimidiate or rosette basidiome and smaller basidiospores. The novel species is also identified at the molecular level.

Gloeophyllum odoratum (Wulfen) Imazeki, Bulletin of the Tokyo Science Museum 6: 75, 1943. a" *Boletus odoratus* Wulfen, Collectanea ad botanicam, chemiam, ethistoriam naturalem spectantia 2: 150, 1788(Fig.4).

Basidiome annual, pileate, sessile, broadly attached, with anise odour; pilei unguulate, up to 4.5 × 2 × 1.5 cm.

Abhymenial surface tomentose when young, becomes glabrous on maturity, azonate, brown to dark brown when fresh, not changing much on drying; margin concolorous obtuse, entire.

Hymenial surface poroid, brown when fresh, not changing much on drying; margin concolorous, sterile up to 1mm.

Pores angular to sinuous, 6-7 per cm; dissepiments lacerate, up to 110 µm in thickness.

Tube layer light brown, up to 0.5 cm deep.

Context homogenous, brown, up to 1cm thick.

Hyphal system dimitic. Generative hyphae thin- to thick-walled, hyaline, clamped, branched, up to 5 µm in width. Skeletal hyphae pale yellowish, thick-walled, aseptate, unbranched, up to 7 µm in width.

Hyphal arrangement: subhymenium dominated with richly branched, hyaline, thin-walled, generative hyphae. Trama equally distributed with somewhat irregularly arranged hyaline, generative hyphae and pale-yellowish, thick-walled skeletal hyphae. Context dominated with loosely interwoven and irregularly arranged skeletal hyphae and generative hyphae.

Cystidioles subulate, thin-walled, clamped at the base, originate in the hymenium, 20-25 × 4-6 µm; projecting up to 15 µm from the hymenium.

Basidia clavate, thin-walled, tetrasterigmate, clamped at the base, 21-49 × 4-7 µm; sterigmata upto 4 µm in length.

Basidiospores subcylindrical to cylindrical, hyaline, thin-walled, smooth, no reaction in Melzer's reagent and cotton blue, 7-12.8 × 2.3-4.5 µm.

Material examined: Jammu and Kashmir, Doda, Bhaderwah, Jai, on *Picea smithiana* stump, Brij Bala 9644 (PUN), September 26, 2015; Kishtwar, way to Sinthon top, on *P. smithiana* stump, Brij Bala 11305 (PUN), August 21, 2017.

Notes: *Gloeophyllum odoratum* is peculiar in having smaller, unguulate pilei with characteristic anise odour. The author (Bala *et al.* 2020) already published it as a new record for India.

Gloeophyllum sepiarium (Wulfen) P. Karst., Bidrag till Kännedom av Finlands Naturoch Folk 37: 79 (1882).

a" *Agaricus sepiarius* Wulfen, Collectanea ad botanicam, chemiam, et historiam naturalem spectantia 1: 339 (1786)(Fig.5)

Basidiome annual, pileate, solitary, sessile, narrowly attached; pilei applanate, dimidiate, up to 2.7×2×0.5 cm.

Abhymenial surface tomentose, on maturity becomes hispid, faintly concentrically zonate, light brown to greyish brown when fresh, not changing much on drying; margin concolorous when fresh, not changing much on drying, acute, entire.

Hymenial surface poroid, greyish brown when fresh, not changing much on drying; margin concolorous, sterile up to 1mm.

Pores lamellate to sinuous, 6-7 per cm tangentially; dissepiments entire, up to 750 µm in thickness.

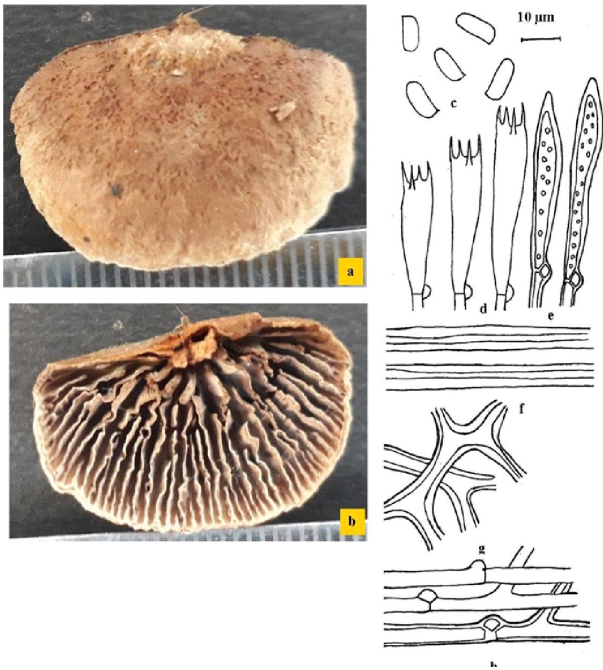
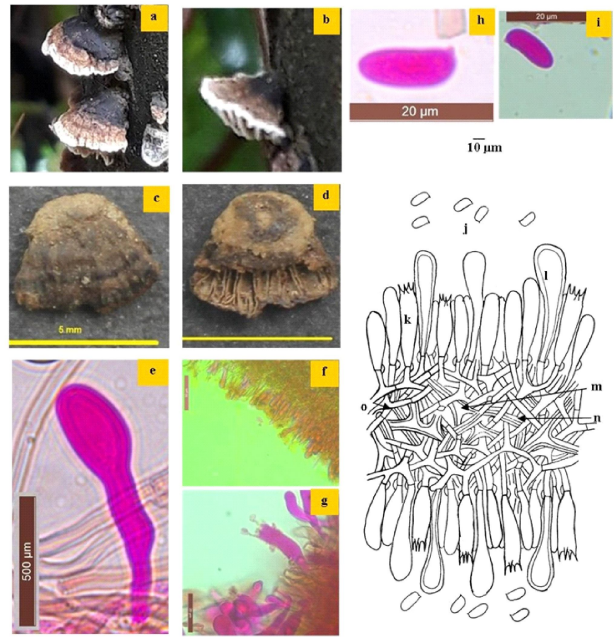


Fig.1: *Gloeophyllum abietinum* (a)-(b) Basidiome showing (a) abhymenial surface, (b) hymenial surface, (c) basidiospores, (d) basidia (e) Cystidia, (f) skeletal hyphae



Figs.3: *Gloeophyllum longisporum*: (a)-(b) Basidiome showing abhymenial surface and portion of hymenial surface (fresh); (c)-(d). Basidiome showing abhymenial and hymenial surface (dry); (e)-(i). Photomicrograph showing (e). cystidium, (f). hymenial layer (g). basidium with basidiospores (h)-(i). basidiospores; (j). Basidiospores; (k). Basidia; (l). Cystidia; (m). Generative hyphae; (n). Binding hyphae; (o). Skeletal hyphae.

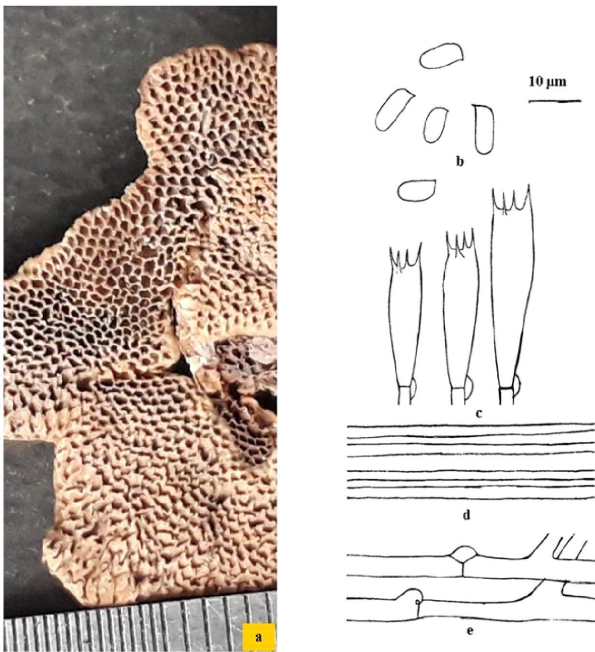
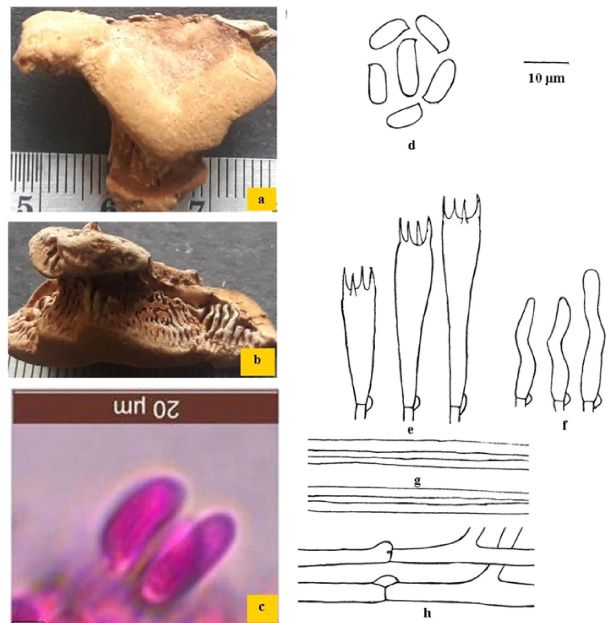


Fig.2: *Gloeophyllum carbonarium*: (a)-Basidiome showing hymenial surface (fresh), (b) basidiospores (c) basidia (d) skeletal hyphae (e) generative hyphae.



Figs. 4: *Gloeophyllum odoratum*: (a)-(b). Basidiome showing abhymenial and hymenial surface; (c). Photomicrograph showing basidiospores; (d). Basidiospores; (e). Basidia; (f). Cystidia; (g). Skeletal hyphae; (h). Generative hyphae.

a" *Daedalea striata* Fr., Systema Mycologicum 1: 334 (1821)(Fig.7).

Basidiome annual, pileate, solitary, narrowly attached; pileidimidiata, up to 5×3.5×1.5 cm.

Abhymenial surface tomentose, concentrically zonate, sulcate, light-brown when fresh, turning grey on drying; margin concolorous when fresh, not changing much on drying, acute, entire.

Tube layer brown up to 5 mm deep.

Context homogenous, brown, up to 5 mm thick.

Hyphal system trimitic. Generative hyphae hyaline, thin- to thick-walled, clamped, aseptate, branched, up to 5 µm in width. Binding hyphae sub hyaline to pale yellowish, thick-walled, aseptate, branched up to 6 µm in width. Skeletal hyphae pale yellowish, thick-walled, aseptate, unbranched, up to 6 µm in width.

Hyphal arrangement: subhymenium dominated with thin-to thick-walled, irregular and interwoven generative hyphae. Trama distributed with loosely interwoven, generative, binding and skeletal hyphae. Context dominated with interwoven skeletal hyphae.

Cystidia subulate to obtuse, thick-walled, originate in the subhymenium, 25-60×5-7.2 µm; projecting up to 15 µm from the hymenium.

Basidia clavate, thin-walled, clamped at the base, tetrasterigmate, 23.7-29×7-8.5 µm; sterigmata up to 3 µm in length.

Basidiospores cylindrical, hyaline, thin-walled, smooth, no reaction in Melzer's reagent and cotton blue, 9-11.2×3-5 µm.

MATERIAL EXAMINED

Jammu and Kashmir, Doda, Attalgarh, on *Cedrus deodara* stump, Brij Bala 11283(PUN), September 26, 2015; Attalgarh, on *C. deodara* stump, Brij Bala 11287 (PUN), September 26, 2015; Attalgarh, on *C. deodara* stump, Brij Bala 11293(PUN), September 26, 2015; Nalhi on *C. deodara* stump, Brij Bala 11295(PUN), September 26, 2015; Kishtwar, Dacchin on *C. deodara* stump, Brij 11296 Bala (PUN), September 26, 2015; Doda, Attalgarh, on *C. deodara* stump, Brij Bala 11298 (PUN), September 26, 2015; Doda, Attalgarh, on *C. deodara* stump, Brij Bala 11303(PUN), September 26, 2015.

Notes: *Gloeophyllum sepiarium* is characterized by solitary, pileate, basidioma with light brown to greyish brown abhymenial surface, subulate cystidia and larger, cylindrical basidiospores. It is a new report for Jammu Division and is earlier recorded from Pahalgam district of Kashmir, Meghalaya, Uttarakhand and West Bengal.

Gloeophyllum subferrugineum (Berk.) Bondartsev & Singer, Annales Mycologici 39 (1): 64 (1941).

a" *Lenzites subferrugineus* Berk., Hooker's Journal

of Botany and Kew Garden Miscellany 6: 134 (1854)(Fig.6)

Basidiome annual, pileate, sessile, imbricate, broadly attached; pilei convex, semicircular, up to 5×3×1.5 cm.

Abhymenial surface velvety, azonate, yellowish white when fresh, changing to yellowish grey on drying; margin pale yellowish when fresh, not changing much on drying, acute, entire.

Hymenial surface poroid, brown when fresh, not changing much on drying; margin incurved on drying, concolorous, sterile up to 1mm.

Pores lamellate, 6-7 per cm tangentially; dissepiments entire, up to 350 µm in thickness.

Tube layer light brown, up to 5mm deep.

Context homogenous, brown, up to 10 mm thick.

Hyphal system dimitic. Generative hyphae hyaline, thin-walled, clamped, branched, up to 3 µm in width. Skeletal hyphae brown, thick-walled, aseptate, unbranched, up to 6 µm in width.

Hyphal arrangement: subhymenium dominated with thin-walled, hyaline, irregular, interwoven generative hyphae. Trama distributed with both generative hyphae and skeletal hyphae. Context dominated with loosely interwoven, skeletal hyphae with few generative hyphae.

Basidia clavate, thin-walled, clamped at the base, tetrasterigmate, 9-19×4-6 µm; sterigmata up to 3.5 µm in length.

Basidiospores ellipsoid to broadly ellipsoid, hyaline, thin-walled, smooth, no reaction in Melzer's reagent and cotton blue, 5-8.5×2-4 µm.

MATERIAL EXAMINED

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ammu and Kashmir, Doda, Bhaderwah, Nalhi on *Cedrus deodara* stump, Brij Bala 11287 (PUN), September 26, 2014; Jai, on *C. deodara* stump, Brij Bala 11290 (PUN), September 28, 2015; Shunishir, on *C. deodara* stump, Brij Bala 11307 (PUN), August 17, 2017; Kishtwar, way to Sinthon top, on *C. deodarastump*, Brij Bala 11309 (PUN), August 21, 2017.

Notes: *Gloeophyllum subferrugineum* is peculiar in having convex, semicircular pilei with yellowish white abhymenial surface and smaller basidiospores. It is a new record for Jammu division. Earlier it is reported from Gulmarg District of Kashmir by Dhanda (1977).

Gloeophyllum striatum (Fr.) Murrill, Bulletin of the Torrey Botanical Club 32 (7): 370 (1905).

Hymenial surface poroid, yellowish-brown when fresh, not changing much on drying; margin concolorous when fresh, not changing much on drying, sterile up to 3 mm.

Pores lamellate, become bifurcated towards margin, 6-7 per cm tangentially; dissepiments entire, up to 700 µm in thickness.

Tube layer brown, up to 3 mm deep.

Context homogenous, turns black in KOHsol., brown, up to 7 mm thick.

Hyphal system dimitic. Generative hyphae hyaline, thin- to thick-walled, clamped, branched, up to 4 µm wide. Skeletal hyphae pale-yellowish, thick-walled, aseptate, unbranched, up to 6 µm wide.

Hyphal arrangement: subhymenium dominated with thin-to thick-walled, irregularly branched generative hyphae. Trama equally distributed with generative and skeletal hyphae. Context dominated with interwoven skeletal hyphae.

Cystidia not seen.

Basidia clavate, thin-walled, clamped at the base, tetrasterigmate, 18.4-27.8×6-7 µm; sterigmata up to 2.5 µm in length.

Basidiospores cylindrical, hyaline, thin-walled, smooth, no reaction in Melzer's reagent and cotton blue, 7.5-9 × 3-4 µm.

MATERIAL EXAMINED

Jammu and Kashmir, Doda, Bhaderwah, Nalthi on *Cedrus deodara* stump, Brij Bala 11284(PUN), September 26, 2014; Bhaderwah, Jai, on *C. deodara* stump, Brij Bala 11292(PUN), September 28, 2015; Kishtwar, Dacchin, on *C. deodara* stump, Brij Bala, 11294 (PUN), August 21, 2017; Kishtwar, on way to Sinthon Top, on *C. deodara* stump, Brij Bala 11308 (PUN), August 21, 2017.

Notes: *Gloeophyllum striatum* is a new record for the Jammu and Kashmir. It is unique in having tomentose and concentrically zonate abhymenial surface. The earlier account of *G. striatum* from India is based upon reports from Maharashtra, Uttarakhand, West Bengal and Himachal Pradesh (Table 2).

Gloeophyllum trabeum (Pers.) Murrill, North American Flora 9 (2): 129 (1908).

a" *Agaricus trabeus* Pers., Synopsis methodica fungorum: XXIX (1801). (Fig.8)

Basidiome annual, pileate, solitary, sessile, imbricate, broadly attached; pilei applante, flabelliform, up to 10×6×0.7 cm.

Abhymenial surface sulcate, tomentose, scrupose, concentrically zonate towards

margins, brown to dark brown when fresh, not changing much on drying; margin paler, acute, entire.

Hymenial surface poroid, brown when fresh, not changing much on drying; margin concolorous, sterile up to 2 mm.

Pores lamellate, 2-4 per cm tangentially; dissepiments entire, up to 600 µm in thickness.

Tube layer brown, up to 3mm deep.

Context homogenous, brown, up to 4 mm thick.

Hyphal system trimitic. Generative hyphae hyaline, thin- to thick-walled, clamped, branched, up to 3.3 µm in width. Binding hyphae subhyaline to pale yellowish, thick-walled, aseptate, branched, up to 4 µm in width. Skeletal hyphae brown, thick-walled, aseptate, unbranched up to 4.5 µm in width.

Hyphal arrangement: subhymenium dominated with thin-to thick-walled, irregular and interwoven generative hyphae. Trama composed of interwoven, generative, binding and skeletal hyphae. Context dominated with loosely interwoven skeletal hyphae and generative hyphae.

Cystidia fusoid, thin-walled, clamped at the base, originate in the hymenium, 19.5-30.5×5-6 µm; projecting up to 20 µm from the hymenium.

Basidia clavate, thin-walled, clamped at the base, tetrasterigmate, 29-69×5-6µm; sterigmata up to 3 µm in length.

Basidiospores subcylindrical to cylindrical, hyaline, thin-walled, smooth, no reaction in Melzer's reagent and cotton blue, 5.5-8.5×2.5-4 µm.

MATERIAL EXAMINED

Jammu and Kashmir, Doda, Bhaderwah, Duggi, on *Abies pindrow* stump, Brij Bala 11288 (PUN), September 26, 2014; Nalthi, on *A. pindrow* stump, Brij Bala 11306(PUN), September 28, 2015.

Notes: This species is characterized by brown to dark brown basidiome with irregular, smaller lamellate pores and scrupose abhymenial surface. It is recorded earlier from Meghalaya and Arunachal Pradesh by Sharma (2012). It is a new addition to the polypores of Jammu and Kashmir.

DISCUSSION

Union Territory of Jammu and Kashmir is diverse in topography, altitude range of forests and Climatic parameters. As a result, the earlier workers (Bala et al., 2020, Bala, 2022a and Bala 2022b) reported the 54 species of polypores from

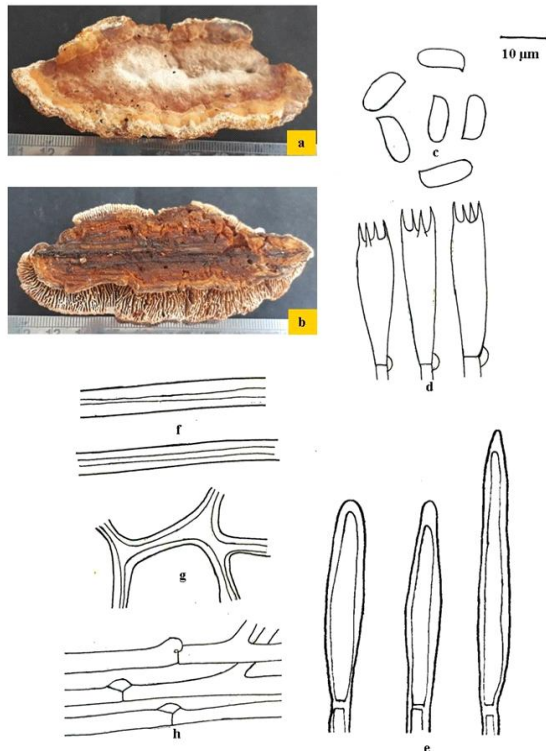


Fig.5: *Gloeophyllum sepiarium*: (a)-(b). Basidiome showing abhymenial and hymenial surface; (c). Basidiospores; (d). Basidia; (e). Cystidia; (f). Skeletal hyphae; (g). Binding hyphae; (h). Generative hyphae.

the Union Territory of Jammu and Kashmir. Presently, 4 new records for Jammu and Kashmir and 2 new records for Jammu Division are described and thus, increasing the number of polypore species in Union Territory of Jammu and Kashmir from 54 to 62. The two species of *G. longisporum* and *G. odoratum* has been already described by author Bala et al., 2020 and Mattoo et al., 2022. These 62 species are classified under 23 genera, 9 families and 4 orders.

The nature of Polypore species ranges from saprophytic to parasitic. These fungi degrade the lignin, cellulose and hemicelluloses of wood by ligninase, cellulases and hemicellulases and absorb the nutrients from the wood. Thus, they perform a significant role in recycling of nutrients. Polypore grows both in association with angiospermous as well as gymnospermous host. Of these, 54 species described and illustrated

from the study area, 36 species have been found growing in association with gymnospermous host [*Cedrus deodara* (18), *Abies* sp. (10), *Pinus excelsa* (7), *Pinus roxburghii* (1) and unidentified gymnospermous wood (3)], 14 species have been found growing in association with angiospermous host [*Quercus* sp. (8), *Berberis aristata* (1), *Platanus orientalis* (1), *Pyrus malus* (1) and unidentified angiospermous wood (6)] and the remaining 4 species have been found with unknown stumps and one species have been found both on angiospermic as well as gymnospermic host (Fig.8).

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DECLARATIONS

Conflict of interest: Authors declare no conflict of interest.

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