

ADDITIONS TO THE DIVERSITY OF MUSHROOMS IN GILGIT-BALTISTAN, PAKISTAN

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Abstract

Samples of Basidiomycetous fungi were collected from different parts of Gilgit, Pakistan. Spore prints were prepared by removing the stalk and placing the cap overnight on a white sheet. The samples were brought to the laboratory of Biological Sciences department, KIU, Gilgit, for further in-vitro investigation. During this research work 15 species have been collected and identified viz., *Krombholziella oxydabilis*, *Krombholziella scabra*, *Leccinum carpini*, *Leccinum crocipodium*, *Leccinum versipelle*, (Order Boletales: Family: Boletaceae); *Gyrodontolividus* (Order Boletales: Family: Strobilomycetaceae); *Porphyrellus psedoscaber*, *Tylopilus felleus* (Order Boletales: Family: Gyrodontaceae); *Omphalotus olearius* (Order Boletales: Family: Paxillaceae); *Inocybe agardhii*, *Inocybe geophylla*, *Inocybe nappies*, *Naucoria centunculus* (Order Cortinariales: Family Cortinariaceae); *Ganoderma applanatum* (Order Ganodermatales: Family Ganodermataceae); and *Inonotus radiates* (Order Hymenochaetales: Family Hymenochaetaceae). All these species appeared to be new records from Gilgit-Baltistan, not hitherto reported.

Key Words: Boletaceae, Strobilomycetaceae, Gyrodontaceae, Cortinariaceae, Ganodermataceae, Hymenochaetaceae

Introduction

The fungi comprise a very large group of organisms originated in every ecological areas. Approximately 1.5 million species of fungi are reported from all over the world, but so far only 70,000 of them have been identified. Hawksworth (1995). The fungi comprising the phylum basidiomycota commonly are known as basidiomycetes. Basidiomycetes are large and diverse group commonly known as mushrooms, puffballs, earthstars, stinkhorn, bird nest fungi, jelly fungi, bracket fungi or shelf fungi, rust and smut fungi. Alexopoulos *et al.*, (1996). Several members of Basidiomycota are well known plant pathogens, whereas others are important for their food value or because of scents, tastes, colors, and toxic properties of a wide variety of secondary products Gallois *et al.*, (1990). More than 31,000 species of basidiomycetes have been reported from different parts of the world. In contrast, approximately 700 species have been documented Pakistan Ahmad *et al.*, (1997); Sultana *et al.*, (2011). The Gilgit-Baltistan region appears to be generally ignored by previous workers despite the climate is suitable for growth of Basidiomycota. The present report describes a total of 15 species belonging to 10 genera, 7 families and 4 orders of Basidiomycota were identified. The collected specimens are belonging to the following orders and families with genus and species are as under.

Material and Methods

During the survey of Basidiomycetous fungi of Pakistan, members of Basidiomycota were collected from different areas of Gilgit-Baltistan and photographed in their natural habitat along with macroscopic details were recorded. A GPS was used to record the altitude and latitude information. The samples were brought to Department of Biological Sciences, Karakoram International University, Gilgit for identification up to species level after reference to Ahmad *et al.*, (1997), Demoulin & Mirriott (1981), Surcek (1988), Buczacki

(1989), Leelavathy & Ganesh (2000), Swann & Taylor (1993), Shibata (1992), Murakami (1993), Gardezi (2002) and Sultana *et al.*, (2011). Synonymy of the species was checked from www.speciesfungorum.org. The specimens dried at room temperature and labeled properly to make a herbarium for future reference.

Results

During the present work, fifteen species viz., *Krombholziella oxydabilis*, *Krombholziella scabra*, *Leccinum carpini*, *Leccinum crocipodium*, *Leccinum versipelle*, *Gyrodontolividus*, *Porphyrellus psedoscaber*, *Tylopilus felleus*, *Omphalotus olearius*, *Inocybe agardhii*, *Inocybe geophylla*, *Inocybe nappies*, *Naucoria centunculus*, *Ganoderma applanatum* and *Inonotus radiates* were recorded. These species have been described initially from the newly established province of Gilgit-Baltistan (previously known as northern areas of Pakistan), all these species are appeared to be new records from Pakistan which were not reported before. A total of 4 orders comprise by 7 families, 10 genera and 15 species were recorded during the present study. The order Boletales is the largest order with 04 families, 06 genera and 09 species. Boletaceae appeared to the largest family of this order containing 2 genera and 05 species. Family Gyrodontaceae was represented by 2 genera and 2 species. Family Strobilomycetaceae included 1 genus and 1 species while the family Paxillaceae was also represented by 1 genus and 1 species. The order cortinariales containing 1 family Cortinariaceae that is second largest family containing 2 genera and 4 species. The order Ganodermatales represented by 1 family Ganodermataceae containing 1 genera and 1 specie while the order Hymenochaetales represented by 1 family Hamenochaetaceae containing 1 genus and 1 species. Of these 15 species, 12 species have been documented for the first time from Pakistan, whereas other 3 species have been reported for the first time from Gilgit-Baltistan region, Mirza & Qureshi, (1978); Ahmed *et al.*, (1997).

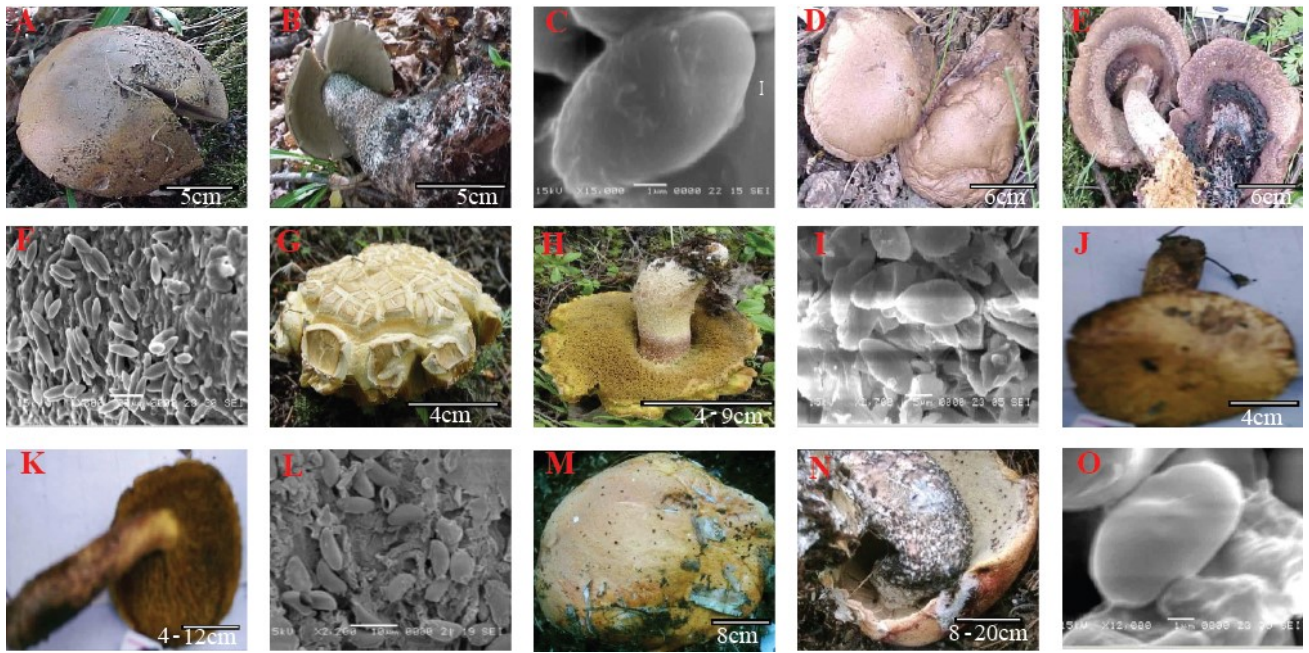


Fig.1. A *Krombholziella oxydabilis* (A-C), *Krombholziella scabra* (D-F), *Leccinum carpini* (G-I), *Leccinum crocipodium* (J-L) and *Leccinum versipelle* (M-O)

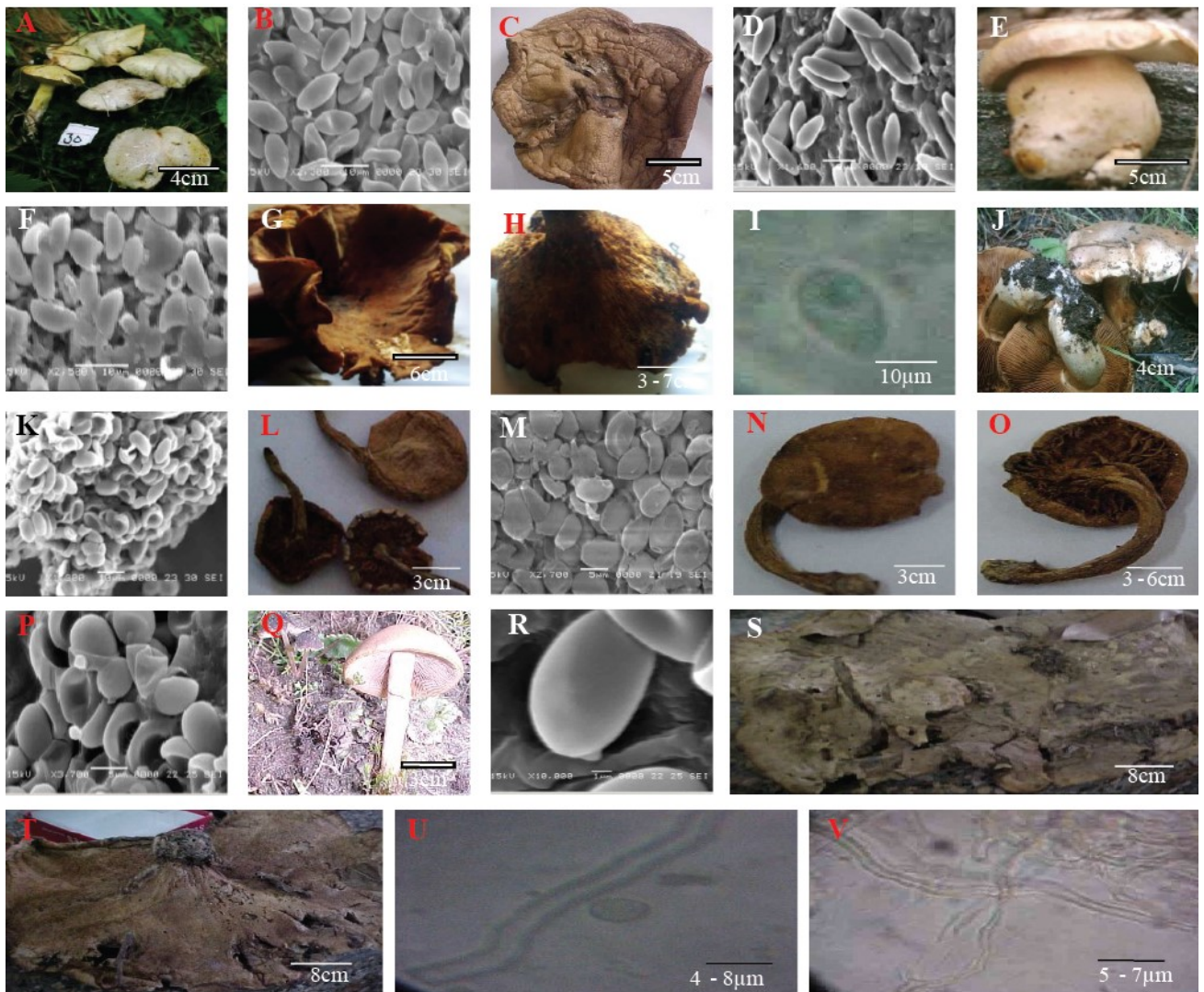


Fig.1 B. *Gyrodon lividus*(A,B), *Porphyrellus pseudoscaber* (C,D), *Tylopilus felleus* (E,F), *Omphalotus olearius* (G-I), *Inocybe agardhii* (J,K), *Inocybe geophylla* (L,M), *Inocybe nappies* (N-P), *Naucoria centunculus* (Q,R) and *Inonotus radiates* (S-V)

Description of Species:***Krombholziella oxydabilis* Singer**

Distinguishing characters: Cap 5-10cm wide, flattened and pale brown in colour. Stipe 10cm long and 4cm thick with blackish scales on a white background. Flesh white. Pores small, angular, pore surface cream. Spores 13-21x5-7µm, fusiform, brown (Fig.1A).

Habit/Habitat: Usually solitary, on soil under the mixed forest.

Common in rainy season.

Season: July-September.

Occurrence: Collected from Dichal Nalla, District Astore, alt 34°22m, N=35°68, E=74°55.

Ethnic Uses/Importance: Edible.

Previous Report from Pakistan: None.

***Krombholziella scabra* Bull.**

Distinguishing characters: Cap 5-12cm wide, brown. Stipe white, covered with almost black scales. Flesh whitish, unchanged when cut. It has a pleasant taste and smell. Cap soon becomes soft and stipe is tough like wood. Spores sub-spindle shaped, smooth, 13-18x5-6µm in size, yellowish (Fig.1A).

Habit/Habitat: It grows under the old birches and young trees, solitary or in small groups.

Season: June- July

Occurrence: Dichal nalla, District Astore, alt 3342m, N=35°27, E=74°45.

Ethnic uses/Importance: It is a tasty edible mushroom.

Previous Report from Pakistan: None.

***Leccinum carpini* R. Schulz**

Distinguishing characters: Cap 3-7cm, first smooth then cracks appears on surface. Stem 8-9cm long and 2-3cm thick, slender and often swollen towards base. Tubes depressed white or cream, turning very quickly pink then dark brown when cut. Pores are angular, first white then yellowish and turning black. Spore print brown. Smell indistinct. Flesh straw coloured then black. Spores smooth, yellowish, sub-spindle shaped, 15-19x5-6µm in size (Fig.1A).

Habit/Habitat: Usually in small groups, on soil among the coniferous forest.

Season: July- August

Occurrence: It was collected from Dichal nalla (Dashkin), District Astore, alt 3080m, N=35°27, E=74°47.

Ethnic uses/Importance: Edible.

Previous Report from Pakistan: None.

***Leccinum crocipodium* Letellier**

Distinguishing characters: Cap 4-8 cm wide, convex, streaked over the surface at first but soon becomes smooth. Stem 12cm long and 2cm wide, swollen towards the base with irregular yellowish pink scales that darken

when dry. Tubes and pores yellow, darkening when handled. Tubes depressed. Pores angular, minute. Smell pleasant. Flesh fairly firm, straw coloured in cap, very quickly darkening. Spores sub-spindle shaped, smooth, 11-14x4.5-6µm in size (Fig.1A).

Habit/Habitat: Usually in small groups, on soil with oaks.

Season: July-August.

Occurrence: It was collected from Mushkin, District Astore alt 2768m, N=35°24, E=74°42.

Ethnic uses/Importance: Edible.

Previous Report from Pakistan: None.

***Leccinum aurantiacum* S.F. Gray**

Distinguishing characters: Cap 8-20cm, very slightly downy when young, then smooth and dry or faintly sticky, margin overhanging quite distinctly. Stem 8-20cm, swollen towards base and covered with wooly brown-black scales. Tubes depressed white then buff. Pores small, rounded, gray becoming ochraceous. Spore print brown. Smell unpleasant. Flesh firm, white then pale wine-red, slightly blue green in stem base, then black. Spores sub-spindle shaped, smooth, 12-16x4-5µm in size (Fig.1A).

Habit/Habitat: Solitary or in a small groups, on soil with birch.

Season: July- August.

Occurrence: Specimens were collected from Dichel nalla (Dashkin), District Astore, alt 3570m, N=35°30, E=74°53.

Ethnic uses/Importance: Inedible.

Previous Report from Pakistan: None.

***Gyrodon lividus* Bull**

Distinguishing characters: Cap 4-9cm, sticky at first, and then dry. Stem 5-7cm, equal. Tubes and pores yellow. Tubes decurrent, very short. Pores large, angular. Smell indistinct. Flesh lemon yellow, brown colour towards stem base. Spores ellipsoid, smooth, 5-6x3-4µm in size (Fig.1B).

Habit/Habitat: Usually in groups, on soil among grasses, especially in rainy season.

Season: June-July.

Occurrence: It was collected from Mushkin, District Astore, alt 2442m, N=35°32, E=74°34.

Ethnic uses/Importance: Edible.

Previous Report from Pakistan: None.

***Omphalotus olearius* DC.ex Fr.**

Distinguishing characters: Cap 5-15cm wide, irregular, smooth and funnel shaped, with a wavy-lobed margin, orange-brown. Gills decurrent, golden-yellow and attached with stipe. Stipe 2-4cm long, initially smooth but finally becomes velvety. Spores sub-globose, smooth, colorless, 5-7x4-6µm in size. Flesh reddish. Smell and taste is unpleasant. Hyphal system monomitic (Fig.1B).

Habit/Habitat: Solitary or in small groups on soil among the grass.

Season: July- August.

Occurrence: Nulter, District Gilgit 2939m alt, N=35°29, E=74°49, and Mushkin, District Astore, alt 3021m, N=35°27, E=74°46.

Ethnic uses/Importance: Inedible.

Previous Report from Pakistan: None.

Porphyrellus psedoscaber Secr.

Distinguishing characters: Cap 5-16cm wide, dark brown in color. Tubes also dark brown. Pores angular with a denticulate mouth. Stipe dark brown frequently hooked at the base, finely punctuate and longitudinally striate. Spores smooth, elongated, brownish, 12-16x 5-6µm in size (Fig.1B).

Habit/Habitat: Abundantly in coniferous and mixed forest, less common in deciduous forest.

Season: July-August.

Occurrence: Specimens were collected from Hunza, District Gilgit, alt 2488m, N=35°28, E=74°46.

Ethnic uses/Importance: Edible, its taste is less appetizing than that of *Boletus* species.

Previous Report from Pakistan: None.

Tylopilus felleus Bull.ex Fr.

Distinguishing characters: Cap 6-13cm, downy, smooth. Stem 7-10cm long and 3-6cm thick with brown surface network. Tubes and pores white then brownish. Pores large, angular. Smell pleasant. Flesh soft, creamy-white. Spores sub-spindle shaped, smooth, 10-14x4-5µm in size (Fig.1B).

Habit/Habitat: Usually in small groups. On soil under the conifer trees.

Season: July-August.

Occurrence: It was collected from Lashtang forest (Dashkin), District Astore, alt 2785m, N=35°28, E=74°46.

Ethnic uses/Importance: Edible.

Previous Report from Pakistan: None

Inocybe agardhii N. Land

Distinguishing characters: Cap 4-9cm, at first convex then flattened and slightly depressed at center, fibrous lines when wet, then smooth, first white then reddish-brown. Stem 3-6cm, tapering upward and bulbous at the base, rather fibrous below, with a cottony ring zone. Gills at first pale buff then olive-brown, fairly crowded. Smell unpleasant. Flesh pale yellowish buff. Spore print brown. Spores ellipsoid, smooth 8-12x5-6µm in size (Fig.1B).

Habit/Habitat: Solitary or in small trooping groups. On soil.

Season: August- September.

Occurrence: It is collected from Dichal nallah (Dashkin), District Astore, alt 3575m, N=35°30, E=74°53.

Ethnic uses/Importance: Inedible.

Previous Report from Pakistan: None.

Inocybe geophylla Sow.

Distinguishing characters: Cap 1-3cm wide, at first conical then convex and then slightly umbonate, silky smooth. Stem 1-5cm long, equal, slender. Gills crowded, adnate, buff. Spore print brown. Smell unpleasant. Flesh whitish. Spores ellipsoid smooth, brownish yellow, 5-6x7-10µm in size (Fig.1B).

Habit/Habitat: Trooping, on soil among grasses.

Season: July-August.

Occurrence: Collected from Hunza, District Gilgit, alt 1916m, N= 35°68, E=74°11.

Ethnic uses/Importance: Inedible.

Previous Report from Pakistan: None.

Inocybe nappies JE Lange (10) *Inocybe nitidiuscula* (Britzelm) Lapl, (Pers. Ex Fr.) Fr. 59, 186,135, 1900.

Distinguishing characters: Cap3-6cm, first bell shape, then convex, sharply umbonate, first smooth then cracks appearing on the cap surface, margin enrolled and cracked when dry. Cap whitish. Stem 5-6cm long, 1-2cm thick, tapering upward, slender, bulbous at base. Gills at first whitish, then brown. Smell indistinct. Flesh whitish in cap, brown in stem. Spores ellipsoid, smooth, 5-6.5x9-10µm in size (Fig.1B).

Habit/Habitat: Solitary or in small groups, on soil.

Season: June-July.

Occurrence: It was collected from Rama forest, District Astore, alt 2915m, N=36°08, E=74°11.

Ethnic uses/Importance: Poisonous.

Previous Report from Pakistan: None.

Naucoria centunculus Fr.

Distinguishing characters: Cap 2-5cm, at first convex then flattened, lined at margin when wet. Stem 1-3cm, equal, fairly stout. Gills first olive-buff then brown, crowded. Smell faint. Flesh brown olive. Spores ellipsoid-kidney-shaped, smooth, 7-8x4-5µm in size (Fig.1B).

Habit/Habitat: Trooping, on twigs of broad-leaved trees.

Season: August- September.

Occurrence: It was collected from Mushkin area, alt 2433m, N=35°78, E=74°68, and also from Rama forest alt 2477m, N=35°78, E=74°68.

Ethnic uses/Importance: Inedible.

Previous Report from Pakistan: None.

Inonotus radiatus (Sow.)

Distinguishing characters: Fruit body 3-8cm, annual, broadly attached with substrate, warty first then smooth, concentrically zoned, margin rather thin. Stem absent. Pore surface at first whitish, then brown. Tubes 0.5-0.8 mm deep. Pores angular, 2-4mm. Flesh reddish brown. Hard and woody when dry. Spores broadly ellipsoid, smooth 4.5-7x3.5-4.5µm in size. Hyphal system monomitic (Fig.1B).

Habit/Habitat: Usually in large groups, overlapping. On woods of broad leaved trees.

Season: July- August.

Occurrence: It is collected from Dashkin forest, District Astore, alt 2787m, N=35°29, E=74°43.

Ethnic uses/Importance: Inedible; may cause to damage the trees trunk.

Previous Report from Pakistan: None.

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(Received for publication 15 January 2016)