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Taxonomic studies and diversity of some wild mushrooms of Bangus valley North Kashmir, India

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The present study was carried out in Bangus valley of Jammu and Kashmir, India for the diversity of wild mushrooms. The valley is endowed with alpine meadows and dense coniferous forests. Owing to its remoteness, security considerations, and proximity to the Line of Control, a significant number of these areas have either undergone limited exploration or remain completely unexplored. In the course of an extensive survey across different locations, a total of 20 wild mushrooms were gathered and subjected to an assessment of their edibility status.

Keywords : Diversity, edibility, habit and habitat,Kashmir valley, mushrooms

INTRODUCTION

Mushrooms are the fleshy, spore-bearing fruiting bodies of macro fungi usually formed above ground on humus, soil, or on dead wooden logs (Mitra *et al*.2013). Greeks and Romans considered mushrooms to be food of God, while Chinese believed they were an elixir of life (Boa, 2004). Mushrooms have been cherished for centuries for their delightful taste, unique texture, and, at times, their beneficial tonic and medicinal qualities. Growing awareness surrounds their rich protein content, unsaturated fatty acids, and nucleic acids, making them a versatile vegetable for regular consumption. Mushrooms have varied diversity in different parts of the world. They alone are represented by 14,0000 species of which 850 species are recorded from India (Deshmukh, 2006). Mushrooms exhibit a fleshy, spore-bearing form, evident in their external appearance characterized by a prominent cap atop a sturdy stalk. Globally, mushrooms have been esteemed for their culinary and medicinal virtues.

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These fungi harbor an array of active compounds, such as polysaccharides, oligosaccharides, triterpenoids, dietary fibers, selenium, amino acids, alcohols, and mineral constituents. (Gregori *et al.* 2007). They have anticancer, anti-diabetic, antiviral, and anti-toxin properties, and they also lessen the negative side effects of radiation and chemotherapy(Ajith, 2007). Furthermore, mushrooms contain various bioactive substances, such as phenols, glycoproteins, steroids, nucleotides, terpenoids, and polysaccharides. They are also abundant in proteins, vitamins, and minerals, serving as an excellent source of thiamine, riboflavin, niacin, and folic acid. Ozturk *et al*. (2003) emphasize the importance of mushrooms in agriculture, ecological restoration, biodegradation, and promoting human health. The climatic conditions in Jammu and Kashmir range from subtropical to sub-temperate, creating an ideal environment for the abundant growth of mushrooms. Researchers have reported over 283 species of mushrooms across various regions of Jammu and Kashmir. (Pala *et al*. 2011; Malik *et al.* 2017; Talie*et al.* 2020; Yousuf *et al.* 2022; Malik *et al.* 2023; Wani *et al.* 2023). Although the North

portions of the Kashmir Valley are known to offer a wide variety of edible and inedible macro-fungi due to their lush green woodlands, gorgeous mountains, and large meadows, they have yet to be explored due to the high security zone and challenging terrain. Therefore, our purpose was to document the diversity of mushrooms from North Kashmir

MATERIALS AND METHODS

Study area

The Bangus Valley, situated in the Kupwara district of Jammu and Kashmir, India, spans approximately 300 square kilometers and sits at an elevation of 3,500 meters above sea level (Fig. 1). Surrounded by the Rajwar and Mawar mountains to the east, the Shamasbury and Dajlingun Mountains to the west, and the Chowkibal and Karnah Mountains to the north, the valley is celebrated for its breathtaking natural splendor. This includes verdant meadows, snow-capped peaks, dense forests, and shimmering water bodies. Lush hills adorned with alpine and coniferous forests encircle the valley, creating a picturesque landscape. The region boasts diverse coniferous forests and hosts a plethora of indigenous flowers and medicinal plants. Areas surveyed for the current study encompass Bangus, Choki, Chokibal, Lower Bangus, Marsary, Nard bek, Panzgam, Rangwar, Redii, Tippi, and Upper Bangus.

Sampling and macro-morphological study

During the years 2022-2023, wild mushrooms were collected from various sampling sites across the Bangus Valley in the Kupwara district of Jammu and Kashmir, following the methodology of Halling (1996). The coordinates of each study site were meticulously recorded using a hand-held GPS device, and details of the surrounding vegetation were documented, with a focus on possible ectomycorrhizal associations. Macroscopic characteristics of the fresh basidiomata were carefully noted and photographed in their natural habitat using a Nikon DSLR D3400 camera, as well as with a MI smartphone. Each specimen was appropriately labeled to include information on its habit, habitat, and collection number, date of collection, locality, and potential uses. Subsequently, the specimens were dried and stored in zip lock bags before being transported to the Plant Pathology and Mycology Laboratory at the Department of Botany, University of Kashmir, for further analysis.

Microscopic characteristics of the samples were examined using a Leica DM 750 microscope in department of botany, after treatment with 2% KOH, 1% Congo red stain and Melzer's reagent. Basidiospores were observed using Melzer's reagent, and their measurements were recorded in a side view, excluding any surface ornamentation. All collected specimens were deposited within the Mycology Section of the KASH herbarium at the Department of Botany, University of Kashmir, Srinagar, along with assigned accession numbers. Identification of the specimens was conducted by comparing recorded characteristics with relevant literature, including monographs, keys, field guides, etc. (Krieger, 1967; Kibby, 1979; Purkayastha and Chandra, 1985; Pacioni,1985), as well as online resources such as Mycokey, naturalist, Mushroom Expert, and Index Fungorum., etc.

RESULTS AND DISCUSSION

During survey of different habit and habitats of Bangus valley of district Kupwara, many wild mushrooms species were collected, characterized and identified on the basis of macro and microscopic features.The mushrooms collected during the survey were species of *Agaricus, Auricularia*, *Boletus*, *Coprinus, Geopora, Lentinus, Morchella, Neolentinus, Ramaria, Scleroderma* and *Falmmulina.*

The description of mushroom collected and identified during the present study are as under:

Division: Ascomycota

Family:Pyronemataceae

1.*Geopora sumneriana* M.Torre (Fig. 2a)

Synonyms: *Sepultaria sumneriana* (Cooke) Massee, *Sepultaria sumneri* (Berk.) Boud., and *Peziza sumneriana* Cooke.

Common name : Cup fungus

Site of collection : Tippi, Panzgam and Marsary
Accession number **:** KASH-8798

Classification

Description
Fruiting body sessile, develops a spherical, brown, with rough flexuous hair on the outer surface which bind the substratum, inner surface creamish white measuring 1.5-5.5 cm in diameter; Asci cylindrical with rounded apex, 8-spored measuring 205-290 × 12.8-14.4 µm; Ascospores smooth, ellipsoid, uniseriate, hyaline, bigutulate, measuring 12.5-22.5 × 7.5-11.9 µm, Paraphysis wider, septate and measuring 110.0-155.8 × 2.8-3.5 µm.
Habit and habitat: Gregarious, found mostly found under confiner trees.
Edibility: Edible

Family: Morchellaceae
2.***Morchella esculenta* Fr. (Fig. 2b)**
Synonyms: *Helvella esculenta* (L.) Sowerby, *Phallus esculentus* L., and *Morchella rotunda* (Fr.) Boud.
Common name : Yellow morel
Site of collection : Nard bek, Marsary, Bangus and Choki
Accession number : KASH-8806

Description

Pileus oval or sub-globose, not tapering towards apex,internallyhollow,yellow or pale brown to grayish brown measuring 3-8 × 2-4 cm; Stipe:cylindrical but sometimes bulbous, hollow and white in color measuring 2-7 ×1-3 cm; Asci: cylindrical, hyaline and eight spored measuring 225- 265 × 18.5-25.0 µm; Ascospores: smooth, elliptical and hyaline measuring 12.5-21.0 × 8.0-12.0 µm; Paraphysis: septate and cylindrical measuring 275-345 × 2.5-5.0 µm.

Habit and Habitat: Saprobic, growing singly or in groups on the ground.
Edibility: Edible.
Division: Basidomycota
Family: Agaricaceae

3.*Coprinus comatus* (O.F. Mull.) Pers. (Fig. 2c)

Synonyms:*Agaricus comatus* O. F. Muller. *Agaricus fimetarius* Bolton, *Coprinus ovatus* (Schaeff.) Fr.,
Common name: Shaggy ink cap
Site of collection: Bangus and Choki
Accession number: KASH-8799

Description

Pileus 4-12 cm; ovoid to cylindrical when young, enlarging to campanulatewith a rising edge; maturing to black “ink”; dry; sides paler with a browncentre; Gills: free; grayish, becoming slightly pink and then black at maturity; Stipe: 4.5-15.3 cm long; 1-2 cm thick; usually tapering to apex; smooth; white; Spores: smooth, elliptical, and 9–12 × 7-8 in size; Cystidia: hyaline, thin walled, ovoid to pyriform measuring 65.0-115.0 × 20.5-35.5 µm.

Habit and Habitat: Saprobic, developing lone or in groups, lines, or fairy rings on grass.
Edibility: Inedible.

4.*Lycoperdon perlatum* Pers. (Fig. 2d)

Synonyms: *Lycoperdon gemmatum* Batsch, *Lycoperdon umbrinum* Kreisel
Common name : Puffball
Site of collection : Panzgam, Nard bek and Marsary
Accession number : KASH-8800

Description

Fruiting body inverted pear shaped or globose with a well-developed mycelial base measuring 1.3-2.2 cm in diameter;Peridium: thin, dehiscing haphazardly comprising of two zones: outer warted zone, comprised of dense spines which on shedding give reticulated appearance to the peridium, and inner yellowish-brown zone containing aseptate and unbranched, thin to thick-walled hyphae measuring 1.5-3.5 µm wide; Gleba: brownish colour becoming dark brown on maturity; Basidiospores: globose, echinuate with central vacuole, deep rusty brown in melzer measuring 5.5-11.0 µm in diameter.

Habit and Habitat: Saprobic, growing alone, scattered, or in clusters in woods under hardwoods or conifers.
Edibility: Edible when young.

7. *Agaricus campestris* L. (Fig. 2 g)

Synonyms: *Pratella campestris* (L.) Gray, *Psalliota campestris* (L.) Quél., and *Psalliota flocculosa* Rea
Common name: Meadow mushroom
Site of collection: Bangus, Lower Bangus, Rangwar, Upper Bangus and Tippi
Accession number: KASH-8803

Description

Pileus medium-sized, convex to widely convex, sometimes almost flat, white, shiny to finely silky or slightly scaly measuring 3.5-10.5 cm in width; Gills: free, numerous, short, deep pink in colour when young and becomes brown and finally dark chocolate brown on maturity; Stipe: cylindrical, with a tapering base; with a rapidly collapsing white ring measuring 5.5-12.5 × 1.2- 3.5 μm; Basidiospore: thick-walled, dark brown, and elliptical in shape measuring 5.5–9.2 × 3.5-6.3 μm; Cystidia: 4-sterigmate, clavate measuring 35.5–59.5 × 9.5-26.5 μm.

Habit and Habitat: Gregarious, found in fields and grassy areas and often found on lawns.
Edibility: Edible.

8. *Calvatia gigantean* Batsch and Lloyd. (Fig. 2 h)
Synonyms: *Lycoperdon giganteum* Batsch, *Bovista gigantea* (Batsch) Gray, *Langermannia gigantea* (Batsch) Rostk., and *Lasiosphaera gigantea* (Batsch) F.
Common name: Giant puffball

Site of collection: Upper bangus, Lower Bangus, Nard bek and Bangus
Accession number: KASH-8804

Description

Fruiting bodyglobose to sub-globose, depressed, white when fresh, becoming yellow; soft and delicate, the interior is white and velvety, without

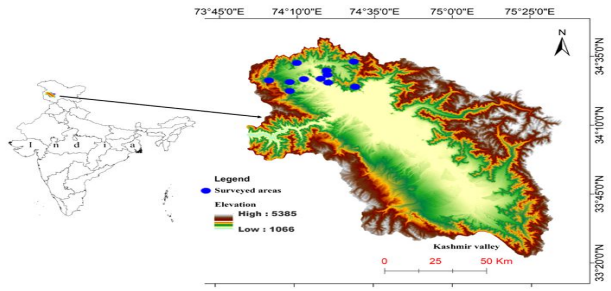

Fig.1: Map of the study area showing sampling sites

a sterile basal region measuring 5.5-25.0 × 5.5-20.7cm; Exoperidium: white when young and turns dark coffee brown or black on maturity with many cracks Gleba:first white and turns black on maturity; Basidiospores: globose, spiny, hyaline to yellowish in KOH, measuring 5.5-7.5μm in diameter.

Habit and Habitat: solitary to gregarious, saprobic, found often in the grasslands.
Edibility: edible at earlier stage becomes toxic at later

Family: Sclerodermataceae

5. *Scleroderma citrinum* Pers. (Fig. 2e)
Synonyms: *Lycoperdon verrucosum* Bull., *Lycoperdon gemmatum* Batsch, *Lycoperdon defossum* sensu Sowerby
Common name: Earth ball
Site of collection: Bangus, Rangwar, Marsary and Lower Bangus
Accession number: KASH-8801

Description

Fruiting body : inverted pear rounded or globose with a well-developed mycelial base measuring 1.3-2.2 cm in diameter; Peridium: thin,dehiscing haphazardly comprising of two zones: outer warted zone, comprised of pale yellow hyphae, septate, measuring 3.5- 7.5 μm wide, and inner pale yellow zone containing intricate hyphae, aseptate, measuring 2.7- 6.5 μm wide; Gleba: light chocolate colour becoming dark brown on maturity; Basidiospores: globose, echinuate measuring 6.0-10.5 μm in diameter.

Habit and Habitat: Mycorhizal,growing singly, scattered or gregariously in broad leaved tress like Populus sp.

Ediblity: Inedible

Family: Boletaceae

6. *Boletus edulis* Bull. (Fig. 2f)

Synonym: *Boletus solidus* Sowerby
Common name:King Bolete, Penny bun
Site of collection: Upper Bangus, Nard bek and Panzgam
Accession number:KASH-8802

Description

Pileus reddish brown, convex when young and becomes flats with age, surface smooth to wrinkled measuring 3.5-10.5 cm in diameter; Pore surface:pinkish-whitish when young, but changes to greenish-yellow on maturity; Stipe: stout, white to yellowish in colour measuring 5.5-20.5 × 2.2-7.5 cm; Basidiospores: elliptical to spindle shaped, smooth, bi-guttulate measuring 4.5-10.5 × 3.1- 5.0 µm; Cystidia:clavate measuring 32.5-60.0 × 8.5-15.5 µm.

Habit and Habitat:Scattered, grows in deciduous and coniferous forests and tree plantation of Populas sp. etc.

Edibility: edible

Family: Hericiaceae

9*. Hericium corralloides* (Scop.) Pers.(Fig. 2i)
Synonyms: Hydnum erinaceus Bull., *Hydnum caput-medusae* Bull., *Steccherinum quercinum* Gray, and *Hericium unguiculatum* Pers.

Common name: Comb tooth
Site of collection: Choki, Chokibal, Marsary and Nard bek
Accession number: KASH-8805

Description

Fruiting body composed of branches emerging from a roughly central core that is connected to the wood measuring 8.5–25.5 cm across; Branches:thin, smooth, and covered with fleshy spines measuring 0.5–1 cm; Basidiospores: hyaline, globose, minutely crumpled, and uniguttulate in KOH, and amyloid measuring 8.5–12.0 × 3.5–5.5 µm.

Habit and Habitat: Solitary, saprobic or parasitic on fallen hardwood branches and stumps.

Edibility: Edible when young.

Family: Psatherellaceae
10.*Coprinellus micaceus* (Bull.)Vilgalys, Hopple & Jacq. Johnson**(Fig. 2j)**
***Synonyms: Agaricus micaceus* Bull., and *Coprinus micaceus* (Bull.) Fr.**
Common name: Mica cap
Site of collection: Lower Bangus, Choki
Accession number: KASH-8807

Description

Pileus: oval when young and become campanulate on matuarity, button covered with mica like granules which frequently wash off with rain or dew measuring 2-15cm; Gills: free-adnate, pale at first and becomes black on maturity; Stipe: cylindrical, white, finely granulated or fibrous measuring 2.5-5.5× 1.5-3.5 cm; Basidiospores: oval, smooth, measuring 6.0-8.5 × 4.5-6.5 µm.

Habit and Habitat: Gregarious, saprobe typically grows on or near the rotting wood, tree stumps or underground tree roots.
Edibility: Edible

Family: Gomphaceae

11.*Turbinellus floccosus* (Schwein.) Earle ex Giachini& Castellano (**Fig. 2k)**

Synonyms: *Gomphusfloccosus*Giachini& Castellano, *Cantharellus floccosus* Schwein.
Common name: Woolly chanterelle
Site of collection: Upper Bangus
Accession number: KASH-8808

Description

Fruiting body A fleshy vase-shaped with a shallow to deep depression at the centre measuring 6.5-15.0× 4.5-10.5 cm; Stipe: bald coloured like the underside or with vivid to dull yellow tones; discolouring brownish; base mycelium whitish; stem: 3.4-8.7 cm high; 1.8-4.1 cm wide; Basidiospores: ellipsoid with an apicular end,

hyaline and measuring 8.5–15.5 × 3.8–5.5 µm; Cystidia: not found.

Habit and Habitat: Gregarious, found in older tree stands and areas with more decayed wood on the forest floor.
Edibility: Edible

Family: Gomphaceae
12.*Ramaria formosa* Quel.
(Fig. 2 l)
Synonym: Clavaria formosa Pers. *Meris maformosum* (Pers.) Lenz, *Clavaria formosa*, *Orallium formosum* (Pers.) G.Hahn.
Common name:
Coral fungus or Pink clavaria
Site of collection:
Redii, Marsary and Lower Bangus
Accession number: KASH-8809
Fruiting body pinkish to orangish darker at the ends of branches and becomes ochraceousat maturity, measuring 10-25.5× 10.5- 15.5 cm, branches vertically oriented, coral pink when young and becomes yellowish tan at maturity; Basidiospores: subfusoid-elliptical measuring 7.5-13.5 × 3.5-6.0 µm; Basidia: clavate measuring 20.5-35.6 × 3.5-5.8 µm.

Habit and Habitat: Solitary, saprobic or parasitic on fallen hardwood branches and stumps often found under conifers.

Edible: If the acrid tips are removed.

Family: Auriculariaceae

13.*Auricularia auricular-judae* (Bull.) Quél. (Fig. 2m)
Synonyms: *Trernella auricula-judae* Bull., *Hirneola auricularis* (Gray) Donk Bull., *Hirneola auricula-judae*var. lactea (Quél.) D.A. Reid
Common name:
jelly ear fungus
Site of collection:
Bungus, Upper Bangus and Chokibal
Accession number KASH-8810

Description

Fruiting body gelatinous, ear shaped, tanbrown with a purple tinge measuring 1.5-3.5 cm wide; Pileus: hyphae septate to aseptate, branched and unbranched measuring 2.5-5.5 µm wide; Basidiospores: allantoid, bi- to multigutullate measuring 9.6-14.4 × 5.6-6.4 µm; Basidia: cylindrical measuring 25.5- 55.6 × 5.0-7.5 µm; Cystidia: not found.

Habit and Habitat: Gregarious, Saprobic on dead and decaying wood logs.

Edibility: Inedible.
Family: Gloeophyllaceae
14. *Neolentinus lepideus* Ginns (Fig. 2 o)
Synonyms: *Agaricus lepideus* Fr., *Lentinus lepideus* (Fr.) Fr. *Clitocybe lepidea* (Fr.) P. Kumm., *Pocillarialepidea* (Fr.) Kuntze, *Agaricus tubaeformis* Schaeff.,*Agaricus serpentiformis* Batsch, *Ramaria ceratoides* Holmsk.
Common name: Scaly *Lentinus*
Site of collection: Chowkibal
Accession number: KASH-8811

Description

Pileus hard, upper surface white with coarse brown scales, inrolled margins, measuring 3.5-10.5 cm wide; Gills sub-decurrent or decurrent, adnate, and white in colour; Stipe: dry; whitish, cylindrical, developing brown scales, measuring 3.7-12 × 1.2-2.3 cm; Basidiospores: cylindrical, smooth, inamyloid, measuring 7.5–12.5 × 4.5–6.5 µm; Cystidia: not found.

Habit and Habitat:Found sprouting from dead and rotting coniferous wood, old stumps, logs, and lumber, either individually or in clumps.

Edibility: It is edible and non-toxic.

Family: Polyporaceae
15. *Lentinus tigrinus* (Bull.) Fr. (Fig. 2 n)
Synonym: *Agaricus tigrinus* Bull., *Agaricus dunalii, Clitocybe tigrina* (Bull.) P. Kumm., *Panu stigrinus* (Bull.) Singer, and *Pleurotus tigrinus* (Bull.) Kühne
Common name: Scaly *Lentinus*
Site of collection:Bangus, Lower bangus, Chokibal and Rangwar
Accession number:KASH-8812
Description

Pileus convex, with a central depression,fibrillose-scaly with small, dark brown scales over a tan to

Fig.2 (a-t): Fruiting bodies of different wild mushrooms.**a.** *Geopora sumneriana* **b.***Morchella esculenta* **c.***Coprinus comatus* **d.** *Lycoperdon perlatum* **e.***Scleroderma citrinum* **f.** *Boletus edulis* **g.** *Agaricus campestris* **h.** *Calvatia gigantea* **i.** *Hericium coralloides* **j**.*Coprinellus micaceus* **k.***Turbinellu-sfloccosus* **l**. *Ramaria Formosa* **m**. *Auriculariaauricula judae* **n.** *Lentinus tigrinus* **o.** *Neolentinuslepideus* **p.** *Flammulina velutipes* **q.** *Russula emetica* **r.** *Amanita flavipes* **s**. *Inonotus hispidus* **t.** *Ganoderma applanatum*

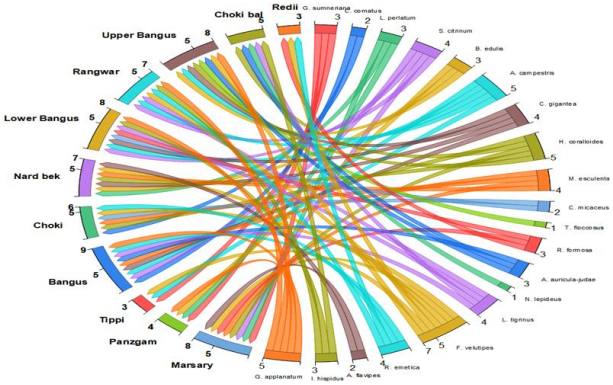

Fig. 3: Linkage between mushroom collected and sampling sites. The chord diagram depicts distribution of various reported polypore mushrooms from various study sites of North Kashmir. The size of a circle section corresponds to the spectral counts of survived sampling sites, while as curves connecting them parallel to the amount of spectra shared by two entities like mushroom species and study sites.

brown ground with incurved margins measuring 1–3 cm wide;Stipe:scaly, cylindrical, or marginallypointed toward the base, measuring 3.2–5.4 × 0.8–1.5 cm; Basidiospores: ellipsoid, smooth, inamyloid, measuring 5.5–8.5× 2.3–3.5 µm; Cystidia: sub-clavate measuring 40.6-65.5 × 4.2-8.0 µm.
Habit and Habitat: Gregarious, saprophyte on the wooden logs of hardwoods.
Edibility: Edible

Family: Physalacriaceae

16. *Flammulina velutipes* Singer (Fig. 2 p)
Synonyms: *Agaricus velutipes* Curtis, *Gymnopus velutipes* (Curtis) Gray, *Collybea veluticeps* Rea.
Common name: Velvet shank
Site of collection: Choki, Marsary, Nard bek, Rangwar, Redii, Tippi and Upper Bangus
Accession number: KASH-8813

Description

Pileus convex when young flattens with age, usually sticky when fresh, orange brown to yellowish brown, measuring 1.5-5.7 cm; Gills: adanate; pinkish white with a paler yellowish tinge; Stipe: cylindrical, tough; whitish to yellowish-brown, measuring 1.5-10.0 × 0.5-1.2 mm; Basidiospores: smooth, more or less elliptical, inamyloid, measuring 6.5-10.0 × 3.8-5.5 µm; Cystidia: utriform, hyaline measuring 30.5-60.0 × 10.5-20.0 µm.

Habit and Habitat: Gregarious, found on stumps, logs, roots, and living wood of hardwoods.
Edibility: Not reported.
Family: Russulaceae

17.*Russula emetic* (Schaeff.) Pers.

(Fig. 2 q)

Synonyms: *Agaricus emeticus* Schaeff., *Russula emetic* var. *emetica* (Schaeff.) Pers., and *Russulaemetica* var. *gregaria* Kauffman

Common name: The sickener

Site of collection:Bungus, Rangwar, Redii and Choki

Accession number: KASH-8818

Description

Pileus convex to flattened, smooth, sticky, red or scarlet which fades on maturity and turning pinkish, flesh brittle, measuring 5.5-10.5 cm diameter; Gills: off-white to white, free, densely packed and forked near cap margin; Stipe: cylindrical, off-white, smooth, brittle measuring 3.5-8.5 × 1-2.5 cm; Basidiospores: globose, amyloid, reticulate warts, measuring 5.5-12.0 ìm in diameter;Cystidia: clavate, wide at top, measuring 30.5-55.0 × 10.5-18.5 µm.

Habit and Habitat: Solitary, grows mainly under conifers like Cedrus deodara.
Edibility: Not reported.

Family: Amanitaceae

18. *Amanita flavipes* S. Imai **(Fig. 2r)**
Synonyms: None
Common name: Asian Yellow Dust *Amanita*
Site of collection:Nard bek and Marsary
Accession number: KASH-8821

Description
Pileusconvex to flat, slightly umbonate, yellowish, covered with yellowish scales, measuring 4.5–6.0 cm in diameter; Gills: Free, edges entire, crowded and creamish-yellow; Stipe: central, cylindrical, narrower bulbous at the base, light yellow on upper side measuring 6.3 11.3 × 0.4 1.5 cm; Annulusyellowish white, membranous, and superior; Volva: present as yellow patches on the bulbous base. Basidiospores: ellipsoidal, smooth walled, inamayloid measuring 6.4-11.5 × 5.2 7.8 ìm. Cystidia: clavate, measuring 43.1-65.5 × 8.5-17.8 µm.

Habit and Habitat: Solitary to gregarious found under hard and soft woods.
Edibility: Inedible

Family: Hymenochaetaceae

19. *Inonotus hispidus* (Bull.) P. Karst. (Fig. 2s)
Synonyms: *Inonotus hirsutus* and *Polyporu shispidus* (Bull.) Fr.

Common name: Shaggy Bracket
Site of collection: Chokibal, Lower Bangus and Rangwar
Accession number: 8822-KASH

Description
Pileus rusty reddish yellow on its upper surface with rounded margin and concentric zones measuring up to 25.5 cm across whenmature;Stipe: absent; Tubes: rusty reddish measuring 1-3 per mm and are 0.5 to 1.2cm deep; Basidiospores: ellipsoidal, smooth, inamyloid, measuring 5.5-8.5 µm.

Habit and Habitat:Gregarious, saprobic on Oaks and other broad leaved trees.
Edibility: Inedible.

Family: Ganodermataceae

20.***Ganoderma applanatum*** (**Pers.) Pat.**
(Fig. 2 t)
Synonyms:

Boletus applanatus Pers., *Polyporus applanatus* (Pers.) Wallr., and *Fomes applanatus* (Pers.) Gillet.

Common name: Artist's Fungus

Site of collection:Bangus, Lower Bangus, Panzgam, Upper Bangus and Rangwar
Accession number: KASH-8817
Description

Pileus unvarnished and dull in appearance,tough when young and turns woody on maturity, zonate, semi-circular with irregular surface, brown on top, off white at margins, with thin, sharp and rounded margin, measuring 10-35 cm across and 3.5 to

8.5 cm thick; Stipe: absent; Pores circular,3–5 per mm; divided by brown tissuewith corky-hard thick texture, 0.7–2.1 cm deep; Basidiospores: ellipsoid with a truncated end, inamyloid, measuring 5.5–8.7 × 3.5–5.5 µm; Cystidia:not found; Hyphae:trimitic.
Habit and Habitat:Solitary to gregarious, saprobic or parasitic on broad leaved trees like *Ulmus* sp.Edibility: Inedible.

Out of the 20 identified wild mushroom it was found that 16 species were utilised by the locals for treating various ailments as shown in Table 1.

During the present study, 20 wild mushroom species belonging to 20 different genera and 12 families were collected and identified on the basis of macro and micro-morphological features. Among these, *Geopora sumneriana* and *Morchella esculenta* were ascomycetes and *Lycoperdon perlatum,Scleroderma citrinum, Boletus edulis, Agaricus campestris, Calvatia gigantea, Hericium coralloides, Coprinellus micaceus, Turbinellus floccosus, Ramaria formosa, Auricularia auricula-judae, Neolentinus lepideus, Lentinus tigrinus, Flammulina velutipes, Russula emetica, Amanita flavipes, Inonotus hispidus,* and *Ganoderma applanatum* were basidiomycetes. Nine species were collected from Bungus, eight from Upper bangus, Marsary, and Lower bangus, seven from Nard bek and Rangwar, six from Choki, five from Chokibal, four from Panzgam and three from Tippi and Reddi as shown in Fig. 4.The edaphic, physiographic and the enormous variation in agro-climatic condition of Bangus valley harbor rich macro fungal diversity. In addition theedibility status of the collected species was also evaluated. They play a significant role in the ecosystem of the forest. Their edibility, poisonous nature, mycorrhizal and parasitic association is important and interesting areas of research. In addition to being a source of nutrients and medications, mushrooms play a crucial role in the biodegradation and recycling of materials (Yousuf *et al*. 2022). Mushrooms are of incident lineage, omnipresent, remarkable and diverse in their form in their interaction with other living organisms. The presence of mushrooms on well-known substrates including wood, trash, and soil suggests that they play a part in these microhabitats. According to an estimate by Boa (2004) there are 1069 wild mushrooms which are utilized as food by various ethnic communities but a recent estimate by Li *et al.* (2021) states that there are about 2189 wild edible species of mushroom globally out of which 283 have been reported from India.

The state of Jammu and Kashmir represents a rich repository of macro-fungal resources and has been explored by various workers (Wani*et al*., 2010; Pala *et al*., 2014; Malik *et al.,* 2023; Wani*et al*.2023).People from ethnic tribal communities are said to be closely connected and quite knowledgeable about the riches of the forest mycoflora (Das *et al*.2014).These results are in accordance with the previous studies conducted by various researchers in different parts of India and Jammu and Kashmir region (Wani*et al*. 2010; Pala *et al*. 2014; Wani*et al.*2023).There is an urgent need to investigate and conserve this diversity of mushrooms for potential application as in nutritional benefits for the future growing population, also it was also noted that different wild mushroom species were utilized in the investigated area to treat various disease but are currently losing their relevance.Exploring and cataloguing the abundance of mushrooms in valley requires immediate attention, as is educating the general public about the value of mushrooms and their exploitation using sound scientific principles.The richness and diversity of macrofungi in Jammu and Kashmir can be attributed to significant variations in environmental conditions. The valley provides an optimal environment for the development of mushrooms, reaching its peak during specific months characterized by humid weather, wet soil, and abundant substrate. Mushrooms beyond being crucial sources of nutrition and medication, play a vital role in biodegradation and the recycling of materials.Furthermore, the study assessed the local population's perception of edibility. This discovery underscores the true diversity of the macrofungal flora in the Kashmir valley.

CONCLUSION

We extensively studied the diversity of wild mushrooms in Bangus valley of Kashmir and

collecting wild mushroom samples for two years. Successful mushroom harvesting in relies on deep local environmental knowledge. Local collectors, particularly men, have rich experience of mushroom habitats, fruiting times, and species identification passed down through generations. Our study contributes to preserving the diversity wild mushrooms, especially ectomycorrhizal fungi, in markets and natural areas. This aids accurate species recognition. While local preferences for a wider range of mushroom species may ease pressure on traditional choices, managing high-yield and using ectomycorrhizal fungi germplasm resources will support sustainable local utilization. This study represents the first endeavor to document the macrofungi in the UT of Jammu and Kashmir, signifying a groundbreaking exploration in this domain. A comprehensive collection and description of 20mushroom species were carried across varied study sites. Acknowledging the nutritional and medicinal importance of these mushrooms, there is an urgent call to explore and document the abundant mushroom diversity in Kashmir valley. Additionally, it is imperative to raise community awareness regarding the significance of mushrooms and advocate for their extraction grounded in scientific principles.

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DECLARATION

Conflict of Interest. The authors declare that there is no conflict of interest.

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