

MUSHROOM FLORA OF DISTRICT KUPWARA (JAMMU AND KASHMIR)

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ABSTRACT

During the present study, 40 species of mushrooms were collected from the district Kupwara in Jammu and Kashmir. All the species were reported for the first time from the study area. Of these, 8 species are discussed in this paper.

Key words: *Agaricus bispora*, fungi, Himalaya, habitat, stipe, pileus, mushrooms.

INTRODUCTION

The term "Mushroom" describes a wide variety of gilled fungi, with or without stem and is used even more generally to describe both the fleshy fruiting bodies of some Ascomycota and the woody or leathery fruiting bodies of some Basidiomycota. The standard for the name "mushroom" is the *Agaricus bisporus*, hence the word mushroom is most often applied to those fungi that have a stem (Stipe) a cap (Pileus) and gills (Lamellae) or pores on the underside of the cap typically. They are produced above ground on soil or on its food source. There is a vast diversity of mushrooms and about 14,000 species have been described. The structure that we call a mushroom is in reality only the fruiting body of the fungus called the mycelium and comprises of a system of branching threads and cord like strains that branch out through soil, compost, wood, log or other lignocelluloses material on which the fungus may grow. After a period of growth and under favorable conditions the established mycelium produces the fruiting

structure which is called mushroom.

Mushroom grows wild in almost all types of soils, on decaying organic matter, wooden stumps, etc. Singer (1989) had reported 1320 species belonging to 129 genera under Agaricales. Mushroom showed varied diversity in different parts of the world. They alone are represented by about 14,000 species, of which approximately 850 species are recorded from India (Deshmukh, 2004). An extensive survey of the Himalayan region was compiled by Lakhanpal (1997). Atri *et al.* (2000) has done taxonomic studies on agarics from Punjab plains. Pradeep *et al.* (1998) worked on the diversity of mushrooms from Western Ghats. Dar *et al.* (2009) worked on the biodiversity of macro fungi from conifer dominated forest of Kashmir. Hardly 254 macro fungal species have been reported from the Jammu and Kashmir State (Gardezi and Najma, 2005; Beig *et al.*, 2008; Dar *et al.*, 2009). However due to farflungness, steepness of mountains and dense forest areas, all districts of Kashmir have not been explored extensively.

Therefore a study entitled studies of mushroom flora of Kupwara district was initiated during 2010-2011 to explore and identify the mushroom flora of district Kupwara.

MATERIAL AND METHODS

Kupwara district is situated at an altitude of 5,300 feet above sea level and is the northern most district of the Kashmir Valley. It shares a long border with Pakistan occupied Kashmir in its north and western side and is totally enclosed by the Baramulla district on the other side. Minimum and maximum temperatures are recorded as 4 and 30°C respectively. The edaphic, physiographic and the enormous variation in agro climatic condition harbor rich and diverse macro fungi. Being the disturbed area and due to difficult passes and paths the area has never been surveyed regarding the mushrooms in view. Forest and plain areas viz. Handwara, Trehgam, Vilgam, Kralpora, Tarathpora, Panzgam, Lalpora, Khumryal, Bumhama, Takipora, Mawar, Kulrosa, Nowgam Padamhill, Sadnagali, Lolab were surveyed for the collection of the mushrooms from 5th February to ending June 2011. Standard methods were followed for collection preservation and simultaneously macro and microscopic features of the mushrooms were studied.

The identification of mushrooms was done by using various authentic keys (Arora,1986; Hawksworth, 1974).The identification of the macro fungi was also made by using authentic publications (Corner, 1972; Pegler, 1977; Arora, 1986).Photographs of the specimen were taken in their natural habitat using digital camera with a

power of 12 megapixels. The specimens were maintained in the formalin solution (Rectified alcohol+ formalin+ distilled water, 25:5:70) in the mycology and pathology laboratory of the PG Department of Botany, University of Kashmir in cylindrical jars and were properly labeled.

RESULTS

During the survey a large number of mushrooms were collected but only 14 species belonging to 11 genera and 9 families were identified. These are individually described below.

1. *Boletus edulu Bull*

Common name Penny bun, porcino or cep

Location: Nowgam Padamhill

Specimen examined: On the dead and decayed material of the trees

Season: Late spring

Date of collection: 22-05-2011

Family: *Boletaceae*

Description:(Fig. 1)

Habitat: It grows in deciduous and coniferous forests and tree plantations, forming symbiotic ectomycorrhizal associations with living trees by enveloping the tree's underground roots with sheaths of fungal tissue.

Pileus: The fruiting body has a large brown cap which on occasion can reach 35 cm in diameter and 1 kg in weight. The pore surface of the fungus fruit body is whitish when young, but ages to a greenish-yellow.

Stipe: The stipe is stout, white or yellowish in colour, up to 22 cm tall and 10 cm thick and partially covered with a raised network pattern, or

reticulations.

Spore: The spores are elliptical to spindle shaped, yellow-brownish in colour. The spore print is olive-brown. The size of the spore measures 12-15×5-7µm.

Edibility: It is an edible mushroom.



Fig. 1. Field photographs of *Boletus edulu*

2. *Coprinus atramentarius* (Bull.) Redhead, Vilgalys & Moncalvo

Common name: Tippler's bane or Ink cap.

Location: Takipora

Specimen examined: Found on the wet soil on the bank of a lake.

Season: Mid spring

Date of collection: 05-04-2011

Family: *Psathyrellaceae*

Description: (Fig. 2)

Habitat: It is a widespread and common fungus found throughout the study area. It grows in tufts and is commonly associated with wood and is found in grassland, meadows, disturbed ground

and open terrain. It grows in bunches during the rainy season (spring) in Kashmir commonly in disturbed habitats such as vacant lots and lawns, as well as grassy areas.

Pileus: It is grey-brown and initially bell-shaped before opening, after which, it flattens and disintegrates measuring 37 cm in diameter. The color is more brownish in the centre of the cap, which later flattens before melting. The very crowded gills are free; they are whitish at first but rapidly turn black and easily deliquesce.

Stipe: The stipe measures 613 cm high by 1.5-2 cm in diameter, is grey in color, and lacks a ring.

Spores: The spore print is dark brown, and the almond-shaped spores measure 711 by 56 µm. The flesh is thin and pale grey in colour.

Edibility: The species is edible in study area.



Fig. 2. Field photographs of *Coprinus atramentarius*

3. *Coprinus micaceus* (Bull. ex Fr.) Fr.

Common name: Mica Cap.

Location: Langate

Specimen examined: On the decayed material of animal waste

Season: Mid spring

Date of collection: 10-04-2011

Description: (Fig. 3)

Habitat: The species is very common and found in dense tufts around stumps or on bruised wood widely distributed throughout the study area.

Pileus: The pileus is 1.2 - 5cm high, ovoid expanding to bell-shaped, with a split or sometimes rolled-back margin that is lined and grooved almost to the center; tawny becoming cinnamon toward the center; covered with white powdery granules from the veil, especially when young, becoming smooth. Gills attached, close, moderately broad; white becoming dark brown then black.

Stipe: The stipe is 2.5-8.5cm long and 0.5-1cm wide, hollow, fragile; white, discoloring buff in lower part; smooth or slightly felty.

Spores: Spores are ellipsoid; smooth, with pore at tip, measuring 7-10 x 4.5-6 μ .

Edibility: It is less edible.



Fig. 3. Field photographs of *Coprinus micaceus*

Date of collection: 02-06-2011.

Description: (Fig. 4)

Habitat: Grows on live and dead coniferous or (less common) deciduous trees. The fruiting body is perennial with a new layer of pores produced each year on the bottom of the old pores.

Pileus: The Cap is crescent or fan shaped, hard and tough texture, 25-35 cm long and 10-20 cm wide. The surface is more or less smooth, at first orange-yellow with a white margin, later turns to brown and then frequently with orange margin. Pore surface pale yellow to leather-brown.

Stipe: The stipe is usually absent and if present very small in size.

Spores: The spores are cylindrical, smooth measuring 6-9 x 3.5-4.5 μ .

Edibility: The mushroom is inedible due to its woody texture.



Fig. 4. Field photographs of *Fomitopsis pinicola*

4. *Fomitopsis pinicola* (Sw.) P. Karst

Common name: Red Banded Polypore

Location: Kalarosa.

Specimen examined: On the stem of pine trees.

Season: Early summer.

5. *Lentinus squarrosulus* (Mont. 1842) Singer.

Common name:

Location: Khumryal.

Specimen examined: On the dead and decayed

leaves of pine trees.

Season: Early summer.

Date of collection: 07-06-2011.

Family: Polyporaceae

Description: (Fig. 5)

Habitat: It is usually found on dead leaves and bark of trees.

Pileus: The cap is white in the early stages and turns brown with maturity. It is elliptical-conical in shape, measuring 5.4cm in diameter.

Stipe: The stalk is 4-6cm long white to yellowish in color having 1-2cm in diameter.

Edibility: It is an edible mushroom in study area.



Fig. 5. Field photographs of *Lentinus squarrosulus*

6. *Morchella vulgaris* Dill.ex. Pers.

Common name: Morels

Location: Takipora.

Specimen examined: From short grasses (*Heteropogon contortum* and *Cynadon dactylon*) of Takipora forest

Season: Early spring

Date of collection: 10-03-2011

Family: Morchellaceae

Description: (Fig. 6)

Habitat: It grows in wastelands, on the ground and marshy places.

Cap: The cap is 3-4cm broad, brown and bell shaped. It is fleshy and granular. It possesses the fertile head with ridges obtuse and irregular, grey-brown.

Stipe: It is 5-12 cm in height, 1.5-2 cm in diameter and white in color.

Spores: The spores are white, creamish or yellowish in color measuring 16-18×9-11μ.

Edibility: It is edible in study area.



Fig. 6. Field photographs of *Morchella vulgaris*

7. *Psathyrella candolleana* (Fr.) Maire

Common name:

Location: Trehgam.

Specimen examined: On the decayed wood.

Season: Mid-spring.

Date of collection: 06-04-2011.

Family: Psathyrellaceae

Description: (Fig. 7)

Habitat: Cespitose growth around old hardwood stumps or buried wood, decayed leaves in the vicinity of rocks and in red soil.

Pileus: Cap 3- 6 cm in diameter, convex when young, usually expanding to broadly convex or flat, or with obtuse umbo; hygrophanous, at first light to dark honey-color, gradually becoming dingy purplish brown at least near margin, fading to whitish margin at first with hanging veil remnants; flesh thin, fragile. Gills are adnate, crowded, 2-3 tiers of subgills

Stipe: The stipe is 4-12 cm in height and almost 0.7cm in width in diameter, fragile, hollow, white; sometimes striate, lower part fibrillose-scaly to appressed fibrillose; veil usually disappearing from stem but sometimes forming a membranous annulus.

Spores: Spores are purplish brown, 7-9 x 4-5 um, elliptic, smooth;

basidia 4-spored apex broadly rounded to obtuse or knob-like, wall thin, smooth and colourless, content not distinctive; clamp connections present.

Edibility: It is an inedible study area.



Fig. 7. Field photographs of *Psathyrella candolleana*

8. *Trametes versicolor* (L.) Lloyd

Common name: Turkey Tail

Location: Madanpora

Specimen examined: Found on the dead and

decayed wood logs

Season: Mid-spring to Early summer.

Date of collection: 05-04-2011

Family: Polyporaceae

Description: (Fig. 8)

Habitat: *It is very common polypore mushroom* which is found throughout the Kashmir.

Pileus: The top surface of the cap shows typical concentric zones of different colors. The flesh is 25 mm thick with leathery texture. The pileus is found with rust-brown or darker brown, sometimes blackish zones and commonly grows in tiled layers. It is flat, up to 8-8.5 x 0.5-1.00 cm, often triangular or round, with zones of fine hairs.

Pores: The pores are round twisted and with whitish to light brown surface. The number of pores vary from 3-5 per mm.

Edibility: It is inedible in study area.



Fig. 8. Field photographs of *Trametes versicolor*

DISCUSSION

Mushrooms have been objects of much curiosity and speculation since time immortal. They are an important component of the forest ecosystem. Their edibility, poisonous nature, mycorrhizal and

parasitic associations with the forest trees make them economically important and interesting to study. Mushrooms are of ancient lineage, omnipresent, remarkably beautiful and diverse in their form, in their interaction with other living organisms. The occurrence of mushrooms on such familiar substrates as wood, litter and soil, implies a role for them in these microhabitats (Lakhanpal, 1996). Mushrooms tend to appear seasonally, the most productive months are those of rainy days (March-May), starting after the harsh winter passes in Kashmir. Mushrooms are cosmopolitan and are found almost everywhere such as pastures, forest areas. Many of the mushrooms are found in only one kind of habitat such as decayed logs, roadsides, gardens, deserts, etc. They actually emerge from substrates such as peat, humus, dung, sawdust, charcoal heaps (Sharma and Samota, 2006). The variability of physiological features has rendered greater chances for the natural availability of a large spectrum of species of mushrooms. Mushrooms as a class of heterotrophic organisms, depend on the growth substrates for all their requirements of carbon, water, nitrogen and minerals (Rajarithnam *et al.* 1997). Since forest is a good source of lignocellulosic wastes which is ultimately used by many fungi for their growth (Vyas *et al.* 2003). Jain and Vyas (2005) reported use of lignocellulosic waste of botanic garden for cultivation of mushroom.

The state of Jammu and Kashmir represents a rich repository of micro-fungal resources and has been explored by various workers (Beig *et al.*, 2008; Dar *et al.*, 2007, 2009). During a survey of micro-fungal flora of Poonch district situated on the western border of Jammu and Kashmir several

large fleshy fungi were collected and identified. Bodha (2010) worked on the mushroom flora of the South Kashmir and has reported more than 40 species from the area.

In the present study, all the 8 species collected for the first time from the study area have been reported earlier collected from other areas of Jammu and Kashmir by various workers (Gardezi and Najma, 2005; Dar *et al.*, 2007, 2009; Beigh *et al.*, 2008; Bodha, 2010).

CONCLUSION

From the present study, it is concluded that the region is rich in mushrooms. Further, most of these species are found to be edible with medicinal properties. Therefore, the present study may be useful for the local people of the area and for the future pharmaceutical uses.

REFERENCES

- Arora, D. 1986. *Mushroom Demystified. A comprehensive guide to fleshy fungi.* 2nd ed. Ten Speed Press, Berkeley, California. 936 pp
- Atri, N.S., Kaur, A., and Saini, S.S. 2000. Taxonomic Studies on *Agaricus* from Punjab Plains. *Indian J. Mush.* **18**: 6-14.
- Beig, M.A., Dar, G.H., Ganai, N.A., and Qazi, N.A. 2008. Some hitherto unreported macrofungi from India. *J. Mycol. Pl. Path.* **38**: 208-211.
- Bodha, R.A. 2010. *Mushroom Flora of Southern Kashmir.* Ph.D. Thesis, P.G. Department of Botany, University of Kashmir, Srinagar.
- Corner, E.J.H. 1972. *Boletus in Malaysia.* Govt. Printing Office, Singapore. 253 pp.
- Dar, G.H., Beigh, M.A., and Ganai N.A. 2009. Diversity of ectomycorrhizal fungi of various forests in district Baramulla (Jammu and Kashmir). *Ind. J. Forest.* **32**: 137-140.

- Dar, G.H., Beigh, M.A., and Ganai, N.A. 2007. Effect of source and inoculum load of ectomycorrhizae on the growth and biomass of containerized Kile pine (*Pinus wallichiana*) seedlings. *App. Biol. Res.* **9**:19-28.
- Deshmukh, S. K. 2004. *Biodiversity of tropical basidiomycetes as sources of novel Secondary metabolites*. p. 121-140. In: *Microbiology and Biotechnology for Sustainable Development* (Ed. Jain., PC), CBS Publishers and Distributors, New Delhi..
- Gardezi, S.R.A. and Najma, A. 2005. Mushrooms of Azad Jammu and Kashmir, their collection, identification and descriptions. *Arch. Phytop. Pl. Prot.* **38**:53-68.
- Hawksworth, D.L. 1974. *Mycologist Handbook. An Introduction to the Principles of Taxonomy and Nomenclature in Fungi and Lichen*. CMI, Kew, Surrey, England.
- Jain, A.K. and Vyas, D. 2005. Supplementation of Soybean choker: Enhances the Growth the growth and yield of *P. sajorcaju* grown in lignocellulosic Waste. *J. Basic App. Mycol.* **3 & 4**:88-90.
- Lakhanpal, T.N. 1996. *Mushrooms of India Boletaceae-Vol-I. Studies in Cryptogamic Botany* (ed. Mukherjii KG). APH Publishing Corporation, Delhi.
- Lakhanpal, T.N. 1997. *Diversity of mushroom mycoflora in the North West Himalaya*. p. 35-68. In: *Recent Researches in Ecology, Environment and Pollution* (Eds. Sati SC. Saxena, J. and Dubey, RC). Today and Tomorrow's Printers and Publishers, New Delhi..
- Pegler, D.N. 1977. *A preliminary agaric flora of east Africa. Kew Bulletin Additional Series VI*. Her Majesty's Stationary Office, London. 615 pp.
- Pradeep, C.K. Virinda, K.B. Mathew, S. and Abraham, T.K. 1998. The genus *Volvariella* in Kerala State. *India. Mush. Res.* **7**:53-62.
- Rajarithnam, S., Shashirekha, M.M., Bano, Z and Ghosh, P.K. 1997. Renewable lignocellulosic wastes - the growth substrates, for mushroom production: national strategies. p. 291-304. In: Rai, R.D. Dhar, B.L. Verma, R.N. (Eds). *Advances in Mushroom Biology and Production*, MSI, Solan,
- Sharman, S.S. and Samota, R.K. 2006. Tapping into India's Mushroom biodiversity; Identification, Conservation and Domestication of wild Mushroom flora. p. 69-84. In: *Compendium of lectures Emerging Areas in Mushroom diversity, Production and Post harvest development*. Organised by Mushroom Research laboratory, Department of Plant Pathology. Indira Gandhi Agriculture University, Raipur.
- Singer, R. 1989. *The Agaricales in Modern Taxonomy*. J Cramer, Weinheim, 4th ed. 912 p
- Vyas, A., Vyas, D. and Vyas, K.M. 2003. Screening of extra cellular producing Fungi from different lignocelluloses waste. *J. Basic App. Mycol.* **2**:41-43.