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# Diversity of mushrooms in Patharia forest of Sagar region-II

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**ABSTRACT**

Patharia forest is a dry deciduous forest. It has a undulating topography with low rising hills scattered all round. The average monthly minimum and maximum temperatures are 11.1°C and 25°C in January and 40°C and 44°C in June. Forest is dominated by *Tectona grandis,, Butea monosprma, Accacia sp. etc*., and ground flora consist of *Lantana camara, Parthenium hysterophorus, Euphorbia geniculata, Heteropogon contortum, Cyanadon dactylon, Biophytum sensitivum, Cassia tora etc.* Occurrence of various shapes, sizes, colours of mushrooms in the forest suggest that climatic conditions together with forest waste provides conducive environment to these mushrooms. Present studies deals with the diversity of mushrooms in Patharia forest. After survey of Patharia forest which has been done during the period of July 2012-July 2013, there are number of wild mushrooms were collected but only 18 mushroom species which belong to 12 families are identified viz. *Tyromyces caesius, Coprinus saccharinus, Clavaridelphus sp., Tremets elegans, Schizophyllum commune, Macrolepiota procera, Geastrum triplx Polyporous sp.,Lepiota caerulescens, Pycnoporus cinnabarinus,Macolepiota sp., Tricoloma* sp., *Pleuteus sp Ganoderma sp., Pluteus flavofuligineus, Fomoptopsis pinicola Stereum hirsutum,Coltricia sp.*



## Introduction

India being the top ten megadiversity has ample species of wild mushrooms which occur during rainy season. Many species are traditionally consumed since the ages and mistaken identity is a problem in many areas which cause causalities. These come up especially during monsoon season from the branching mycelia infiltrating the soil or leaf litter or on wood of living or dead trees. Their diversity in shape, texture, colour, smell, taste, ecological preferences etc. lead to their complexity in the identification of specimen as such (Sharma and Samota, 2006).

Patharia forest is situated on Vindhyan ranges near the Tropic of Cancer at Sagar (Madhya Pradesh, India) between the latitude 24°27' N and longitude 78°4' E, undulating topography with low rising hills with an altitude of 620.26 m above msl. The average annual rainfall of Sagar is 1200 mm, min. and max. temp. are recorded as 11 and 25°C in Jan, 25.8 and 40.5° C in May. The edaphic, the physiographic and the biotic factors combine to create a dynamic system of habitat (Mishra and Joshi, 1952) and remains water logged throughout the rainy season. Forest wealth and conducive environmental condition provides abundant substrates for the occurrence of mushrooms of the various shapes, sizes and colors, in the region.

Mushrooms, a special group of macrofungi, are rather more selective than other fungi in that the size of the fruiting body requires the availability of more nutrients than are required for the production of asexual spores by microfungi. Nevertheless, in damp places, such as tree-fern gullies and areas of rain forest, plentiful moisture leads to mushroom formation and mushrooms can be collected during most of the year. There may be a particular flora of mushroom species associated with the seasons of autumn, summer, and spring. Relatively few mushrooms are produced during the cold winter months, although there are perennial fruiting bodies that persist during the winter. But in drier regions mushrooms occur only after seasonal rains. Formation of mushroom fruiting bodies depends very much on the pattern of rain and, in some years, there may be virtually a complete lack of fruiting (Chang, 2008).

Since mushrooms lack chlorophyll they can not, like green plants, get their energy from the sun through photosynthesis. Instead, during their vegetative growth stage, mushroom mycelia secrete enzymes that break down compounds such as cellulose and lignin present in the substrate. The degraded compounds are then absorbed by the hyphae and the mycelium enlarges-usually laterally, and in some cases growing several meters in diameter with the substrate. Partially understood environmental factors (temperature and light are known to be critical) stimulate the second or reproductive growth stage. Cells of one mycelial strain fuse with cells of the opposite type to form a mycelium that contains both types of nuclei. The new mycelium continues to grow and eventually develops into a mature fruiting body, the gills of which are lined with spore bearing cells called basidia. Various mechanisms trigger the dispersal of spores, which in turn lodge in a substrate, become hyphae and begin the cycle anew (APCAEM, 2007).

## Material and method

Patharia forest is a dry deciduous forest dominated by *Tectona grandis, Butea monosperma, Accasia sp*. Ground flora is consist of *Lantana camara, Parthenium hysterophorus, Euphorbia geniculata, Heteropogon contortum, Cyanadon dactylon, Biophytum sansitivum, Cassia tora* . During several visits from July 2012 to July 2013, we collected many species of mushrooms. For collecting the mushrooms various equipments such as hunting knife, plough, sessior, digging tools and wax paper pockets for wrapping the collected mushrooms were used. Collection sites other than Patharia forest are Botanical garden, residential area in Sagar. Collected specimens were then

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preserved in a liquid preservative (25:5:70 ml Rectified alcohol + formalin + distilled water, Hawksworth *et al*., 1995). Parts of the collected material were dried in a hot air oven. For identification of mushrooms various authentic keys (Arora 1986; Singer 1986; Howksworth 1974; Jorden 2000; Pegler and Spooner1997; Kuo 2003) were used. All the identified and un-identified specimens were deposited in Museum, Department of Botany of Dr. H. S. Gour University, Sagar Madhya Pradesh. Length and width dimension of each mushroom collected were measured and photographs were taken.

**Result**: During the survey number of mushrooms were collected and identified. At present we could able to identified 18 genera belonging to 12 families. These are individually described.

***Tyromyces caesius* (family: Polyporaceae)**

**Common name:** Blue cheese polypore

**Description:** It is a small, white bracket fungus. Cap 1-4 cm in diameter, semicircular with a broad lateral attachment, white but bruishing bluish grey, not zoned. Tubes0.5-0.8 cm. long, pores 4-5 per 0.1 cm., soon bruishing buish grey. Spore deposit white.

**Specimen examined:** On dead stem of *Delonix regia* of Patharia forest, Sagar, M.P., India, 24° 27' N, 79°21'E and 620.26m.

**Edibility:** Inedible

***Coprinus saccharinus*: (family: Coprinaceae)**

**Common name:** Ink cap

**Description:** The cap is 2-4cm. across, brown and bell shaped with a few tiny scales at the centre and finally grooved towards the margin. Stem is 5-10 cm., cylindrical, hollow, white. Gills free, from brown to a dark inky mass. The spore print is brown.

**Specimen examined:** On the cow dung near Patharia forest, Sagar, M.P., India, 24° 27' N, 79° 21'E and 620.26m.

**Edibility:** Inedible

***Clavaridelphus sp.* (family: Clavaridelphaceae)**

**Common name:** Club fungi

**Description:** Fruit body 10-20 cm. tall and up to 6 cm. in diameter, swollen club shaped with a rounded apex and tapering below into a slender stem, light brown in color. Spore deposit white.

**Specimen examined:** On the base of stem of *Delbergia sissoo* of Patharia forest, Sagar, M.P., India, 24° 27' N, 79°21'E and 620.26m.

**Edibility:** Edible after cooking

***Tremetes elegance*: (family: Polyporaceae)**

**Common name:**

**Description:** Cap up to 35 cm across and 3 cm thick; semicircular, irregularly bracket-shaped, or kidney-shaped; flattened-convex, smoother toward the thin margin; often with concentric zones of texture; whitish to buff; sometimes becoming darker with age, especially near the point of attachment or along the margin. pore surface whitish; variable, ranging from poroid with round to angular pores (1-2 per mm), to maze-like, with slots up to 2 mm wide, to gill-like (often with all three of these conditions present); tubes or gills up to 6 mm deep; not bruising or bruising yellowish in some collections. Stem usually absent, but occasionally present as a stubby lateral structure.

**Specimen examined:** From the stem of *Mimmopsis elangii* of Patharia forest, Sagar, M.P., India, 24° 27' N, 79°21'E and 620.26m.

**Edibility:** Inedible

***Schizophyllum commune*: (family: Schizophyllaceae)**

**Common name:** Split gill

**Description:** Cap 1-4 cm. in diameter, shell shaped and laterally attached, pale grey or pure white, densely hairy scaly. Gill radiating from a lateral attachment point, appearing to split length wise along their edges in dry weather and the sides curling upwards, narrow, grey, stem none. Spore deposit white.

**Specimen examined:** From the stem of *Acacia nilotica* of Patharia forest, Sagar, M.P., India, 24° 27' N, 79°21'E and 620.26m

**Edibility:** Inedible

***Macrolepiota procera*: (family: Agaricaceae)**

**Common name:** Parasol mushroom

**Description:** Cap: 7-20 cm, oval when young, becoming convex to broadly convex in age, with a dark central bump; dry; at first smooth and yellowish, soon becoming scaly, the scales brown, the surface below whitish and later yellowish, Stem: 10-215 cm long; .5-1.5 cm thick; long and slender, with an enlarged base, pale above the ring, below the ring with small brown scales that break up as the mushroom matures.

**Specimen examined:** Among the short grasses of Patharia forest of Sagar**,** M.P., India 24° 27' N, 79° 21'E and 620.26m.

**Edibility:** Edible

***Geastrum triplx:* (family: Geastraceae)**

**Common name:** Collared earthstar

**Description:** Fruit body up to 6-8 cm in diameter, in the young, spore sac 2-4 cm. in diameter, globose, grayish brown, containing a powdery mass, with an apical pore and surrounded by a thick, fleshy collar. Rays 5-6, thick and fleshy, curved downwards, creamy brown, often cracked on the upper surface, grayish on the underside. Spore deposit dark brown

**Specimen examined:** Among leaf litter of Patharia forest of Sagar**,** M.P., India 24° 27' N, 79° 21'E and 620.26m.

**Edibility:** Inedible.

***Polyporous* sp. (family: Polyporaceae)**

**Common name:** Bracket fungi

**Description:** Cap 4-8 cm. in diameter, fan shaped, pale orange brown, wrinkled, with a wavy margin. Tubes decurrent, 0.3 cm. long, pores per 0.1 cm..Stem 0.5-1.5 cm., laterally attached. Spore deposit white.

**Specimen examined:** On the dead stem of botanical garden, Dr. H.S. Gour, University, Sagar, M.P. ., India 24° 27' N, 79° 21'E and 620.26m.

**Edibility:** Inedible.

***Lepiota caerulescens:* (family: Agaricaceae)**

**Common name:** Parasol mushroom

**Description:** Cap: 1-2 cm; convex, broadly convex, with a central bump; dry; smooth and brown to reddish brown over the center; elsewhere finely radially scaly with brown to reddish brown scales and fibers over a whitish ground color; the margin lined; bruising pinkish, then blue. Gills Free from the stem; white; close; bruising pinkish, then blue. Stem: 3-5 cm long; up to 2 mm thick; more or less equal, with or without a small basal bulb; smooth; whitish, bruising pinkish to reddish on handling, then turning blue; with a persistent but fragile ring.

**Specimen examined:** Among dead organic matter of Patharia forest Sagar, M.P., India 24° 27' N, 79° 21'E and 620.26m..

**Edibility:** Poisonous

***Pycnoporus cinnabarinus* (family: Polyporaceae)**

**Common name:** Cinnabar-red polypore

**Description:** Cap 2-13 cm. in diameter, semicircular to kidney-shaped with a broad lateral attachment, orange red discoloring paler when old, upper surface finely hairy to suede like, becoming roughened or nearly smooth (often pocked in age),

bright reddish orange to dull orangish with age; undersurface bright reddish orange, with 2-4 round to angular (or sometimes slot-like) pores 2-3 per 1/16 in/ 0.1cm, occasionally extending onto the substrate below the cap; tubes to 5 mm deep; stem absent; flesh tough, reddish to pale orange.

**Specimen examined:** On the stem of *Mimmopsis elengii* of Patharia forest, Sagar, M.P., India 24° 27' N, 79° 21'E and 620.26m.

**Edibility:** Inedible

***Macrolepiota sp.* (family: Agaricaceae)**

**Common name:** Parasol mushroom

**Description:** Cap: 7-25 cm, oval when young, becoming convex to broadly convex in age, with a dark central bump; dry; at first smooth and brownish, soon becoming scaly, the scales brown, the surface below whitish and later grayish or brownish, Stem: 14-20 cm long; .5-1.5 cm thick; long and slender, with an enlarged base, pale above the ring, below the ring with small brown scales that break up as the mushroom matures.

**Specimen examined:** On the dead debris of Patharia forest of Sagar**,** M.P., India 24° 27' N, 79° 21'E and 620.26m.

**Edibility:** Edible

***Tricholoma sp*. (family: Tricholomataceae)**

**Description:** Cap 5-10 cm. in diameter, convex or with a swollen centre, smooth, white. Stem 1-1.5 cm. long, cylindrical, smooth, white. Spore deposit white.

**Specimen examined:** Among the short grasses of Patharia forest of Sagar**,** M.P., India 24° 27' N, 79° 21'E and 620.26m.

**Edibility:** Inedible.

***Pluteus sp. :* (family: Pluteaceae)**

**Description:** Cap 2-6 cm. in diameter, conical then expended with a raised centre, scarlet with a orange margin, smooth in the centre. Gills free, whitish, crowded. Stem 2-4 cm. long, cylindrical, dark brown. Spore deposit brown

**Specimen examined:** On the stem of *Acacia* sp. of Patharia forest of Sagar**,** M.P., India 24° 27' N, 79° 21'E and 620.26m.

**Edibility:** Edible

***Ganoderma sp.:* (family: Ganodermataceae)**

**Description:** Cap 5-30 cm. in diameter, kidney shaped and semi-circular, attached to a lateral stem, Yellowish, white to yellowish brown margin. Tubes up to 2cm.long, brown, pores 0.1cm,whitish. Stem 5-15×1-3 cm, cylindrical or flattened, smooth. Flesh pale yellow, Spore deposit white.

**Specimen examined:** From the stem of *Delbergia sissoo* of Patharia forest of Sagar**,** M.P., India 24° 27' N, 79° 21'E and 620.26m.

**Edibility:** Inedible.

***Pluteus flavofuligineus:* (family: Pluteaceae)**

**Description:** Cap: 2-8 cm; convex or bell-shaped becoming broadly convex to flat; finely velvety, especially over the center; golden to dull or brownish yellow, with a brownish center. Gills Free from the stem; close or crowded; whitish at first, becoming pink. Stem: 5-12 cm long; up to 1.5 cm thick; equal; smooth or silky-streaked; variable in color, from white to yellowish or pinkish. Flesh thin, pale.

**Specimen examined:** On dead organic matter of Patharia forest, Sagar,M.P., India 24° 27' N, 79° 21'E and 620.26m..

**Edibility:** Edible but poor

***Fomoptopsis pinicola:* (family: Fomitopsidaceae)**

**Common name:** Red rimmed bracket

**Description:** Cap 5-25 cm. in diameter, very thick, hoof shaped and layered with a thin brittle, resinous crust, at first shiny and yellow or reddish orange, finally black and dull, with a rounded whitish margin. Tubes layered, each layer about 1 cm. long; pores 3-4 per 0.1 cm., whitish, bruising grey. Flesh up to 4 cm. thick. Spore deposit white.

**Specimen examined:** From the stem of *Delonix regia* of Patharia forest of Sagar**,** M.P., India 24° 27' N, 79° 21'E and 620.26m.

**Edibility:** Inedible

***Stereum hirsutum*: (family: Stereaceae)**

**Common name:** Yellow stereum

**Description:** Cap 2-6 cm. in diameter, bracket like with the broad basal attachment region spreading over the substrate, upper surface yellowish orange to grayish white, with conspicuous concentric zoning, and a thin wavy margin. Lower surface smooth, yellowish to brownish orange. Flesh 0.1-0.2 cm. thick, spore deposit white.

**Specimen examined:** On dead trunk of Patharia forest of Sagar**,** M.P., India 24° 27' N, 79° 21'E and 620.26m.

**Edibility:** Inedible.

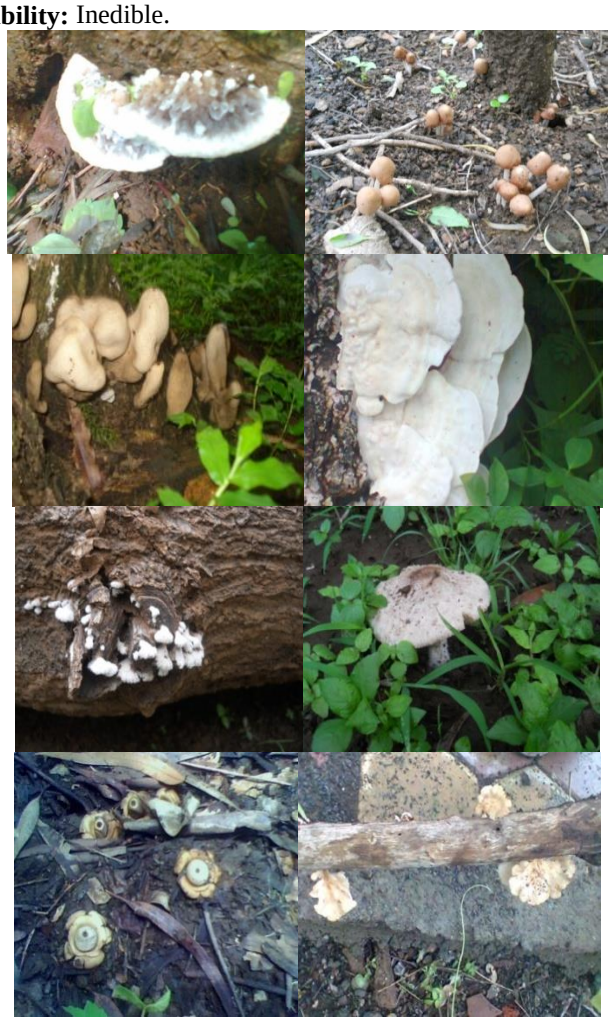
***Coltricia sp*.(family: Hymenochataceae)**

**Common name:** Funnel Polypore

**Description:** Cap size 2-10 cm in diameter, circular with a depressed centre to almost funnel shaped, golden brown to cinnamon brown, finally velvety, with numerous concentric zones, and a thin, straight margin, Tubes decurrent, reddish brown; pores small angular, rusty brown. Stem 2-6cm., cylindrical, similarly colored to the cap, solid.

**Specimen examined:** Among short grasses of Patharia forest of Sagar**,** M.P., India 24° 27' N, 79° 21'E and 620.26m.

**Edibility:** Inedible.



***Tyromyces caesius, Coprinus saccharinus*, *Clavaridelphus sp., Tremets elegans*, *Schizophyllum commune*, *Macrolepiota procera, Geastrum triplx*, *Polyporous* sp., *Lepiota caerulescens, Pycnoporus cinnabarinus***

***Macrolepiota sp., Tricholoma sp., Pleuteus* sp., *Ganoderma* sp. *Pluteus flavofuligineus, Fomoptopsis pinicola, Stereum hirsutum, Coltricia sp.***

**Discussion**-: Mushrooms are phenomenon of the nature that is hard to overlook. They are an important component of the forest ecosystem. Their edibility, poisonous nature, psychotropic properties, mycorrhizal and parasitic association with the forest trees make them economically important and interesting to study (Lakhanpal, 1996; Dehariya, 2011).

Mushrooms, indeed are beautiful beauty derives not merely from elegance and variety of form and colour, but structure and architecture superbly linked to function and life style. They are of ancient lineage, omnipresent, as decomposers, symbionts, and root infecting pathogens, remarkably beautiful and diverse in their form, in their interaction with other biota. The occurrence of mushrooms on such familiar substrates as wood, litter and soil, implies a role for them in these microhabitats. Forest litter and forest soils are often literally permeated by fungal threads (mycelium). These fungi may obtain food directly from the substrate which then serves as a food base for the mycelium of the fungus spreading radially there from. They have enzyme system required to break down substrates, especially lignin, hemicellulose and cellulose which are the main components of litter and of wood in the forest floor. Thus they are a unique component of biota. Their diversity is a reflection of their lineage and their evolution. Their enumeration, taxonomy, distribution, biology, chemistry, cultivation and conservation are of great relevance and will remain of perennial interest and fascinating for us (Subramanian, 1995).

Mushrooms grow wild in almost all types of soils, on decaying organic matter, wooden stumps, etc. They appear in all seasons, however rains favor rapid growth when organic matter or its decomposition products are easily available (Manoharachary *et al* 2005; Chaubey *et al* 2010). Singer (1989) had reported 1320 species belonging to 129 genera under Agaricales. Mushrooms alone are represented by about 41,000 species, of which approximately 850 species are recorded from India (Deshmukh, 2004). Besides extensive surveys of the Himalayan region are compiled by Lakhanpal (1997). Upadhyay *et al.* (2008) reported some new records and taxonomy of Agaricales from North-Western Himalaya. Atri *et al* (2000) has done taxonomic studies on Agarics from Punjab plains. Pradeep *et al* (1998) were worked on the diversity of mushrooms from Western Ghats. Doshi and Sharma (1997) were recorded wild mushrooms of Rajasthan. Dehariya *et al* (2010) recorded 18 genera of wild mushrooms from Sagar region. Thakur *et al* (2011) reported biodiversity of mushrooms in Chhatisgarh region. Pushpa and Purushothama (2012) reported biodiversity of mushrooms in Karrnataka. At present we have recorded 18 more sp. of mushrooms from Patharia forest of Sagar, M.P. Some of them are edible (*Pluteus flavofuligineus*), some are have medicinally importance (*Polyporous* sp., *Ganoderma* sp.),some are poisonous(*Lepiota caerulescens*)and some are ecologically important. We observe that there is a great variation in species in tropical, sub-tropical and temperate regions. Thus we identify some sp. up to genus level.

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