

## RESEARCH ARTICLE

### BIODIVERSITY OF MACROFUNGI FROM GORAKHPUR DISTRICT, (U.P.), INDIA

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#### ABSTRACT

Macrofungi plays an important role in maintaining the biogeochemical cycle in nature and helps in recycling of matter. They can be use as food as well as in traditional medicine and thus they are considered one of the best forest products. In the present study survey of Gorkhpur district was done for collection and identification of macrofungi. Fruiting bodies of macrofungi were collected from different localities of Gorakhpur district between the years 2011-2014. In present study 24 species of macrofungi belonging to 14 genera of 7 families were identified. The most dominant family was Agaricaceae represented by 10 species. The present study confirms that this area is rich reservoir of macrofungi which can be use as food and medicine.

**KEYWORDS:** Macrofungi, diversity, Gorakhpur, wild, season, taxonomy.

#### Introduction

Mushrooms have been fascinating man due to their unusual characters like sudden appearance in isolated places in groups, rings and in different geometrical shapes since the time immemorial. Mushrooms have been existing on earth prior to humans and have been used as food by man since the hunting and gathering period of human history. Mushrooms belong to the kingdom fungi, which constitutes the most diverse group of organisms after insects on this biosphere (Pala *et al.*, 2011, 2012). Mushrooms are cosmopolitan, heterotrophic organisms that are quite specific in their nutritional and ecological requirements. The importance of macrofungi has been well established since ancient times. Many Asian countries use traditionally wild edible mushrooms as delicious and nutritional food and medicine. Wild edible macrofungi are appreciated not only for texture and flavor but also for their chemical and nutritional characteristics (Tapwal *et al.*, 2013).

Mushrooms comprise largely the group of fleshy fungi, which include bracket fungi, fairy clubs, toadstools, puffballs, stinkhorns,

earthstars, bird's nest fungi and jelly fungi (Karwa & Rai, 2010). Many of them are edible, famous for their palatability and delicacies fetching high market prices. Mushrooms have been extensively studied in Western countries, while India in this respect is relatively less explored.

Gorakhpur is situated in North Eastern part of state of Uttar Pradesh in India near the border with Nepal. It has area of 3483.8 square kilometres with latitude of 26° 13' N and 27° 29' N and longitude of 83°05'E and 83°56' E. Average annual temperature of Gorakhpur is 26° C and summer temperature varies from 30°-40° C and winter temperature 2°-18°C. Annual rainfall is 1393.1 mm and 87% of rainfall is recorded during period of June to September. Soil is simple ordinary river borne alluvial which is not old. Mineral products few and consist of kankar, brick and saltpeter. Extensive and periodical survey of important parts of Gorakhpur district were undertaken during the year 2011-2014. This paper deals with the study of 24 macrofungi collected from different localities of Gorakhpur district.

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## Materials and methods

Macrofungi were collected from different localities of Gorakhpur during the year 2011-2014. Regular field trips were carried out in different places of Gorakhpur villages and forests, usually 4-5 times per months. Samples were photographed in field in its natural habitat by using digital camera (Panasonic, DMC-F2). The main criteria used for macrofungi identification were the structure of fruiting body and the mode of its growth, for example whether it is growing as symbiotic, parasitic or saprobic. Fresh samples are more easily identified than its dried forms. The important things which are taken into consideration during identification of macrofungi are: size, shape and color of pileus and stipe, gill structure and its attachment mode, spore print and the most important is the spore structure and color. Habit and habitat of specimens were also noted down.

Character of pileus and stipe such as shape, size, surface texture, in some cases behavior of the cuticle when peeled, presence or absence of the remnants of the veil, flesh type, in some cases microscopic details of the cells in the cuticle, change in color after bruising in case of pileus while additional information about the presence or absence of ring, base rooting mode are noted in case of stipe. Mode of gill attachment with stem indicates the genus of the sample hence it become very important to note it down. Color of gill, its shape, type of attachment with stem was also being noted. The microscopic details of spores viz., color, surface, texture, shape and size are also very important points which helps in proper identification of macrofungi. The samples were preserved in formaline solution for herbarium purpose. Dry preservation of macrofungi were done by hot air oven at 40-50°C and stored in air tight zip lock polyethylene bags with naphthalene balls for further microscopic studies. The spore prints were taken according to the guideline given by Kuo (2001) then the spore morphology such as shape and size were recorded and photographed with the aid of stereo-binocular (Nikon-Ci-digital) camera attached microscope. Reagents used for preparation of spore slides were 3% KOH, cotton blue, lactophenol and Melzer's reagent. The specimens were deposited at the herbarium of Botany department, DDU Gorakhpur University. Various literatures including monographs, reviews, books and recently published research papers were used for proper identification and confirmed by mycokeys ([www.mushroomexpert.com](http://www.mushroomexpert.com) and [www.mycokokeys.com](http://www.mycokokeys.com)).

## Results

During the survey done between the year 2011-2014 of Gorakhpur, 24 species of macrofungi belonging to 14 genera of 7 families were identified which includes edible and inedible forms. Many macrofungi collected from this region show good medicinal value. The detailed descriptions of identified specimens are as follows:

### *Agaricus bernardii* Quél.

**Family:** Agaricaceae

Description: Pileus 5-8 cm dia., convex becoming plane at maturity, margin incurved when young, disk frequently depressed

at maturity, surface white, smooth, typically with cottony warts. Stipe 3-6 cm long, 2-3 cm thick, smooth, narrower toward base, veil membranous, sheathing the stipe, forms medial ring. Gills free, pinkish becoming chocolate brown with age, close, crowded. Spores 6.8-7.3 X 2.5-3.7 µm, elliptical, smooth. Spore print blackish brown. Flesh thick, fleshy, turns reddish brown when cut. Excellently edible. Saprobiic, in group, forms fairy ring, found in grassy areas.

Herbarium number: DDUNPL-207. Date of collection: 11/7/2012

### *Agaricus bitorquis* (Quél.) Sacc.

**Family:** Agaricaceae

Description: Pileus 5-8 cm dia., whitish with faint ochraceous tinge, at first convex becoming flattened convex, finally flattened at maturity, smooth. Stipe 4-6 cm long, 1-2 cm thick, white, more or less equal, slightly tapering at base, smooth, silky, ring upper rigid, double, white, striate above, lower thin, erect, reminiscent of volva, both persistent. Gills dull pink, becoming clay and chocolate brown to blackish, free, crowded. Spores 4-5.8 X 4.5-5 µm, sub spherical, smooth, chocolate, inamyloid. Spore print blackish brown. Flesh white, with pink tinge on cutting, firm and thick. Edible but choice. Saprobiic, in group forming fairy ring, on manure and sandy soil.

Herbarium number: DDUNPL-208. Date of collection: 5/7/2014

### *Agaricus impudicus* (Rea) Pilát

**Family:** Agaricaceae

Description: Pileus 4-9 cm dia., convex when young, expanded convex to flattened with maturity, dull brown, soon breaking into adpressed fibrous scales against a buff brown, background. Stipe 5-9 cm long, 0.5-1 cm thick, more or less equal, with slight bulbous base, whitish becoming more brown with age. Gills free, crowded, at first pink, becoming darker brown with age. Spores 5.5-6.7 X 2.8-3.2 µm, elliptical, smooth. Spore print chocolate brown. Flesh white, becomes red where cut, firm, soft. Edible. Saprobiic, in group, scattered on humus.

Herbarium number: DDUNPL-209. Date of collection: 11/7/2012

### *Agaricus langei* (F.H. Møller)

**Family:** Agaricaceae

Description: Pileus 3-8 cm dia., yellowish-brown, soon breaking up in to dense fibrous adpressed scales against whitish background, subspherical when young, becoming convex at maturity. Stipe 3-6 cm long, 1-2.2 cm thick, white, tinged pink, bruising reddish, more or less equal, stout, smooth above the ring, finely woolly scaly below. Ring white, single, superior, thick. Gills pinkish when young, becoming chocolate brown with maturity, crowded, free. Spores 8.2-9.7 X 3.7-4.4 µm, ellipsoid, smooth, purple brown. Spore print brownish. Flesh white, dark red where cut, thick, glabrous. Edible. Saprobiic, in group on soil under mixed wood.

Herbarium number: DDUNPL-210. Date of collection: 5/7/2014

### *Agaricus silvicola* (Vittad.) Peck

**Family:** Agaricaceae



**Figure 1.** 1. *Agaricus bernardii*; 2. *Agaricus bitorquis*; 3. *Agaricus impudicus*; 4. *Agaricus langei*; 5. *Agaricus silvicola*; 6. *Chlorophyllum molybdites*; 7. *Clitocybe vibecina*; 8. *Collybia fuscopurpurea*; 9. *Fomitopsis pinicola*; 10. *Hygrophorus eburneus*; 11. *Lepiota aspera*; 12. *Lepiota atrodisca*; 13. *Lepista flaccid*; 14. *Lepista luscina*; 15. *Leucocoprinus brebissonii*; 16. *Leucocoprinus cepistipes*; 17. *Omphalina ericetorum*; 18. *Omphalina postii*; 19. *Pluteus luteovirens*; 20. *Pluteus petasatus*; 21. *Pluteus rimulosus*; 22. *Sparassis crispa*; 23. *Stereum hirsutum*; 24. *Volvariella taylori*.

Description: Pileus 3-5 cm, convex at first, becoming broadly flattened with maturity, dry, whitish in color, developing yellowish stains. Stipe 4-6 cm long, 0.5-1 cm thick, equal, smooth, white developing yellow stains, ring large and persistent. Gills free, close, whitish when young to pinkish in color, covered by whitish partial veil. Spores 3-5 X 2-4  $\mu\text{m}$ , elliptical, smooth. Spore print dark brown. Flesh thick, white. Edible. Saprobic on decaying litters, solitary, scattered.

Herbarium number: DDUNPL-212. Date of collection: 11/8/2011

***Chlorophyllum molybdites* (G. Mey.) Massee**

**Family:** Agaricaceae

Description: Pileus 10-15 cm dia., convex to conical when young, becoming convex to broadly convex or nearly flat at maturity, dry, smooth at first but soon becoming scaly with brown to pinkish brown scales, that are uplifted to flat and concentrated near the centre with age, whitish to tan to yellowish white. Stipe 5-20 cm long, 0.5-1 cm thick, cylindrical, more or less equal, slightly enlarged toward base, smooth, firm, white, sometime discoloring to slightly brownish, with a persisting double edge ring. Gills free, close, white when young, becoming grey with age. Spores 9-12 X 6-9  $\mu\text{m}$ , smooth, elliptical. Spore print greenish. Inedible. Saprobic, growing gregariously in lawn and garden.

Herbarium number: DDUNPL-213. Date of collection: 3/7/2013

***Clitocybe vibecina* (Fr.) Quél**

**Family:** Tricholomataceae

Description: Pileus 1-3.5 cm dia., flattened, depression in centre, light grey brown with faintly striate margin when moist, drying cream. Stipe 2.5-5 cm, paler than cap, covered with fine downy hair, brown in color. Gills light brown in color, decurrent. Spores 4.5-5 X 3-3.5  $\mu\text{m}$ , ellipsoid. Spore print white. Poisonous. Saprobic, scattered, on decaying litter under hardwood.

Herbarium number: DDUNPL-198. Date of collection: 23/9/2011

***Collybia fuscopurpurea* (Pers.) P. Kumm.**

**Family:** Tricholomataceae

Description: Pileus 0.5-3 cm dia., wide, convex, flat, smooth, radially fibrillose, dry, buff, thin, delicate. Stipe 1.3-2 cm long, 0.2-0.5 cm thick, cylindrical, more or less equal, delicate, soft, fragile, brownish. Gills free, white, parallel, crowded. Spores 5-6 X 1.5-2.5  $\mu\text{m}$ , ellipsoid, cylindrical, smooth. Spore print white. Flesh thin, soft, delicate. Inedible. Saprobic, in group, on decaying litter.

Herbarium number: DDUNPL-199. Date of collection: 5/7/2013

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

**Family:** Fomitopsidaceae

Description: Fruiting body 25 cm dia, 4-8 cm wide, semicircular, convex to hoof shaped, hard, tough, woody, smooth, wrinkles with age, cap surface usually red to reddish brown with a white or yellow margin. Stem absent. Pore surface is cream colored and it does not bruise brown, 3-5 pores per mm. Spores 6-8 X 4-4.5  $\mu\text{m}$ , cylindrical, inamyloid and smooth. Spore print yellowish. Flesh white and leathery to woody. Inedible. Saprobic on decaying tree (*Mangifera indica*), perennial, solitary to group.

Herbarium number: DDUNPL-172. Date of collection: 5/8/2012

***Hygrophorus eburneus* (Bull.) Fr.**

**Family:** Hygrophoraceae

Description: Pileus 4-5.5 cm dia., pinkish white in color, surface smooth, slimy, convex with inrolled margin, expanding to nearly plane with the depression in disc with an upturned margin. Stipe 3.8-4.8 cm long, 1-1.3 cm thick, cylindrical, tapering toward base, stuffed, becoming hollow at maturity, smooth, white, viscid, veil absent. Gills decurrent, broad, waxy, white. Spores 5.5-7 X 2.5-4  $\mu\text{m}$ , elliptical, smooth. Spore print white. Flesh white, thick. Edible. Saprobic, solitary, on humus rich soil and on straw heap.

Herbarium number: DDUNPL-196. Date of collection: 23/9/2011

***Lepiota aspera* (Pers.) quell.**

**Family:** Agaricaceae

Description: Pileus 2-5 cm dia., convex, becoming broadly convex to nearly flat with maturity, dry, when young soft fibres densely covered the pileus which forms small sharp scales with maturity, at maturity orangish brown to dark brown scales over a whitish background are formed with darker centre. Stipe 4-8 cm long, 1-1.5 cm thick, more or less equal, dry, finely to densely hairy, with persistent ring that cannot be easily detached and often features brown scales. Gills free, white, close, crowded. Spores 6-9 X 2-3  $\mu\text{m}$ , long ellipsoid, smooth. Spore print white. Flesh white, leathery. Edible with precaution. Saprobic, in group or scattered in hardwood leaf litter.

Herbarium number: DDUNPL-215. Date of collection: 1/10/2011

***Lepiota atrodisca* Zeller**

**Family:** Agaricaceae

Description: Pileus 1-3 cm, broad, convex, expanding to nearly plane, disc slight umbonate, margin at first incurved then decurved, surface dry, tomentose at the disc, cuticle cracking with expansion forming covering of fine blackish scales, scales are less dense toward the margin, revealing a pallid ground color, cuticle unchanged when bruised. Stipe 2-3.5 cm long, 1-4 mm thick, cylindrical, fragile, soft, stuffed, more or less equal, white, glabrous at apex, patchy fibrillose below, veil present and membranous, thin, fragile, white, superior ring present. Gills free, close, white. Spore 5-6.5 X 2-3.5  $\mu\text{m}$ , ellipsoid, smooth, thick walled. Spore print white. Flesh thick, soft, white. Inedible. Saprobic, solitary to group, on decaying leaf litters.

Herbarium number: DDUNPL-216. Date of collection: 4/7/2014

***Lepista flaccid* (Sowerby) Pat.**

**Family:** Tricholomataceae

Description: Pileus 4-7 cm dia., flattened convex when young, infundibuliform with maturity, pale ochraceous buff darkening with age. Stipe 5-8 cm long, 0.3-0.5 cm thick, more or less equal, paler than pileus, wooly at base, stuffed, becoming hollow with maturity, cylindrical. Gills decurrent, narrow, crowded, yellowish white in color. Spores 3.5-4.6 X 4-4.8  $\mu\text{m}$ , subglobose, minutely roughened. Spore print white. Flesh thin, soft, delicate, pale cream. Inedible. Saprobic, in group under mixed forest.

Herbarium number: DDUNPL-200. Date of collection: 4/7/2014

***Lepista luscina* (Fr.) Singer**

**Family:** Tricholomataceae

Description: Pileus 7-10 cm dia., pallid beige with darker brown small spots or blotches, concentrically arranged, becoming gray brown at maturity, smooth, at first hemispherical, then flattened, convex, lateral, slightly depressed. Stipe 3-5 cm tall, 0.5-1 cm thick, concolorous with cap, smooth or finely fibrillose, equal, ring absent, flesh white, stuffed. Gills adnate, narrow, crowded, pallid cream, becoming greyish pink with age. Spores 4.5-6 X 3-4  $\mu$ m, ellipsoid, hyaline, minutely roughed. Spore print light pink. Flesh whitish, thick. Edible. Saprobic, in group on humus.

Herbarium number: DDUNPL-201. Date of collection: 31/8/2012

***Leucocoprinus brebissonii* (Godey) Locq.**

**Family:** Agaricaceae

Description: Pileus 2-3 cm dia., white with uniform dark grey brown disc in centre, ornamented with dark grey brown scales, becoming more dispersed toward the coarsely grooved margin, delicate, conical then flattened. Stipe 3-5 cm long, 0.3-0.4 cm thick, cylindrical, pure white, small ring present, more or less equal, slightly thickens toward base. Gills free, crowded, white. Spores 8-10 X 5-6  $\mu$ m, elliptical, smooth. Flesh delicate, soft, fragile. Spore print white. Inedible. Saprobic, solitary, scattered under hardwood, on litter.

Herbarium number: DDUNPL-221. Date of collection: 16/7/2012

***Leucocoprinus cepistipes* (Sowerby) Pat.**

**Family:** Agaricaceae

Description: Pileus 3-6 cm dia., white with darker centre, oval, conical to bell shaped to nearly flat at maturity, dry, powdery with white and soft granules, scaly in age, margin, distinctly lined. Stipe 3-7 cm long, 0.3-0.8 cm thick, more or less equal, base swollen, smooth sometime with white powder, stipe often discoloring to yellowish to brownish in color, ring present. Gills free crowded, white. Spores 5.5-9.8 X 4.6- 7.8  $\mu$ m, elliptical, smooth, thick walled. Flesh white, thin. Spore print white. Inedible. Saprobic, in group on humus rich soil.

Herbarium number: DDUNPL-222. Date of collection: 24/2/2013

***Omphalina ericetorum* (Pers.) M. Lange**

**Family:** Tricholomataceae

Description: Fruiting body 0.5-2 cm dia., yellowish buff agarics with funnel shaped cap, at first more or less convex, becoming depressed, infundibuliform, margin incurved, smooth, sulcate at margin. Stipe 0.5-1.5 cm long, 0.2-0.4 cm thick, concolorous, equal, finely downy and darker at the base, ring absent. Gills decurrent, pallid, creamy yellow, broad, distant. Spores 8-9 X 4-5  $\mu$ m, hyaline, smooth, ellipsoid, non amyloid. Flesh whitish ochre, thin. Spore print yellowish. Inedible. Saprobic, in small groups, on *Bambusa arundinacea* leaf litter.

Herbarium number: DDUNPL-202. Date of collection: 7/7/2014

***Omphalina postii* (Fr.) Singer**

**Family:** Tricholomataceae

Description: Pileus 0.3-1 cm dia., bright orange in color, convex, centrally depressed, striate at the margin. Stipe 0.5-0.9 cm long, 0.1-0.2 cm thick, pale yellow orange, cylindrical, hollow, fragile. Gills decurrent, yellowish. Spores 6-8 X 4-5  $\mu$ m, elliptical. Spore

print whitish. Flesh thin, yellowish, delicate. Inedible. Saprobic, solitary to in group in grassy areas.

Herbarium number: DDUNPL-203. Date of collection: 5/7/2014

***Pluteus luteovirens* Rea**

**Family:** Pluteaceae

Description: Pileus 1-3 cm dia., mustard yellow in color, convex, becoming more flattened. Stipe 2-5 cm, white in color, tapering slightly upward, cylindrical, smooth, ring absent. Gills whitish, becoming pink with age, free, broad, crowded. Spores 3.5-4  $\mu$ m, smooth, ellipsoid. Spore print pinkish. Flesh whitish, firm, thin. Inedible. Saprobic, in group, on leaf litters.

Herbarium number: DDUNPL-224. Date of collection: 4/7/2014

***Pluteus petasatus* (Fries) Gillet**

**Family:** Pluteaceae

Description: Pileus 3.5-4 cm dia., convex to flat, whitish to pale tan with darker centre, dry, glabrous, shiny, margin in young stage incurved to plane at maturity. Stipe 4.5-5 cm long, 10 mm thick, tapering upward, solid, cylindrical, white and smooth. Gills free, crowded, cream to pink in color. Spore 5-8 X 3-4  $\mu$ m, elliptical, smooth. Spore print pink. Flesh white and firm. Edible. Saprobic, in group, on wood debris.

Herbarium number: DDUNPL-225. Date of collection: 19/8/2011

***Pluteus rimulosus* Kühner & Romagn.**

**Family:** Pluteaceae

Description: Pileus 2-5 cm dia., dark brown, downy, convex, becoming more flattened, smooth, but faintly sulcate when damp, cuticle tearing radially when mature revealing white flesh. Stipe 4-6 cm long, 0.5-0.8 cm thick, more or less equal, slightly swollen at base, smooth, whitish in color with tinged cap color at the base, ring absent. Gills free, crowded, at first whitish becoming pink at maturity. Spores 7.5-8.9 X 5.6-6.2  $\mu$ m, ellipsoid, smooth, pink. Flesh white and moderate. Spore print salmon pink. Inedible. Saprobic, solitary to in small groups, on rotting wood.

Herbarium number: DDUNPL-226. Date of collection: 7/7/2014

***Sparassis crispa* (Wulf) Fr.**

**Family:** Sparassidiaceae

Description: Fruiting body 10-40 cm dia., creamish to yellowish in colour, sub spherical comprising large number of flattened wavy lobes arising from thin and short rooting stem. Stipe brown in colour, branched, woody. Spore bearing surface ochraceous. Spore 5-6 X 4-4.5  $\mu$ m, ellipsoid, non amyloid, hyaline. Spore print whitish. Flesh crispy, elastic and ochraceous. Edible. Saprobic, in group, on decaying wood log.

Herbarium number: DDUNPL-170. Date of collection: 18/8/2011

***Stereum hirsutum* (Wild.) Pers.**

**Family:** Stereaceae

Description: Fruiting body 1-3.5 cm dia., crust fungus, caps fuse laterally with one another, fan shaped to semicircular, densely velvety, with concentric zones of variable colors, yellowish in color, stem absent. Pores yellowish in color, 2-4 pores per mm. Spore 4.5-7 X 2-3 $\mu$ m, smooth, narrowly elliptical, amyloid. Spore

print whitish. Flesh tough. Inedible. Saprobiic on deadwood, gregarious.

Herbarium number: DDUNPL-166. Date of collection: 9/5/2013

### *Volvariella taylori* (Berk. & Broome) Singer

**Family:** Pluteaceae

Description: Pileus 3-5 cm dia., convex to broadly conic, becoming flat with maturity, dry, finely hairy, grayish to brownish gray, margin not lined. Stipe 2-4 cm long, 0.4 cm thick, tapering gradually toward apex, base slightly swollen, dry, whitish to grayish in color, smooth, base encased in a thick, gray to brownish sack like volva. Gills free, whitish, becoming pink with maturity, close. Spores 5-8 X 3-5 µm, elliptical, smooth. Spore print salmon pink. Flesh thin, white. Edible. Saprobiic, solitary to in group, scattered in open field.

Herbarium number: DDUNPL-229. Date of collection: 25/6/2013

### Discussion

Macrofungi play important roles in nutrient cycling, forestry, pharmacology industry, production of cultivated fungi in the food industry, as well as their vital role in biodegradation and biodeterioration (Tibuhwa, 2011). It not just only play important role in protecting the environment from pollution and has significant role for tree health as it buffers the toxic present and nourish the mycorrhizal association but also act as an important source of food and medicine (Servi *et al.*, 2010, Li *et al.*, 2012).

From time to time different workers had studied macrofungal diversity of different parts in India. Ghosh & Pathak (1965) collected 3 species of *Macrolepiota* from Lucknow (U.P.), Ghosh *et al.* (1967) also described about some edible macrofungi of Lucknow. Semwal *et al.* (2014) collected 23 species of edible mushrooms from North-Western Himalaya (Uttarakhand and Himachal Pradesh). Lots of macrofungi had been identified from Jammu and Kashmir by various workers like Kumar & Sharma (2008) collected three lignicolous macrofungi, Anand & Chowdhry (2013) collected five new species of macrofungi viz., *Scleroderma citrinum*, *Psilocybe subtropicalis*, *Ganoderma applanatum*, *Cyptotrama asprata* and *Entoloma serrulatum*.

Karwa & Rai (2010) collected 153 species of mushrooms from Central India (Maharashtra). Borkar *et al.* (2014) collected five mushrooms from family Agaricaceae viz., *Agaricus arvensis*, *Agaricus trisulphuratus*, *Agaricus placomyces*, *Macrolepiota procera* and *Leucocoprinus brinbaumii* from different places in Konkan, Maharashtra. Vrinda & Pradeep (2006, 2009) had done extensive survey of Kerala for documentation of macrofungi.

Only few works had been done in this area for documentation of macrofungi (Chandrawati *et al.*, 2014, Vishwakarma *et al.*, 2014, 2016, 2017a). Chandrawati *et al.* (2014) has reported 29 macrofungi belonging to 12 families from different part of Gorakhpur. Vishwakarma *et al.* (2014) studied 10 taxa of macrofungi belonging to 8 families from this area. In another work Vishwakarma *et al.* (2017b) reported 20 different species of macrofungi belonging to 17 genera and 10 families from Gorakhpur district.

In present study 24 macrofungi were collected from different localities of Gorakhpur district. The most dominant family was found to be Agaricaceae representing 10 species, this was followed by Tricholomataceae (6 species), Pluteaceae (4 species), while other families were represented by 1 species each. Agaricaceae had high number of species in this area and this could be because of the fact that species of this family are saprotrophic in nature. It is capable of refractory organic-based substrates present in nature. It has high biological efficiency to utilize available substrates.

### Conclusion

Macrofungi are essential for the function and maintenance of earth's ecosystem. Study of fungal diversity is essential for our understanding and also for the world's natural heritage. The present study demonstrate that the area taken under survey harbours high diversity of macro fungal species with varied exploitable properties whose edible and medicinal uses may be exploited. Varied climatic condition and wide range of soil makes Gorakhpur a natural habitat for the growth of different types of macrofungi. The study of macrofungal flora of this area is only in its exploratory stage.

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