



# COLLECTION, IDENTIFICATION AND MORPHOLOGICAL CHARACTERIZATION OF EDIBLE MUSHROOMS IN THE WEST SINGHBHUM DISTRICT OF JHARKHAND

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**Abstract:** Mushrooms are the fleshy and spore-bearing fruiting bodies of some members of a lower group of plants known as fungi. Edible mushrooms have been collected and consumed by people from many countries for thousands of years as a source of food and medicine. However, there is a shortage of information in the literature regarding the edible mushrooms of Jharkhand state. In the present study, the collection and identification of 12 edible mushrooms from the different places in the West Singhbhum district of Jharkhand were studied. The collected edible mushrooms were as follows: *Volvariella volvacea*, *Agaricus bisporus*, *Pleurotus ostreatus*, *Termitomyces heimii*, *Termitomyces microcarpus*, *Lycoperdon pyriforme*, *Russula violacea*, *Ganoderma applanatum*, *Tuber magnatum*, *Calocybe indica*, *Geastrum indicum*, and *Pleurotus florida*. The different morphological characteristics of mushrooms, such as cap, stalk, gills, volva, annulus, shape, and color, were recorded. Most of the mushroom species belong to the Basidiomycota division, the Agaricomycetes class, and the Agaricales division. They are in the saprophytic, parasitic, mycorrhizal, and endophytic categories of habitat.

**Keywords:** Collection, Habitat, Identification, Morphological, Mushrooms

## I. INTRODUCTION

Mushrooms are umbrella-like structures that are mostly seen during the rainy season in our nearby place. They are the fruiting bodies of fungi that are capable of degrading organic matter. They can either be epigeous or hypogeous (Chang S T and Miles P G, 1992). They cannot synthesize their own food because they lack chlorophyll. Mushroom is a heterogeneous group whose composition, size, color, properties, nature and taste are different. Mushrooms are those fungus which can be found almost any habitat. Their natural habitat may vary depending on the species. Some mushrooms grow on rotten logs, trees, leaf litter, while other grow in the soil, animal's dung etc. When the mushrooms spores fall into the substrate, they start to grow hyphae, then mycelium, and finally develop into mature mushrooms with the help of environmental conditions such as temperature, rainfall, humidity, moisture, etc. (Boa, 2004). Mushrooms are called white vegetables or

boneless vegetarian meat which contain proteins, vitamins and fibers similar to vegetables and meat. It has been used by people since ancient times in the form of both food and medicines (Thakur *et al.*, 2013).

In the present study, the collection and identification of 12 edible mushrooms from the different places in the West Singhbhum district of Jharkhand were studied. The collected edible mushrooms were as follows: *Volvariella volvacea*, *Agaricus bisporus*, *Pleurotus ostreatus*, *Termitomyces heimii*, *Termitomyces microcarpus*, *Lycoperdon pyriforme*, *Russula violacea*, *Ganoderma applanatum*, *Tuber magnatum*, *Calocybe indica*, *Geastrum indicum*, and *Pleurotus florida*. This study was aimed to collect, identify and morphological characterization of edible mushrooms in the West Singhbhum district of Jharkhand.

## II. MATERIALS AND METHODS

**Collection of edible mushrooms:** Mushrooms develop from spreading spores that flourish in moist and dark circumstances. They require a medium that is high in rotting plant matter. During rainy days, the edible mushrooms are found mostly in the West Singhbhum region of Jharkhand. They are mainly developed from late April to late October at their location sites. The mushroom samples were collected during the rainy seasons of 2021–2022, from different places of West Singhbhum, Jharkhand. The samples were collected by getting independently the basidiocarps by cautiously digging them with the help of a sharp knife. The information about their habitat, soil types, temperature, and humidity were also recorded. Every sample was carefully packed in a paper bag and brought to the research facility for additional review.

**Identification of edible mushrooms:** The collected mushroom samples were identified following a guide named "The Pocket Guide to Wild mushrooms" (Pelle Holmberg and Hand Marklund, 2013), a book named "Science of Mushrooms" (Shubhrata R. Mishra, 2013) and a manual named "A Manual of Indian Edible Mushrooms" (R.P. Purkayastha and Aindrilla Chandra, 1985). The identification of cap, spore colour, stalk, gills, and scales colour changes after cutting, their habitat, etc. were recorded.

**Morphological characterization of edible mushrooms:** The techniques of Singer (1986), Atri and Kaur (2005), and Upadhyay and Kaur (2004) were employed for implementing the morphological characteristics observed in observational studies, such as cap, stalk, gills, volva, annulus, shape, and color.

## III. RESULT AND DISCUSSION

In the present research, a comprehensive survey had been carried out in the West Singhbhum District (Chaibasa blocks: - Amita, Anchu, Barkhundia, Diliyamarcha, Dobrosai, Dumbisai, Khuntta, Lupungutu, Sikursai. Purana Chaibasa, Tonto and Ulihattu) of Jharkhand. Following a complete investigation of twelve edible mushroom species were found in the studied areas and they were collected with date wise and local names (Table 1). They were classified based on taxonomical, morphological, and other characteristics. The investigation processes additionally indicated that, all the mushrooms that were gathered and identified, all edible species are of division Basidiomycota, class Agaricomycetes except *Tuber magnatum* which belongs to class Pezizomycetes (Table 2). The collected edible mushrooms are: *Volvariella volvacea*, *Agaricus bisporus*, *Pleurotus ostreatus*, *Termitomyces heimii*, *Termitomyces microcarpus*, *Lycoperdon*

*pyriforme*, *Russula violacea*, *Ganoderma applanatum*, *Tuber magnatum*, *Calocybe indica*, *Geastrum indicum* and *Pleurotus florida*.

S.NO.	SCIENTIFIC NAME	COMMON NAME	DATE OF COLLECTION
01	<i>Volvariella volvacea</i>	Paddy straw mushroom	07.07.2021
02	<i>Agaricus bisporus</i>	Button mushroom	18.09.2021
03	<i>Pleurotus ostreatus</i>	Black oyster mushroom	20.09.2021
04	<i>Termitomyces heimii</i>	Chirko, Bada Khukri	02.10.2021
05	<i>Termitomyces microcarpus</i>	Teelha Khukri	02.10.2021
06	<i>Lycoperdon pyriforme</i>	Stump Buffballs	09.10.2021
07	<i>Russula violacea</i>	Patta shattu	12.10.2021
08	<i>Ganoderma applanatum</i>	Reishi mushroom	15.10.2021
09	<i>Tuber magnatum</i>	Truffles	14.11.2021
10	<i>Calocybe indica</i>	Milky mushroom	16.05.2022
11	<i>Geastrum indicum</i>	Puttu, Rugra	20.09.2022
12	<i>Pleurotus florida</i>	White oyster mushroom	22.09.2022

Table 1: Scientific name, Common name and Date of collection of edible mushrooms



Fig 1: The Collected samples of edible mushrooms

S. No.	Name of the mushroom species	Division	Class	Order	Family	Genus	Species
01	<i>Volvariella volvacea</i>	Basidiomycota	Agaricomycetes	Agaricales	Pleurotaceae	<i>Volvariella</i>	<i>volvacea</i>
02	<i>Agaricus bisporus</i>	Basidiomycota	Agaricomycetes	Agaricales	Agaricaceae	<i>Agaricus</i>	<i>bisporus</i>
03	<i>Pleurotus ostreatus</i>	Basidiomycota	Agaricomycetes	Agaricales	Pleurotaceae	<i>Pleurotus</i>	<i>ostreatus</i>
04	<i>Termitomyces heimii</i>	Basidiomycota	Agaricomycetes	Agaricales	Lyophyllaceae	<i>Termitomyces</i>	<i>heimii</i>
05	<i>Termitomyces microcarpus</i>	Basidiomycota	Agaricomycetes	Agaricales	Lyophyllaceae	<i>Termitomyces</i>	<i>microcarpus</i>
06	<i>Lycoperdon pyriforme</i>	Basidiomycota	Agaricomycetes	Agaricales	Agaricaceae	<i>Lycoperdon</i>	<i>pyriforme</i>
07	<i>Russula violacea</i>	Basidiomycota	Agaricomycetes	Russulales	Russulaceae	<i>Russula</i>	<i>violacea</i>
08	<i>Ganoderma applanatum</i>	Basidiomycota	Agaricomycetes	Polyporales	Ganodermataceae	<i>Ganoderma</i>	<i>applanatum</i>
09	<i>Tuber magnatum</i>	Basidiomycota	Pezizomycetes	Pezizales	Tuberaceae	<i>Tuber</i>	<i>magnetum</i>
10	<i>Calocybe indica</i>	Basidiomycota	Agaricomycetes	Agaricales	Lyophyllaceae	<i>Calocybe</i>	<i>indica</i>
11	<i>Geastrum indicum</i>	Basidiomycota	Agaricomycetes	Geastrales	Geastraceae	<i>Geastrum</i>	<i>indicum</i>
12	<i>Pleurotus florida</i>	Basidiomycota	Agaricomycetes	Agaricales	Pleurotaceae	<i>Pleurotus</i>	<i>florida</i>

Table 2: Scientific classification of collected edible mushrooms

There are mainly four categories of mushrooms: Saprophytic, Parasitic, Mycorrhizal and Endophytic. The study revealed that 08 mushrooms are from saprophytic category (Table). They mostly grow in decaying plant parts, dead wood, decaying logs and stumps, grassland, and fields. *Termitomyces microcarpus* and *Ganoderma applanatum*, were found in both saprophytic and parasitic. *Termitomyces heimii*, *Russula violacea*, and *Calocybe indica* were found in mycorrhizal mode (*Calocybe indica* is saprophytic but sometimes has an ectomycorrhizal relationship with the roots of a coconut tree), and *Tuber magnatum* was found in endophytic mode of habitat (Table 3).

S. No.	Scientific Name	Habitat	Category (Saprophytic, Parasitic, Mycorrhizal or Endophytic)
01	<i>Volvariella volvacea</i>	Decaying plant parts (straw)	Saprophytic
02	<i>Agaricus bisporus</i>	Grassland/Field	Saprophytic
03	<i>Pleurotus ostreatus</i>	Dead wood	Saprophytic
04	<i>Termitomyces heimii</i>	Gardens/Orchard	Mycorrhizal
05	<i>Termitomyces microcarpus</i>	Roots of bamboo stumps	Saprophytic/Parasitic
06	<i>Lycoperdon pyriforme</i>	Decaying logs and stumps	Saprophytic
07	<i>Russula violacea</i>	Near rotting wood	Mycorrhizal
08	<i>Ganoderma applanatum</i>	On fallen logs	Saprophytic/Parasitic
09	<i>Tuber magnatum</i>	Cancerous soil	Endophytic
10	<i>Calocybe indica</i>	Grassland/Fields	Mycorrhizal
11	<i>Geastrum indicum</i>	Ground/Soil	Saprophytic
12	<i>Pleurotus florida</i>	Dead and decaying wood	Saprophytic

Table 3: Habitat and category (Saprophytic, Parasitic, Mycorrhizal and Endophytic) of collected edible mushrooms

S. NO.	NAME OF SPECIMEN	CAP	STALK	GILLS	VOLV A	ANNULU S	SHAPE	COLOUR
1.	<i>Volvariella volvacea</i>	+	+	+	+	+	Round	Dark brown
2.	<i>Agaricus bisporus</i>	+	+	+	-	+	Button	Whitish to brown
3.	<i>Pleurotus ostreatus</i>	+	+	+	-	-	Oyster shell	Greyish to brown
4.	<i>Termitomyces heimii</i>	+	+	+	+	+	Dome	Pale yellow
5.	<i>Termitomyces microcarpus</i>	+	+	+	+	+	Little dome	Silky white
6.	<i>Lycoperdon pyriforme</i>	-	-	-	-	-	Pear	Dirty white
7.	<i>Russula violacea</i>	+	+	+	-	-	Convex	White to brown
8.	<i>Ganoderma applanatum</i>	+	-	-	-	-	Circular	White
9.	<i>Tuber magnatum</i>	+	+	+	-	+	Circular	Brown
10.	<i>Calocybe indica</i>	+	+	+	+	+	Umbrella	Milky white
11.	<i>Geastrum indicum</i>	+	+	+	-	-	Circular	White to brown
12.	<i>Pleurotus florida</i>	+	+	+	-	-	Sea seep	White

Whereas, '+' for present and '-' for absent

Table 4: Morphological characteristics of collected edible mushrooms

All 12 of the edible mushrooms that had been collected were examined and their morphological characteristics identified (Table 4). The fruiting structure cap was present in 11 edible mushrooms, but it was absent in *Lycoperdon pyriforme*. Stalks and gills were present in 10 edible mushrooms, but they were absent in *Lycoperdon pyriforme* and *Ganoderma applanatum*. Volva was present in *Volvariella volvacea*, *Termitomyces heimii*, *Termitomyces microcarpus*, and *Calocybe indica*, but it was absent in *Agaricus bisporus*, *Pleurotus florida*, *Pleurotus ostreatus*, *Lycoperdon pyriforme*, *Russula violacea*, *Ganoderma applanatum*, *Tuber magnatum*, and *Geastrum indicum*. Annulus were present in *Volvariella volvacea*, *Agaricus bisporus*, *Termitomyces heimii*, *Termitomyces microcarpus*, *Tuber magnatum*, and *Calocybe indica* but were absent in *Pleurotus ostreatus*, *Pleurotus florida*, *Lycoperdon pyriforme*, *Russula violacea*, *Ganoderma applanatum*, and *Geastrum indicum*.

The edible mushrooms that had been collected had a unique shape, ranging from a button to a shell, dome, pear, convex, round, and umbrella-shaped sea seep. Round-shaped *Volvariella volvacea*, button-shaped *Agaricus bisporus*, oyster-shell-shaped *Pleurotus ostreatus*, dome-shaped *Termitomyces heimii*, pear-shaped *Lycoperdon pyriforme*, convex-shaped *Russula violacea*, circular-shaped *Ganoderma applanatum*, *Geastrum indicum*, and *Tuber magnatum*, umbrella-shaped *Calocybe indica*, and sea seep-shaped *Pleurotus florida* had been found.

A variety of colors had been observed in the edible mushrooms that were collected: brown, whitish to brown, greyish to brown, light yellow, silky white, filthy white, white, and milky white. The colors *Volvariella volvacea*, *Tuber magnatum*, *Agaricus bisporus*, *Russula violacea*, and *Geastrum indicum* were found in

brown, while the colors greyish to brown belonged to *Pleurotus ostreatus*, pale yellow to *Termitomyces heimii*, silky white to *Termitomyces microcarpus*, dirty white to *Lycoperdon pyriforme*, white to *Ganoderma applanatum* and *Pleurotus florida*, and milky white to *Calocybe indica*. This finding was in accordance with the result of Yadav M K *et al.* (2017), who recorded the morphological characterization of collected edible mushrooms from the Vindhya Forest of Northern India conducted during the years 2011–2014.

#### IV. CONCLUSION

This is the first systematic study on the collection, identification and morphological characterization of edible mushrooms in the West Singhbhum district of Jharkhand. The diversity of geographical and climatic conditions makes the region a natural habitat for a number of edible mushrooms. The findings of collection and identification of mushrooms will be a reference database of edible mushrooms in the state and will help in future research works.

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