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Wild Macrofungi of Chhindwara District: Diversity and Ecological Significance

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ABSTRACT

The Chhindwara district of Madhya Pradesh harbours a remarkable diversity of wild macrofungi owing to its varied forest types, agroecosystemsand seasonal climatic patterns.The present study focused on assessing the diversity, distributions and ecological roles of macrofungi inforest ecosystems of the Chhindwara district,situated in the Satpura Range of Madhya Pradesh, India—one of the mega biodiversity centres of the state. The district extends between 21°28′–22°49′N latitude and 78°10′–79°28′E longitudecharacterised by dry deciduous forests dominated by *Shorea robusta*, *Tectona grandis*, *Butea monosperma* and *Diospyros melanoxylon*. The region experiences an average annual rainfall of about 1,139.3–1,183mm and ranging from 38–42°C.Field surveys were conducted across diverse habitats, including road sides, open fieldsforest areas and local markets (Tamia–Patalkot region), during the rainy seasons from July-September 2023 to July-September2024.A total of 74 macrofungal species,belonging to 13 orders and 41 families, were recorded.These included parasitic, saprophyticand ecto-mycorrhizal forms. Several species with medicinal and edible properties were also recorded, reflecting the ecological and socio-economical significance of wild macrofungi.This study represents the first systematic documentation of macrofungal diversity in the Chhindwararegion. The results highlight the potential of these fungi in sustainable forest management, soil enrichmentand local livelihood enhancement. Emphasis is placed on integrating fungal biodiversity into conservation planning and promoting awareness of their ecological and nutraceutical values. Future research should focus on molecular identifications, biotechnological potentialand long-term monitoring of macrofungal diversity for sustainable ecosystem resilience.

Keywords: Macrofungi, Chhindwara district, Satpura Range, ethnomycology, tribal knowledgeandwild mushrooms.

INTRODUCTION

The district of Chhindwara, established on November 1st, 1956, is situated in the southwestern part of Madhya Pradesh within the Satpura Range of Mountains (Galkate et al., 2008).It covers an area of 11,815 km², extending between 21°28′–22°49′ N latitude and 78°10′–79°28′ E longitude (Bawistale et al., 2010; Haque and Singh, 2022).The district is bordered by Narmadapuram (previously known as Hoshangabad) and Narsinghpur to the north, Betul to the west, Seoni to the east and the Nagpur plains of Maharashtra to the south –(Collector, 2023; Rai, 2016; Vijendra and Pavan Kumar, 2010).

The forest cover within the district is primarily characterized as tropical dry deciduous, with prominent species such as *Tectona grandis* (Teak), *Shorea robusta* (Sal), *Butea monosperma* (Palash) and *Diospyros melanoxylon* (Tendu) representative of this biome. The forests are generally categorized into reserved and protected classifications, exhibiting variations in species composition, quality and physiognomic characteristics attributable to discrepancies in topographical features, soil depth and biotic interactions (Bawistale et al., 2022). This diverse array of vegetation creates a favourable ecological niche that sustains an assortment of macrofungal taxa.

Fungi represent a significant proportion of essential elements within forest ecosystems, as they serve the functions of decomposition, nutrient recycling and symbiotic associations with plant life(Hande and Shelke, 2023).These organisms are found in every ecological region and are the second largest group of terrestrial life forms, subsequent to insects (Andrew et al., 2013; Zeb et al., 2023). Approximately 69,000 of the estimated 1.5 million fungus species found worldwide have been formally identified, including 46,124 species of Basidiomycetes and Ascomycetes (Kothiyal et al., 2022).

Additionally, fungi play crucial roles in the breakdown of lignocellulosic substrates and aid in the sequestration of carbon in soil systems, making them to essentials biological cycling (Bhandari and Jha, 2017; Chandrawati et al., 2014).They maintain symbiotic, saprophytic and parasitic habits and are essential to soil fertility and forest health. Fungi have significant economic significance additionally to their ecological activities because of their application in the food, medical, biocontroland fermentation areas (Meena et al., 2020).

Fungi that produce large and visible fruiting bodies (sporocarps), primarily Ascomycetes and Basidiomycetes, are generally referred to as macrofungi (Mueller et al., 2007).These include mushrooms, puffballs, truffles, stinkhorns, jelly fungi, coral fungiand bracket fungi

(Bhambri et al., 2022; Krishnappa et al., 2014). Macrofungi are essential biological components of natural ecosystems, acting as food sources for humans and animals and especially decomposing organisms and nutrient cyclers (Niegoet al., 2023).

In terms of structure, mushrooms are the ordered fruiting products of a mycelial network that grows when the right amount of moisture and temperature is present (Chaudhary and Tripathy, 2016).These fructifications may be fleshy, sub-fleshy, or leathery, bearing spores on lamellae or pores(Joshi et al., 2022).These forms are frequently referred to as mushrooms or toadstools based on their shape and edibility, whereas poroid individuals are called boletes (Meena et al., 2020). Macrofungi are essential for preserving ecological balance and nutrient turnover in forest soils due to their capacity to break down complex organic materials (Verma et al., 2018).

Macrofungi have diverse industrial and nutraceutical possibilities from a commercial perspective (Parveen et al., 2017; Dehariya and Jain, 2025).They contribute to the food, pharmaceuticaland biotechnology industries (Zeb et al., 2022).In India, both cultivated and wild edible species are traditionally used as food and medicines, especially among tribal communities (Singh et al., 2020). Commonly consumed genera's include *Agaricus*, *Pleurotus*, *Astraeus* and *Termitomyces* (Das et al., 2014; Garibay-Orijel et al., 2012; Pandita and Pandita, 2023; Sudheep and Sridhar, 2014; Valverde et al., 2015).

Despite being one of the biodiversity-rich regions of Madhya Pradesh, the macrofungal diversity of the Chhindwara district remains largely unexplored. Most previous studies in Central India have focussed on cultivated mushrooms or general fungal flora, with limited emphasis on wild macrofungi inhabiting forest ecosystems. Consequently, there exists a significant knowledge gap regarding their species richness, ecological distributions and ethnomycological significance. Therefore, a systematic documentation of macrofungal species and their ecological roles in Chhindwara is essential to support fungal biodiversity conservation and sustainable utilization strategies.

Hence, the present study aims to provide a comprehensive assessment of the diversities, distribution and ecological significance of wild macrofungi in the forest ecosystems of the Chhindwara district. The research further seeks to evaluate their relationship with environmental factors, explore traditional knowledge and ethnomycological uses among local communities and highlight their potential contributions to nutrients cycling, ecosystem stability and rural livelihoods (Thakur et al., 2023).

MATERIALS AND METHODS

1. Study Area

1.1 District Overview

Chhindwara district, located in the south-western part of Madhya Pradesh, is the largest district of the state by area (Meshram and Khobragade, 2021).Topographically, the region is part of the Satpura Range, consisting of forested plateaus and valleys (Galkate et al., 2008). The district's elevation ranges between 550-1200m above mean sea level and the climate is subtropical, with average winter 4–6°C, summer to 38–42°C, and annual rainfall ranging from 1139–1183mm, mainly during June to September (Collector, 2023).Such conditions provide ideal habitats for macrofungal growth and fruiting. The district comprises 12 tehsils (Chhindwara, Chhindwara Nagar, Parasia, Chourai, Junnardeo, Amarwara, Tamia, Bicchua, Mohkhed, Umreth, Chandand Harrai) and 9 development blocks(Collector, 2023). Forests occupy about 36% of the total area, dominated by *Tectona grandis* (Teak), *Shorea robusta* (Sal), *Diospyros melanoxylon* (Tendu), *Butea monosperma* (Palash) and *Terminalia tomentosa* (Saja) (Collector, 2023; Meshram and Khobragade, 2021).

1.2 Patalkot Valley (Study Site)

The main field survey was conducted in the Patalkot valley, located in the Tamia block of Chhindwara district. The valley lies at a depth of approximately 365–457m (1200–1500ft), covering about 79km², and at an elevation of 838–99m (2750–3250ft) above sea level (Dwivedi and Sakalle, 2014; Kumar et al., 2020). The Doodhi river drains this valley, which is inhabited predominantly by the Bharia and Gond tribes(Kumar et al., 2020; Shrivastava and Shrivastava, 2019).Patalkot is located about 62km from the Chhindwara district headquarters and 23km from Tamia (Ahirwar and Gautam, 2015). The dense vegetation, high humidity and minimal anthropogenic disturbance make the valley an ecologically suitable microhabitat for diverse macrofungal communities.

2. Sampling Sites and Designs

The survey was conducted in the Chhindwara district of Madhya Pradesh, with special focus on the four representativesites: (I) Patalkot valley (tribal-dominated sacred grove, 700–900m elevation),(ii)Chhindwaraforest area (Sal-dominated plains, 400–600m), (iii) Satpura tiger reserve unreserved forest areas (mixed deciduous, 300–500m)and (iv) Tamia Hills (teak-bamboo forests, 800–1,000m) .

These sites cover 25% of the district's 3,200km² forest cover, characterised by red lateritic soils, annual rainfall of 1,200–1,500mm and ranging from 15-40°C. Also, sampling sites included undisturbed forests, secondary forests, roadsides, plantations, crop fields and agricultural lands. Macrofungal fruiting bodies were collected during the rainy seasons of 2023–2024 using a simple random sampling method, which allows unbiased representation of specimens. Fresh specimen's morphological characteristics were also observed in field conditions. The survey aimed to obtain a preliminary baseline assessment of macrofungal diversity. No fixed transects or quadrats were established; instead, all accessible habitats were randomly explored to maximise species representation within the limited field duration. At each site, basic ecological information including substrate

type, vegetation, canopy cover and micro habitat conditions was recorded and specimens were photographed *in situ* using a digital camera.

Although, the study was based on a single-season visit, it provides a valuable baseline dataset for future multi-seasonal and long-term monitoring of macrofungal diversity in the Chhindwara district.

3. Field Collections and Handling

Specimens were collected using sterile knives, forceps and trowels to prevent damage to basidiocarps. Field equipment's included hand lenses, gloves, sterile polythene bags and measuring tapes. Each sample was assigned a unique field code with detailed notes on date, habitat, substrate, colour, odour, taste and size (Thakur et al., 2023).

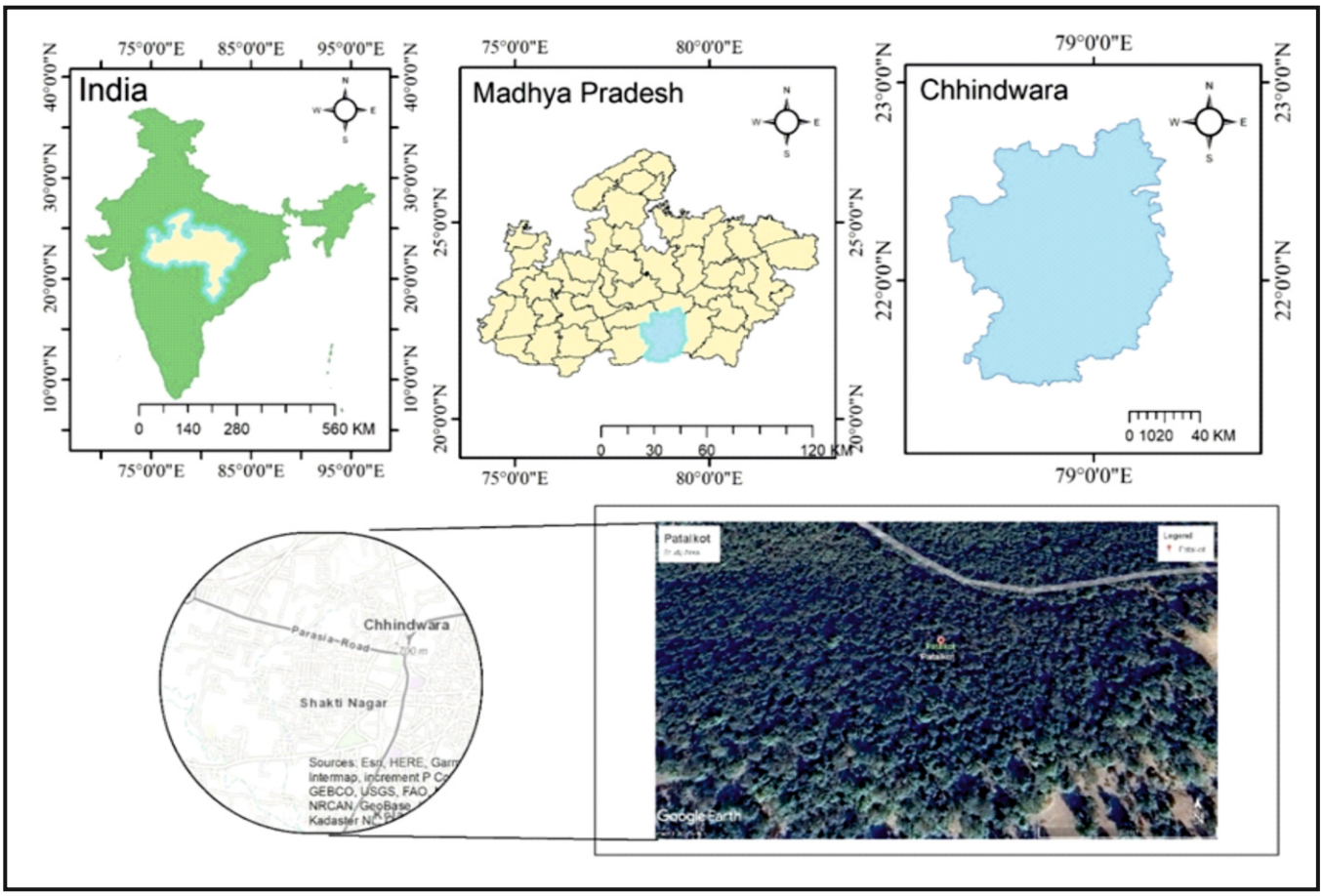


Figure1. Showing study sites of macro fungi collections.



Figure 2. Interaction with local communities and collection of wild macro fungi specimens from different forest habitats of Chhindwara district.

4. Preservation of Specimens

Fresh specimens were initially shade-dried and subsequently oven-dried at 45–55°C for 48 hours with minor modifications. Dried samples were stored in airtight polyethylene bags containing 1,4-dichlorobenzene to prevent insect infestation. Fresh samples were preserved in a liquid fixative solution composed of rectified alcohol: formalin: distilled water (25:5:70 ml) as described by (Vyas et al., 2014). All voucher specimens were deposited in the Laboratory of Microbial Technology and Plant Pathology, Department of Botany, Dr. Harisingh Gour Vishwavidyalaya, Sagar (M.P.), for future references.

5. Morphological and Microscopic Characterisations

Morphological examination was based on pileus (cap) size, shape, texture, colour, stipe characteristics and the arrangement and colour of gills or pores, following (Boa, 2004; Laessoe, 2013).

6. Identifications of Macrofungi

Preliminary segregation of edible species was carried out through interviews and discussions with local villagers, who traditionally consume wild mushrooms as food.Critical macroscopic and microscopic observations of the specimens were then made, followed by a review of relevant literature for confirmation. The identification of specimens was based on comparison with published taxonomic works and regional checklists (Joty et al., 2020; Vyas et al., 2011; Chaudhary and Tripathy, 2016; Debnath et al., 2020; Parveen et al., 2017; Sandhya et al., 2015; Singha et al., 2020; Vishwakarma and Tripathi, 2019; Singh et al., 2021; Vyas et al., 2014; Yuwa-amornpitak and Yeunyaw, 2020).

RESULTS AND DISCUSSION

Table 1. Taxonomic classification of macrofungal species collected from various forest regions of Chhindwara district, Madhya Pradesh, India, showing their hierarchical placement from division to species level.

Division	Order	Family	Genus	Species
Asco-mycota	Xylariales	Xylariaceae	*Xylaria*	*Xylaria apiculata* *Xylaria hypoxylon* *Xylaria filiformis* *Xylaria polymorpha*
		Hypoxylaceae	*Daldinia*	*Daldinia concentrica*
Basidio-mycota	Agaricales	Agaricaceae	*Lycoperdon*	*Lycoperdon rubroflavum*
				Vascellum pratense
			Lepiota	*Lepiota* sp.
			Leucocoprinus	*Leucocoprinus cretaceus*
				Leucocoprinus birnbaumii
				Leucocoprinus fragilissimus
			Agaricus	*Agaricus bisporus*
				Agaricus sp.
		Crepidotaceae	*Crepidotus*	*Crepidotus fimbriatus*
				Crepidotus variabilis
		Marasmiaceae	*Marasmius*	*Marasmius* sp.
			Marasmiellus	*Marasmiellus candidus*
		Clavariaceae	*Clavaria*	*Clavaria* sp.
			Ramariopsis	*Ramariopsis* sp.
		Schizophyllaceae	*Schizophyllum*	*Schizophyllum commune*
		Strophariaceae	*Hypholoma*	*Hypholoma fasciculare*
		Hygrophoraceae	*Hygrocybe*	*Hygrocybe umbilicate*
				Hygrocybe sp.
		Amanitaceae	*Amanita*	*Amanita vaginata*
				Amanita bisporigera
				Amanita sp.
		Bolbitiaceae	*Conocybe*	*Conocybe* sp.
		Physalacriaceae	*Armillaria*	*Armillaria mellea*
		Meruliaceae	*Podoscypha*	*Podoscypha petalodes*

Division	Order	Family	Genus	Species
		Lyophyllaceae	*Termitomyces*	*Termitomyces microcarpus*
				Termitomyces eurhizus
				Termitomyces heimii
				Termitomyces clypeatus
				Termitomyces sp.
		Pleurotaceae	*Pleurotus*	*Pleurotus djamor*
		Nidulariaceae	*Cyathus*	*Cyathus striatus*
		Tricholomataceae	*Clitocybe*	*Clitocybe gibba*
		Hymenogastraceae	*Gymnopilus*	*Gymnopilus* sp.
		Psathyrellaceae	*Coprinellus*	*Coprinellus* sp.
		Mycenaceae	*Mycena*	*Mycena* sp.
	Russulales	Russulaceae	*Russula*	*Russula cyanoxantha*
				Russula mairei
				Russula emetica
				Russula sp.
			Lactarius	*Lactarius gerardi*
				Lactarius sp.
		Stereaceae	*Stereum*	*Stereum hirsutum*
	Boletales	Hericiaceae	*Hericium*	*Hericium* sp.
		Boletaceae	*Boletus*	*Boletus* sp.
			Indoporus	*Indoporus squamulosus*
		Diplocystaceae	*Astraeus*	*Astraeus hygrometricus*
		Sclerodermataceae	*Scleroderma*	*Scleroderma citrinum*
		Hygrophoropsidaceae	*Hygrophoropsis*	*Hygrophoropsis*sp.
	Polyporales	Polyporaceae	*Lentinus*	*Lentinus* sp.1
				Lentinus sp.2
				Lentinus arcularius
			Trametes	*Trametes versicolor*
				Trametes gibbosa
			Daedaleopsis	*Daedaleopsis* sp.
		Irpicaceae	*Irpex*	*Irpex lacteus*
		Ganodermataceae	*Ganoderma*	*Ganoderma* sp.
		Sparassidaceae	*Sparassis*	*Sparassis* crispa
		Laetiporaceae	*Laetiporus*	*Laetiporus sulphureus*
	Tremellales	Tremellaceae	*Tremella*	*Tremella* sp.
	Dacrymycetales	Dacrymycetaceae	*Dacrymyces*	*Dacrymyces chrysospermus*
	Auriculariales	Auriculariaceae	*Auricularia*	*Auricularia polytricha*
	Thelephorales	Bankeraceae	*Hydnellum*	*Hydnellum* sp.
	Hymenochaetales	Hymenochaetaceae	*Inonotus*	*Inonotus dryadeus*
			Hymenochaete	*Hymenochaete rubiginosa*
	Cantharellales	Cantharellaceae	*Cantharellus*	*Cantharellus* sp.
		Clavulinaceae	*Clavulina*	*Clavulina* sp.
	Geastrales	Geastraceae	*Geastrum*	*Geastrum*sp.1
				*Geastrum*sp.2
	Liceales	Tubiferaceae	*Lycogala*	*Lycogala epidendrum*

Table 2. Field record of macrofungal species collected from different forest areas of Chhindwaradistrict with their associated flora, substrates preferences, and nutritional classification.

Survey / Place	Areas and Coordinates	Altitude	Species	Associated Flora / Substrates	Modes of Nutrition
Ghatlinga forest area (Patalkot)	22.124212°N and 78.820586°E	590m	*Xylaria hypoxylon*	Dead wood	Saprophytic
			Xylaria apiculata	Dead wood	Saprophytic
			Xylaria polymorpha	Dead tree trunk	Saprophytic
			Termitomyce seurhizus	Living tree	Parasitic / endophytic
			Amanita bisporigera	Leaf litter	Litter decomposer
			Amanita sp.	Ground soil	Soil decomposer
			Leucocoprinus cretaceus	Ground soil	Ectomycorrhizal / soil decomposer
			Leucocoprinus birnbaumii	Living tree	Parasitic / endophytic
			Dacrymyces chrysospermus	Living tree	Saprophytic (wood decomposer)
			Agaricus bisporus	Living tree	Parasitic / endophytic
			Scleroderma citrinum	Ground soil	Ectomycorrhizal / soil decomposer
			Lycoperedon rubroflavum	Ground soil	Ectomycorrhizal / soil decomposer
			Agaricus sp.	Living tree	Parasitic/ endophytic
			Stereum hirsutum	Decaying wood	Saprophytic (wood decomposer)
Ghatlinga forest area (Patalkot)	22.124212°N and 78.820586°E	590m	*Lactarius gerardii*	Sandy soil	Ectomycorrhizal / soil decomposer
			Hymenochaete rubiginosa	Living tree	Parasitic / endophytic
			Cantharellus sp.	Decaying wood	Saprophytic (wood decomposer)
			Clitocybe gibba	Decaying wood	Saprophytic (wood decomposer)
			Hypholoma fasciculare	Leaf litter	Litter decomposer
			Daldinia concentrica	Dead wood log	Saprophytic
			Sparassis crispa	Bamboo wood	Parasitic / endophytic
			Armillaria mellea	Leaf litter	Litter decomposer
			Xylaria filiformis	Dead wood	Saprophytic
Gangiwara road, Chhindwara	22.394809°N and 78.640984°E	714m	*Conocybe* sp.	Sandy soil	Ectomycorrhizal / soil decomposer
			Podoscypha petalodes	Ground soil and leaf litter	Litter decomposer
			Marasmius sp.	Leaf decaying wood	Saprophytic (wood decomposer)
			Coprinellus micaceus	Ground soil	Soil decomposer
			Mycena sp.	Living tree	Saprophytic (wood decomposer)
			Marasmiellus candidus	Living tree	Saprophytic (wood decomposer)
Tamia, Patalkot road	22.381646°N and 78.630121°E	556m	*Termitomyces clypeatus*	Living tree	Parasitic / endophytic
			Leucocoprinus fragilissimus	Leaf litter	Litter decomposer
			Hydnellum sp.	Bamboo wood	Parasitic / endophytic
			Ganoderma sp.	Living tree	Saprophytic (wood decomposer)
			Lepiota sp.	Ground soil	Ectomycorrhizal / soil decomposer

Survey / Place	Area and Coordinates	Altitude	Species	Associated Flora / Substrate	Mode of Nutrition
Patalkot road	22.381646°N and 78.630121°E	577m	*Boletus* sp.	Ground soil	Ectomycorrhizal / soil decomposer
			Inonotus dryadeus	Decaying wood	Saprophytic (wood decomposer)
			Tremella sp.	Decaying wood	Saprophytic (wood decomposer)
			Trametes gibbosa	Dead wood	Saprophytic (wood decomposer)
			Russula sp.	Ground lateritic soil	Ectomycorrhizal / soil decomposer
			Irpex lacteus	Dead wood	Saprophytic (wood decomposer)
Shrijhot Pratapgarh, Road	22.394941°N and 78.644908°E	593m	*Russula mairei*	Living tree	Parasitic / endophytic
			Russula cyanoxantha	Ground soil	Ectomycorrhizal / soil Decomposer
			Russula emetica	Living tree	Parasitic / endophytic
			Clavulina sp.	Ground soil	Ectomycorrhizal / soil decomposer
			Clavaria sp.	Ground soil	Ectomycorrhizal / soil decomposer
			Indoporus squamulosus	Sandy soil/Leaf litter	Ectomycorrhizal / soil decomposer
			Lycogala epidendrum	Dead wood trunk	Saprophytic (wood decomposer)
			Amanita vaginata	Ground soil	Ectomycorrhizal / soil decomposer
ShrijhotPratapgarh Road	22.394941°N and 78.644908°E	593m	*Ramariopsis* sp.	Ground soil/leaf litter	Soil decomposer
			Crepidotus fimbriatus	Dead wood trunk	Saprophytic (wood decomposer)
			Crepidotus variabilis	Dead wood branch	Saprophytic (wood decomposer)
			Hericium sp.	Living tree	Parasitic / endophytic
			Laetiporus sulphureus	Bamboo	Parasitic / endophytic
			Gymnopilus sp.	Ground soil	Soil decomposer
			Hygrocybe chlorophana	Ground soil	Soil decomposer
			Hygrophoropsis sp.	Ground soil/leaf litter	Soil decomposer
			Daedaleopsis sp.	Dead wood trunk	Saprophytic (wood decomposer)
			Lactarius sp.	Ground soil	Soil decomposer
			Schizophyllum commune	Decaying wood branch	Saprophytic (wood decomposer)
			Lentinus sp.2	Ground soil	Soil decomposer
Sitadongri, Patalkot	22.457348° N and 78.606142° E	569m	*Termitomyces heimii*	Termite nest	Termitophilic (symbiotic with termites)
			Termitomyces sp.	Termite nest	Termitophilic (symbiotic with termites)
			Astraeus hygrometricus	Sandy soil	Ectomycorrhizal/soil decomposer
			Geastrum sp.1	Lateritic soil	Saprophytic
			Geastrum sp. 2	Lateritic soil	Saprophytic
			Trametes versicolor	Dead wood branch	Saprophytic(wood decomposer)
			Lentinus arcularis	Dead wood branch	Saprophytic (wood decomposer)

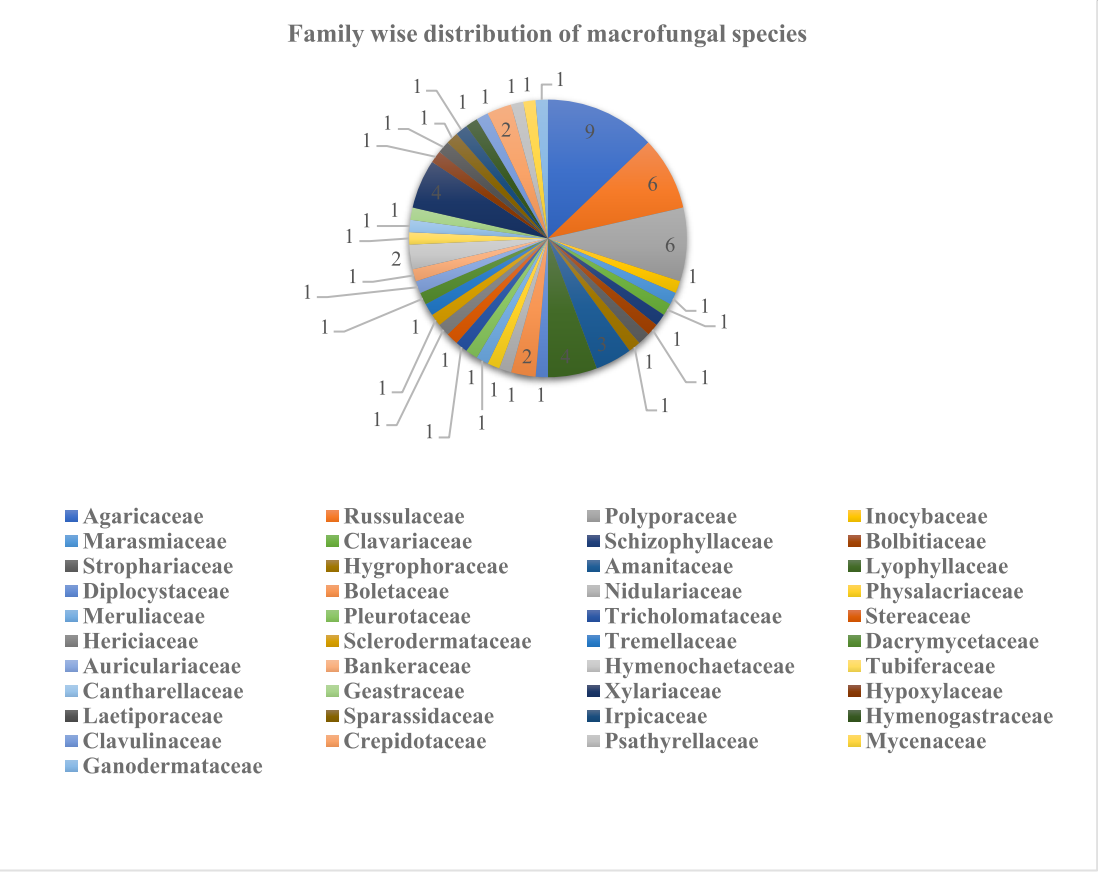


Figure 3. Family-wise Distribution of Macrofungal Species Chhindwara District, M.P.

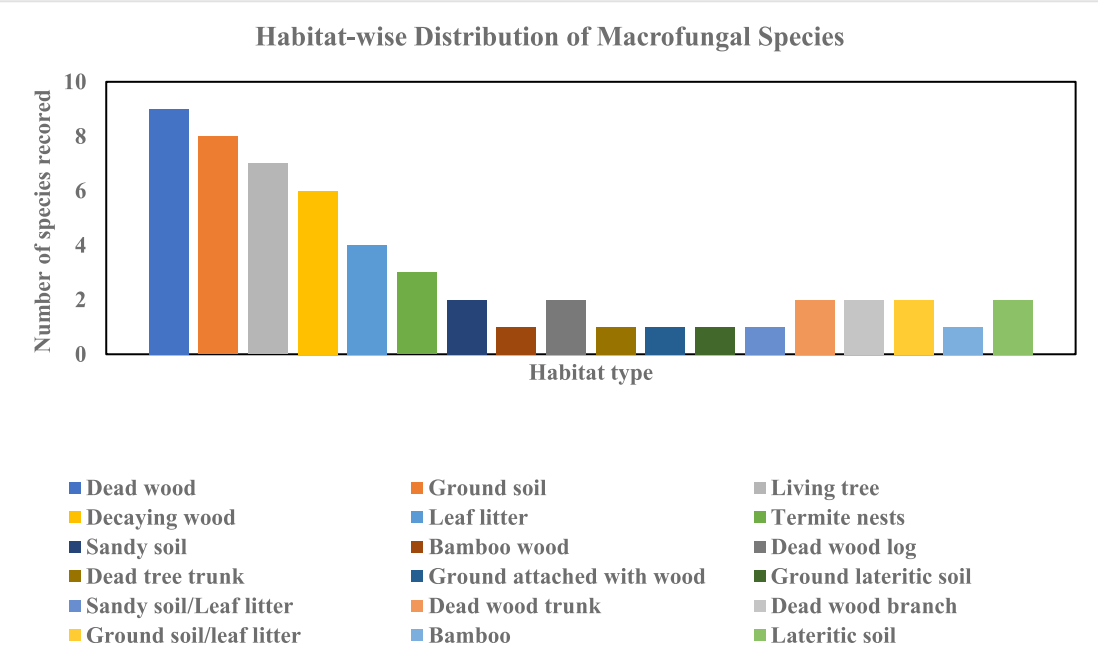


Figure 4. Habitat-wise distributions showing species richness of macrofungi across different substrates in Chhindwara district.

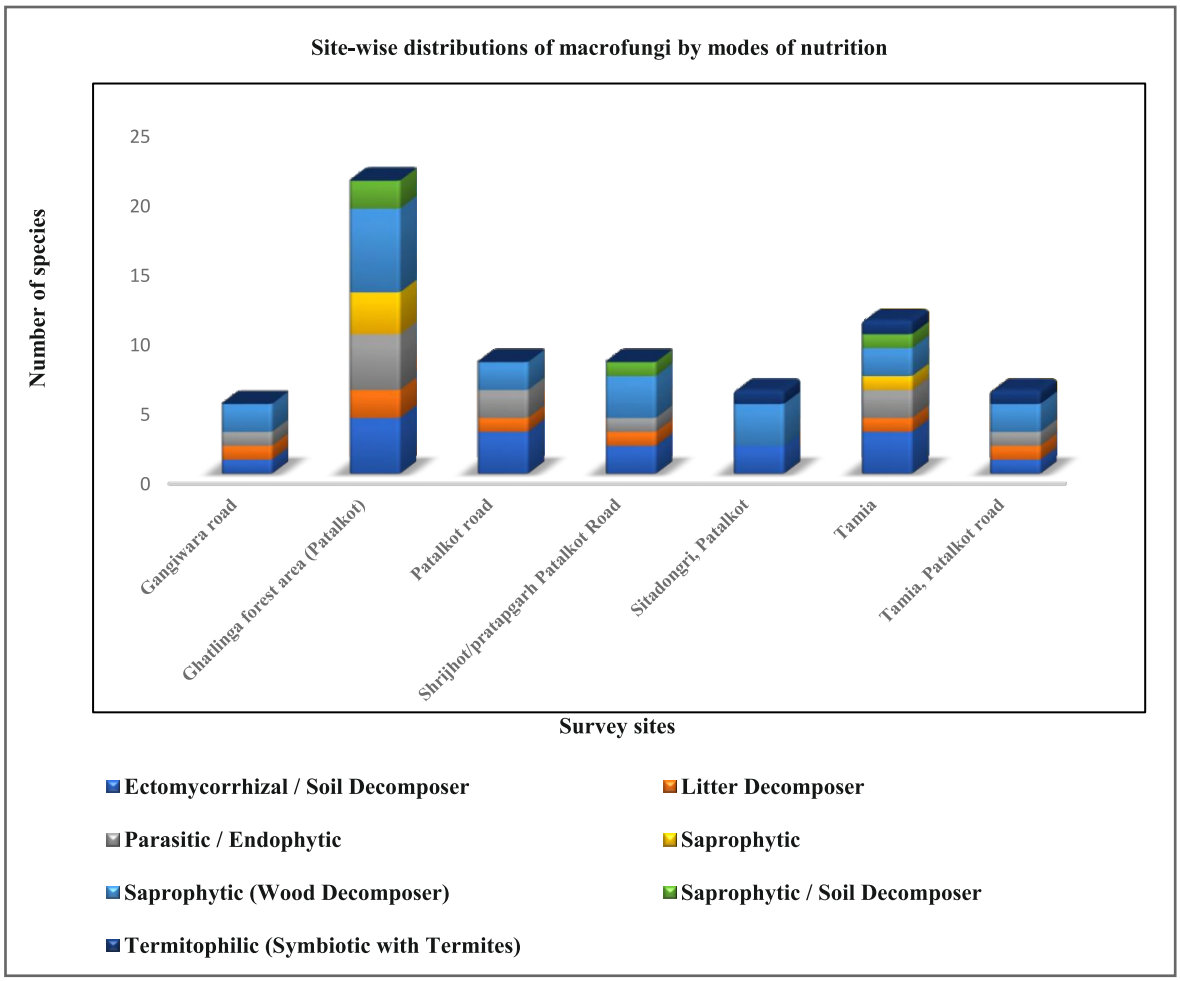


Figure5. Site-wise distributions of macrofungal species based on their modes of nutrition in different forest areas of Chhindwara district, Madhya Pradesh.

Traditional Knowledge and Ethnomycological Uses

The tribal communities inhabiting Madhya Pradesh, including the Gond and Bharia tribes of the Chhindwara district, possess a rich repository of traditional knowledge concerning the use of forest resources, with macrofungi holding a significant place in their cultural and practical lives.This ethnomycological knowledge, passed down through generations, encompasses the identification of various macrofungal species, their edibility, medicinal propertiesand cultural uses.Several macrofungal species are traditionally consumed as food by local communities in Madhya Pradesh, including those residing in the Chhindwara district.Studies in the Satpura Plateau region have documented the consumption of species such as *Termitomycesheimii*, *Agaricus campestris*, *Lentinus* sp.and *Astraeus hygrometricus*.In the Patalkot area of Chhindwara, inhabited predominantly by Gond and Bharia tribes, specific types of mushrooms, locally known as *Termitomyces* sp.(Bhamodi,Jangali Gajar and Bhagoda), *Termitomyces heimii* (Bamita Bami, Gajar, Narvad and Sap ka gata), *Termitomyces clypeatus*(Pukka Biraad and Kumbha), *Termitomyces microcarpus*(Bhidi-chatri and Dhadhara), *Lentinus* sp. (Baans Gajar) and *Astraeus hygrometricus* (Sarai Gota, Safed Dhupeda and Sarai Dhupeda) are commonly used as foods. These wild edible mushrooms serve as a valuable source of nutrition, contributing significantly to the dietary needs and food security of these communities.

The Bharia tribe of Patalkot possesses extensive knowledge of medicinal plants and also utilizes macrofungi for therapeutic purposes. Many macrofungal species are traditionally used for their hemostatic and antiseptic properties in wound healing. These traditional medicinal applications highlight the potentials of macrofungi from the Chhindwara district as sources of bioactive compounds with therapeutic values.

Beyond foods and medicines, macrofungi also hold cultural significance within tribal communities, being associated with

rituals, beliefs and socio-economic practices. Documenting these diverse uses and the associated traditional knowledge is crucial for preserving the cultural heritage of these communities and for gaining a comprehensive understanding of the relationship between humans and macrofungi in the region.

Table 3. Ethnomedicinally used wild mushrooms collected by different tribes or local peoples of Patalkot Chhindwara

S.N0	Mushroom names	Common names	Formulation for use	Use as
1	*Termitomyces* sp.	Bhamodi and jangaligajar	They are used for making vegetables after being dried. For cow and calf, Bajra is prepared by mixing jaggery, kachri and Kairfenugreek and turmeric and given to the cattle. They are dried, made into crumbs, and the vegetable is made by making a paste with gram flour.	• Mushrooms are also used to ward off snakes. • Cattle in Hatpan Jadi (*Tridax procumbens*) boil are fed ground wild mushrooms as treatment. • Jangalchhatari - Use of wild mushrooms for Dhat syndrome disease and swelling • It is also given to cows and women in case of lack of milk. • Dry mushrooms are processed with gram flour and eaten to minimize edema. • Kids are treated with fumigation with mushrooms • When suffering from heatstroke follows a cold, the feet may get a dip in the toes. • Give powdered mushrooms if you have arthritis or another illness.
2	*Termitomyces heimii*	Bamita Bami gajar,Narvod and sap ka gata		
3	*Termitomyces clypeatus*	Pukka Biraa and Kumbha		
4	*Termitomyces microcarpus*	Bhidi-chatri and Dhadhara		
5	*Astraeus hygrometricus*	Safed dhupeda, sarai dhupeda and sarai gota	They are used for making vegetables when mature conditions.	• Powder use forhealing burns and ringworm.
6	*Lentinus* sp.	Baas gajar	They are used for making vegetables when fresh condition. Dry mushrooms are processed with gram flour.	• The powder is dried and given after delivery, BP or fever formulation with water. • Bas gajar - Eating bamboo mushroom does not cause blood clotting (thrombosis).
7	*Lycoperdons* sp.	NA	Do not use for eating.	• Traditionally used for its hemostaticand antiseptic properties in wound healing.

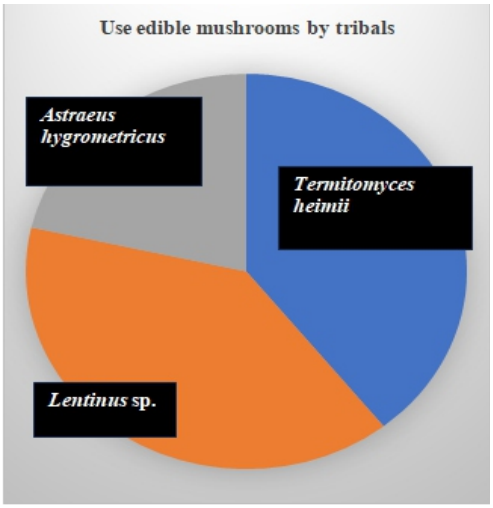


Figure 6. Pie chart showing the three edible mushroom species recorded from the tribal regions of Patalkot, Chhindwara district (Madhya Pradesh).

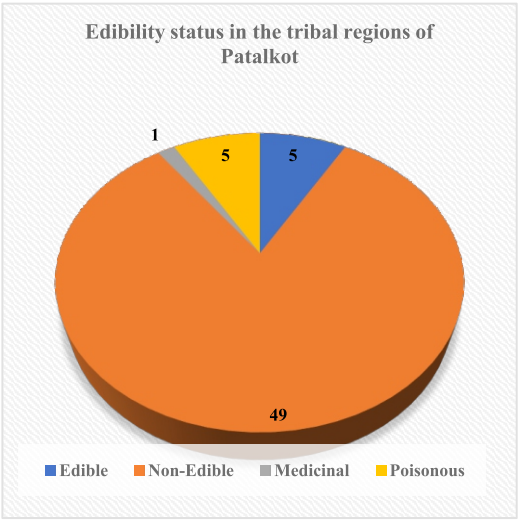


Figure7. Pie chart showing the proportion of mushroom species collected from the tribal regions of Patalkot, Chhindwara district (Madhya Pradesh).

DISCUSSIONS

1. Taxonomic Composition of Macrofungi

A total of 74 macrofungal species were recorded from the forest ecosystems of the Chhindwara district, Madhya Pradesh, representing 41 families and 13 taxonomic orders under two divisions-Ascomycota and Basidiomycota (Table 1). Among them, Basidiomycota dominated with 65 species (92.8%), whereas Ascomycota contributed only 5 species (7.2%). This dominance of Basidiomycota aligns with previous studies from Central India, including Amarkantak (Dwivedi et al., 2012), Vindhyan forests (Dwivedi et al., 2015) and Dindori (Verma et al., 2019).The order Agaricales exhibited the highest species richness, followed by Russulales, Polyporalesand Boletales. Similar dominance of Agaricales has been reported from Seoni (Kamble et al., 2021) and Mandla (Pawar, 2025), indicating a common taxonomic structure across the moist deciduous forests of Central India. Families such as Agaricaceae, Russulaceae, Polyporaceaeand Lyophyllaceae contributed majorly to the total diversity, consistent with reports from Sagar (Vyas et al., 2014) and Dindori (Verma et al., 2019).The high abundance of Agaricales members reflects favourable conditions for humus-rich and lignicolous fungi, which are key decomposers facilitating forest nutrient cycling and litter degradation (Niego et al., 2023).Figure 3 shows that Agaricaceae and Polyporaceae together contributed the largest proportion of recorded species, emphasizing their ecological dominance in subtropical mixed forests of Chhindwara.

2. Ecological and Habitat-wise Distribution

Out of the 74 recorded species, 45 were saprophytic, 15 ectomycorrhizal, 6 parasiticand 4 termite-associated (*Termitomyces*sp.) (Table 2).This trophic diversity agrees with studies from Sal forests of Dindori (Verma et al., 2019) and Melghat forests (Hande and Shelke, 2023), which also reported mixed decomposer and mutualistic fungal communities. Wood-inhabiting species such as *Xylaria hypoxylon*, *Trametes versicolor* and *Ganoderma lucidum* were frequently observed. These genera are known for efficient lignocellulosic degradation, crucial for nutrient recycling in tropical ecosystems (Debnath et al., 2019; Parveen et al., 2017).Termite-associated fungi, notably *Termitomyces microcarpus*, *Termitomyces heimii* and *Termitomyces clypeatus*were exclusively found on termite mounds, representing a specialized symbiosis with *Odontotermes* species (Mathew et al., 2012).Habitat-wise analysis (Figure 4) revealed that dead wood supported the maximum fungal richness (31.4%), followed by soil (22.9%)and leaf litter (14.3%). These trends align with patterns from the Vindhyan region (Sandhya et al., 2015) and Amarkantak Biosphere Reserve (Dwivedi et al., 2012), suggesting that microclimatic humidity and organic matter availability are the primary drivers of fungal abundance in these forests. The site-wise distribution (Figure 5) showed that Patalkot (especially Ghatlinga and Sitadongri) exhibited the highest species richness, followed by Tamia and Gangiwara. This variation corresponds to dense forest canopy, high moisture content and soil organic matter availability in Patalkot subtropical environment. The macrofungal assemblage indicates a healthy and balanced ecosystem, where saprophytic species dominate, enabling active decomposition and nutrient cycling. Families such as Agaricaceae, Russulaceae, Lyophyllaceae and Polyporaceae maintain soil fertility through their dual role as decomposers and mycorrhizal partners. Additionally, the occurrence of habitat-specific taxa like *Hydnellum*sp., *Ramariopsis* sp. and *Sparassis crispa* highlights microhabitat heterogeneity and the ecological uniqueness of Chhindwara's forest landscape. When compared with other Central Indian macrofungal studies (Dwivedi et al., 2012; Kamble et al., 2021; Pawar, 2025; Verma et al., 2019; Vyas et al., 2014; Verma and Pandro, 2018), the Chhindwara forests show a similar dominance of Agaricales and Polyporales, but a higher proportion of termite-associated species, indicating the ecological distinctness of this region. The presence of multiple trophic groups—saprophytic, ectomycorrhizal, parasitic and termitophilicillustrates a complex trophic network, promoting organic matter turnover and maintaining soil–plant–fungus equilibrium. Such diversity demonstrates the resilience and functional importance of macrofungi in sustaining the subtropical forest ecosystem. Overall, the study establishes that the forest habitats of Chhindwara support a diverse, functionally significant and partially unexplored macrofungal flora. This diversity not only contributes to ecosystem functioning, but also offers potential for nutraceutical and biotechnological exploration. Further molecular characterization and long-term monitoring are essential to document seasonal variation and to conserve this hidden fungal wealth.

3. Ethnomedicinal and Nutritional Significance

Several macrofungi recorded from Patalkot and adjoining forests were found to have significant ethnomycological and nutritional importance among Bharia and Gond tribes (Table 3).Species such as *Termitomyces heimii, Lentinus* sp. and *Astraeus hygrometricus* are traditionally consumed as wild edible mushrooms, whereas *Lycoperdon* sp. and *Astraeus hygrometricus* are used for antiseptic and wound-healing properties. These mushrooms are locally dried, powdered, and added to food or given medicinally to treat ailments such as fever, arthritis, swelling and heatstroke. Similar ethnomycological uses of *Termitomyces* species have been reported from Satpura Plateau and Eastern Ghats (Vishwakarma and Tripathi, 2019; Ullah et al., 2022).Figure 6 illustrates that *Termitomyces* species dominate among edible mushrooms, while Figure 7 shows the overall proportion of edible, medicinaland non-edible taxa from Patalkot, highlighting the socio-economic importance of fungi in tribal livelihoods. Such traditional applications underline the biocultural relationship between humans, plants and fungi and offer potential leads for biochemical validation and nutraceutical research (Bhambri et al., 2022; Pandita and Pandita, 2023; Kumar et al., 2022)


1.

Termitomyces heimi


2.

Termitomyces sp.


3.

Termitomyces microcarpus


4.

Termitomyces clypeatus


5.

Termitomyces eurrhizus


6.

Amanita vaginata


7.

Amanita bisporigera


8.

Amanita sp.


9.

Crepidotus variabilis


10.

Crepidotus fimbritus


11.

Stereum hirsutum


12.

Dacrymyces chrysospermus


13.

Leucocoprinus birnbaumii


14.

Leucocoprinus fragilissimus


15.

Leucocoprinus cretaceous


16.

Schizophyllum commune


17.

Lactarius gerardii


18.

Lactarius sp.


19.

Vascellum pratense


20.

Agaricus bisporus


21.

Agaricus sp.


22.

Pleurotus djamor


23.

Hydnellum sp.


24.

Podoscypha petalodes


25. *Lepiota* sp.


26. *Hymenochaete rubiginosa*


27. *Cyathus striatus*


28. *Cantharellus* sp.


29. *Russula mairei*


30. *Russula cyanoxantha*


31. *Russula emitica*


32. *Russula* sp.


33. *Coprinellus* sp.


34. *Mycena* sp.

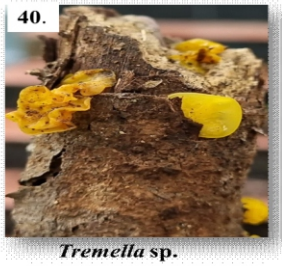

35. *Marasmius rotula*


36. *Conocybe* sp.


37. *Lentinus arcularius*


38. *Lentinus* sp.1


39 *Lentinus* sp.2


40. *Tremella* sp.

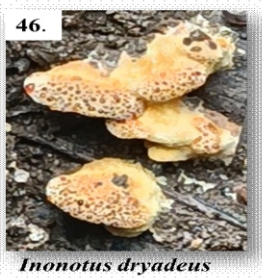

41. *Boletus* sp.


42. *Indoporus squamulosus*


43. *Gymnopilus* sp.


44. *Auricularia polytricha*


45. *Trametes gibbosa*


46. *Inonotus dryadeus*


47. *Clitocybe gibba*


48. *Hericium* sp.


49.

Xylaria hypoxylon


50.

Xylaria polymorpha


51.

Xylaria filiformis


52.

Xylaria apiculata


53.

Clavulina sp.


54.

Clavaria sp.


55.

Ramariopsis sp.


56.

Lycogala epidendrum


57.

Astraeus hygrometricus


58.

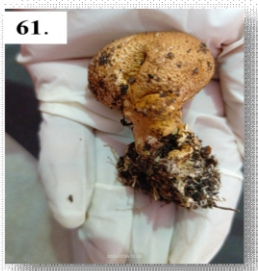
Geastrum sp.1


59.

Geastrum sp.2


60.

Hygrocybe sp.


61.

Scleroderma Citrinum


62.

Lycoperdon rubroflavum


63.

Hygrophoropsis sp.


64.

Ganoderma sp.


65.

Sparassis crispa


66.

Marasmiellus candidus


67.

Irpex lacteus


68.

Laetiporus sulphureus


69.

Hypholoma fasciculare


70.

Armillaria mellea


71.

Daedaleopsis sp.


72.

Daldinia concentrica



Hygrocybe umbilicate



Trametes versicolor

Figure8.Field photographs of macrofungicollected from the tribal regions of Patalkotand different forest areas of Chhindwaradistrict (Madhya Pradesh, India).

CONCLUSIONS

The present study provides the first comprehensive account of macrofungal diversity from the forest ecosystems of Chhindwaradistrict, Central India.A total of 74 species belonging to 41 families and 12 orders were recorded, revealing the dominance of Basidiomycota and the order Agaricales.The diversity pattern closely resembles those reported from other Central Indian regions such as Amarkantak, Seoniand Dindori, indicating a shared biogeographical and ecological framework.Habitat-wise analysis revealed that dead wood and soil substrates supported the highest fungal richness, highlighting the role of organic matter and microclimate in shaping fungal communities. The occurrence of edible, medicinaland symbiotic fungi underscores their ecological and nutraceutical significance. Overall, the study emphasizes the richness, ecological importancesand conservation values of Chhindwara's macrofungal flora. Further molecular characterization and seasonal monitoring are recommended to document cryptic diversity and assess potential biotechnological applications.

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