International Journal of
Life Sciences
International Peer Reviewed Open Access Refereed Journal

Int. J. of Life Sciences, 2025; 13 (1): 109-115
ISSN:2320-7817(p) | 2320-964X(o)

Research Article Open Access

Ecological Role and Diversity of Macrofungi from North Maharashtra, India

Dipashri V. Chaudhari and Dr. V. B. Sonawane

PG and Research Center, Department of Botany K.T.H.M. College, Gangapur Road, Nashik.
Email: chaudharidipashri84@gmail.com

Manuscript details:

Received: 11.03.2025
Accepted: 25.03.2025
Published: 31.03.2025

Cite this article as:
Dipashri V. Chaudhari and Sonawane VB. (2025) Ecological Role and Diversity of Macrofungi from North Maharashtra, India, *Int. J. of Life Sciences*, 13 (1): 109-115.

Available online on http://www.ijlsci.in
ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

ABSTRACT

Saprophytic fungi are vital organisms in ecosystems, playing a key role in the decomposition of organic material and the cycling of essential nutrients. This paper provides a detailed examination of saprophytic fungi, focusing on their morphology, ecological role, and identification methods, as well as the implications for both ecosystem health and human safety. The ecological significance of saprophytic fungi is tempered by the risks they pose to humans. While many species are edible and have culinary or medicinal value, others are highly toxic and can lead to severe health issues, including poisoning or even death. Therefore, identification is crucial, particularly for mushroom foragers, to avoid consuming toxic species. Their identification is both an ecological and safety imperative, as the same features that allow researchers to understand fungal ecology can also aid in distinguishing between edible and toxic species. Despite the critical ecological functions they provide, macrofungi remain understudied, especially in less-explored "ecosystems" like tropical rainforests and remote highlands. This diversity enhances ecological resilience and has economic and medicinal importance, as many macrofungi are utilized in food and medicine. Understanding the factors that drive macrofungal diversity is essential for biodiversity conservation and the sustainable management of ecosystems.

Keywords: Saprophytic fungi, decomposition, morphology, ecological role, edible fungi, toxic fungi, soil fertility, fungal diversity.

INTRODUCTION

Fungi are critical decomposers within ecosystems, breaking down dead organic matter and cycling nutrients that sustain plant and animal life. Saprophytic fungi, which feed on decaying organic material, play a particularly important role in the decomposition process. These fungi recycle nutrients back into the soil and support other organisms' growth by enriching soil fertility. The diversity of fungal species presents challenges in identification, as certain species are edible, while others are highly toxic. This research aims to explore

the morphological features, identification techniques, and ecological significance of saprophytic fungi. Macrofungi, commonly referred to as large fungi, include species of mushrooms, toadstools, and other visible fungi that play crucial ecological roles in ecosystems around the world. They belong to various taxonomic groups, including Ascomycota, Basidiomycota, and Zygomycota, and are characterized by their large fruiting bodies that can be easily observed with the naked eye. The considerable significance of pH conditions and evolving climatic conditions as pivotal determinants of potential biodiversity reduction in macrofungi (Noor Aisyah Mohd Nordin., et.al, 2024). Macrofungi diversity is influenced by numerous factors, including climate, soil composition, and host availability. Their distribution patterns are often linked to the presence of specific ecological niches, such as decaying wood, leaf litter, or mycorrhizal associations with plants (Peay et al., 2010).

Understanding the diversity of macrofungi is critical for conservation, sustainable use of fungal resources, and the study of ecosystem dynamics. Maharashtra, a state in western India, is home to a rich and diverse flora, including a wide variety of macrofungi. The state's varied climatic conditions, ranging from coastal to mountainous regions, create an ideal environment for macrofungi to thrive. Macrofungi in Maharashtra include numerous species of mushrooms, toadstools, and other large fungi that contribute significantly to the ecological functions of nutrient cycling, decomposition, and symbiotic relationships with plants (Patil et al., 2018). The richness of fungal species in this region is also influenced by its tropical and subtropical ecosystems, where fungi play key roles in forest dynamics. Recent surveys in Maharashtra have documented hundreds of species of macrofungi, many of which remain underexplored in terms of their ecological roles and medicinal potential (Patil et al., 2019). Despite the considerable fungal diversity in Maharashtra, many species are still unrecorded, underscoring the need for further mycological exploration and conservation efforts to preserve these organisms in light of environmental changes (Gajbhiye & Ingole, 2017). The region’s fungal diversity is influenced by several factors, including the geographical features of the area, the type of vegetation, soil composition, and the moisture levels provided by the seasonal rains. For example, the forests of the Sahyadri and Satpura ranges are known for their rich biodiversity, supporting various species of macrofungi, many of which are not yet fully documented. Research on macrofungi in North Maharashtra has highlighted the presence of both ectomycorrhizal and saprotrophic species, which help break down organic matter, thereby enhancing soil fertility and promoting plant growth (Kadam & Pawar, 2015).

Ecological Role of Saprophytic Fungi

Fungal diversity directly influences soil structure and stability. Mycorrhizal fungi, in particular, enhance soil aggregation through the production of extracellular enzymes and the creation of fungal hyphal networks that bind soil particles together. These networks improve soil structure, increase water retention, and reduce soil erosion, particularly in disturbed or degraded areas (Brundrett, 2009). Certain macrofungi, like wood-decay fungi and other ligninolytic species, act as ecosystem engineers. By breaking down wood and other tough organic materials, they create niches for other organisms, including invertebrates, microorganisms, and even other fungi. This process increases biodiversity and structural complexity within ecosystems (Hickin, 1971). Macrofungi serve as an important food source for a variety of animals, including mammals, insects, and birds. Their high nutritional value and abundant availability during certain seasons make them critical components of food webs in forest and grassland ecosystems (Kozlowski et al., 2020). Macrofungi are primary decomposers, breaking down dead organic matter, such as plant material, wood, and animal remains. This process releases essential nutrients like nitrogen, phosphorus, and carbon back into the soil, making them available for other organisms, particularly plants. Through decomposition, macrofungi help maintain soil fertility, contributing to the cycling of organic matter (Lücking et al., 2020).

MATERIAL AND METHODOLOGY

Regular field visits were conducted during the rainy season and late rainy season at various locations in Dhule district, located in North Maharashtra.". To identify saprophytic fungi, multiple methods are employed. These methods include the examination of physical characteristics like shape, color, size of fruiting bodies of the fungus. Collecting fruiting bodies packed in polythene bags and boxes for identification

and advanced microscopic analysis. "Microscopic analysis was conducted using the free-hand section method, with cotton blue or lactophenol stain." Identification of species with the help of some relevant literatures to provide unique characteristics that can differentiate species. This method is especially helpful for closely related species that appear similar to the naked eye.

RESULT AND DISCUSSION

1). ***Agaricus bohusii*** (bon.)
Habitat: "It is found in coniferous forests, particularly in areas with decaying plant matter, such as forest floors and grassy clearings." **Morphology:** Features a white to cream-colored cap, often 5–10 cm in diameter, with a smooth texture and a slight umbo (central bump). The gills are initially white, turning pink and then brown as the mushroom matures. The stem is white and cylindrical, with a characteristic ring.
Ecological Role: Decomposes organic material, especially plant matter, contributing to nutrient cycling in forest ecosystems.
Edibility: Edible, but its small size and lack of distinctive flavor make it less commonly consumed.
Toxicity: Not toxic, but should be consumed with caution.

2). ***Agaricus andrewii*** (Fr.)
Habitat: "It is found in grassy areas, meadows, and woodlands, often on decaying plant matter and humus-rich soils.
Morphology: Features a white to cream-colored cap that becomes slightly brownish with age, with a smooth, convex shape. The gills are initially white, turning pink to brown as it matures, and the stem is stout and white.
Ecological Role: Decomposes organic material, helping in nutrient cycling within its ecosystem.
Edibility: Edible, but not commonly consumed due to its resemblance to other species.
Toxicity: Generally not toxic, but caution is needed to avoid confusion with other potentially toxic mushrooms.

3). *Candolleomyces luteopallidus*
Habitat: "It is found in tropical and subtropical forests, typically growing on decaying wood, particularly on fallen branches and logs.
Morphology: Features a pale yellow to light brown, smooth, and somewhat gelatinous cap, with a central stem that is often slender and pale. The gills are white to pale yellow and finely spaced.
Ecological Role: Decomposes wood and organic matter, contributing to nutrient cycling in forest ecosystems.
Edibility: Not commonly consumed; it is not considered a typical edible species due to its small size and gelatinous texture.
Toxicity: Not known to be toxic, but not recommended for consumption due to its inedible nature and lack of culinary use.

4). ***Leucocoprinus birnbaumii*** (Corda)
Habitat: Grows in warm, humid environments, typically in soil of potted plants, on decaying organic material, and in greenhouses.
Morphology: Features a small, yellow to orange, umbrella-shaped cap (3-7 cm in diameter) with a smooth texture.
Ecological Role: Decomposes organic matter, particularly plant material, contributing to nutrient recycling in soil.
Edibility: Not typically consumed due to its small size and lack of culinary value.
Toxicity: Considered toxic, causing gastrointestinal symptoms if ingested. It should be avoided due to potential health risks.

5). *Hexagonia tenuis* (Hook.) Fr.
Habitat: "It is found in temperate forests, grasslands, and woodlands, often on decaying organic matter.
Morphology: A small, reddish-brown to yellowish fungus with a waxy cap typically 1-3 cm in diameter, and gills underneath.
Ecological Role: Decomposes organic material, contributing to nutrient cycling in ecosystems.
Edibility: Generally considered inedible due to its small size and potentially tough texture.
Toxicity: Not known to be toxic but not commonly consumed due to its limited size and tough nature.

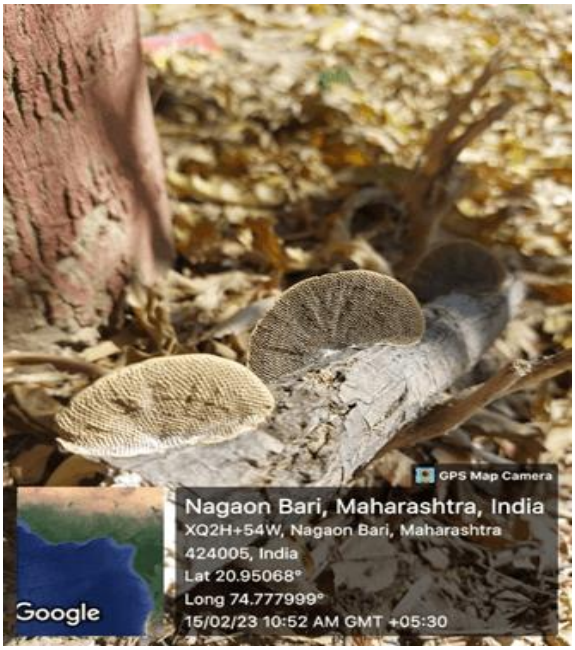
6). *Trametes betulina* (L.) Pilát
Habitat: Grows on decaying hardwoods, particularly beech and oak, in temperate forests.
Morphology: A fan-shaped cap typically 4-10 cm wide, leathery to woody polypore with concentric zones, typically white to pale yellow, with a finely pore-lined underside.

Agaricus bohusii (Bon.)

Agaricus andrewii (Fr.)

Candolleomyces luteopallidus

Leucocoprinus birnbaumii (Corda)



Hexagonia tenuis (Hook.) Fr.

Trametes betulina (L.) Pilát

Calvitia sculpta (Harkn)

Ganoderma lucidum (Curtis) P. karst

Schizophyllum commune (Fr.)

Agaricus subrufescens (Peck)

Ecological Role: Acts as a decomposer, breaking down wood and contributing to nutrient recycling in ecosystems.

Edibility: *Trametes betulina* is considered inedible due to its tough, leathery texture. It lacks culinary appeal, as it is extremely difficult to chew and digest.

Toxicity: Not toxic, but not commonly consumed due to its tough, woody texture.

7). *Calvitia sculpta* (Harkn.)

Habitat: "It is found in temperate and subtropical forests, typically growing on decaying wood, especially on stumps or fallen branches.

Morphology: Features a white to cream-colored, spherical to conical fruiting body with a textured surface that can appear sculpted or rough, often 3–10 cm in diameter.

Ecological Role: Acts as a decomposer, breaking down organic matter and contributing to nutrient cycling in forest ecosystems.

Edibility: Generally not consumed due to its tough texture and inedible nature.

Toxicity: Not known to be toxic, but not considered edible due to its tough consistency.

8). *Ganoderma lucidum* (Curtis) P. Karst

Habitat: Grows on decaying hardwoods, particularly oak, elm, and maple, often found in forests, woodlands, and sometimes urban areas.

Morphology: Large, reddish-brown to yellowish, glossy, and kidney-shaped with a hard, woody texture; the underside has white to pale pores.

Ecological Role: A decomposer, breaking down lignin in wood, playing a significant role in nutrient cycling and forest health.

Edibility: Not typically consumed in its raw form due to its tough, woody texture, but used in traditional medicine and as a supplement.
Toxicity: Not toxic, but it is not edible in the usual culinary sense due to its hardness and bitterness.

9). *Schizophyllum commune* (Fr.)
Habitat: "It is commonly found on decaying wood, including fallen branches, logs, and tree stumps, often in temperate and tropical regions.
Morphology: Features small, fan-shaped or split caps (2-5 cm), white to light gray in color, with distinct, split or "schizoid" edges. The underside has fine, radiating gills.
Ecological Role: A decomposer that breaks down lignin and cellulose in wood, playing an important role in nutrient cycling in forest ecosystems.
Edibility: Edible but not commonly consumed due to its tough texture and small size.
Toxicity: Not toxic, though it is not typically eaten due to its leathery texture and lack of culinary appeal.

10). *Agaricus subrufescens (*Peck)
Habitat: Grows in rich, organic soils, often in forests, grassy areas, and on decaying plant matter. It is cultivated commercially in some areas as well.
Morphology: Features a white to pale brown, convex cap (6–15 cm), which becomes more flattened with age. The gills are initially white, turning pink and eventually dark brown as the mushroom matures. The stem is sturdy, white, and has a ring near the top.
Ecological Role: Decomposes organic material, especially plant matter, contributing to nutrient cycling in its environment.
Edibility: Edible and prized for its mild almond-like aroma and flavor, often used in culinary dishes.
Toxicity: Not toxic, and is considered safe for consumption, though it can be confused with other potentially toxic Agaricus species.

CONCLUSION

Saprophytic fungi are indispensable to ecosystem health, acting as key decomposers that recycle organic material and enhance soil fertility. The identification of these fungi is essential for both ecological research and public safety. Identification through morphological features ensures the appropriate use of fungi species. This research underscores the importance of saprophytic fungi in forest ecosystems and their potential use in bioremediation and sustainable agricultural practices, while also emphasizing the safety risks posed by the toxic varieties. "Some of them have high medicinal value, while others cause wood rotting, and some are saprobes found on soil and decaying debris." The present article reports ten species of macrofungi.

Acknowledgements:
Greatly thankful to my guide Dr. V. B. Sonawane, PG & Research Centre, Department of Botany, K.T.H.M. College, Nashik, (MS) for laboratory and facilities. And also thankful to my family and friends for kind support.

Conflict of Interest: The authors declare no conflict of interest in relation to this research.

Data Availability Statement: Not applicable.

Correspondence and requests for materials should be addressed to **Pavan Kumar Rathore**

Peer review information
IJLSCI thanks the anonymous reviewers for their contribution to the peer review of this work. A peer review file is available.

Reprints and permissions information is available at https://www.ijlsci.in/reprints

REFERENCES

Alexopoulos, C. J., Mims, C. W., & Blackwell, M. (1996). *Introductory Mycology* (4th ed.). John Wiley & Sons.

Brundrett, M. C. (2009). Mycorrhizal associations and other functional diversity in the rhizosphere. *Mycorrhizal Symbiosis*, 56(4), 253–278.

Gajbhiye, A., & Ingole, S. (2017). *Fungal Diversity in the Western Ghats of Maharashtra, India*. *Mycosphere*, 8(5), 639-645.

Hickin, E. R. (1971). The role of fungi in forest ecology. *Canadian Journal of Forest Research*, 1(1), 19–23.

Kadam, A. V., & Pawar, R. K. (2015). Diversity and distribution of macrofungi in the forests of North Maharashtra. *Indian Journal of Mycology*, 9(1), 48-53.

Kozlowski, J., Kaczmarek, Z., & Karpiński, A. (2020). Ecological roles of fungi in terrestrial ecosystems: A review of the potential contributions of macrofungi. *Biological Journal of the Linnean Society*, 129(3), 406–420.

Lücking, R., et al. (2020). Fungal taxonomy and sequence-based nomenclature. *Nature Microbiology*, 5(4), 540-548.

Madhusoodanan, P. V., Kumar, A. S., & Kumar, R. (2008). *Macrofungal Diversity in Maharashtra, India: A Preliminary Survey of Edible and Medicinal Fungi*.

Journal of Mycology and Plant Pathology, 38(2), 242-250.

Noor Aisyah Mohd Nordin1, Nur Ain Izzati Mohd Zainudin1,2*, Wan Mohd Syazwan1, Nor Azwady Abd Aziz1 , Mohd Termizi Yusof3 , Nurul Shazini Ramli4 (2024) Unveiling The Diversity and Ecological Roles of Macrofungi in Ayer Hitam Forest Reserve, Selangor, Malaysia. Malaysian Applied Biology (2024) 53(3): 59-70 https://doi.org/10.55230/mabjournal.v53i3.2996.

Patil, S. B., Patil, S. M., & Bhamare, A. S. (2018). *Diversity and Distribution of Macrofungi in Forest Ecosystems of Maharashtra, India*. *Fungal Diversity*, 37(1), 85-95.

Patil, S. B., Wani, S. M., & Mahajan, P. K. (2019). *Fungal Diversity in the Deccan Plateau Region of Maharashtra, India: Ecological and Economic Perspectives*. *Mycosphere*, 10(3), 269-278.

Peay, K. G., Schubert, M. G., & Bruns, T. D. (2010). *Metagenomic Analysis of the Fungal Microbiota of the California Bay Laurel Forests*. PLoS ONE, 5(8), e11142. https://doi.org/10.1371/journal.pone.0011142

Purdue, R. R., & Allen, M. F. (2006). *Macrofungi and Ecosystem Function*. *Fungal Diversity*, 21(1), 109-123.

Schmit, J. P., & Mueller, G. M. (2007). *An Annotated List of the Macrofungi of the Great Smoky Mountains National Park*. *Mycological Research*, 111(1), 107-118.

Shinde, S. M., Gaikwad, N. N. (2016). Macrofungal diversity in the moist deciduous forests of North Maharashtra. *Fungal Ecology*, 19, 58-63.

Smith, S. E., & Read, D. J. (2008). Mycorrhizal Symbiosis (3rd ed.). Academic Press.

Vasilenko, L., et al. (2020). The role of macrofungi in bioremediation of environmental pollutants: A review. *Fungal Ecology*, 45, 47–57.

Vasilenko, M. M., Demidchik, S. V., & Shcherbina, A. A. (2012). *The Diversity of Macrofungi in the Forest Ecosystems of the Russian Far East*. *Mycological Progress*, 11(1), 89-98.