

Diversity, Habitat Distribution, and Substrate Preference of Basidiomycetes: An Ecological Assessment from Jorhat, Assam, India

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ABSTRACT

A study was conducted to document the diversity, habitat distribution and substrate preference of Basidiomycetes fungi in Jorhat, Assam. The study revealed a rich Basidiomycetes fungal diversity comprising 39 species under 9 orders and 18 families, with Agaricales and Polyporales as dominant groups and Polyporaceae family with the highest 11 number of species. Species richness was highest in gardens, backyards and woodland habitats, with a marked preference for woody substrates. The findings highlight the ecological significance of fungi in decomposition, nutrient cycling, and habitat sustainability, underscoring the importance of conserving both natural and semi-managed ecosystems for maintaining fungal diversity.

Key words: *Fungi, Basidiomycetes, Agaricales, Polyporales, Fruiting body.*

Introduction

Basidiomycetes, commonly called club fungi, are the most highly evolved, advanced, and interesting group of macroscopic fungi (Kokni, 2019). Basidiomycetes are the second-largest phylum, representing 28-40% of fungal diversity (He *et al.*, 2022). They are known for their diverse fruiting bodies, including mushrooms, toadstools, bracket, shelf, and crust fungi, puff balls, earthstars, and coral fungi, and are characterised by the production of sexual spores on the outside of a club-shaped microscopic structure called the basidium (Hood, 2006). The life cycle of basidiomycetes is characterised by a prolonged dikaryotic stage and sexual reproduction involving

plasmogamy, karyogamy, and meiosis. Most of them are terrestrial, and a few are aquatic. Most of the Basidiomycetes may be saprophytes, which are responsible for the decay of litter, wood, or dung. Some of them are found in symbiont form with mycorrhizae in trees, while others are harmful parasites damaging a wide range of woody and herbaceous plants. Pharmaceutical scientists have discovered many bioactive compounds, like cytotoxic effects important in cancer treatment, antioxidants, antiviral, and antifungal compounds from Basidiomycetes fungi (Fulzele, 2013). As saprotrophs, basidiomycetes play a vital role in recycling nutrients, but they also cause severe damage as agents of timber decay (Webster and Weber, 2007). Basidiomycetes

are considered important edible and medicinal resources, as many species serve as a source of nutritious food, bioactive compounds, and therapeutic agents.

The study of basidiomycete diversity is important because it helps us understand their ecological and economic significance, supports conservation efforts, provides valuable resources for food and medicine, and enriches scientific knowledge.

Materials and Methods

About the study site: Jorhat is a major urban centre of the Upper Brahmaputra valley zone of Assam and lies near 26°45'2" N, 94°12'2" E. The Jorhat district covers about 2,851 km². The climate is humid subtropical, with an average annual temperature of 23.7 °C and an annual precipitation of 2,700 mm. Relative humidity is consistently high, peaking above 80–85% during the monsoon months.

Methods of the study

Basidiomycetes and other fungi grow best during the monsoon season. Thus, regular field visits are carried out in forests, grasslands, agricultural lands, and other habitats of the Jorhat district of Assam during May, 2024 to July, 2025 for the collection of fruiting bodies of different basidiomycete fungi from the study site. Ecological data, such as habitat type, substrate preference, etc., are also recorded. Macroscopic characters like size, shape, colour, texture, gills, etc., were recorded. The species of Basidiomycota were identified by comparing their morphological characters with descriptions available in the standard literature (Ainsworth *et al.*, 1973; Singer, 1986; Arya, 2004; Kirk *et al.*, 2008; Nagadesi and Arya, 2014; Rajput *et al.*, 2015). Specimens were preserved in 4% formalin or 70% ethanol and were submitted to the Department of Botany, Jagannath Barooah University.

Results and Discussion

The recorded basidiomycetes fungal species from the study site are presented in Table 1, arranged in sequence of their scientific name along with corresponding details on family, order, fruit body characters, colour, flesh, habitat, collection site, and substrate preference.

A total of 39 basidiomycetes fungal species were documented, representing 9 orders and 18 families,

which reflects considerable taxonomic and ecological diversity. Among these, the order Agaricales was the most dominant, accounting for 41% (16 species), followed by Polyporales with 30.7% (12 species). Other orders, such as Auriculariales, Dacrymycetales, Russulales, Cantharellales, Boletales, Tremellales, Psathyrellales, and were represented by only one to three species each, indicating their relatively limited presence. At the family level, Polyporaceae contains 11 species (28.2%), underscoring the ecological significance of wood-decaying bracket fungi. Bracket fungi (Polypores) are a morphologically distinct category of Basidiomycota that are important agents for decomposition and nutrient cycling in forest ecosystems (Adhikari, 2025). Families such as Agaricaceae, Omphalotaceae, Mycenaceae (3 species each, 7.7%) and Auriculariaceae, Hymenochaetaceae and Dacrymycetaceae (2 species each, 5.1%) were moderately represented, while many others were represented by a single species, thereby contributing to overall diversity.

Regarding habitat distribution, the highest num-

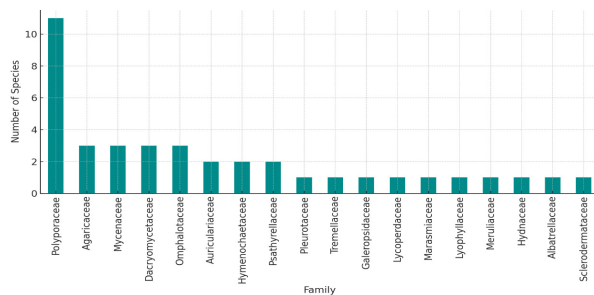


Fig. 1. Relative distribution of Basidiomycetes by family

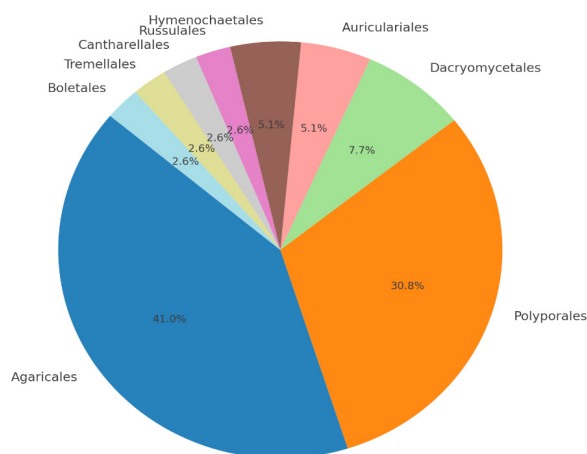


Fig. 2. Relative distribution of Basidiomycetes by order.

Table 1. Recorded basidiomycetes fungal species from the study site.

Sl. No.	Scientific Name	Family	Order	Fruit body	Colour	Flesh	Habitat from	Collected	Substrate
1	<i>Cantharellus</i> sp.	Agaricaceae	Agaricales	Broadly convex to flat cap, central fleshy stem, false gills beneath	Pale yellow to egg yolk yellow	Yellow, solid and fibrous	Ground, branches and shoots of trees etc.	Woodland	Old shoot of <i>Bambusa</i> spp.
2	<i>Abortiporus-biennis</i> (Bull.) Singer	Meruliaceae	Polyporales	Fruit body is irregular, top or rosette-like or fused masses, 5-12 x 5-15 cm; hymenium with worm-like refractive	White to cream coloured	Soft, smooth and brittle.	Grows on the ground from roots or wood chips of trees.	Kitchen garden	Bark of <i>Ficus religiosa</i>
3	<i>Agaricus</i> sp.	Agaricaceae	Agaricales	Cap is about 3-5 cm wide, convex then plane, fleshy, floccose to smooth, centrally depressed.	Dirty white	White, thin at cap margin, very tender, soon flaccid and watery	Grows in groups under trees, on stumps etc.	Woodland	Stump of <i>Mangifera indica</i>
4	<i>Albatrellusovinus</i> (Schaeff.) Kotl. & Pouzar	Albatrellaceae	Russulales	Cap 4-20 cm, circular/irregular, flat to depressed; pores tiny, white to yellow, angular with age.	Dirty white bruising pale light brown	Whitish to yellowish, brittle	Usually growing gregariously on stumps, branches, logs etc.	Flower garden	Stump of <i>Ficus religiosa</i>
5	<i>Auricularia auriculariadae</i> (Bull.) Quéf.	Auriculariaceae	Auriculariales	Ear or cup-shaped, 5-15 cm, forming brownish crust when old.	Dark reddish brown	More or less elastic or rubbery in nature	Branches and trunks of trees, common species and can be found at any time of the year	Swampy area	Bamboo shoot (<i>Bambusa</i> spp.)
6	<i>Auricularia cornea</i> Ehrenb.	Auriculariaceae	Auriculariales	Ear or inverted cup-shaped, translucent.	Light brown	Soft and jelly like	Tenaciously attached to the branches, logs or trunks of trees.	Swampy area	Old, decaying dead shoot of <i>Bambusa</i> spp.
7	<i>Calocera cornea</i>	Dacryomycetaceae	Dacryomycetales	1 cm tall, yellow when moist, orange when dry.	Golden yellow	Yellow, thin and cartilaginous in nature	Common and gregarious on damp wood.	Swampy area	Damp wood. (Batsch) Fr.
8	<i>Calocera viscosa</i> (Pers.) Bory	Dacryomycetaceae	Dacryomycetales	Reminiscent stage horn shaped and 3-8 cm in height	Golden yellow	Golden yellow, cartilaginous	Conifer stumps or roots	Swampy area	Bamboo shoot (<i>Bambusa</i> spp.)
9	<i>Ceritoporus squamosus</i> (Huds.) Quéf.	Polyporaceae	Polyporales	Cap 3-8 cm, ochre-yellow with concentric brown	Yellow	White coloured, soft at first then tough	Common species, usually	Flower garden	Stump of <i>Acglennar-melos</i>

Table 1. Continued

Sl. No.	Scientific Name	Family	Order	Fruit body	Colour	Flesh	Habitat from	Collected	Substrate
10	<i>Clavulinacora-looides</i> (L.) J. Schröt.	Hydnaceae	Cantharellales	feathery scales. Fruit body 3-8 cm, irregularly branched, stag-horn apex; base blackened by Helminthosphaeria.	Crested branch tips are greyish white in colour and the base is blackish.	White	gregarious and tired on trunks of living or dead tree. Very common Mycorrhizal species usually gregarious or solitary or crowded on the ground in woods.	Small woodland	Ground
11	<i>Collybiopsis-amealis</i> (Bull.) Earle	Omphalotaceae	Agaricales	Cap 1-2 cm, convex or shield-shaped; stipe 6 cm, scurfy, darker at base.	White to cream	Flesh is thin, fibrous, usually pliable (like debris grass) and white.	Wood, plant material, or manual.	Pasture	Ground
12	<i>Daedalea</i> sp.	Polyporaceae	Polyporales	The bracket is about 5-8 cm, sessile, semicircular, hard; hymenium on upper surface, pores elongated/labyrinthine.	Light brownish to cream coloured	Brittle	It grows frequently on branches, logs etc. Of trees.	Woodland	Trunk of <i>Ficusreligiōsa</i>
13	<i>Fomes</i> sp.	Hymenochaetaceae	Hymenochaetales	Hoof-shaped, 3-8 cm.	Rusty brown or reddish brown	Corky, tough and reddish brown in colour	Side of living as well as dead trees or stumps	Kitchen garden	Trunk of <i>Areca catechu</i>
14	<i>Ganoderma appplanatum</i> (Pers.) Pat.	Polyporaceae	Polyporales	Cap is bracket shaped, 5-40 cm, semicircular, and very hard with age.	Upper surface is reddish brown to cocoa coloured and the lower surface is white to whitish bruising brown	Chestnut to umber brown coloured, fibrous and corky thick and very hard	Trunks of felled, fall or ageing trees.	Woodland	Trunk of <i>Ficusreligiōsa</i>
15	<i>Ganodermalucidum</i> (Curtis) P. Karst.	Polyporaceae	Polyporales	The cap is bracket shaped, 10-30 cm, semicircular with concentric humps; short stipe, woody.	The upper surface is brown colour and the lower surface is dull whitish in colour.	Chestnut to umber brown, fibrous and or corky, thick and very hard.	Found on trunks of felled, fallen ageing trees.	Garden	Trunk of <i>Artocarpus heterophyllus</i>
16	<i>Ganoderma pfeifferi</i> Bres.,	Polyporaceae	Polyporales	Large perennial, semi-circular, coriaceous-woody, sulcate, waxy yellow pores in late season, sweet-scented.	In older specimen where the upper surface is brownish to bay colour and the lower surface is cream coloured ochraceous to buff.	Woody	It grows on the trunk of living or dead trees.	Small grassland	Trunk of a tree

Table 1. Continued ...

Sl. No.	Scientific Name	Family	Order	Fruit body	Colour	Flesh	Habitat from	Collected	Substrate
17	<i>Ganoderma</i> sp.	Polyporaceae	Polyporales	Semicircular bracket shaped, pale yellow pores bruising brown; stipe absent.	Upper surface is brown while the lower surface is pale whitish yellow bruising brown.	Tough, fibrous and corky.	It is found on the trunks of felled, fallen or ageing trees.	Garden	Trunk of <i>Artocarpushete-rophyllus</i>
18	<i>Gymnopisdrjophilus</i> (Bull.) Murrill	Omphalotaceae	Agaricales	The cap is 2-6 cm, convex then depressed, smooth, fleshy, tan to brown at disc.	Pale, dirty white to dark tan, tinged brown at disc.	Thin white.	Solitary or loosely gregarious on the ground among fallen leaves. It is found from May to November.	Small woodland	Ground
19	<i>Inonotusobliquus</i> (Fr.) Pilát	Hymenochaetaeaceae	Hymenochaetales	The fruit body is broadly expanded up to 14 cm, irregular patch, a thread like margin, and imbricate pores.	Yellow brown, finally fuscous black.	Very hard	Usually grows on stumps, dead branches or living trees.	Roadside avenue	Dead branch
20	<i>Lenzitesbetulinus</i> (L.) Fr.	Polyporaceae	Polyporales	Bracket 4-8 cm, semicircular, hymenium of elongated gill-like plates.	Yellowish brown	White and thin, soft and corky	Common on stumps and branches of trees, often tired and sometimes resupinate.	Roadside verges	Small log
21	<i>Lycoperdonex-cipuliforme</i> (Scop.) Pers.	Lycoperdaceae	Agaricales	Pestle-shaped, 8 cm tall, head 3 cm, whitish with granules.	White	First firm and white, then yellowish and later olive brown, becoming pulverulent	Bare ground on grassy places, occasionally grows in wood also	Grassland area covered with	Ground grasses
22	<i>Lyophyllumde-castes</i> (Fr.) Singer	Lyophyllaceae	Agaricales	The caps are about 4-12 cm, convex with an involute margin, then plane and often undulate.	Yellowish brown	The flesh is thin in cap, fibrous elastic, and whitish in colour.	Common in woods and parkland, where it can be found growing densely tufted around stumps or in grass attached to buried roots.	Pasture	Ground
23	<i>Macrolepiota-procera</i> (Scop.) Singer	Agaricaceae	Agaricales	The fruit body is large and prominent, resembling a lady's parasol. The height may be about 25 cm and	White	Thick, white and soft in cap.	Fairly common species on well drained soils. It is found solitary or in group and fairy	Pasture	Ground

Table 1. Continued ...

Sl. No.	Scientific Name	Family	Order	Fruit body	Colour	Flesh	Habitat from	Collected	Substrate
24	<i>Marasmiusrotula</i> (Scop.) Fr.	Marasmiaceae	Agaricales	the diameter of the cap may be about 5-15 cm.	Cap is whitish to greyish white while the stipe is light brownish	White, thin, smooth, soft in cap	rings in pastures and occasionally in woodland, widespread in temperate regions.	Small grassland	Ground
25	<i>Mycenaagale-riculata</i> (Scop.) Gray	Mycenaceae	Agaricales	Cap 1-3 cm, campanulate then umbonate; stipe variable, smooth, hollow, rooting.	Dingy white	Whitish and thin	It grows on grounds in grasslands	Kitchen backyard	Stump
26	<i>Mycena sepia</i> J.E. Lange	Mycenaceae	Agaricales	Cap 1-1.5 cm, campanulate with umbo; long flaccid stipe, strigose base.	Greyish brown	Whitish but brownish in the stipe	Common and very densely caespitose on stumps, ground, or buried branches of trees.	Kitchen garden	Ground
27	<i>Mycetinisco-rodonius</i> (Fr.) A.W. Wilson & Desjardin	Omphalotaceae	Agaricales	Cap 1-2 cm, convex to plane, gibbous; stipe 2 cm, thin, rooting.	White	Whitish, thin, soft and smooth.	The species is common amongst plant debris, twigs etc.	Garden	Ground
28	<i>Panaeolussemiovatus</i> (Sowerby) S. Lundell & Nannf.	Galeropsidaceae	Agaricales	Cap 1-6 cm, semi-ovate, with veil remnants; slender, fragile stipe, ring often present.	White and very thin	Very common on dung and rich garden soil.	Near cow shed	Ground	Greyish to pale tan
29	<i>Panellusstipticus</i> (Bull.) P. Karst.	Mycenaceae	Agaricales	Cap 1-4 cm, convex, ear-like; luminous gills, cap, and mycelium.	Pale tan to cinnamon	Tough	Very poisonous fungus, grows on tree stumps,	Residential area	Decaying log of <i>Mangifera</i>
30	<i>Parasolapicatilis</i> (Curtis) Redhead, Vilgalys & Hopple	Psathyrellaceae	Agaricales	Cap 0.5-1.5 cm, miniature parasol, fragile.	Pale greyish with brownish disc	Virtually none	Pastures, lawns, and roadside verges	Kitchen garden	Ground
31	<i>Phaeotremella-foliacea</i> (Pers.) Wedin, J.C. Zamora & Millanes	Tremellaceae	Tremellales	Globose to cushion, 5-15 cm, ruffled leaf-like blades fused at base, fertile on both sides.	Dull brownish - vinaceous to cinnamon brown, darkening in age	Gelatinous, slimy and somewhat rubbery.	Usually solitary on downed hardwood logs and branches.	Woodland	Old shoot of <i>Bambusa</i> sp.
32	<i>Pleurotuscornu-copiae</i> (Paulet) Quéf.	Pleurotaceae	Agaricales	Shell-like, white oyster-like, growing in layers on logs.	White	Soft	They always grow on wood in nature usually on dead standing trees or on fallen logs.	Kitchen garden	Dead <i>Areca catechu</i>

Table 1. Continued ...

Sl. No.	Scientific Name	Family	Order	Fruit body	Colour	Flesh	Habitat from	Collected	Substrate
33	<i>Polyporus</i> sp.	Polyporaceae	Polyporales	Thin, semicircular, flattened brackets, 8 cm, flexible when young, spreading along branches.	White	White, thin, dry and rigid in nature.	Found frequently on stump, trunks or log of living or dead trees	Flower garden	Stump of <i>Aegle marmelos</i>
34	<i>Psathyrellacor rugis</i> (Pers.) Konrad & Maubl.	Psathyrellaceae	Agaricales	Cap 1-3 cm, conical to convex, wrinkled, pale tan to brown; stipe slender, 13 cm, rooting.	Pale whitish	Greyish white and very thin	It is very common in woods and hedge banks.	Hedge (a barrier of closely growing bushes)	Ground
35	<i>Scleroderma citrinum</i> Pers.	Sclerodermataceae	Boletales	Oval, scaly to netted, 4-8 cm, from cord-like mycelia.	Olive yellow or brown	Soft	Occurs singly or gregarious under tree, very common from August to December	Playground	Stump of <i>Cassia fistula</i>
36	<i>Trametes cinnabarina</i> (Jacq.) Fr.	Polyporaceae	Polyporales	Bracket 3-6 cm, semicircular, with white spots on surface.	Reddish orange to cinnabar red	Tough	Saprophytic on hardwood, logs, branches or stumps	Woodland	Old shoot of <i>Bambusa</i> spp.
37	<i>Trametes gibbosa</i> (Pers.) Fr.	Polyporaceae	Polyporales	37. Bracket 3-6 cm, lower surface with elongated gill-like plates.	Whitish or off white to pale brownish	Thick and tough, whitish to pale brownish	Branches, logs of dead or living trees	Garden	Branch of <i>Hibiscus rosasinensis</i>
38	<i>Trametes versicolor</i> (L.) Lloyd	Polyporaceae	Polyporales	3-6 cm, tiered, spreading, with concentric zones of colour.	Greyish black	White, thin and tough	Logs, stumps and branches of frondose trees, a very common fungus	Flower garden	Stump of <i>Aegle marmelos</i> .
39	<i>Tremella</i> sp.	Dacryomycetaceae	Dacryomycetales	Sessile, gelatinous when wet; hymenium on large leaflike folds.	Light pinkish to flesh coloured	Slimy soft and jelly like	Trunks, logs, branches of trees.	Garden	Trunk of <i>Areca</i> nut tree

ber of species was recorded in gardens, flower gardens, kitchen gardens, and backyards (30.7%), followed by woodlands and small woodlands (23%). This indicates that anthropogenic habitats with abundant organic matter and moderate disturbance also harbour a considerable diversity of macrofungi, a pattern reported in similar studies (Adhikari, 2025). Analysis of substrate preference revealed that a majority of fungi showed a strong association with woody substrates such as trunks, stumps, logs, branches, and bamboo shoots, which together supported more than 70% of the total species. This finding is consistent with the well-established ecological role of basidiomycetes as principal wood decayers, contributing significantly to nutrient cycling and forest ecosystem functioning (Rayner and Boddy, 1988; Hibbett *et al.*, 2014).

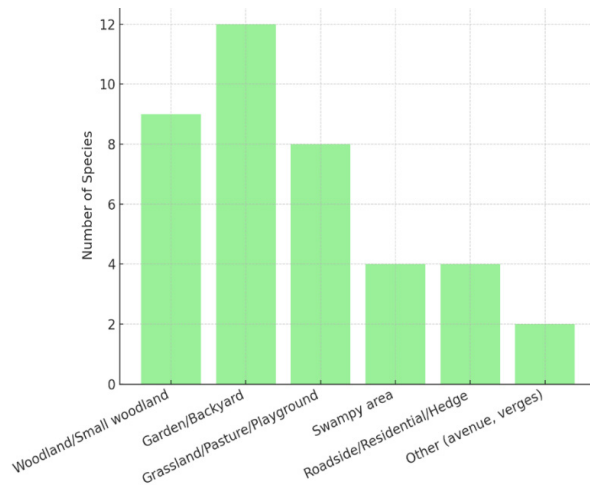


Fig. 3. Habitat diversity of Basidiomycetes fungi in the study site.

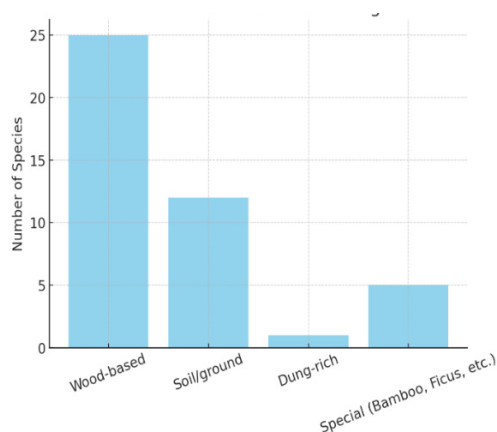


Fig. 4. Substrate preference of Basidiomycetes fungi in the study site

Conclusion

Fungi represent one of the most ecologically important groups of organisms, playing vital roles in decomposition, nutrient cycling, and symbiotic associations within ecosystems. Their diversity and distribution are strongly influenced by environmental factors such as habitat type, substrate availability, and microclimatic conditions. Documenting fungal taxa at the local level provides valuable insights into their taxonomic composition, ecological preferences, and functional significance. In the present study, a total of 39 species belonging to 9 orders and 18 families were recorded from diverse habitats and substrates. The observations emphasize the dominance of Agaricales and Polyporales, the prevalence of woody substrates as major colonization sites, and the importance of gardens, backyards, and woodland habitats in supporting fungal diversity.

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