

Diversity of Higher Fungi on University of Ibadan Campus (2)

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ABSTRACT

Fungi generally play crucial roles in the forest ecosystems; by enhancing soil fertility, facilitating nutrient recycling, decomposing organic matter, and promoting plant health. In our first published article, some higher fungi (mushrooms) that were collected from University of Ibadan Botanical Gardens were reported. In this present study, further investigations were carried out on the diversity, distribution, and ecological significance of other higher fungi collected from the University of Ibadan campus. The collections were done between April and October 2024. The research was aimed in identifying macro-fungal species, estimate their population, and determining their preferred habitats .Findings from this study emphasized the ecological importance of fungi in nutrient cycling, decomposition, and soil enrichment. In addition to the twenty four(24) already reported higher fungi in Part 1 of this study, additional twenty one (21) new genera of macrofungi were collected ,characterized and reported in this present investigation. The new fungi group in Part2 of this study includ the Agarics, Auricularias Lycoperdons , Clavarias ,Polypores and Craterellas .These fungi play important roles in forest ecosystem, food production and medicines .The significance of the of the study were discussed.

Keywords: biodiversity, fungi, distribution, ecological significance

INTRODUCTION

Higher fungi are important components of forest ecosystems and; this group of organisms have received less attention than animals and plants. (Arnold and Lutzoni, 2020;Jonathan et.al.,2025a) Fungi are essential, cosmopolitan ,omnipresent and highly diverse in nature(Jonathan et.al.,2025b;Omotayo et.al.,2025).They could be microscopic or macroscopic in nature.The kingdom fungi is made of many simple,complex and diverse groups.) Fungi play many important functions in their natural habitats. They exist in soil, water and

air in spore form (Adeoye-Isijiola et al.,2021; Asemoloye,2022;Agbaje et al.,2024; Jonathan et al., 2023).Their activities in any environment could have great influence on humans and human-related functions. Soil fungi play uncountable roles in many ecological processes which are crucial in maintaining ecosystem stability, as influencing soil fertility, cycling of minerals and organic matter, as well as plant health and nutrition (Jonathan et al., 2018a; Okpewho et al.,2024). Fungi are important in forest habitats and are involved in the degradation and decomposition of dead trees and forest litters .They deliver species-specific benefits to their host plants, which aid in plant-microbes nutrition (Jonathan et al., 2024;Omotayo et. al.,2025). Edible fungi are important article of food for human beings; besides their usefulness in agro-industrial industries, pharmaceutical companies and textile companies (Otunla et al., 2017;Jonathan et al., 2018b;Omotayo et. al.,2025;Anakaa et. al.,2025).

Economically important fungal group may include morels, mushrooms, canthrellas, auricularia puffballs and ;plant and animal pathogens (Omotayo et. al., 2025; Jonathan et al., 2025a). The two major classes of fungi that form fruiting bodies are Ascomycota and Basidiomycota.. Most members of Ascomycota are microscopic species, but they also have some macrofungi members such as cup-fungi, morels and truffles. The Basidiomycotes, is a large class including mushrooms, toadstools, bracket fungi, polyporus and puffballs, although about 30% of its species are microscopic (Vargas et al., 2015; Jonathan,2019).

The higher fungi are differentiated by their spore-bearing structures “basidiocarp” that could be seen with naked eye. These group may compose of Auricularia, bracket fungi ,mushrooms, puffballs, , false-truffles, and cup fungi, which are common examples of macrofungi (Jonathan et al.,2025a). Higher fungi usually produce a visible basidiocarp (fruiting bodies) under favorably atmospheric conditions of optimal temperature, humidity, light, and surrounding flora (Martínez et al., 2019; Jonathan et al.,2025a).). Fruiting bodies are usually short lived and may last only a 2 to7 days before bio deterioration (Karasawa et al., 2016). Macroscopic fungi with specific fruiting organs and sizes are big enough to be visible to the naked eyes (Karim et al., 2017; Jonathan et al., 2024). Many highernfungal species are believed to fruit sporadically with no consistent pattern of occurrence from year to year (Tedersoo et al., 2018).

Macro-fungi are much abundant in rainy seasons because of the wetness and richness of the soil substrates in the lawns ,forests and fields (Martínez et al., 2019). In some species, fruiting bodies may be short-lived; while in others, they are persistent and may be perennial (Karim et al., 2017;Jonathan,2019). The fruiting body of macrofungi are dependent on weather conditions, and the abundance of the basidiocarps may vary from species to species over the years (Tedersoo et al., 2018; Jonathan et al.,2025b). When there is a change in climate,the basidiomycetes fruiting bodies are among the first biotic groups that are unusually being affected by environmental disturbance, and as such, they can be considered as good indicators of ecosystem changes or modification (Barrico et al., 2016).

Higher fungi mycelia and fruiting bodies are known to contain multiple nutrients and bioactive health components such as amino acids, proteins, dietary fibers, active polysaccharides and functional components such as lovastatin, gamma-aminobutyric acid (GABA), and ergothioneine. Thus, they are good sources of healthy food, nutraceuticals, and food-flavoring additives (Jonathan,2019).. Macrofungi could be used in flour based products such as breads and biscuits. They could also enhance antioxidant and nutritional content of pasta, decrease the digestibility of carbohydrates, and regulate the hypoglycemic activities ion human beings (Lu et al., 2018). The adverse effects of the toxins in certain edible macrofungi on human health remain a matter of concern. It was reported that the consumption of yellow knight mushrooms (*Tricholoma equestre*) could cause rhabdomyolysis in rats (Jonathan,2019;Bedry et al., 2021). After extensive and numerous human trials on *T. equestre* intake there were no hematological or biochemical alterations nor any adverse effects (Klimaszyk and Rzymiski, 2018).

Wild macro fungi constitute important natural resources on which the people of many nations depend. In Nigeria, edible macrofungi are known and consumed by many tribes in many homes..

Fungal biodiversity is an important component of global ecological niche, particularly community diversity, which is an essential part of biological niche (Hyde et. al., 2019; Jonathan et al.,2025a)). The current rate of bush burning, deforestation, and overexploitation of both timber and non-timber products are threatening to macrofungi diversity in Nigeria . Although macrofungi have perhaps the long history of existence, but they are nevertheless not well studied Only about 6.7% of the 1.5 million species of fungi estimated in the world have been described. The tropical region, which has the highest fungal diversity, has not been fully exploited. Therefore, the present study sheds light on the diversity of higher fungi on University of Ibadan campus.

MATERIALS AND METHODS

Study Area

Higher fungi in this study were collected from University of Ibadan campus. Latitude N 7° 22' 39.1296" and Longitude E 3° 56' 49.344". University of Ibadan is located within the Tropical rain forest supported the luxuriant growth of various types of mushrooms and other varieties of other higher fungi.

Collection and preparation of samples

Samples of macro-fungi used for this study were obtained during the rainy season (April to October) 2024. They were collected randomly at different locations within the University of Ibadan campus. Wild higher fungi samples was sourced for in fairly wet places that contained decomposing organic materials of leaves, agricultural wastes, wood and soils. The fungal samples were collected by carefully uprooting from soil, termite nests, the decaying agricultural wastes, leaves debris, and log of wood (Jonathan, et al.,2024). Careful precautions were taken not to damage any vital part of the sample, especially the annulus and the volva.. With the aid of a thermometer and humido -meter, the temperature and relative humidity of the each sampled location was taken. GPS readings were taken using Compass software. Matured fruit bodies were collected manually, cleaned with dry cotton wool to remove soil debris, and disinfected with ethanol. The specimens were subsequently transported to the Pathology Laboratory Department of Botany for authentication. Preliminary identification of the collected higher fungi were carried out using the morphological features such as pileus color, stipe morphology, presence of annular ring, arrangement of gills and volva (Ostry et al., 2017) Digital photographs were also taken for each specimen. Confirmed identification was carried out using chemicals tests (Bassette et al.,2019,) and spore prints (Jonathan,2019). Completed identification were carried out using micro-morphological descriptions observed under the X60 objective of the microscope (Alexopolous et al,1996) .Standard features such as pore type, spore sizes shape and attachment were considered.

Spore prints

To prepare the spore print, the fungal cap was placed with its undersurface facing downward on a piece of white paper. In cases where the spore print was expected to be white, black, green, or red paper was used as the background for better visibility. A light weight was placed on the pileus to prevent the delicate cap from collapsing, ensuring that spores would not escape, (Jonathan 2019).

Chemical Tests

Chemical tests were carried out for confirmed identification of the collected macrofungi. The procedure were according to the outline of Jonathan (Bassette et al., 2019)

Ammonia (NH₄OH, Ammonium Hydroxide)

A drop of ammonia was separately placed on the cap, stipe, and pore surface of the fungal specimen and color changes were observed and recorded. Blue-green colour confirms that the fungus is *Boletus illudens* while

Boletus separans usually has a greyish colour (Bassette et al., 2019)

KOH (Potassium Hydroxide)

This is a general identification test for polypores and agarics, Aqueous KOH Solution (5%) was added to the fresh tissue of collected fungi to test for color changes. KOH was employed in the identification of various mushrooms, including boletes, polypores, and Agarics. For boletes, a drop of KOH was applied to the cap, stem, sliced flesh, and pore surface. For polypores, KOH was applied to the flesh and the cap surface. In the case of agarics, a drop was placed under the fungal surface. Any color changes that occurred were carefully observed and recorded. A yellow color indicates that the fungus is agarics e.g. *Agaricus* and *Amanita*; magenta or olive reactions show that is *Russula* and *Lactarius*. Sometimes deep red or black reactions were common in many agarics; black reactions were crucial for distinguishing polypore species; and various color reactions (Jonathan, 2019).

Iron Salts (FeSO₄)

Aqueous (5%) FeSO₄ was used in this experiment to test for color changes, primarily in the identification of Boletes and *Russulas*. For Boletes, a drop of the solution was applied to the cap, stem, sliced flesh, and pore surface. For *Russulas*, the drop was applied to the stem surface. For example, in *Boletus edulis*, the cap surface stained orange upon the application of either KOH or NH₄OH.

Ammonia: A couple of drops were placed on the flesh. For polypores and agarics will change blue-green (Bassette et al., 2019)

Meixner test

The Meixner test, also known as the Wieland test, which used concentrated hydrochloric acid and newspaper to test for the deadly amatoxins found in some species of *Amanita*, *Lepiota*, and *Galerina*. Red colour indicate the presence of *Amanita*, *Lepiota* and *Macrolepiota*. (Bassette et al., 2019)

Melzer's reagent:

Melzer's reagent was used to test whether spores were amyloid, nonamyloid, or dextrinoid. Spores that stained bluish-gray to bluish-black were classified as amyloid, while those that stained brown to reddish-brown were categorized as dextrinoid. This test is typically performed on white-spored mushrooms, as color changes in darker spores are not readily detectable. Although the color change is most easily observed under a microscope, it is also possible to discern the reaction with the naked eye, provided a good spore print is available (Jonathan, 2019).

Potassium hydroxide:

A 3–10% solution of potassium hydroxide (KOH) was used, which induced a color change in some species of mushrooms. In *Agaricus*, some species, such as *A. xanthodermus*, turned yellow with KOH, many species showed no reaction, and *A. brutescens* turned green. Distinctive color changes were observed in certain species of *Cortinarius* and *Boletus*. The Schaeffer reaction, developed by Julius Schäffer, was used to assist with the identification of *Agaricus* species. A positive reaction in Schaeffer's test, which involves the reaction of aniline and nitric acid on the surface of the fungus, was indicated by an orange to red color. This reaction is characteristic of species in the section *Flavescentes*. The compounds responsible for the reaction, named schaefferal A and B, were named in honor of Schäffe

RESULTS

Table 1: Group of macro -fungi collected from University of Ibadan Campus

SN	Macro-fungi Group	General Descriptions	Total Number of fungi collected	Percentage (%) of total collection
1	Agarics	The Agarics possessed umbrella-like caps known as pileus and stalk(stipe) which attaches the fungus to the substratum with gills on the lower surface of the cap. Few agarics may have annular ring and volva. Agarics (mushrooms) have members with both edible and poisonous species	770	26.8
2	Auricularias	This group is made up of gelatinous fungi that resemble human ear. The basidiocarp when fresh is rubbery, gelatinous and ear-like in structure but when dried, it is shapeless and brittle. They are generally edible.	155	5.4
3	Boletes	The Boletes possessed vertical tubes instead of gills as seen in the Agarics. The tubes which are arranged side by side in parallel to form layers that can be detached from the flesh of the pileus. Many members of this group are edible while only few species are poisonous	55	1.9
4	Clavarias	Clavarias resembles that of shrubs. may also appears as shrubs having the structure of small club.It usually appear in groups.All the species of Clavaria are edible.	80	2.8
5	Ascomycetes	Ascomycetes fungi are characterized by their funnel-shaped fruiting bodies, smooth spore-bearing surfaces, and ecological role as mycorrhizal fungi, contributing to forest health and biodiversity.	103	3.6
6	Hydnums	The hydnums are characterized by the presence of teeth or spines under the pileus.They are made up of homogenous group where only few species are edible	22	0.8
7	Lycoperdons	They are made up of macrofungi which appear as globular in structure. While some are very small roundish in structure. Some may be large enough like the football.These are excellent edible species which are attached to the soil by hyphae aggregation called tendrils	97	3.4
8	Pezizas	Pezizas are cup shaped macrofungi that may be poisonous. They are made up of large saprophytic species of cup fungi that grow on the dung, soil and decaying wood	70	2.4
9	Polypores	. In this group, horizontal tubes are found the pileus.The tubes in polypores are borne in layers and firmly attached to the sporophore.This group comprises of few edible species which are tender enough to be eaten	1525	53.0
		TOTAL	2877	53.0

PLATES OF MACROFUNGI COLLECTED



Plate 1: *Panus velutinus* (Fr.) Sacc.

Kingdom: Fungi

Phylum: Basidiomycota

Class: Agaricomycetes

Order: Polyporales

Family: Panaceae

Genus: Panus

Species: *Panus velutinus*

Edibility: Inedible



Plate 2: *Trametes gibbosa* (L.) Lloyd

Kingdom: Fungi

Phylum: Basidiomycota

Class: Agaricomycetes

Order: Polyporales

Family: Polyporaceae

Genus: *Trametes*

Species: *Trametes gibbosa*

Edibility: Inedible



Plate 3: *Amanita cokeri* (E.J. Gilbert & Cleland) Bas

Kingdom: Fungi

Phylum: Basidiomycota

Class: Agaricomycetes

Order: Agaricales

Family: Amanitaceae

Genus: Amanita

Species: *Amanita cokeri*

Edibility: Inedible/Poisonous



Plate 4: *Hydnopolyporus fimbriatus* (Fr.) D.A. Reid

Kingdom: Fungi

Phylum: Basidiomycota

Class: Agaricomycetes

Order: Polyporales

Family: Irpicaceae

Genus: *Hydnopolyporus*

Species: *Hydnopolyporus palmatus*

Edibility: Inedible



Plate 5: *Boletellus emodensis* (Berk.) Singer

Kingdom: Fungi

Phylum: Basidiomycota

Class: Agaricomycetes

Order: Boletales

Family: Boletaceae

Genus: *Boletellus*

Species: *Boletellus emodensis*

Edibility: Not commonly consumed



Plate 6: *Daedaleopsis confragosa* (Bolton) J. Schröt.

Kingdom: Fungi

Phylum: Basidiomycota

Class: Agaricomycetes

Order: Polyporales

Family: Polyporaceae

Genus: *Daedaleopsis*

Species: *Daedaleopsis confragosa*

Edibility: Inedible

Both species are essential to nutrient recycling in their ecosystems.



Plate 7: *Pycnoporus sanguineus* (L.) Merrill

Kingdom: Fungi

Phylum: Basidiomycota

Class: Agaricomycetes

Order: Polyporales

Family: Polyporaceae

Genus: *Pycnoporu*

Species: *Pycnoporus sanguineus*

Edibility: Inedible



Plate 8: *Mycena laeiana* (Berk.) Sacc

Kingdom: Fungi

Phylum: Basidiomycota

Class: Agaricomycetes

Order: Agaricales

Family: Mycenaceae

Genus: *Mycena*

Species: *Mycena laeiana*

Edibility: Inedible

Cymatoderma elegans and *Schizophyllum commune* are both wood-decaying fungi. *Cymatoderma elegans* has a distinctively elegant, whitish to pale yellow cap and typically grows on decaying wood in temperate forests, contributing to wood degradation. *Schizophyllum commune*, known for its split, fan-like cap, is one of the most widely distributed fungi, often found on decayed wood, where it plays a significant role in lignin breakdown and nutrient cycling. Both fungi are important in the decomposition process in forest ecosystems.



Plate 9: *Cymatoderma elegans* (Jungh.) D.A. Reid

Kingdom: Fungi

Phylum: Basidiomycota

Class: Agaricomycetes

Order: Polyporales

Family: Meruliaceae

Genus: *Cymatoderma*

Species: *Cymatoderma elegans*

Edibility: Inedible



Plate 10: *Schizophyllum commune* Fr.

Kingdom: Fungi

Phylum: Basidiomycota

Class: Agaricomycetes

Order: Agaricales

Family: Schizophyllaceae

Genus: *Schizophyllum*

Species: *Schizophyllum commune*

Edibility: Inedible

Marasmius albuscorticis and Ganoderma applantum are both fungi associated with decaying wood. Marasmius albuscorticis has a small, white fruiting body and typically grows on decayed bark in forest environments, contributing to the breakdown of plant material. Ganoderma applantum, also known as the artist's conk, has a woody, large fruiting body with a smooth, white to brownish cap, often found on hardwoods. It plays a crucial role in the decomposition of lignin and cellulose, aiding nutrient recycling in forest ecosystems.



Plate 11: Marasmius albuscorticis Desjardin

Kingdom: Fungi

Phylum: Basidiomycota

Class: Agaricomycetes

Order: Agaricales

Family: Marasmiaceae

Genus: Marasmius

Species: Marasmius albuscorticis

Edibility: Inedible



Plate 12: Ganoderma applantum (Pers.) Pat.

Kingdom: Fungi

Phylum: Basidiomycota

Class: Agaricomycetes

Order: Polyporales

Family: Ganodermataceae

Genus: Ganoderma

Species: Ganoderma applanatum

Edibility: Inedible

Humaria hemisphaerica and *Lycogala epidendrum* are both fungi with unique appearances and ecological roles. *Humaria hemisphaerica*, also known as the hemisphere jelly fungus, features a small, semi-circular, translucent fruiting body and typically grows on decaying wood in temperate regions. It contributes to the decomposition of organic matter. *Lycogala epidendrum*, commonly known as the wolf's milk slime mold, is a bright, pinkish slime mold found on decaying wood and plant debris, where it plays a role in breaking down organic material and recycling nutrients.



Plate 13: *Humaria hemisphaerica* (F.H. Wigg.) Fuckel

Kingdom: Fungi

Phylum: Ascomycota

Class: Pezizomycetes

Order: Pezizales

Family: Pyronemataceae

Genus: *Humaria*

Species: *Humaria hemisphaerica*

Edibility: Inedible



Plate 14: *Lycogala epidendrum* (L.) Fr.

Kingdom: Protista

Phylum: Cercozoa

Class: Mycetozoa

Order: Amaurochaetales

Family: Amaurochaetaceae

Genus: *Lycogala*

Species: *Lycogala epidendrum*

Edibility: Inedible

Calvatia fragilis and *Trametes betulina* are both wood-associated fungi. *Calvatia fragilis*, also known as the fragile puffball, features a round, whitish to tan fruiting body that easily breaks apart when disturbed. It typically grows on decaying organic matter in forests, contributing to decomposition. *Trametes betulina*, a bracket fungus, has a white to pale cap with a characteristic pore surface and grows on decaying wood, particularly hardwoods. It plays an essential role in breaking down lignin and cellulose in forest ecosystems.



Plate 15: *Trametes betulina* (L.) Ryvarden

Kingdom: Fungi

Phylum: Basidiomycota

Class: Agaricomycetes

Order: Polyporales

Family: Polyporaceae

Genus: *Trametes*

Species: *Trametes betulina*

Edibility: Inedible

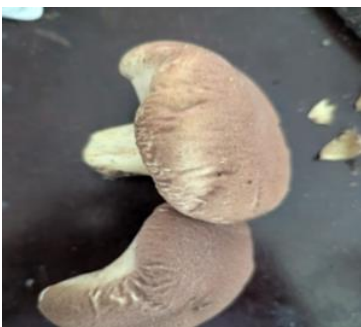


Plate 16: *Calvatia fragilis* (Vittad.) Morgan

Kingdom: Fungi

Phylum: Basidiomycota

Class: Agaricomycetes

Order: Amaurochaetales

Family: Amaurochaetaceae

Genus: *Calvatia*

Species: *Calvatia fragilis*

Edibility: Inedible

Clavaria rosea and Lepiota atrodisca are both fungi with distinct characteristics. Clavaria rosea, also known as the pink coral fungus, features delicate, branching, pink to reddish fruiting bodies that resemble coral and typically grows on decaying organic matter in woodlands. Lepiota atrodisca, with its small, white to brownish cap and scaly appearance, grows on the ground in forests or grassy areas, often associated with decaying plant material. Both species contribute to the decomposition of organic material in their ecosystems.



Plate 17: Clavaria rosea (Pall.) Fr.

Kingdom: Fungi

Phylum: Basidiomycota

Class: Agaricomycetes

Order: Cantharellales

Family: Clavariaceae

Genus: Clavaria

Species: Clavaria rosea

Edibility: Inedible



Plate 18: Lepiota atrodisca Zeller

Kingdom: Fungi

Phylum: Basidiomycota

Class: Agaricomycetes

Order: Agaricales

Family: Agaricaceae

Genus: Lepiota

Species: Lepiota atrodisca

Edibility: Inedible

Meripilus giganteus, commonly known as the giant polypore, is a large, wood-decaying fungus found at the base of trees, particularly beech. From an upper view, its fruiting body appears as a rosette-like cluster of overlapping, fan-shaped caps with a brown to tan coloration that darkens with age. The surface is often slightly rough or wrinkled. This fungus plays a significant role in breaking down lignin and cellulose, contributing to forest nutrient cycling. Let me know if you need an illustration or more details!



Plate 19a: *Meripilus giganteus* (upper view) Plate

(Pers.) P. Karst.

Kingdom: Fungi

Phylum: Basidiomycota

Class: Agaricomycetes

Order: Polyporales

Family: Meripilaceae

Genus: *Meripilus*

Species: *Meripilus giganteus*

Edibility: Inedible



19b: *Meripilus giganteus* (lower view)

(Pers.) P. Karst.

Kingdom: Fungi

Phylum: Basidiomycota

Class: Agaricomycetes

Order: Polyporales

Family: Meripilaceae

Genus: *Meripilus*

Species: *Meripilus giganteus*

Edibility: Inedible

Armillaria gallica and *Caloporus dichrous* are both wood-decaying fungi with ecological significance. *Armillaria gallica*, a species of honey fungus, has a yellow-brown cap, thick stipe with a bulbous base, and bioluminescent mycelium. It primarily grows on decaying wood and roots, contributing to decomposition while also being a potential plant pathogen. *Caloporus dichrous* is a polypore fungus with a reddish-brown to purplish cap and a contrasting pore surface, commonly found on decaying hardwoods, where it aids in lignin breakdown. Both species play vital roles in forest nutrient recycling.



Plate 20: *Armillaria gallica* Marxm. & Romagn

Kingdom: Fungi

Phylum: Basidiomycota

Class: Agaricomycetes

Order: Agaricales

Family: Physalacriaceae

Genus: *Armillaria*

Species: *Armillaria gallica*

Edibility: Edible



Plate 21: *Caloporus dichrous* (Fr.) Quél.

Kingdom: Fungi

Phylum: Basidiomycota

Class: Agaricomycetes

Order: Polyporales

Family: Irpicaceae

Genus: *Gloeoporus*

Species: *Gloeoporus dichrous*

Edibility: Inedible

Results of Chemical Tests and Spore prints

This table presents the results of key chemical tests used in the identification of macrofungi. The Ammonia Test involves applying ammonia (NH₃) to fungal tissue to observe color changes, which can indicate specific chemical compounds within the fungus. The Potassium Hydroxide (KOH) Test was used to detect pigmentation changes in fungal structures by applying KOH (3-10%), helping to distinguish between different fungal genera and species. The Iron Salts Test identifies the presence of certain iron-binding compounds in fungi by adding iron salts and observing any resulting color reactions. Lastly, the Meixner Test (Guaiac Test) is a toxicological test used to detect amatoxins, poisonous compounds found in some fungi, such as Amanita species. This was done by applying guaiac reagent and hydrochloric acid to produce a blue or green color reaction.

Table 2

Macrofungi	Ammonia Test	Potassium Hydroxide Test	Iron Salts Test	Meixner Test
Agarics	Some species show yellowing	Usually turns yellow, reddish or orange on cap or flesh	Often unreactive	Some species (e.g., Amanita) may test positive
Auricularias	No significant reaction	No strong color change	No significant reaction	Negative
Boletes	Some species stain blue or red	Strong reddish-brown reaction in some species	Typically turns greenish	Some toxic species test positive
Clavarias	Usually no reaction	No strong color change	No significant reaction	Negative
Craterellas	No reaction	May stain orange or reddish, sometimes Weak or no color change	No significant reaction	Negative
Hydnums	No significant reaction	May turn yellow to red while other may show Some species show mild discoloration	Usually no reaction	Negative
Lycoperdons	No reaction	Weak color change or no reaction, may turn reddish or brown	Some species turn greenish	Negative
Pezizas	No reaction	Weak or no color change and may show yellow or orange	No significant reaction	Negative
Polypores	Some species turn yellowish	May turn reddish-brown or black with strong reaction in some species	May react green or black	Negative

DISCUSSION

This study investigated the diversity, ecological roles, and edibility of macrofungi within the University of Ibadan campus. Fungal diversity varied across the study sites: the Botanical Gardens exhibited the highest diversity and abundance due to minimal human disturbance and high organic matter, followed by the Teaching and Research Farm, where agricultural activities influenced fungal communities. This results is similar to those obtained by (Jonathan,2019) whom suggested that many higher fungi were found at the University of Ibadan due to reduce no agricultural activities.The fact that the Nurserysection of the Botany Department had the second fungal population may be due to similar reason (Jonathan et al.,2024).

Fungal groups identified included Agarics (26.8%), Polypores (53.0%), Auricularias (5.4%), Boletes (1.9%), Clavarias (2.8%), Craterellas (3.6%), Hydnums (0.8%), Lycoperdons (3.4%), and Pezizas (2.4%). Many of these fungi contribute to nutrient cycling, bioremediation, and food security. The dominance of Polypores aligns with previous studies (Chikwem et al.,2019), while findings on edible fungi support the previous studies of Jonathan et al., (2013) and Hyde et al.,(2019). International research corroborates the observed roles

of Agarics, Boletes, and Craterellas in ecosystem stability and nutrient cycling (Brudedrelt and Tenderson,2018).

Overall, macrofungi play crucial ecological roles, including organic matter decomposition and symbiotic relationships, with some species offering potential as alternative food sources. The presence of toxic fungi highlights the need for further research to differentiate edible from poisonous species, emphasizing the importance of fungal biodiversity conservation and food security.

This study provides a comprehensive assessment of macrofungi diversity, ecological significance, edibility, and potential applications within the University of Ibadan campus. The Botanical Gardens exhibited the highest fungal diversity due to minimal human disturbance and rich organic matter, while the Teaching and Research Farm supported considerable fungal populations influenced by agricultural activities. The Nursery of the Botany Department showed moderate diversity, and the Heritage Park along Queen's Hall had the lowest diversity, likely due to anthropogenic activities and soil compaction (Jonathan et al,2024).

The study highlights macrofungi's role in bioremediation, with Polypores (53.0%), Craterellas, and Auricularias significantly contributing to nutrient cycling and organic matter decomposition. Edible species such as Auricularias, Lycoperdons, and Clavarias offer nutritional benefits, supporting food security. However, the presence of toxic fungi like certain Agarics (26.8%) underscores the need for further taxonomic classification. The findings align with previous local and international research, confirming the ecological importance and distribution patterns of these fungal groups.

Beyond ecological roles, macrofungi have potential applications in bioremediation, pharmaceuticals, and sustainable agriculture. Some species possess enzymatic properties useful for breaking down pollutants and detoxifying soils, while others have medicinal properties with antimicrobial and immunomodulatory effects. Further biochemical studies could reveal novel bioactive compounds for pharmaceutical use. Additionally, integrating macrofungi into sustainable agriculture through mycorrhizal inoculation could enhance soil fertility and crop productivity.

This study underscores the need for fungal conservation strategies, public awareness on edible fungi, and further research on their biochemical properties. Understanding fungal diversity and ecological interactions will enhance biodiversity conservation, environmental sustainability, and food security, reinforcing the need for continued research and preservation efforts.

Based on these findings, it is recommended that further research be conducted to assess the potential for sustainable cultivation and utilization of edible macrofungi species. There should be increased efforts in educating the public and local communities on the identification of edible and toxic fungi to prevent accidental poisoning. Conservation policies should be implemented to protect fungal biodiversity, particularly in urban and semi-urban environments where ecological balance is crucial. Additionally, collaborations between mycologists, ecologists, and policymakers should be encouraged to enhance fungal research, conservation, and commercialization efforts. Future studies should also explore the molecular characterization of identified species to expand scientific knowledge on their taxonomy and potential biotechnological applications.

Global Comparisons aim to compare the fungal diversity of the University of Ibadan campus with similar ecosystems worldwide. By conducting comparative studies, researchers can identify regional differences in fungal species composition, distribution, and ecological roles. This contributes to the broader understanding of global fungal biodiversity and informs conservation strategies. These research areas provide a comprehensive understanding of macrofungi within the University of Ibadan campus, highlighting their ecological importance, biotechnological potential, and commercial viability. These studies not only advanced scientific knowledge but also support sustainable development and environmental conservation efforts.

CONCLUSION

University of Ibadan, Ibadan, Nigeria is very rich in vast number of wild higher fungi because of the undisturbed natural vegetation. Commercial cultivation of edible fungi should be promoted in Nigeria because there were pockets of undocumented reports that consumption of poisonous fungi have caused death of few people in Nigeria. The best method of identifying edible mushrooms from poisonous toadstools is the proper authentication from trained mycologists/. Identification of edible mushroom species by guessing or books is dangerous and lead to unpalatable experience.

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