DIVERSITY AND NUTRIENT ANALYSIS OF WILDMUSHROOMS IN CHAUKOT, PANAUTI, NEPAL

A Dissertation

Submitted for the Partial Fulfillment of the Requirement for theMaster's Degree in Science, Central Department of Botany, Tribhuvan University

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RECOMMENDATION

This is to certify that the dissertation work entitled "**Diversity and nutrient analysis of wild mushrooms in Chaukot, Panauti, Nepal**" submitted by **Ms. Swostika Thapa** was completed under my supervision. To the best of my knowledge, the work is original and was completed by the candidate; it has not been submitted anywhere else for academic merit. It is hereby recommended this dissertation be accepted as a partial fulfillment of Tribhuvan University's Master of Botany degree requirements.

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LETTER OF APPROVAL

The M.Sc. Dissertation entitled "**DIVERSITY AND NUTRIENT ANALYSIS OF WILD MUSHROOMS IN CHAUKOT, PANAUTI, NEPAL**" submitted at the Central Department of Botany, Tribhuvan University by **Ms. Swostika Thapa** for the partial fulfilment of her Masters of degree in Botany, has been accepted.

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DECLARATION

I, Swostika Thapa, M.Sc student of botany declare that this dissertation entitled **"Diversity and nutrient analysis of wild mushrooms in Chaukot, Panauti, Nepal"** is a record of genuine work performed by me under the supervision of Associate Professor, **Dr. Sanjay Kumar Jha**, and Central Department of Botany. I further declare that the work reported in this research has not been previously submitted in any degree, in this or any other institute or University.

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Swostika Thapa

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Swostika Thapa

ABSTRACT

Exploration on Mushroom is very less in comparison to other group of organism in the world. Research has shown that Mushroom has great nutritional value. This study aims to determine how important the soil pH, moisture and canopy cover which influence on growth of mushroom and nutrients present in it. Based on a review of the literature on macrofungal distribution and nutritional value, field visit between 1500-1700 m altitudinal range and chemical analysis research was done. Research analysis demonstrated that total of 68 mushroom was collected belonging Basidiomycota, Ascomycota and Mycetozoafrom community forest of Chaukot. Among mushroom species, most of the mushroom were of russulaceae family and agaricales order. Half of the mushroom were mycorrhizal and 16 species are edible. Dominant edible species *Laccaria laccata* and *Scleroderma cepa* was frequently used in local habitat and chosen to perform nutrient analysis. Chemical analysis of Mushroom such as determination of moisture, ash, protein, fiber, fat and carbohydrate as well as minerals like calcium, phosphorus and iron were done in National Food Research Center, Khumaltar. The quantitative estimation of moisture was done by oven dry method, fat by soxhlet extraction, protein by kjeldahl digestion method, ash by ignition method, carbohydrate by proximate analysis method, crude fiber by acid base digestion method, calcium by complexometric titration method, phosphorous by molybdenum blue method and iron by calorimetric method. *Laccaria laccata* had highest density and *Hymenochaete rubiginosa* was found to have highest abundance.The Shannon diversity index was 3.78 and Simpson diversity index was 0.97. Mushroom contained highest percentage of carbohydrate (54.93-60.42) % and lowest fat (0.38-0.55) % whereas microminerals phosphorus ranges from (424.9–507.72 mg/100 g), calcium (182.83-243.16 mg/100 g) and Iron (43.25–48.14 mg/100 g). The result indicates state of soil and forest type show crucial role in growth and development of Mushroom. On this basis, it is recommended that tree canopy cover should be maintained to flourish Mushroom. Further research is needed for molecular identify that could help to know beneficiaries of mushroom.

Keywords: Diversity index, *Laccaria laccata*, Mushroom, *Scleroderma cepa*

शोधसार

च्याउसम्बन्धीअनुसन्धानअन्यजीवसमूहहरूकोतुलनामानिकैकमगरिएकोछ।च्याउमाउच्चपोषणमूल्यरहेकोअनुसन्धानलेदेखाएकोछ।यसअध्ययनलेमाटोकोpH, चिस्यान, रवातावरणलेच्याउकोवृद्धिरपोषकतत्त्वहरूकोउपस्थितिमापार्नेप्रभावपहिचानगर्नेलक्ष्यराखेकोछ।यसकालागि१,५००–१,७००मिटरकोउचाइक्षेत्रमाभ्रमणगरीरसायनिकविश्लेषणगरियो।chaukot कोसामुदायिकवनबाट Basidiomycota, Ascomycota, र Mycetozoaवर्गका६८प्रजातिहरूसंकलनगरिए।तीमध्येअधिकांशRussulaceae family रAgaricales order मावर्गीकृतथिए।आधाप्रजातिmycorrhizal प्रकृतिकाथिएभने१६प्रजातिहरूखाद्ययोग्यथिए।प्रमुखखाद्यप्रजातिहरू*Laccaria laccata*र*Scleroderma cepa*स्थानीयक्षेत्रमाप्रचुरमात्रामापाइनेच्याउथिए।रसायनिकविश्लेषणलेचिस्यान, खरानी, प्रोटिन, फाइबर, बोसो, कार्बोहाइड्रेट, रक्याल्सियम, फस्फोरस, तथाफलामजस्ताखनिजहरूकोमात्रामापनगरियो।मापनराष्ट्रियखाद्यअनुसन्धानकेन्द्र, खुमलटारमागरियो।*Laccaria laccata*सबैभन्दाबढीघनत्वभएकोप्रजातिथियोभने*Hymenochaete rubiginosa*सबैभन्दाधेरैप्रचुरमात्रामाभेटियो।Shannon diversity index३.७८रsimpson diversity index 0.97 थियो।च्याउमासबैभन्दाधेरैकार्बोहाइड्रेट (५४.९३–६०.४२%) रसबैभन्दाकमबोसो (०.३८–०.५५%) पाइयो।Micromineral कोरूपमाफस्फोरस४२४.९–५०७.७२मि.ग्रा/१००ग्राम, क्याल्सियम१८२.८३–२४३.१६मि.ग्रा/१००ग्राम, रफलाम४३.२५–४८.१४मि.ग्रा/१००ग्रामथियो।माटोरवातावरणकोअवस्था,रूखहरूकोछायालेच्याउकोवृद्धिरविकासमामहत्त्वपूर्णभूमिकाखेल्छ।त्यसैलेच्याउउत्पादनकालागियसकोसंरक्षणगर्नजरुरीछ।च्याउकोविश्लेषणगर्नथपअनुसन्धानआवश्यकछ, जसलेयसकापोषणसम्बन्धीलाभहरूकोपहिचानगर्नसहयोगगर्नेछ।

शब्दसुची: म्याक्रोफंगी, बुढीच्याउ, मुटुश्रीच्याउ, विविधतासूचकांक

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ABBREVIATION AND ACRONYMS

ASL	Above sea level
%	Percent
μm	Micrometer
Approx.	Approximately
Avg.	Average
cm	Centimeter
Conc. H_2SO_4	Concentrated Sulphuric acid
DPR	Department of Plant Resources
g	Gram
GBIF	Global Biodiversity Information Facility
HCl	Hydrochloric acid
KATH	National Harbarium and Plant Laboratories
$KMnO_4$	Potassium per manganate
mg	Milligram
NaOH	Sodium hydroxide
NARC	Nepal Agriculture Research Council
No.	Number
Sp.	Species
Wt.	Weight

CHAPTER 1: INTRODUCTION

1.1 Background of study

Fungi play a critical role in maintaining ecological balance, with mushroom being one of the most viable representatives of this kingdom. Fungi have been able to successfully occupy most of the terrestrial biomes due to formation of hyphae and mycelia. Branching is crucial in colony formation of mycelial fungi, and it seems to be similarly vital for direct and indirect communication with other organisms (Bueno and Silva, 2014). Mutational evidence suggests that the fungi are the members of the animal group than the plants. Fungi are significant in the field of farm, foods, and beverage, particularly in the domain of pharma. At the same time, a number of dangerous diseases which some kinds of a fungus cause in people, animals, and plants are a world threat to the health of ecosystem and food security (Arazoe, 2021).

As Nepal is a mountainous country with Mount Everest, vast valleys, chock and level grounds which create an extraordinary aggregate of divers of several types of habitats and an immense variety of species in such a small area (Aryal and Budhathoki, 2012).

Mushroomsplay essential roles in both natural ecosyStipes and human culture. Mushrooms are crucial decomposers, facilating nutrient recycling in ecosystems, and they exhibit remarkable diversity across different ecological regions of the world (Chang and Miles, 2004). Miushrooms are key players in decomposition, nutrient cycling, and soil formation. As saprotrophs, many fungi recycle nutrients by breaking down dead plant material, while others form symbiotic relationships with plants through mycorrhizae, enhancing plant nutrient uptake in exchange for carbohydrates and significantly involved in cycling energy within the environment (De Mattos-Shipley*et al.*, 2016).

Wild mushrooms are collected in the wet season ranging from May and August and are considered as a nutritionally important (Kumari and Shrivastava, 2020). Mushrooms are of different species and these involve the gilled mushrooms, puffballs mystery of bracket fungi. The best characteristics is the one that can be determines in the course of selecting data for the classification experiment that employs the decision tree algorithm, perhaps with the help of principal component analysis. The accuracy of the classifications, coefficient metric, and time required to configure a classification model on a standard Mushroom data set were determined. The selected characteristic of odour was

considered as the best among the listed characteristics which provide high classification accuracy (Ismail *et al*., 2018).

Eating of mushrooms can be as old as history itself. The Greeks believed the soldiers gained strength and vitality through them while the Romans believed they were the "Food of the Gods." Mushrooms partially consist nutrients such as potassium, selenium, riboflavin, niacin, vitamin D, proteins and fiber (Valverde *et al*., 2015).

1.2 Mushroom diversity

Acording to database of GBIF 2024, fungi of 42,731,728 were occurred worldwide and are belong to 173,660 species.Total of 3971 specimens of mushrooms from Nepal is digititized and published in GBIF portal (GBIF, 2021).

Wild mushrooms of Nepal belong to 108 families, 357 genera, and 1291 species (Ascomycota 165 species and Basidiomycota 1126 species). Currently, 1291species of mushrooms have been recorded from Nepal and 34 of them are reported to be native to the country. Among them 159 species of mushrooms are edible in nature (Devkota and Aryal, 2020). If the species has a body volume of at least 1 liter 6,000 species are potential food, and the texture is suitable for Paleolithic processing (Ordynets *et al*., 2021).

Central Nepal has comparatively more investigations and studies regarding mycology as compared to eastern and western region (Adhikari, 1999; Adhikari, 2000; Adhakari and Bhattarai, 2014). Due to varieties of weather condition the distribution of macrofungal species is high in spring and autumn but low during the hot dry season (Sibounnavong *et al*., 2008). The need for documenting the diversity, distribution and abundance of mushrooms in Nepal cannot be underscored. Recent efforts to document new species have revealed both edible and toxic mushrooms (Adhikari *et al*., 2013).

1.3 Morpholigical Structure of Mushroom and its function

Figure 1: Morphological structure of mushroom

Hibbett, (2007) has described mushrooms have simpler forms of fruiting bodies. Mushroom contain different parts as described below.

Pileus- Pileus is vital for the reproduction process, as it contains gills or pores where spores are produced (Chang and Miles, 2004). Margin of pileus may be split, irregular or entire (Denchev et al., 2013).

Gills- Beneath their Pileus, some species create a single array of unbranched radial gills; many others produces numerous files of lamellulae in between the main gills; branching gills are also prevalent (Fischer and Money, 2010).

Spores- Fungal spores may be mitospores or meiospores and they give rise to hyphae through germination (Margulis and Chapman, 2009). Mushroom can be distinguished by the colour of the spores after preparing a print out of it on a piece of paper (Denchev *et al.*, 2013).

Veil- It is a thin, filamentous or membranous layer developed in a mushroom. Mushrooms vary in terms of the veil; it may have a universal veil, partial veil only or in some cases can have no veil at all.

1.4 Ecology and Habitat

According to Bagyaraj (2014), mushrooms include a variety of ecology, including mycorrhizae (Russula, Boletus, Amanita, and Lactarius), saprophytic (Coprinus, Agaricus,

etc.), hyperparasite (like Asterophora on Russula, etc.), and parasitic (like Polyporous, Fomes, etc.). The mycorrhizal fungi that carry nutrients and water to plant roots and only ectomycorrhizae, out of all the mycorrhizal classes, generate edible mushrooms (Molina *et al.*, 1993).The saprotrophic mushroom is decomposer and can be categorized as primary decomposer, secondary decomposer and tertiary decomposer (Elevitch, 2004).Some of the mushroom are act as facultative parasites as in favourable environmental condition some saprotrophic mushroom may behave as parasitic mushroom (Elevitch, 2004).

Mushrooms can grow well in various habitat in the proper conditions of soil, temperature, humidity, moisture, and other environmental parameters.A wide range of mushrooms could be found in areas with abundant plant diversity (Gezer and Kaygusuz, 2015). Mushroom species can be grown in different habitat such as grassland (praticolous), on woodland (silvicolous), wood, woody debris, rotten wood (lignicolous), on moss (muscicolous), on dung (coprophilous), on leaf litter (humicolous) and so on (Purkaryastha and Chandra, 1985; Daud *et al.*, 2021).

1.5 Edibility of wild mushroom

In general it's hard to tell whether mushrooms are deadly or edible.Mushroom produce toxin named amanitin (Magdalan et al., 2010).Mushroom poisoning is not well documented in Nepal (Aryal, 2009).*Calocybe indica*, *Pleurotus flabellatus*, *P. ostreatus*, and *P. florida* are some edible mushroom. A variety of flavors can be found in mushrooms; some edible varieties include flavors like cheese, vegetables, fish, or chicken. They are eaten in three stages: premature, mature, and post-mature (Yadav *et al.*, 2015).

There are approximately 5000 variety of mushrooms in the world, only 100 are toxic (Chaudhary*et al.*, 2017). Mushroom poisoning is common in mushroom growing on the groud as compared to living trees (McPartland *et al.*, 1997). Mushroom grows in spring and autumn seasons are dangerous to consume (Erguven *et al.*, 2007).

1.6 Nutrients of mushroom

People have been collecting mushrooms for nutrition since prehistoric times (Mattila *et al.*, 2000). Eating mushrooms from the forest has been documented for several hundred years before to the birth of Christ, in China (Aaronson, 2000). Mushroom are rich in

protein, carbohydrates, minerals, fibers, trace elements, and low in calories and cholesterol (Agahar-Murugkar and Subbulakshmi, 2005).

Overall, on a dry weight basis, the fruiting bodies of mushrooms comprise about 56.8% carbohydrates, 25% protein, 5.7% lipids, and 12.5% ash(Demirbas, 2002; Mendil *et al.*, 2004). Mushrooms have a higher food value than other fruits, vegetables, meat, and fish (Kakon *et al.*, 2012). Mushrooms are considered to be helpful foods due to their remarkable flavor, smell, and nutritional value (Chaturvedi *et al.*, 2018). The moisture content of fresh mushrooms varies from 70 to 95%, contingent upon the time of year and environmental conditions. According to Chang and Miles (1969), the protein content of mushrooms is higher than that of milk but lower than that of animal flesh. The protein found in wild edible mushrooms contains a high concentration of the non-essential amino acids proline, serine, glutamic acid, arginine, glycine, aspartic acid, and alanine. These amino acids support hormone synthesis, red blood cell formation, tissue growth and repair (Chan, 1981).

1.7 Scope and significance of the study

The study of mushroom diversity and nutrient analysis is crucial for several key reasons, including environmental sustainability, biodiversity conservation and ecosystem functions, nutritional values, economic benefits and medicinal purpose. The amount of sugars and carbohydrates in mushrooms is lower than in vegetables. As a result, Mushroom digests quickly. In addition to these advantages, their antimicrobial, antiviral, anticancer, antiparasitic, anti-inflammatory, hepatoprotective, and antidiabetic effects can treat a wide range of diseases. Even though Mushroom are incredibly beneficial, there has been relatively little research done on wild mushrooms compared to other types of plants (Muller *et al.*, 2007). Because of this, local people are afraid of consuming wild edible mushrooms.

The studied area offers diverse range of habitat due to its varied altitude, climate and vegetation which supports a wide variety of mushroom. As a less studied area compared to other region, this study will help in the confirmation of current understanding of nutrients and providing new information to the public about the edibility of mushrooms. To broaden our understanding of muhroom species and its use in a wider context, a substantial amount of research is required.

1.8 Hypothesis

1. The diversity of mushrooms is influenced by environmental factos such as moisture concentration, pH levels, and canopy cover.
2. There are species-specific variations in the nutrients of mushrooms.

1.9 Objectives

General objective

To determine the diversity of wild microfungi and its nutrients obtained of some dominant species from the Chaukot.

Specific Objectives

- To enumerate mushrooms species found within study area.
- To analyze nutrient content of dominant wild edible mushrooms.
- To assess the pattern of species diversity and distribution along environmental variables.

1.10 Limitations

1. Certain mushrooms were too mature or too immature, which made identification and preservation difficult.
2. Some of the delicate mushrooms were destroyed during transportation.
3. For the purpose of studying nutrient analysis and diversity, only one season was chosen due to limited time.

CHAPTER 2: LITERATURE REVIEW

2.1 Mushroom diversity

Morel species namely *Morchella angusticeps* and *Morchella umbrina* were first recorded in Jumla district, Nepal (Adhikari, 1999).

Adhikari, (2000) recorded 9 Ascomycotina genera and 28 Basidiomycotina genera in the Maipokhari, Ilam district.

A study demonstrates that while fungal diversity is quite high, the total recorded variety of mushrooms is relatively modest, with only 14,000 species (Hawksworth, 2001).

In Lamjung Nepal, 12 species of higher fungi were found (Adhikari and Adhikari, 2003).

Pandey *et al*., (2004) records *Thelophora Fuscella* from pine forest of Kirtipur.

Adhikari*et al*., (2006) found that of the 24 species of mushrooms from Kaski, 18 are used as food, 8 have medical value, and 3 have other uses.

The study conducted in Lukla and Pangboche by Giri and Rana, (2007) shows total of 150 mushroom species from 37 families and 65 genera. A total of 69 species of wild mushrooms identified upto species level.

Dictyphora duplicate, *Hypholoma Pileusnoides*, and *Volvariellabombycina* species have been recorded from central Nepal (Pandey *et al*., 2007).

Boletellus emodensis, Gyroporous atroviolaceus, and *Strobilomyces* mirandus are wild mushroom species of the class Basidiomyces collected by Pandey and Budhathoki (2007) in Kathmandu.

A total of 33 wild mushrooms were gathered in the phytogeographical environment of central Nepal, ranging in elevation from 200 to 4200 meters (Pandey and Budathoki, 2007).

A total of 228 species of wild mushrooms utilized as food were confirmed by Christensen *et al*., (2008) after they were gathered from forest walks in 17 districts. Households collect an average of 18.1 kilograms of fresh mushrooms annually.

A total of 58 species of mushrooms were gathered from the Bajrabarahi Forest in the Lalitpur with widespread occurrences of *Pleurotus, Russula, Lacaria, Amanita*, and other related species (Shrestha, 2008).

A new variety of *Pholiota microspore* was collected by Adhikari *et al*., (2014) in Quarcus forest of Phulchowki (Kathmandu) at an altitude of 2600m.

Aryal (2015) studied on Termitomyces in three different ecological regions and three phytogeographic sections in which 19 species of termite mushrooms have been reported.

Tamrakar *et al*., (2016) gathered 62 wild mushroom samples of *Inonotus, Cyclomyces, Phellinus, Oxyporus, Ganoderma, Amauroderma,* and *Microporus* genera from various woods in different sections of Nepal.

(Adhikari, 2017) found an edible species *Volvariella bombycina* in Kathmandu valley growing parasitically on Populus trees.

Approximately 120,000 of the 2.2–3.8 million species expected to exist globally are now recognized (Hawksworth and Lucking, 2017) which adds to our incomplete understanding of fungal diversity.

Wild mushroom species, including *Polypore sp., Lenzites betulina, Trichaptum biforme, Stereum complicatum, Trametes versicolor, Trichaptum subchartaceum, Laetiporus sulphureus,* and *Ganoderma Lucidium*, were collected from far western regions of Nepal, primarily Darchula and Baitadi (Upadhyaya *et al*., 2017).

Nepal is home to 2467 different species of fungus (GoN/MoFE, 2018). The wild mushrooms of 46 species of Basidiomycetes belongs to 32 genera, 20 families and 9 order including *Amanita chepangiana, Geastrum fimbriatum, Macrolepiota procera, Pycnoporus cinnabarinus, Schizophyllum commune, Scleroderma bovista,* and *Sparassis crispa* are documented at natural as well as community managed forests of Rangdehi, which cover elevations of 90 to 1229 meters above sea level and include tropical deciduous riverine forest and subtropical deciduous hill forest *(*Aryal and Budhathoki, 2014; Aryal, 2018).

Acharya (2020) reported 33 species of mushroom in the Rotepakho Community Forest next to Dhikura village in the Arghakhanchi area of Central Nepal.

The study carried out in the Lumbini Collaborative Forest in the Rupandehi District shows total of 31 mushroom species, including both Ascomycetes (5 species) and Basidiomycetes (26 species) and the dominant host plant was *Terminalia alata* and *Shorea robusta* (Acharya, 2020).

Devkota and Aryal (2020) stated 1,291 species were examined in Nepal.

In 2020, GBIF.org reported approximately 19 million records of fungus (19,056,194) and 3971 specimens of mushrooms (Tribhuvan University Central Herbarium 707; National Herbarium and Plant Laboratories, 1620; Natural History Museum, 1644) were digitized in the GBIF database.

Total of 15 species of Basidiomycetous fungi were collected from Daunne in the Parasi district belonging to five orders, seven families and 13 genera (Acharya, 2022).

From the study area of Riparian Zone of Lake Kivu, Emmanuel *et al.*, (2022) found the diversity and distribution of mushroom species is related to habitat structure and species richness increases from grassland to forests.

Rout *et al.*, 2022 demonstrate 4–10 tons of Ganoderma produced yearly in Nepalese jungles.

The study conducted at the Brahakshetra Community Forest in Dang, 66 species of Bacidiomycetes (65) and Ascomycetes (1) mushrooms from 21 families were recorded (Thapa *et al.*, 2022).

2.2Nutrition present in Mushrooms

According to Breene (1990), a number of mushrooms have gained popularity, including oyster (*Pleurotus spp.*), enokitake (*Flammulina velutipes*), shiitake (*Lentinula edodes*), button (*Agaricus bisporus*), and straw (*Volvariella volvacea*). These species are rich in dietary fiber, minerals, vitamins B and C, and modest levels of high-quality protein and fatty acids.

Braaksma and Schaap, (1996) found Crude protein content of 19–38% in *Agaricus bisporus.*

Demirbas (2002) reported 56.8% carbohydrates, 25% protein, 5.7% fats, and 12.5% ash by dry weight basis.

Study on 7 wild edible mushrooms from Meghalaya Khasi hills by Murugkar and Subbulakshmi (2005) showed average of 6.12 g of protein, low levels of fat (0.712 g), and micronutrients such as 287 mg of calcium, 9.3 mg of iron, 3.72 mg of zinc, and 0.077 mg of sodium in 250 g of fresh weight.

Pandey and Budhathoki (2006) records mushrooms having 8.01% to 34.44% proteins on a dry weight basis in 23 mushrooms species which is collected from Langtang National Park, Kathmandu valley and Chitwaan district.

Protein, ash, calcium, phosphorus, and iron were found in twelve wild edible Nigerian mushrooms that were collected and examined (Gbolagade*et al.*, 2006).

The study carried out in ranges of 200m-4200m by Pandey and Budhathoki (2007), among 35 species used in protein analysis the highest protein of 1.576mg/ml in *Cantharellus subscibarius* and least 0.131mg/ml in *Cordycep sinensis* were found.

Magrati *et al.*, (2012) described *Morchella conica* collectedfrom lower Mustang of Annapurna Conservation Area having 36.5% of carbohydrate, 35% of protein, 28.8% of crude fiber, 12% of fat, 8.2% of ash and 8% of moisture.

Mishra and Mishra (2013) examined macronutrient and minerals of four mushroom species in Kaski of Gandaki and Baglung and Myagdi of Dhaulagiri zone in which highest amount of nutrient contained in 100g of dry mass was 90% moisture, 15% fiber and ash, 8% carbohydrates, 12% amino acids, 32% proteins, and 2.5% fat and minerals are 3% iron, 5% sodium, 6% phosphorus, 4% potassium, and 2.5% calcium.

Upadhyaya *et al.*, (2017) observed nutrients of the mushrooms ranged from 6.8 to 60.23% for proteins, 0.174 to 36.38% for fibers, 3.642 to 14.6% for fat, 7.058 to 59% for carbohydrates, 10 to 19% for ash, and 10 to 16% for moisture.

Trichaptum abietinum had the greatest total protein content among six wild mushrooms tested from Gaurishankar conservation area of eastern Nepal (Adhikari *et al.*, 2019).

Mushrooms are high in protein, low in calories and fat content. Almost twice as much nutrition as any other fruit or vegetable, it is highly nutritious (Sileman *et al.*, 2019).

The nutrient analysis on 7 mushroom species showed protein, carbohydrate, and fat contents range from 33.46-41.73g/100g, 31.4-53.2g/100g, and 0.63-4.2g/100g, respectively (Kumari and Shrivastava, 2020).

Pandey *et al.*, (2023) stated that *Ganoderma sp.* has 28% protein, 4% fat, 14% fibers, 8% ash, and 45% carbohydrates.

Shrestha*et al.*,(2023) studied on *Cantharellus cibarius*, *Laccaria laccata*, and *Scleroderma cepa* are often consumed by the people of Arjam, Myagdi district used for analysis of ash, carbohydrate, fat, moisture, protein, calcium, magnesium, phosphorus, potassium, copper, iron, manganese, and zinc ranges 7.05-13.38%, 61.89-71.37%, 0.78-1.94%, 12.37-13.66%, 16.18-24.47%, 0.13-0.15 μg/g, 0.09-0.11 μg/g, 0.25-0.37 μg/g, 1.41-3.40 μg/g, 2.40-30.94 μg/g, 0.08-0.20 μg/g, 7.22-16.06 μg/g, and 45.70-77.35 μg/g, respectively.

From the stydy of Singh and Singh (2023), *Agaricus bisporus*, *Pleurotus ostriatus*, *Volvariella volvacea* and *Calocybe indica* from Ayodhya revealed that the cultivable wild edible mushroom contains protein (30.21-34.21%), carbohydrate (22.56-38.39%), lipid (2.35-4.15%), fiber (11.79-23.94%) and ash (7.75-12.97%).

CHAPTER 3: MATERIALS AND METHODS

3.1 Study Area

Physical setting

The research area was situated around 30 km east of Kathmandu in the Panauti Municipality of Kavrepalanchok district, in the central mid-hills region of Nepal (Figure 2). Geographically, it is located between 27° 37' N Latitude and 85° 33' E Longitude. The location of study is Chaukot Community Forest of Kavrepalanchok District. All forests correspond to the montane subtropical Schima-Castonopsis forest type containing*pinus roxburghii, Schima wallichi, Myrica esculenta, Rhododendron arboretum,* and *Castanopsis tribuloites* and so on. The study locations cover an altitudinal range of 1500 to 1700 meters above sea level, along the northern slopes of the hills.

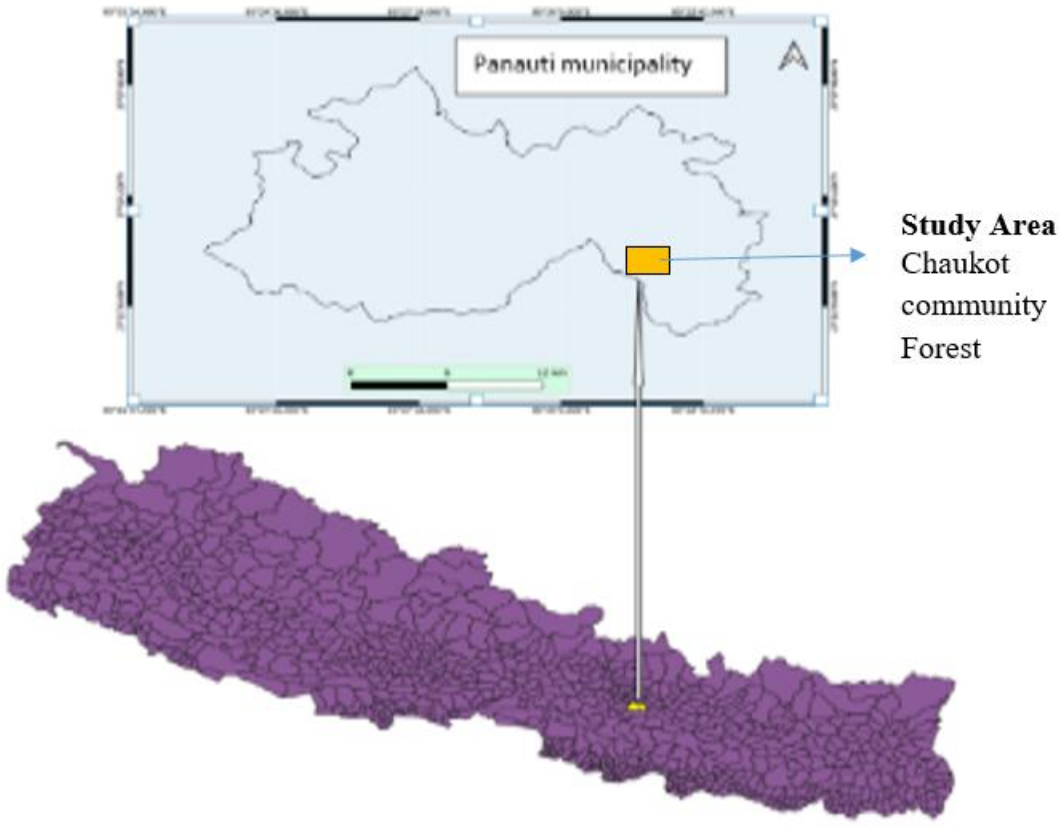

Figure 2: Location map of study sites

3.2 Climatic condition

According to data obtained by the Department of Hydrology and Meteorology across eleven years (2013–2023), the maximum average precipitation took place in July with a total of 364 mm and December and January recorded extremely little precipitation (Figure 3). Parallel to this, January had the lowest recorded temperature of 4 ºC and the highest average temperature of 26 ºC.

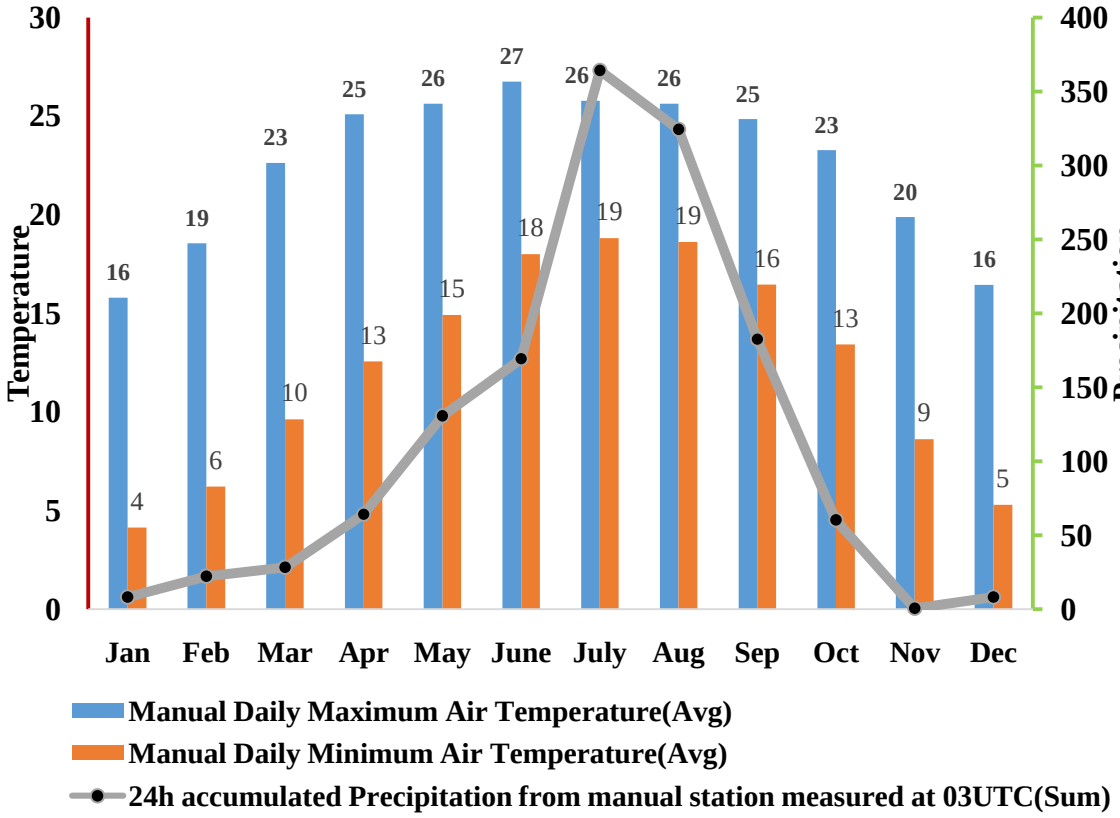

Figure 3: Average monthly temperature and precipitation of nearer station (Dhulikhel) from year 2013 to 2023 (Source: Department of Hydrology and Meteorology)

Based on the data, the maximum relative humidity was determined to be in August and the minimum to be in April, with values of 91% and 62%, respectively (Figure 4).

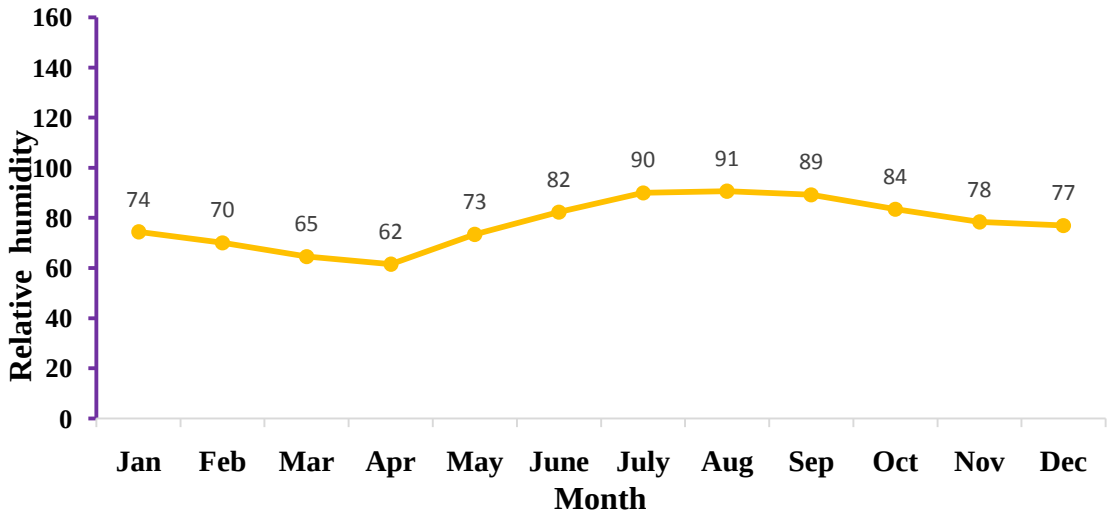

Figure 4: Monthly relative humidity of nearer station (Dhulikhel) from year 2013 to 2023 (Source: Department of Hydrology and Meteorology)

3.3 Collection of sample and sampling process

Samples of mushrooms were gathered at elevations between 1500 and 1700 meters above sea level. A 10 x 10 m quadrat was utilized for sampling in three transects spaced 100 meters apart, and eighteen plots were made. There were roughly 50 meters between each plot (Baral et al., 2015). A 15 cm-deep soil sample was taken from the center of the quadrat as well as from each of its four corners.

Photographs were taken in natural habitat and morphological characteristics such as fruiting bodies, Pileus color, Pileus edge, scale, gill color, gill spacing, stipelength, width, color,veil, annulus, and volva were noted (Srivastava and Bano, 2010). Both the location and the elevation were recorded. The mushroom species were properly dug up, and the wood-rooting mushrooms were extracted from the tree bark that they were adhered to. The gathered samples were labeled, covered in aluminum foil, and put in paper bag.

3.4 Mushroom preservation

Mushroom that were woody dried out in the sun directly, while those that were fleshy were air dried for 5 days at room temperature before exposing them to direct sunlight because direct sunlight deformed them. The mushrooms were stored in liquid using (25: 5: 70 ml of ethyl alcohol, formalin, and distilled water) to prevent from distruction (Hawksworth *et al.*, 1995).

3.5 Microscopic study

For microscopic study, the spore printswere brought to the lab of the Department of Botany. Spores were scratched fron spore prints paper with a needle and placed on slide, stained with 2 drops of lactophenol andcotton blue. The well prepared slides were examined using an Olympus CX22 high power microscope with magnifications of 40x and 100x. The length and width of each spore of mushroom species were measured.

3.6 Identification of Mushroom

The preserved specimen was identified using a mushroom field guide, books, and a range of publications and standard literatures (Watling, 1973; Philips, 1981; Adhikari, 2000). Mushroom were also identified using microscopic characteristics such as spore size and shape, fruiting bodies, Pileus color, Pileus edge, scale, gill color, gill spacing, stipe length, width, color, type of veil, annuls, and volva.

3.7 Evaluation of Diversity Index

The Shannon-Wiener diversity index (H) and Simpson diversity index (D) were calculated using the number of species counted at each sampling site.

The Shannon-Wiener diversity index (H) was computed using the following formula (Magurran, 2004).

$$H = -\Sigma Pi \ln Pi$$

Where,

H = Shannon-Wiener diversity index

Pi = ratio of individual of species i divided by all individuals

n = number of species

Simpson diversity index (D) were calculated by using formula

$$\text{Simpson diversity index (D)} = \frac{\Sigma n\ (n-1)}{N\ (N-1)}$$

Where,

D = Simpson diversity index

N = Total number of individuals of all species

n = Total number of organisms of particular species

The important quantitative analysis such as density and frequency of macrofungal species were determined as per (Daubenmire, 1959; Saleem *et al.*, 2019).

$$\text{Frequency } \% = \frac{number\ \ of\ \ quadrates\ \ with\ species}{Total\ \ number\ \ of\ \ quadrates\ \ taken} \times 100\%$$

$$\text{Density} = \frac{\text{Total number of individual of a species in all quadrates}}{\text{Total number of quatrates}}$$

3.8Soil sampling

Soil samples were taken with a digger at a depth of 15 cm from the center and four corners of each plot to assess the pH and moisture content of the soil. These samples were thoroughly mixed before being placed in a Zipper bag along with 200g of soil for testing in the lab.

3.8.1 Soil pH

The pH of the soil water mixture was measured in a 1:2 ratio using a pH meter. The pH meter was calibrated using a buffer solution with a known pH range of pH 4 to pH 7 prior to doing the measurement. After obtaining a 25 g soil sample, 50 ml of deionized water was added to it. The mixture was stirred for up to thirty minutes with a magnetic stirrer and then allowed to settle for five minutes. The electrode was dipped into the liquid, and the pH was measured. For every soil sample, three measurements were obtained.

3.8.2 Soil moisture

To determine the moisture content of the soil, a dry, clean crucible was used. Ten grams of fresh soil sample from each were heated in a hot air oven for 48 hours at 105 degrees Celsius. The crucible was then completely cooled and weighed once more. The moisture content was determined using the formula given by (Zobel *et al.*, 1987).

$$\text{Moisture content } \% = \frac{\text{Weight of fresh soil} - \text{weight of oven dried soil}}{\text{Weight of oven dried soil}} \times 100\%$$

3.8.3 Canopy Cover

Tree canopy cover was estimated by using densiometer.

3.9 Nutrient analysis

3.9.1 Sample preparation

Nutrient analysis were performed on the two dominant and well-known edible species *Scleroderma cepa* and *Laccaria laccata*. The mushrooms were thoroughly cleaned to remove any mud, dried on blotting paper, sliced without dividing the pileus and stipe, air dried, powdered to about 1mm particle size, and stored at room temperature in polyethylene bottles until analysis (Mallikarjuna*et al.*, 2013).

3.9.2 Determination of macronutrients

Nutrient content of two wild edible mushroom species were determined in National Agricultural Research Council (NARC) according to the Handbook of Analysis and Quality Control for Fruit and Vegetable Product, (Ranganna, 2011).

Moisture

The moisture content of the mushroom samples was determined using the hot air oven drying technique. 2 g sample was taken in tarred oven dried crucible and heated to 110 ^{o} C in hot air oven until its weight stayed constant. The dried sample then allowed to cool in a desiccator until its final weight was determined. A formula is used to determine the moisture content by using formula given by (Raghuramulu *et al.*, 2003).

$$\text{Moisture contents (\%)} = \frac{lnitial\ \ weig\,ht - final\ \ weig\,ht}{weig\,ht\ of\ \ a\ sample\ \ \ taken\ \ for\ \ analysis} \times 100$$

Ash

A dry, clean crucible was weighed. A dry sample weighing 1 gram was measured. The samples were placed inside a muffle furnace at 525 ^{o}C and lit on a hot plate for four to six hours, or until the ash turned white. After the entire ashing process, the crucible with the ash was cooled in a desiccator, and the sample's ash content and the crucible's final weight were determined. The formula is used to get the ash content (%).

$$\text{Ash contents (\%)} = \frac{Weight\ of\ ash\ after\ \ incineration}{Weight\ of\ sample\ \ taken\ \ for\ ashing} \times 100\%$$

Protein

The Kjeldal Digestion technique was used to identify the protein. 3 g of powdered material was mixed with 10 g digesting mixture in the presence of 10 ml of Conc.H_2SO_4. It was heated till the solution turned transparent blue and white fumes started to form. Following digestion, the flask was allowed to cool for 20 to 30 minutes at room temperature. Then, using a pipette, the digested sample was transferred into a volumetric flask, the volume was adjusted with distill water, and the flask was sealed.

The equipment was set up for distillation with cold water running through it constantly. A conical flask was filled with 5 ml of 2% boric acid, 4 drops of mixed indicator. Filling the burette with 0.01 N HCl. The steam trap liquid was then removed by opening the pinched clamp. Next, set the boric acid-filled conical flask underneath the condenser. After pipetting 5 ml of the digested material into the distilling flask, the funnel was washed with distilled water. When steam entered the distillation flask, 10 ml of 30% NaoH was added, stirring the sodium hydroxide and digestion mix. Thus released ammonia escapes into the boric acid solution through the condenser along with steam, creating a solution that is bluish green in color.

$$\text{Total Nitrogen (\%)} = X = \frac{14 \times (V - V1) \times 100 \times S}{W \times 1000}$$

$$\text{Protein \%} = X \times 6.25$$

Where 14 is molecular weight of Nitrogen

V = Volume of standard acid used to neutralize the distillate

V1 = Volume of standard acid used to neutralize the blank

S = Normality of standard acid

X = Total nitrogen %

W = Weight of sample taken for digestion

6.25 is conversion factor

Fat

The method was used to assess the fat content of a sample of mushrooms. 10 g of oven-dried powdered sample was kept in thimble. Next, cotton is folded and inserted into the thimble so as to cover the sample. A dried round-bottom flask weight was noted. After that, the sample and thimble were put inside the Soxhlet apparatus, where they were extracted using petrolium spirit for four to five hours. In an evaporating dish covered in tar, the solvent was evaporated and then weighed. The following calculation was used to determine fat percentage (AOAC, 2005).

$$\text{Fat (\%)} = \frac{M2-M1}{E} \times 100\%$$

Where

M2= wt. of round bottom flask with fat

M1= wt. of round bottom flask

E= sample weight

Carbohydrate

Carbohydrates calculated from the observed values of ash, fat and protein.

Carbohydrate (%) = 100 - (Ash % + Fat % + Protein %+moisture %)

Crude fiber

Acid base digestion method was used to quantify amount of crude fiber. Firstly, 0.5- 1 g sample was taken in gooch crucible and assembled in (fibrotron) crude fibre instrument connected with condenser.Then, digestion is carried out with 1.25% H_2SO_4 for 30 mins. It was washed with warm H_2O to remove excess H_2SO_4. For digestion, 1.25 % of NaOH was used for 30 mins followed by wash with warm H_2O to remove excess NaOH. It was then wash with alcohol. The crucible was heated at 110°C to constant weight and cooled in dessicatorand weighted. The content of the crucible was ignited in muffle furnace for 20 minutes. Finally, it was cooled and weighted to get crude fiber quantity.

$$\text{Fiber \%} = \frac{Sample\ \ weig\,ht\ \ after\ \ drying\ -Sample\ \ weig\,ht\ \ after\ \ ashing}{Weig\,ht\ \ of\ \ sample\ \ tak\,en} \times 100\%$$

3.9.3 Determination of minerals

Preparation of ash solution

25 ml 10% HCl was added to the ash obtained from ashing. The solution was filtered through whatmann filter paper no. 1 and volume was made upto 100 ml.

Phosphorus

5 ml of ash solution obtained by dry ashing and 5 ml of molybdate reagent was mixed well. Aminonalphtholsulphonic acid solution of volume 2ml mixed and made the volume to 50ml. Blank solution was prepared similarly using water in place of the sample. The sample solution was allowed to stand for 15 minutes and colour had been measured at 650nm settings the blank at 100% transmission.

$$\text{Phosphorus mg/100g} = \frac{mg\ \ of\ \ p\ \ in\ \ the\ \ aliquot\ \ \ of\ \ ash\ \ solution\ \ \ \times total\ \ volume\ \ \ of\ \ ash\ \ solution\ \times 100}{ml\ \ of\ \ ash\ \ solution\ \ \ taken for\ \ \ estimation\ \times wt.of\ \ sample\ \ \ taken\ \ \ for\ \ ashing}$$

Standard curve ofPhosphorus

10 ml standard potassium phosphate solution was diluted by using 10ml water. In a 50 ml of volumetric flask 40 ml of aliquot Pipetted out. Then 5ml of molybdate reagent was added and mixed. After that, 2 ml of aminonaphtholsulphonic acid reagent was added and mixed.The final volume was made 50ml and measured tha color as in sample. The plot concentration against absorbance was made.

Calcium

An aliquot of 50ml of the ash solution and 50 ml distilled water was pipetted into 250 ml beaker and 10 ml of saturated ammonium oxalate solution and 2 drops of methyl red indicator was added. To make solution slightly alkaline dil. ammonia was added dropwise until the color turns yellow and few drops of acetic acid was poured until it gets faint pink color to make the solution slightly acidic. Then, solution was heated to the boiling point and left overnight. The solution was filtered using whatmann filter paper no. 42 and precipitate was washed with hot distilled water. Break the point of filter paper withnpointed glass rod and washed using dil. H_2SO_4 (1:4; H_2SO_4: H_20). Make up the

volume 200ml using distilled water. 25 ml of the solution was heated to 70-80 degree celcius and titrated with 0.01N $KMnO_4$ to the first permanent pink color.

$$\text{Calcium mg/100g} = \frac{\text{Titer} \times \text{N of KMnO } 4 \times 20 \times \text{volume of ash solution} \times 100}{ml\ of\ ash\ solution\ taken \times wt.of\ sample\ taken\ for\ ashing}$$

Iron

The oxidizing agent potassium persulphate was used to convert iron into ferric form, and potassium thiocyanite was then added to create a red ferric thiocynate, which was then measured calorimetrically at 480 nm. This method was used to assess iron. Potassium persulphate, potassium thiocyanate, 0.5 ml Conc. H_2SO_4, and 15 ml H20 were used to make the blank solution.First, a sample solution was generated from 10 ml of sample, 5 ml of H_20, 0.5 ml of Conc. H_2SO_4, 1 ml of potassium persulphate, and 2 ml of potassium thiocyanate. The standard solution was made from 1 ml of standard solution, 14 ml of H_20, 0.5 ml of Conc. H_2SO_4, 1 ml of potassium persulphate, and 2 ml of potassium thiocyanate.

$$\text{Iron mg/100g} = \frac{\text{Optical density of sample} \times 0.1 \times \text{total volume of ash solution} \times 100}{\text{Optical density of standard} \times 5 \times wt.of\ sample\ taken\ for\ ashing}$$

3.9.4 Statistical Analysis

A regression analysis was performed to determine the link between environmental variables and the richness of macrofungal species. Excel was utilized to assess the mean value of nutrients among species and conduct an independent sample T-test. Significance was recognized at the 5% significance level. To ensure that the results are accurate, the analysis was done three times.

CHAPTER 4: RESULT

4.1 Description of the Mushroom

Detail description mushrooms found in study area were given below.A total of 3 mushroom species were taken to measure length and diameter. Spore measurement is given in term of lenghth and breadth.

1. *Russula fragilis*Pers.

Family-Russulaceae**Ecology-** Mycorrhizal

Habitat- wet and well-shaded areas, solitary.

Elevation- 1506 m **Lattitude**- 27°35'59" N **Longitude**- 85°32'57" E

Collection date: 2080-3-17 **Collection site**- Chaukot community forest

Pileus- 2 to 6 cm in diameter, convex, and clearly grooved at the edge, fragile, purple with a bit of green emerging from the edges.

Gills- brittle gills are adnate, white, toothed edges.

Stipe- 2 to 6cm long and 5 to 10mm in diameter, white, slightly swollen base.

Spores- 3.8-4µm,GloboseSpore print-White.

Photo plate 1:(A,B)*Russula fragilis* in natural habitat (C) Spores of *R. Fragilis*

2. *Amanita farinosa* (Schw.)

Family-Amanitaceae**Ecology**- Mycorrhizal

Habitat- Growing on grassland below coniferous tree, solitary

Elevation- 1600m **Lattitude**- 27°35'55"N **Longitude**- 85°32'55"E

Collection date: 2080-5-1 **Collection site**- Chaukot community forest

Pileus: 9cm, surface is flat, dry, and covered in fine, mealy powder that easily rubs off. The edge may be bald, spitted, and brownish gray.

Gills:White, close, short gills, free from the Stipe.

Stipe: 7 cm long, 2-3 cm thick, whitish, bald, Stipe becoming thicker toward the base, coated in a powdery gray color similar to the Pileus.

Spores: 4-5µm, smooth, broadly lacrymoid Spore print- White

Photo plate 2:(A, B)*Amanita farinosa* in natural habitat (C) Spores of *A. Farinosa*

3. *Amanita fulva* (Schaeff.) Secr.

Family - Amanitaceae**Ecology**- Mycorrhizal**Habitat** – Soil, Solitary.

Elevation- 1603 m **Lattitude**- 27°35'59" N **Longitude**- 85°32'53"E

Collection date: 2080-4-28 **Collection site**- Chaukot community forest

Pileus - Brown, 5-8 cm in diameter, convex or almost flat.

Gill - White, packed, devoid of Stipe

Stipe - pale brownish, 9-16 cm tall and 1-1.5 cm wide, no ring but volva present, slightly tapering towards apex.

Spores - globose, smooth 5.2- 5.6µmSpore print - white

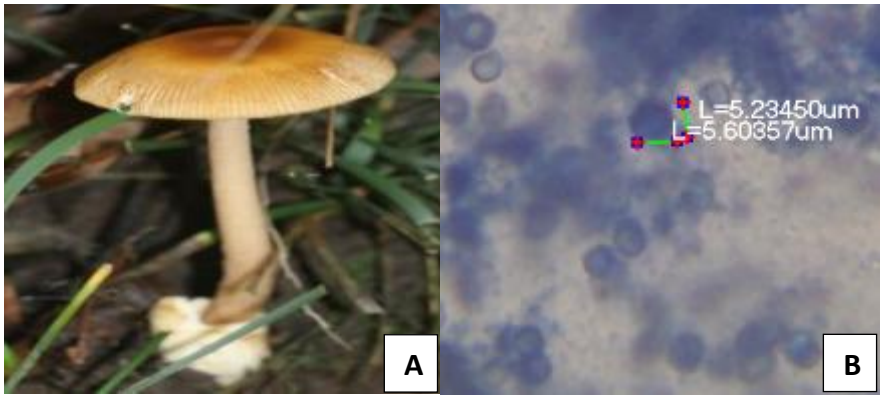

Photo plate 3:(A)*Amanita fulva* in natural habitat (B) Spores of *A. fulva*

4. *Amanita caesarea*(Scop.) Pers.

Family- Amanitaceae **Ecology**- Mycorrhizal **Habitat-** Grassland in Pinus forest

Elevation- 1700 m **Lattitude**- 27°35'49" N **Longitude**- 85°32'34" E

Collection date: 2080-6-3 **Collection site**- Chaukot community forest

Pileus: orange and bell shapedGills: The yellow gills are in contact with the Stipe.

Stipe: 90 mm, white with a yellowish tint and a membraneus yellowish anulus. The base has a prominent, sack like volva

Spores: 4-5µm, subglobose to ellipsoid Spore print - white

Photo plate 4:(A, B)*Amanita caesarea*in natural habitat (C) Spores of *A. caesarea*

5. Amanita veginata (Bull.) Fr.

Family- Amanitaceae **Ecology**- Mycorrhizal**Habitat-** Soil

Elevation- 1606 m **Lattitude**- 27°35'55" N **Longitude**- 85°32'51" E

Collection date: 2080-4-2 **Collection site**- Chaukot community forest

Pileus:6-9 cm in diameter, grey, flat with central umbo, striated edge and below the pellicle the flesh is white.

Gills: white, adnexed, crowded. Stipe: 11-18 cm long, 2cm diameter, tapering slightly towards apex, hollow stipe, white volva present.

Spores:Spherical, smooth, 8-12µm in diameter. Spore print- white

Photo plate 5:(A,B)*Amanita veginata*in natural habitat (C) Spores of *A. veginata*

6. *Amanita phalloides* (Scop.) Pers.

Family - Amanitaceae **Ecology**- Mycorrhizal **Habitat -** Soil

Elevation- 1691 m **Lattitude**- 27°35'37" N **Longitude**- 85°32'26" E

Collection date: 2080-6-2 **Collection site**- Chaukot community forest

Pileus - Orange, smooth, convex to flat, up to 18 cm, Gills - crowded, yellow, and free.

Stipe - yellow-white, cylindrical, measuring 8-15 cm in height and 1-3 cm in width, with a ring and volva

Spores - ellipsoidal, 4.2-5µm.Spore print - white,

Edibility- Poisonous (Zevin *et al.*,1997)

Photo plate 6: (A,B)*Amanita phalloides*in natural habitat(C) Spores *of A. phalloides*

7. *Amanita rubrovolvata*(S. Imai) E.-J. Gilbert

Family-Amanitaceae**Ecology**- Mycorrhizal**Habitat-**Sprout on the soil

Elevation- 1508 m **Lattitude**- 27º36'00" N **Longitude**- 85º32'54" E

Collection date: 2080-3-18 **Collection site**- Chaukot community forest

Pileus- 2–6.5 mm wide, flattened to convex. The Pileus is dark red to reddish-orange in color, with a softer orange to yellowish coloring towards the edge. It has a notched crown edge.

Gills- The lamellulae are shortened. 3 to 6 mm wide and white free gills.

Stipe- bulbous, 5–10 cm by 1 cm thick, somewhat cylindrical, cream above the ring and yellowish beneath; fragments of the volva present, dusty.

Spore- spherical and 5.4µm. spore print- white to cream-colored

Photo plate 7:(A, B)*Amanita rubrovolvata* in natural habitat (C) Spores *of A. rubrovolvata*

8. *Amanita sinensis*(Zhu L. Yang)

Family- Amanitaceae **Ecology**- Mycorrhizal**Habitat-**Soil in pine forest.

Elevation- 1700 m **Lattitude**- 27º35'45" N **Longitude**- 85º32'30" E

Collection date: 2080-5-27 **Collection site**- Chaukot community forest

Pileus- 70-120 mm wide, The warts are subconic, 70-120 mm wide, convex, whitish to grayish, with a grayish to dark gray center and a short-striate edge.

Gills- crowded, free to subfree, white to cream in color.

Stipe-Subcylindric attenuation upwards of 9 cm. Its bottom layer is brownish, while the top layer is white with grayish farinose squamules covering it.

Spores- elliptical, 4.65-7.28 µm.

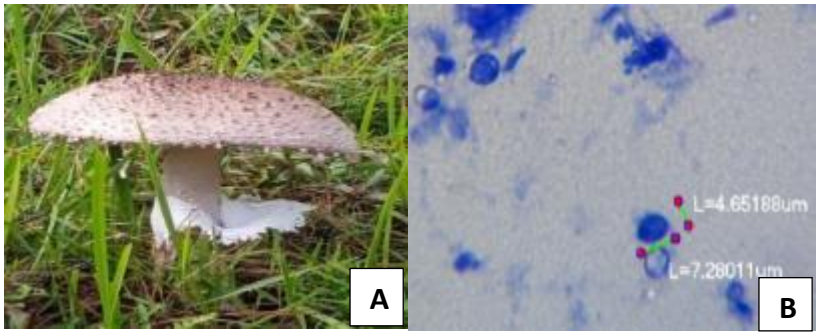

Photo plate 8:(A)*Amanita sinensis*in natural habitat (B) Spores of *A. sinensis*

9. *Amanita strobiliformis*(Paulet ex Vittad.) Bertill.

Family- Amanitaceae**Ecology**- Mycorrhizal**Habitat-**Soil

Elevation- 1505 m **Lattitude**- 27º35'56" N **Longitude**- 85º32'46" E

Collection date: 2080-3-18 **Collection site**- Chaukot community forest

Pileus- 50–220 mm broad, light brownish gray, convex to plano-convex. Dense residues of floccose-felted volva, with a brownish-gray color, create amorphous crusts and patches.

Gills- The gills are somewhat large, packed, and white to cream in color. To attenuate, the short gills are obliquely truncate.

Stipe-8 cm in length and 3 cm in width, roughly equal, white, producing rows of rather coarse, largely formless warts or one or more ridges. The basal bulb of the stipe measures 4 cm.

Spores:4-7µm, ellipsoid to elongate.Spore Print: White.

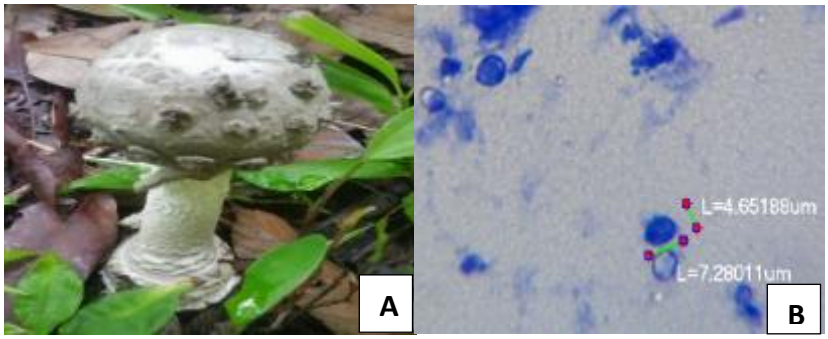

Photo plate 9:(A)*Amanita strobiliformis* in natural habitat (B) Spores of *A. strobiliformis*

10. *Armillaria tabescens*(Scop.) Emel

Family- Physalaciaceae **Ecology**- Saprobe**Habitat-** Animal dung

Elevation- 1695 m **Lattitude**- 27º35'43" N **Longitude**- 85º32'28" E

Collection date: 2080-5-29 **Collection site**- Chaukot community forest

Pileus: 3-6 cm, wide or convex, cinnamon brown or yellowish, with a frequently slightly lined edge.

Gills: frequently short, near-distant gills

Stipe: 3-5 cm long, 0.5-1 cm thick, brownish, tapering to the base; no ring.

Spores: 5 µm, ellipsoidSpore Print: White

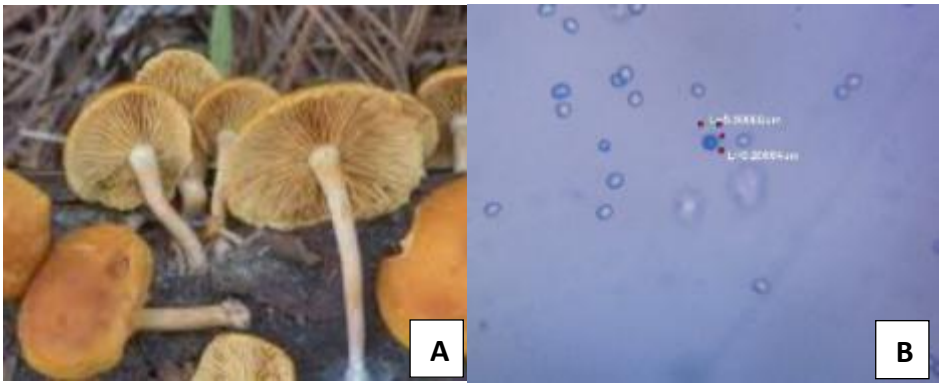

Photo plate 10:(A)*Armillaria tabescens* in natural habitat (B) Spores of *A. tabescens*

11. *Arcyria denudata* (L.) Wettst.

Family -TrichiidaeEcology- Saprobe**Habitat-** leaf litter and woody debris.

Elevation- 1500 m **Lattitude**- 27º35'59" N **Longitude**- 85º32'56" E

Collection date: 2080-3-17 **Collection site**- Chaukot community forest

Sporangia: Cylindrical, brick red, and 1-1.5 mm tall. They are densely packed

Stalk: Slender, striate, and 0.5-1 mm long. It is brick red in color.

Spores- 1-2 µm, subglobose, smooth red to reddish brown in mass.

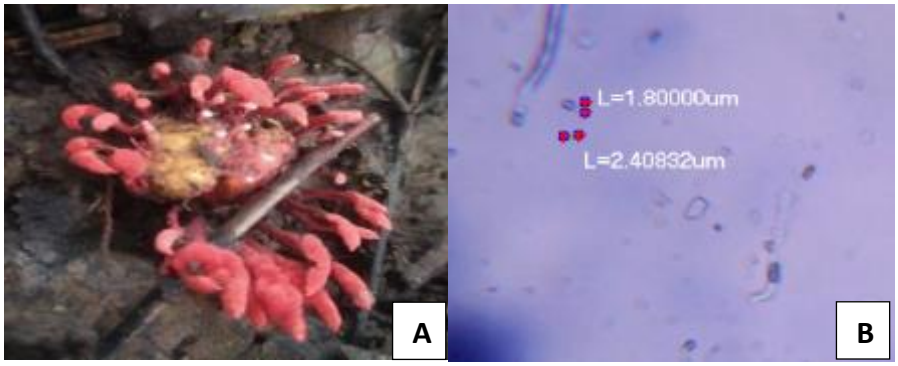

Photo plate 11:(A)*Arcyria denudata* in natural setting (B) Spores of *A.denudata*

12. *Aureoboletus flaviporus*(Earle) Klofac

Family- Boletaceae**Ecology**- Mycorrhizal**Habitat-** Grassland, solitary.

Elevation- 1603 m **Lattitude**- 27º35'48" N **Longitude**- 85º32'49" E

Collection date: 2080-4-28 **Collection site**- Chaukot community forest

Pileus: 6-11 cm broad, convex, surface viscid, innately fibrillose to reticulate, cinnamon-brown to reddish-brown, flesh white, moderately thick.

Hymenophore: Tubes slightly depressed next to stipe; pores bright yellow, approximately 1 mm broad.

Stipe: 1-2 cm thick, solid, equal to tapering downward, surface viscid when moist, white to reddish-brown, yellow apex, white flesh.

Spores:3-4 µm, smooth, elliptical to spindle-shaped Spore print: olive-brown.

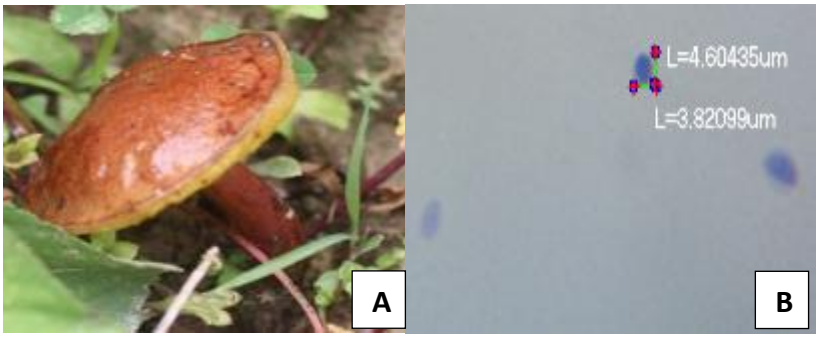

Photo plate 12:(A)*Aureoboletus flaviporous* in natural habitat (B) Spores of A. *flaviporous*

13. *Leccinum crocipodium*(Letell.) Della Magg. & Trassin.

Family- Boletaceae**Ecology**- Mycorrhizal**Habitat-** Found in pine-oak forests.

Elevation- 1510 m **Lattitude**- 27º36'00" N **Longitude**- 85º32'52" E

Collection date: 2080-3-17 **Collection site**- Chaukot community forest

Pileus: 5 to 8cm in diameter, the yellowish, greenish or reddish-brown, and the cuticle slightly overhangs the edge of the cap. The cap flesh is straw coloured.

Tubes and pores: The densely-packed tubes and pale yellowin color. Pores are rounded and bright lemon yellow.

Stem: yellowish stem and typically 2cm in diameter and 6 to 12cm tall; it is often thicker towards the base.

Spores:4-5 µm, boletoid-fusiform, smooth.Spore print- Ochre

Photo plate 13:(A,B)*Leccinum crocipodium* in natural habitat (C) Spores of *L. crocipodium*

14. *Bjerkandera* adusta(Willd.) P.Karst.

Family- Hapalopilaceae**Ecology**- Saprobic**Habitat**- On hardwood or deadwood

Elevation- 1698m **Lattitude**- 27º35'47" N **Longitude**- 85º32'32" E

Collection date: 2080-5-28 **Collection site**- Chaukot community forest

Pileus: Bracket-to shelf-like, semicircular to irregular in form, convex to flat, whitish to grayish, velvety to finely hairy, to about 10 cm broad and 6 cm deep.

Pore Surface: 6-7 small, angular pores per millimeter; gray to black, occasionally bruising darker black.

Stipe: Not present.

Spores: Spores 4.8µm, smooth, somewhat round.Spore Print: White.

Photo plate 14:(A,B)*Bjerkandera adusta* in natural habitat (C) Spores of *B. adusta*

15. *Boletellus emodensis* (Berk.) Singer

Family- Boletaceae**Ecology**- Mycorrhizal**Habitat**- Soil

Elevation- 1605 m **Lattitude**- 27°35'55"N **Longitude**- 85°32'51" E

Collection date: 2080-4-28 **Collection site**- Chaukot community forest

Pileuss: 7cm in breadth, quite shaggy, richly colored with brown scales.

Pores: Blue-green, quickly bruising bright yellow pores. The pores become a drab, dark yellow as we age. The pores are first shielded from damage by a veil that runs from the Stipe to the Pileus margins.

Veil: As it grows, the veil often hangs in bits from the edges of the Pileus.

Stipe: almost equal in length and thickness, measuring 10 cm by 1 cm, with smooth, grey-brown pores.

Spores: 4-7µm, long-ellipsoidal.

Photo plate 15:(A,B)*Boletellus emodensis* in natural habitat (C) Spores of *B. emodensis*

16.*Clitocybe odora*(Bull.) P.Kumm.

Family -Tricholomataceae**Ecology**- Saprobe**Habitat**-Coniferous leaf litter.

Elevation- 1690 m **Lattitude**- 27°35'40" N **Longitude**- 85°32'28" E

Collection date: 2080-5-27 **Collection site**- Chaukot community forest

Gills: Frequently occurring, white, closely spaced, and attached to the Stipe.

Stipe: equal, dry, bald, whitish to brownish, 6 cm lengthy, 5 cm thick, with a profusion of white mycelium at the bottom.

Spore Print: Whitish to creamy in a thin print. Spores - 4 µm, round.

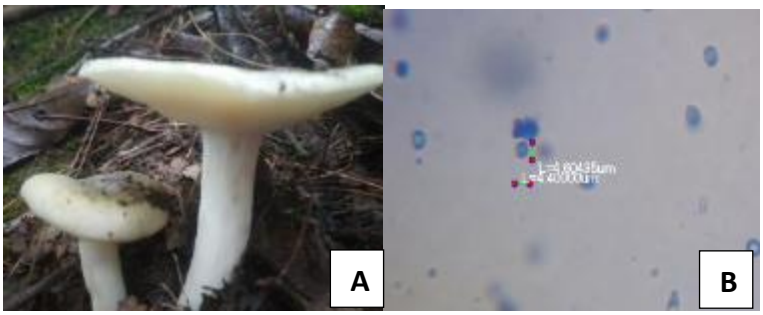

Photo plate 16:(A)*Clitocybe odora* in natural habitat (B) Spores of C. odora

17. *Coltricia cinnamomea*(Jacq.) Murrill

Family-Hymenochaetaceae**Ecology**- Mycorrhizal**Habitat-**Soil, solitary.

Elevation- 1700 m **Lattitude**- 27°35'40" N **Longitude**- 85°32'528" E

Collection date: 2080-5-27 **Collection site**- Chaukot community forest

Pileus: 1 to 5 cm, roughly spherical in shape, flat or vase-shaped, dry, cinnamon brown, typically with colored rings around the center, white and thin margin. Pore surface color: cinnamon brown or brown; pores might be round or angular.

Stipe: 1 to 5 cm long, 1-4 mm thick, silky, somewhat equal, dry, dark to cinnamon brown, robust.

Spore Print- brown. Spores- 3-5 µm, smooth, elliptical.

Photo plate 17:(A,B)*Coltricia cinnamomea* in natural habitat (C) Spores of *C. cinnamomea*

18. *Boletus edulis*Bull.

Family -Boletaceae**Ecology**- Mycorrhizal**Habitat-** Soil

Elevation- 1500 m **Lattitude**- 27º35'59" N **Longitude**- 85º32'50" E

Collection date: 2080-3-18 **Collection site**- Chaukot community forest

Pileus: greasy, penny-bun-like surface texture, the yellow-brown to reddish-brown. The margin is usually a lighter colour than the rest part; white flesh.

Tube: The tubes are pale yellow or olive-brown and are easily removed from the cap.

Stem: A faint white net pattern is visible on the stem, most noticeably near the apex. Club-shaped, 8 to 15cm tall and up to 10cm in diameter.The stem flesh is white.

Spores: 7-9 μm, more or less ellipsoid. Spore print: Olive-brown.

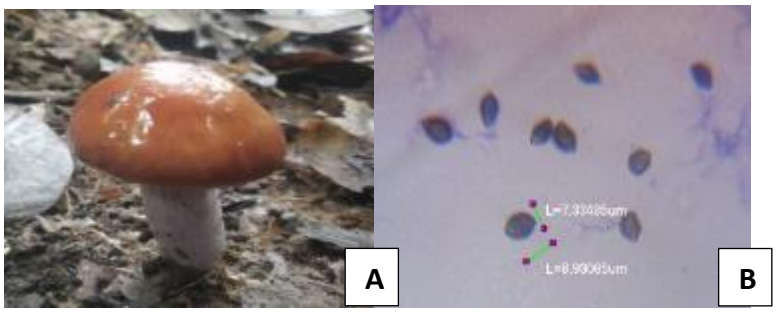

Photo plate 18:(A)*Boletus edulis* in natural habitat (B) Spores of *B. edulis*

19. *Craterellus cornucopioides*(L.) Pers.

Family- Cantharellaceae **Ecology**- Mycorrhizal**Habitat-** Soil

Elevation- 1500 m **Lattitude**- 27º35'59" N **Longitude**- 85º32'50" E

Collection date: 2080-3-18 **Collection site**- Chaukot community forest

Fruiting Body: 3-5 cm wide, 5-9 cm tall, without a distinctly defined Pileus and Stipe; tubular at first, forming a deep vase structure; the upper edge frequently partially folded under as it ages; thin-fleshed.

Upper/Inner Surface: Paler, grayish or grayish brown base hue with dark fibers and scales over a black to dark gray, coarsely roughened or finely scaly texture.

Under/Outer Surface: Dark gray to black, soft or very shallowly wrinkled, with a white bloom.

Spores: Spores 4-5 μm broadly ellipsoid, smooth. Spore Print: White to creamy.

Photo plate 19:(A, B)*Craterellus cornucopioides*in natural habitat (C)Spores of *C. cornucopioides*

20. *Cuphophyllus virgineus*(Wulfen) Kovalenko

Family-Hygrophoraceae**Ecology**- Saprobe

Habitat-Fallen deadwood, grows in moist, shaded environments.

Elevation- 1506 m **Lattitude**- 27º35'56" N **Longitude**- 85º32'50" E

Collection date: 2080-3-18 **Collection site**- Chaukot community forest

Pileus: 1- 5 cm across, convex or flat, a shallow central depression and an uplifted margin;, yellowish.

Gills: Running down the stem; distant or nearly so; white; short-gills frequent.

Stipe: 2-10 cm long; 3-6 mm thick; tapering to base; dry; bald; whitish to faintly yellowish; hollow,white flesh.

Spores- 7-11 x 6-7 µm, ellipsoid to lacrymoid Spore Print: White.

Photo plate 20: (A,B): *Cuphophyllus virgineus* in natural habitat (C) Spores of *C. virgineus*

21.*Dacrymyces spathularia* (schwein.)

Family-Dacrymycetaceae **Ecology**- Saprobe

Habitat- It develops on decaying broadleaf and coniferous wood.

Elevation- 1505 m **Lattitude**- 27º36'00" N **Longitude**- 85º32'47" E

Collection date: 2080-3-18 **Collection site**- Chaukot community forest

Dacrymyces spathularia yields fertile heads that are flattened and fan-shaped, or less commonly palmate, and gregarious, often clustered fruit bodies with a characteristic stipe. They are viscous and vary in hue from yellow to orange.

Spore: The species produces septate, cylindrical basidiospores as they reach maturity, measuring 7-11.5 by 3.5-4.5 µm

Edibility- Edible

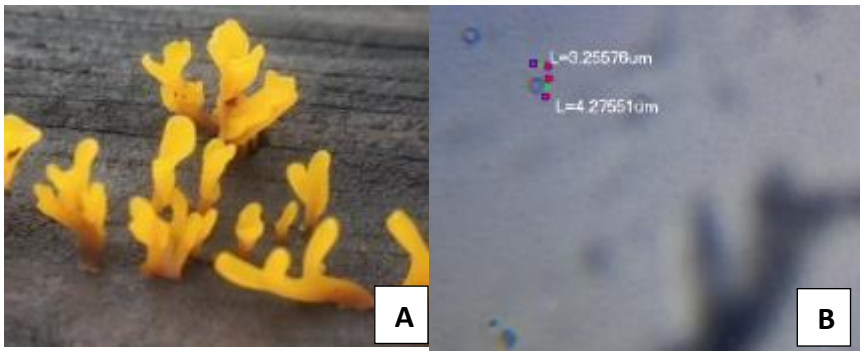

Photo plate 21:(A)*Dacrymyces spathularia* in natural habitat (B) Spores of *D.spathularia*

22. *Heterobasidion annosum* (Fr.) Bref. - Root Rot

Family- Bondarzewiaceae**Ecology**- Saprobe**Habitat**- Tree stump

Elevation- 1501 m **Lattitude**- 27°35'59"N **Longitude**- 85°32'56" E

Collection date: 2080-3-16 **Collection site**- Chaukot community forest

Fruitbody: Narrow, brown, smooth, uneven, frequently with a wavy edge.

Pores and tubes: The tubes end in creamy white, and they are off-white in color.

Spores: Largely ellipsoidal to subglobose, 4-7 µm in size.Spore print- Cream or pale yellow.

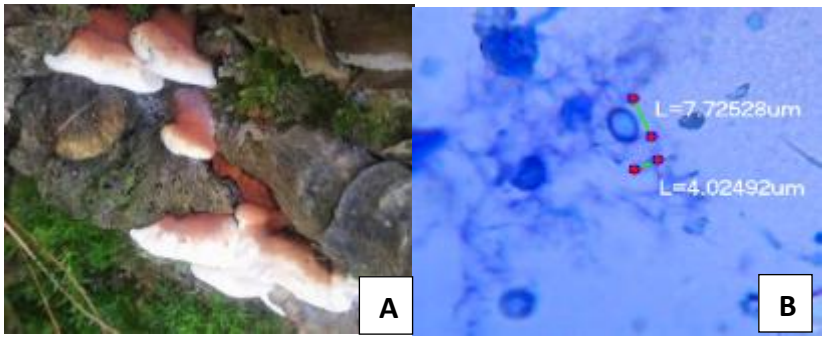

Photo plate 22:(A)*Heterobasidion annosum* in natural habitat (B) Spores of *H. annosum*

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

Family- Ganodermataceae**Ecology**- Saprobe

Habitat- Grows in the fallen twig, hardwood, firewood of pine.

Elevation- 1695 m **Lattitude**- 27º35'37"N **Longitude**- 85º32'26" E

Collection date: 2080-5-29 **Collection site**- Chaukot community forest

Basidiocarps annual stipitate, up to 15 cm wide and 3 cm thick near the base, coriaceous to woody hard, pileus glossy smooth, first yellowish or reddish, Stipe up to 2 cm wide, cylindrical to slightly flattened, almost sessile foot, pore surface white to cream, pores circular.

Spore: 6-11 μm, ellipsoid Spore print: Brown

Photo plate 23:(A,B):*Ganoderma lucidum* in natural habitat (C) Spores of *G. lucidum*

24. *Hygrocybe cantharellus*(Schwein.) Murrill

Family-Hygrophoraceae**Ecology**- Mycorrhizal**Habitat-** sprouting beneath conifers.

Elevation- 1600 m **Lattitude**- 27º35'55" N **Longitude**- 85º32'53" E

Collection date: 2080-4-30 **Collection site**- Chaukot community forest

Cap: 6-20 mm across; broadly convex, with an inrolled and finely scalloped margin; dry or slightly tacky; bald; orange or pale orange.

Gills: Running down the stem; nearly distant; thick; pale yellow; short-gills present.

Stem: 30-70 mm long; 2-4 mm thick; equal; dry or slightly tacky; bald; reddish orange, with a yellowish base.

Spores- 4.6-5 μm, smooth,subcylindric.Spore Print- White

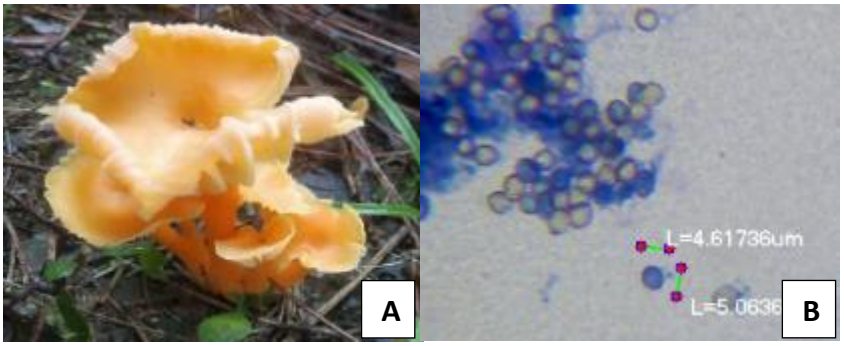

Photo plate 24:(A)*Hygrocybe cantharellus* in natural habitat (B) Spores of *H. cantharellus*

25*. Hygrocybe miniata*(Fr.) P.Kumm.

Family-Hygrophoraceae **Ecology**- Mycorrhizal

Habitat-Soil

Elevation- 1600 m **Lattitude**- 27°35'55" N **Longitude**- 85°32'53" E

Collection date: 2080-4-30 **Collection site**- Chaukot community forest

Pileus: 5-25 mm in diameter, convex, small central depression, slightly wet in humid conditions, reddish-orange

Gills: Often present, widely affixed to the Stipe, thick, first pale yellow before turning yellow to orange, and frequently attached in short strands.

Stipe: 3–4 cm long, 2–5 mm thick, bald, yellow toward the apex, with colors that resemble the Pileus elsewhere but gradually fade to a white base.

Spores: 3-6 μm, smooth, ellipsoid.Spore Print: White,

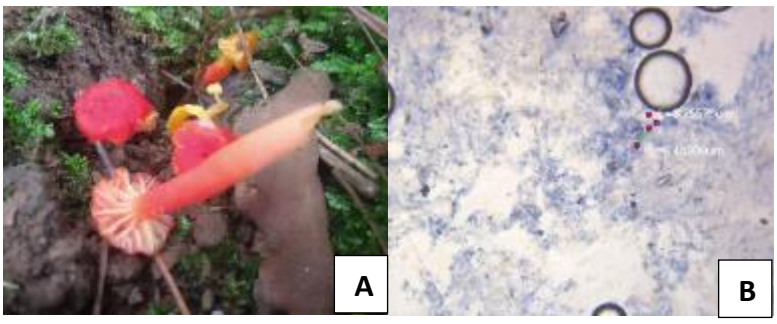

Photo plate 25:(A)*Hygrocybe miniata* in natural habitat (B) Spores of *H. miniata*

26. *Hymenochaete rubiginosa* (Dicks.) Lev.

Family-Hymenochaetaceae**Ecology**- Saprobe**Habitat-**Fallen firewood

Elevation- 1504 m **Lattitude**- 27°35'59" N **Longitude**- 85°32'56" E

Collection date: 2080-3-16 **Collection site**- Chaukot community forest

They are sessile, flattened and semicircular mushroom which adhere to substrate.

Upper surface –infertile, rusty brown, porous, wavy margin.

Lower surface –fertile, brown irregular margin.

Spore- 3-5 µm, ellipsoid.Spore print -white

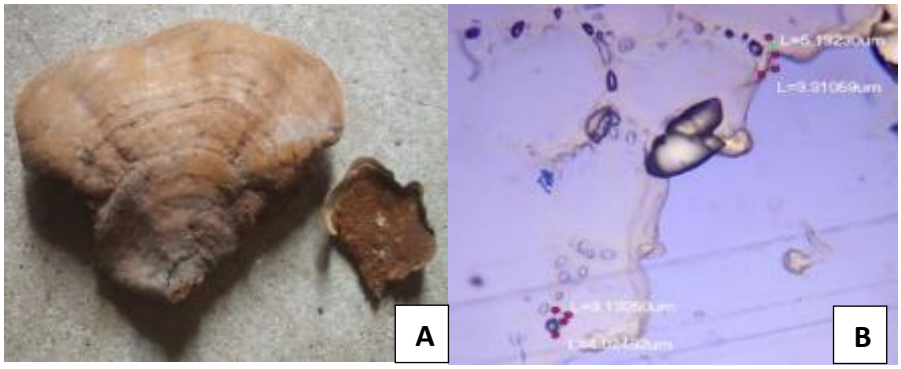

Photo plate 26:(A)*Hymenochaete rubiginosa* (B) spores of *H. rubiginosa*

27. *Hypholoma fasciculare*(Huds.:Fr.) P.Kumm.

Family-Strophariaceae **Ecology**- Saprobe

Habitat- Forming clumps on deteriorating wood

Elevation- 1510 m **Lattitude**- 27º36'00" N **Longitude**- 85º32'52" E

Collection date: 2080-3-16 **Collection site**- Chaukot community forest

Pileus: 2–6 cm, convex, almost flat, whispy partial veil fragents, reddish brown or orange at first, then bright yellow to golden yellow with a darker brownish core.

Gills: Often short, yellow, spore-dusted, and attached to the Stipe in a compact, crowded arrangement.

Stipe: about equal, 3-9 cm long, 4-9 mm thick, and yellowish

Spores: 3.6- 5.5 µm ellipsoid, smooth, thin-walled.Spore Print: Purple brown.

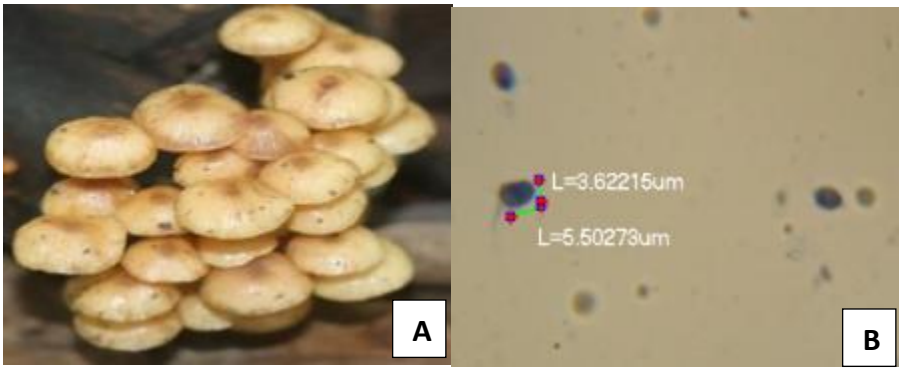

Photo plate 27:(A)*Hypholoma fasciculare* in natural habitat (B) Spores of *H. fasciculare*

28.*Gyroporus castaneus*(Bull.) Quel.

Family-Boletaceae**Ecology**- Mycorrhizal **Habitat**- Soil

Elevation- 1607 m **Lattitude**- 27°35'55" N **Longitude**- 85°32'51" E

Collection date: 2080-4-30 **Collection site**- Chaukot community forest

Pileus: easily identified by its broad, smooth, bay-brown or chestnut-colored Pileus, expanding to a width of 10 cm.

Pores: Pale yellow, angular pores at the end of the tubes

Stipe: The brown Stipe without a ring that has a roughly even diameter and a small curvature, especially close to the base. Usually measuring 10 cm in height and 3 cm in diameter..

Spores- 3-6µm, ellipsoidalSpore print- Olivaceous-brown.

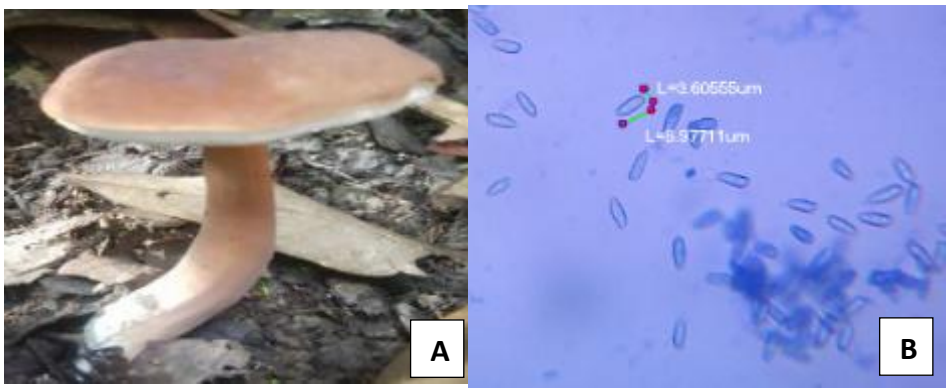

Photo plate 28:(A)*Gyroporus castaneus* in natural habitat (B) Spores of*G. castaneus*

29. *Isaria sinclairii*(Berk.) Lloyd

Family- Cordycipitaceae **Ecology**- Parasitic

Habitat- Growing by penetratin on the body of cicada, soil

Elevation- 1505 m **Lattitude**- 27º36'00" N **Longitude**- 85º32'52" E

Collection date: 2080-3-15 **Collection site**- Chaukot community forest

Isaria sinclairii displaying the parasitized cicada nymphs and fruiting bodies. This fungus targets insects, particularly the larvae of cicadas. Usually, the fungus causes white tufts to emerge from the soil and discharge powdery white spores when the larvae die just below the surface of the ground. Spore powder is present on top of a brownish-colored stalk.

Spore- ellipsoid, spore print- white

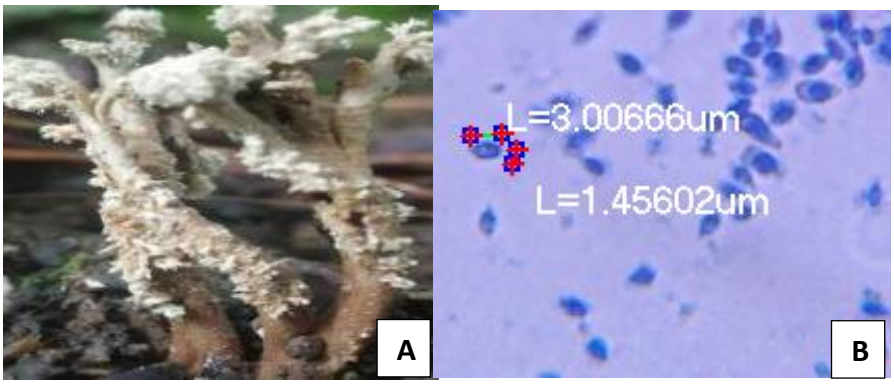

Photo plate 29:(A)*Isaria sinclairii* in natural habitat (B) Spores of *I. sinclairii*

30. *Laccaria laccata* (Scop.) Cooke

Family -Hydnangiaceae**Ecology**- Mycorrhizal**Habitat -** Soil cover by leaf litters

Elevation- 1608 m **Lattitude**- 27º35'56"N **Longitude**- 85º32'48" E

Collection date: 2080-4-30 **Collection site**- Chaukot community forest

Pileus: a pinkish-brown, 2-7 cm in diameter, convex at origin but flattens with age.

Gills: pinkish brown, widely scattered, decurrent.

Stipe: 3-9 cm long, 0.4-1 cm wide, pinkish brown, hollow, hairy at the base, without a ring

Spores –round, 7-10 µm diameter Spore print- white

Photo plate 30:(A)*Laccaria laccata* in natural habitat (B) Spores of *L. laccata*

31.*Lactarius corrugis*(Peck)

Family-Russulaceae **Ecology**- Mycorrhizal **Habitat-**solitary, soil.

Elevation- 1600 m **Lattitude**- 27º35'55" N **Longitude**- 85º32'51" E

Collection date: 2080-4-30 **Collection site**- Chaukot community forest

Pileus: 4-20 cm; convex; shallowly depressed; in maturity wrinkled, dark brown.

Gills: Attached to the stem or beginning to run down it; close; pale buff when young but soon orangish to yellowish or brownish; discoloring brown where injured.

Stem: 6-10 cm long; 2 cm thick; colored more or less like the cap, equal, solid.

Spores- 4.8µm, globose Spore Print: White.

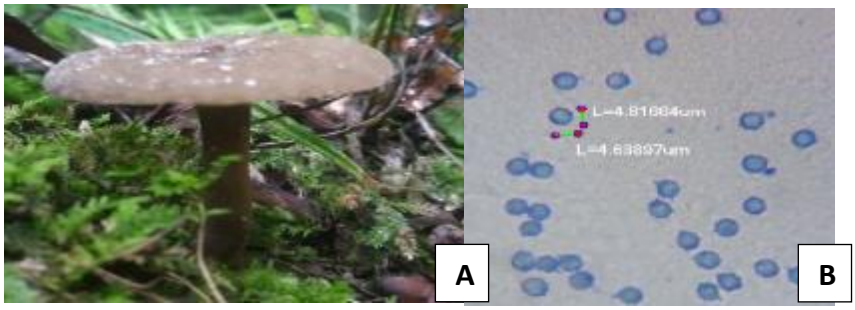

Photo plate 31: (A):*Lactarius corrugis*in natural habitat (B) Spores of*L. corrugis*

32.*Lactarius lilacinus*(Lasch) Fr.

Family-Russulaceae**Ecology**- Mycorrhizal **Habitat-** Soil

Elevation- 1603 m **Lattitude**- 27º35'55" N **Longitude**- 85º32'53" E

Collection date: 2080-4-29 **Collection site**- Chaukot community forest

Pileus: 6 cm, velutinous to squamulose, convex to applanate, thereafter depressed.

Gills: creamy, pale pink, broadly adnate to decurrent.

Stipe- Cylindric, smooth, dry, and reddish Stipe

Milk is scarce, flesh is brittle.

Spores- 4.4 µm, globose

Photo plate 32:(A,B)*Lactarius lilacinus* in natural habitat (C) Spores of *L. lilacinus*

33.*Clitocybe gibba*(Pers.) P. Kumm.

Family-Tricholomataceae**Ecology**- Saprobe

Habitat-Grow beneath a pine tree on leaf litter.

Elevation- 1694 m **Lattitude**- 27º35'45" N **Longitude**- 85º32'30" E

Collection date: 2080-5-27 **Collection site**- Chaukot community forest

Pileus: 4 - 8cm in diameter, convex, smooth and silky, usually with a wavy edge, and creamy-brown, soft flesh.

Gills: deeply decurrent, white or pale buff gills that are narrow and quite crowded.

Stipe: 5 -10mm in diameter and 3 to 7cm tall, often hollow, and only slightly bulbous at the base.

White. Spores:6 µm, ellipsoidal to pip-shaped.Spore Print: White.

Photo plate 33:(A,B)*Clitocybe gibba* in natural habitat (C) Spores of *C. gibba*

34.*Leotia lubrica*(Scop.) Pers.

Family-Leotiaceae **Ecology**- Saprobe**Habitat-**leaf litter

Elevation- 1500 m **Lattitude**- 27°36'00" N **Longitude**- 85°32'47" E

Collection date: 2080-3-16 **Collection site**- Chaukot community forest

Pileus: 1 to 3 cm in diameter, asymmetrical but usually convex, convoluted, bald, smooth or somewhat wrinkled, slimy when young but buff, olive yellowish or greenish).

Stipe: dark green, hollow, or filled with viscous material; 2-8 cm long and up to 1 cm diameter; bald, slimy or sticky when young.

Spores: 4-11µm, ellipsoid, smooth, frequently bent eventually becoming septate, with one or two septum noticeable.

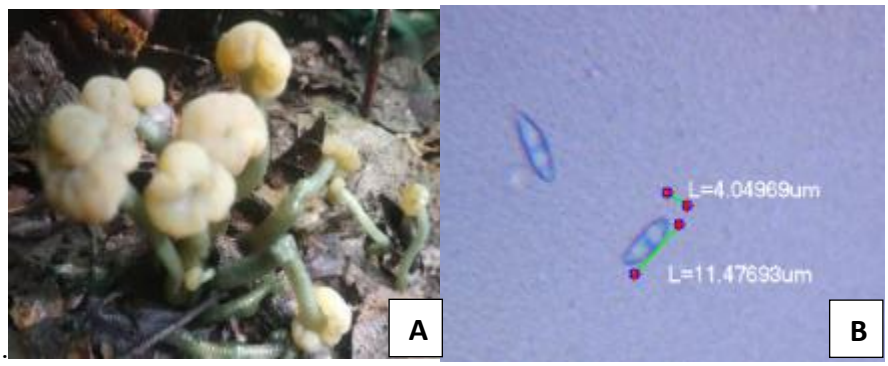

Photo plate 34:(A)*Leotia lubrica* in natural habitat (B) Spores of *L. lubrica*

35. *Lepiota cristata*(Bolton) P.Kumm.

Family-Agaricaceae**Ecology**- Mycorrhizal **Habitat-** Soil

Elevation- 1697 m **Lattitude**- 27°35'43" N **Longitude**- 85°32'28" E

Collection date: 2080-5-30 **Collection site**- Chaukot community forest

Pileus: 2-4 cm, dry, scaly, with brown scales that are organized tightly; the center normally stays bald and darker, turning whitish toward the lined edge. Pileus is convex, obtusely cylindrical, or broadly bell-like.

Gills: Closed, free from the Stipe, short gills often, white to buff in color.

Stipe: almost similar in length and thickness, 5 cm by 2 mm, bald, delicate, and white

Spores: 2-5.8µm, ellipsoid, smooth.Spore Print: White.

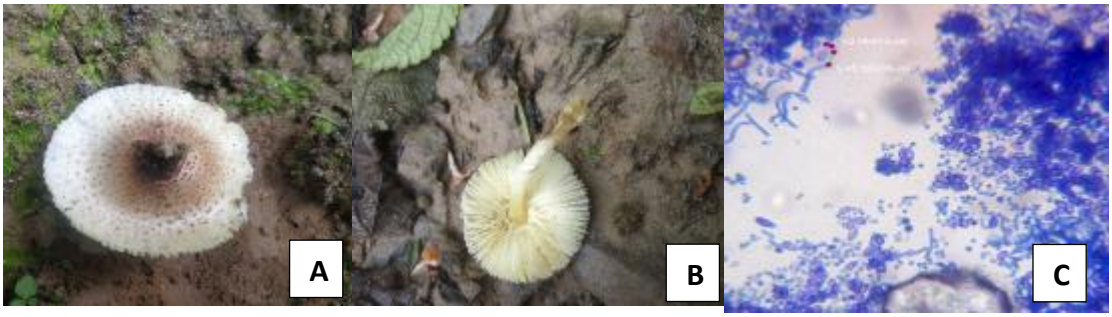

Photo plate 35:(A,B)*Lepiota cristata* in natural habitat (C) Spores of *L. cristata*

36. *Leucocoprinus birnbaumii*(Corda) Singer

Family- Agaricaceae **Ecology**- Saprobic**Habitat-** Animal dung

Elevation- 1692 m **Lattitude**- 27°35'45" N **Longitude**- 85°32'30" E

Collection date: 2080-5-29 **Collection site**- Chaukot community forest

Pileus: bell-shaped, 2-4 cm in diameter, dry, powdery to finely scaly, bright yellow to light yellow, frequently with a center that is somewhat darker.

Gills: Free from the Stipe, packed, often having short gills, pale yellow to yellow in color.

Stipe: roughly equal, 3-10 cm long, 2-5 mm thick, dry, powdery, and delicate.

Spores: Spores 2-7µm, ellipsoid, smooth. Spore Print: White.

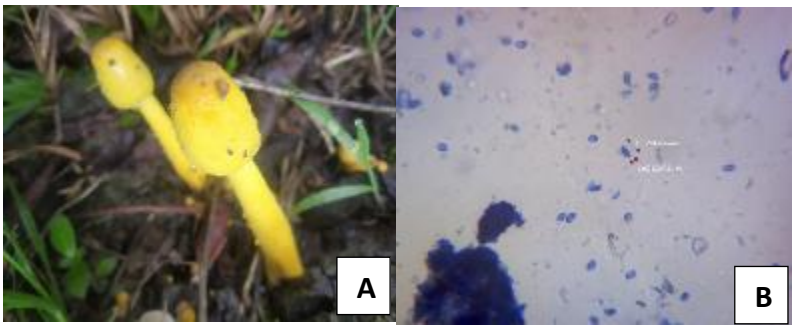

Photo plate 36:(A)*Leucocoprinus birnbaumii* in natural habitat (B) Spores of *L. birnbaumii*

37.*Leucocoprinus fragilissimus*(Ravenel ex Berk & M.A. Curtis) Pat.

Family-Agaricaceae **Ecology**- saprobic

Habitat-In humus, plants growing sporadically or alone

Elevation- 1699 m **Lattitude**- 27°35'47" N **Longitude**- 85°32'32" E

Collection date: 2080-6-1 **Collection site**- Chaukot community forest

Pileus: 1-4 cm in diameter, almost flatting out, with a tiny hump in the middle, extremely delicate, and quickly collapsing; deeply grooved from the edge to the center; dry or damp; pale greenish yellow.

Gills: Disconnected, pale yellow, free from the Stipe, frequently disintegrating in hot weather.

Stipe: equidistant, 4–9 cm long, 1-2 mm thick, bald, pale yellow, fading to almost white, with a thin, brittle, golden ring that occasionally vanishes, all above a little basal bulb.

Spores- Spores 9-12 x 7-8 μ, broadly ellipsoidSpore Print-White.

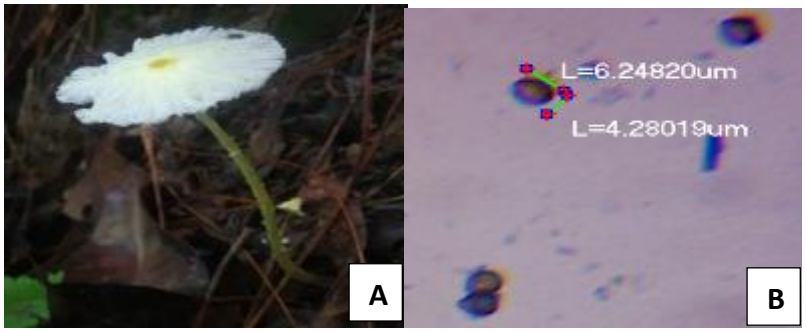

Photo plate 37:(A)*Leucocoprinus fragilissimus* in natural habitat (B) Spores *of L. fragilissimus*

38. *Lycoperdon pyriforme*(Schaeff.) Vizzini

Family- Agaricaceae **Ecology**- saprobic

Habitat-Develop in dense clusters or in random patches, leaf litter.

Elevation- 1505 m **Lattitude**- 27º35'59" N **Longitude**- 85º32'57" E

Collection date: 2080-3-17 **Collection site**- Chaukot community forest

Fruiting Body: Generally round at first but shaped more like an inverted pear as it ages. It is 2-3 cm wide and 2-4 cm high, dry, covered in tiny white spines when it is young and fresh, but these spines usually disappear by maturity. A central perforation forms at a mature stage, through which spores are released by raindrops and wind currents. The spores are brown and filled with brownish spore dust, and the base is attached to many white rhizomorphs.

Spores- 3.2 μm, globose, smooth.

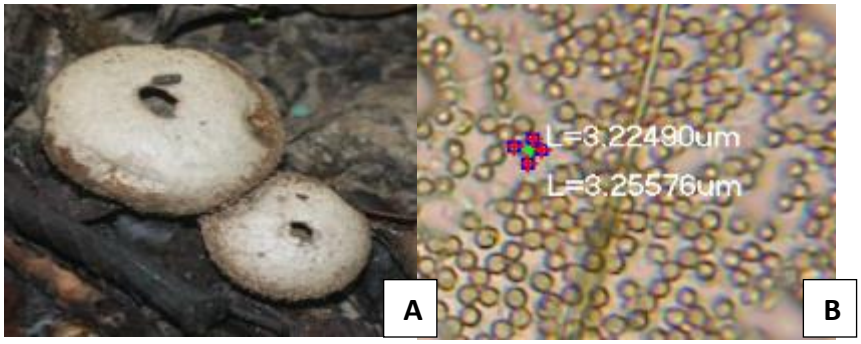

Photo plate 38:(A)*Lycoperdon pyriforme* in natural habitat (B) Spores of *L. pyriforme*

39. *Megacollybia platyphylla* (Pers.) Kotl. and Pouzar - Whitelaced Shank

Family-Tricholomataceae**Ecology**- Saprobic**Habitat-** leaf litter

Elevation- 1604 m **Lattitude**- 27°35'55" N **Longitude**- 85°32'51" E

Collection date: 2080-4-29 **Collection site**- Chaukot community forest

Pileus: 6–14 cm in diameter, convex, irregularly flattening at the center, with a tiny, smooth, dry umbo in the center that is streaked with radial lines in different colors of grey-brown. This mushroom's Pileuss split at the borders in a radial pattern.

Gills: Broad, packed, white, sinuate or attached to Stipe; they turn cream with age. On older species, the gills become irregularly wavy.

Stumps: 5 to 15 cm long, 0.6 to 1 cm in diameter, frequently rooted at the base, white, covered in fibrils that are grey-brown, whiter at the tip, and without a ring.

Spores- Broadly ellipsoidal, smooth,5-7 µm.Spore print- White

Photo plate 39:(A,B)*Megacollybia platyphylla* in natural habitat (C) Spores of *M. platyphylla*

40. *Microporus xanthopus*(Fr.) Kuntze

Family- Polyporaceae **Ecology**- Saprobe**Habitat-** Fallen wood

Elevation- 1509 m **Lattitude**- 27°36'00" N **Longitude**- 85°32'54" E

Collection date: 2080-3-17 **Collection site**- Chaukot community forest

Pileus: The white underside has a smooth, thin, and wavy border and is covered in many tiny pores, each measuring 3 to 9 cm in diameter. The inner surface has clear bands that are banded brown in sub-circular funnel shapes and in different hues of cream and brown.

Pores: White-colored, microscopic pores

Stipe: pale yellow, cylindrical streak that is 0.3 cm broad and 1 cm long.

Spores: 3-4 µm, less elliptical Spore print- white

Photo plate 40:(A,B)*Microporus xanthopus* in natural habitat (C) Spores of *M. xanthopus*

41. *Nigroporus vinosus*(Berk.) Murrill

Family-Polyporaceae **Ecology**- Saprobic

Habitat- On the tree stump of pine conifers, growing alone.

Elevation- 1700 m **Lattitude**- 27°35'49" N **Longitude**- 85°32'34" E

Collection date: 2080-6-1 **Collection site**- Chaukot community forest

Pileus: 4-20 cm across, flat, semicircular in outline, dry, bald, purplish brown with concentric ring band.

Pore Surface: bruising slowly brownish maroon to dark gray.

Spores: 4-6 µm, cylindric, smooth.Spore Print: white.

Photo plate 41:(A,B)*Nigroporus vinosus* in natural habitat (C) Spores of *N. vinosus*

42. *Oudemansiella radicata* (Relhan) Singer

Family- Physalacriaceae**Ecology-**Saprobe**Habitat -** dead tree stump

Elevation- 1507 m **Lattitude**- 27º35'59" N **Longitude**- 85º32'56" E

Collection date: 2080-3-16 **Collection site**- Chaukot community forest

Pileus: Ash brown, convex, 5- 12 cm, sticky when wet, wrinkles with age, Gill: white, thick, broad, adnexed, far away, Dark chocolate brown, naked, deeply rooted, ringless, and measuring 10–20 cm in length and 0.5–1 cm in diameter is the Stipe.

Spores -7.6-10.5 µm, ellipsoidal to lemon shaped, smooth. Spore print - white,

Photo plate 42:(A,B)*Oudemansiella radicata* in natural habitat (C) Spores *of O. radicata*

43. *Panus conchatus*(Bull.) Fr.

Family- Polypoaceae**Ecology**- Saprobic**Habitat-** Fallan wood

Elevation- 1503 m **Lattitude**- 27º36'00" N **Longitude**- 85º32'50" E

Collection date: 2080-3-16 **Collection site**- Chaukot community forest

Pileus: 3–7 cm broad, deeply vase-shaped or with a central depression; dry, bald on the inside or slightly fuzzy around the edge; brown or pale, with color developing in concentric zones; wavy margin.

Gills: White, close-fitting or almost distant gills that run down the Stipe.

Stipe: 0.5–1 cm wide, 2-4 cm long, equal, or slightly increased toward the base; when young, hairy and dry, it has a hue similar to the Pileus.

Spore Print: White. Spores: 3.2-4.3µm, subcylindric, smooth

Photo plate 43:(A, B)*Panus conchatus* in natural habitat (C) Spores of *P. conchatus*

44*. Paxillus involutus*(Batsch) Fr.

Family-Paxillaceae **Ecology**- Saprobe**Habitat-**On a fallen tree.

Elevation- 1600 m **Lattitude**- 27º35'55" N **Longitude**- 85º32'46" E

Collection date: 2080-4-29 **Collection site**- Chaukot community forest

Pileus: 4–8 cm, convex, dry, smooth, brown, irregularly shaped, with a sharply inrolled edge that becomes centrally depressed.

Gills: Pale cinnamon in color, separable as a layer, flowing down the Stipe in close or dense clusters.

Stipe: 5 cm in length, up to 1.5 cm in thickness, frequently tapering towards the base; dry, coarsely hairy, with brownish bruises.

Spores:2-5 µm, smooth, elliptical. Spore Print: yellow-brown.

Photo plate 44:(A,B)*Paxillus involutus*in natural habitat (C) Spores of *P. involutus*

45. *Paxillus cuprinus*Jargeat, Gryta, J.-P. Chaumeton & Vizzini

Family- Paxillaceae **Ecology**- Mycorrhizal **Habitat-** Soil

Elevation- 1606 m **Lattitude**- 27º35'55" N **Longitude**- 85º32'48" E

Collection date: 2080-4-29 **Collection site**- Chaukot community forest

Pileus: 2–5 cm in diameter, smooth and glossy, grey to brown in color, convex when young, then expanding and flattening with a somewhat sunken center.

Gills: yellowish white in color, uneven, narrow, crowded, decurrent, frequently forked, branching, and merging towards the Stipe.

Stipe: 2-3 cm, dry, slender to thin, with a whitish tint and a noticeable zone of pale yellow at the top.

Spores: 2.6-4.6 μm, smooth, elliptical.

Photo plate 45:(A,B)*Paxillus cuprinus*in natural habitat (C) Spores of *P. cuprinus*

46. *Polyporus arcularius* (Batsch) Zmitr.

Family- Polyporaceae **Ecology**- Saprobic

Habitat- On the deadwood of hardwoods, solitary.

Elevation- 1500 m **Lattitude**- 27°36'00" N **Longitude**- 85°32'52" E

Collection date: 2080-3-17 **Collection site**- Chaukot community forest

Pileus: 1-4 cm, dry, coarsely, concentrically scaly with golden brown scales and fibrils on a dull tan ground; edge with tiny projecting hairs. Convex to flat or shallowly depressed.

Pore surface: extends radially and is pale at first before turning brownish. It runs the length of the Stipe.

Stipe: 2-3 cm long, 0.5 cm wide, dry, brown, and hairy; central or slightly off-center.

Spores: 6-7 μm, cylindrical, smooth. Spore Print: Creamy white.

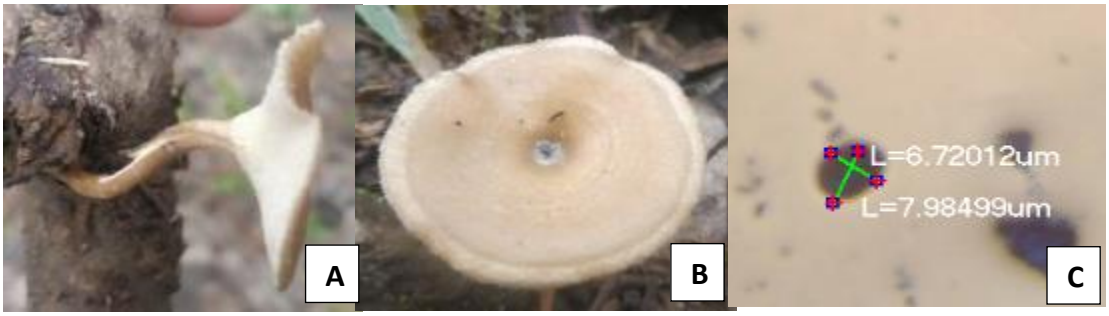

Photo plate 46: (A,B)*Polyporus arcularius* in natural habitat (C) Spores of P. arcularius

47. *Psathyrella candolleana*(Fr.) D. Wacht. & A. Melzer

Family-Coprinaceae **Ecology**- Saprobic

Habitat-Growing on firewood and leaf litter on the forest

Elevation- 1500 m **Lattitude**- 27°35'59" N **Longitude**- 85°32'54" E

Collection date: 2080-3-17 **Collection site**- Chaukot community forest

Pileus: 4–9 cm, bald, dark brown in the center with a white border, rounded-conical or widely convex, broadly bell-shaped, mature margin frequently separating radially in places.

Gills: Grayish, crowded, and either attached to or almost free from the Stipe.

Stipe: 4–12 cm long, 0.5–1 cm thick, hollowing, bald or slightly lined, equal, delicate, white or greenish.

Spores: 3-5µm, ellipsoid with a truncated end, smooth.Spore Print: Dark purplish brown.

Photo plate 47: (A,B)*Psathyrella candolleana* in natural habitat (C) Spores of *P. candolleana*

48. *Rhodocollybia butyracea* (Bull.: Fr.) Lennox

Family -Omphalotaceae**Ecology**- Saprobic**Habitat-** Decomposed conifer litter.

Elevation- 1700 m **Lattitude**- 27°35'37" N **Longitude**- 85°32'26"

Collection date: 2080-6-2 **Collection site**- Chaukot community forest

Pileus: 7 cm wide, convex, wet, and greasy feeling Pileus that is reddish brown or fades to cinnamon when it is young.

Gills: Frequently developing sharply jagged edges, gills are several, pale, and closely affixed to the Stipe.

Stipe: bald, damp or dry, 8 cm long, 1-2 cm thick, typically fashioned like a small club.

Spore Print: Whitish or faintly pinkish. Spores: smooth, 5µm, globose

Photo plate 48:(A,B)*Rhodocollybia butyracea* in natural habitat (C) Spores of *R.Butyracea*

49. *Russula aeruginea*Fr.

Family-russulaceae**Ecology**- Mycorrhizal **Habitat-** Soil

Elevation- 1600 m **Lattitude**- 27°35'54"N **Longitude**- 85°32'51" E

Collection date: 2080-5-1 **Collection site**- Chaukot community forest

Pileus: 6 cm, smooth, slightly damp, flat with a small depression, grayish green to yellowish green, edge lined,

Gills: Close, attached to the Stipe or extending slightly below it, frequently forking close to the Stipe, creamy

Stipe: smooth, white, 4-6 cm long, 1-2 cm thick.

Spores-ellipsoidal,8.4-10 µm Spore print-Cream

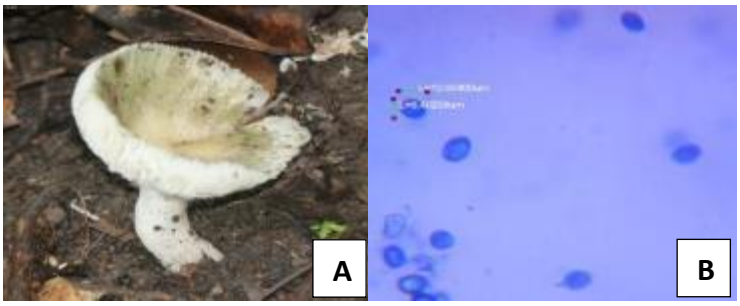

Photo plate 49: (A)*Russula aeruginea* in natural habitat (B) Spores of *R. aeruginea*

50. *Russula mairei*(Singer)

Family- Russulaceae **Ecology**- Mycorrhizal **Habitat-**forest floor, soil

Elevation- 1600 m **Lattitude**- 27º35'55" N **Longitude**- 85º32'55" E

Collection date: 2080-5-1 **Collection site**- Chaukot community forest

Pileus:5 to 6 cm diameter, smooth, bright red or pink, convex with at most only a shallow central depression, flesh is white.

Gills: White, sometimes with a greenish tinge, the adnexed, crowded gills.

Stem: 12 to 14 mm in diameter and 22 to 30 mm tall, smooth and slightly clavate and white flesh.

Spores- 13 µm, ovoid Spores print- White.

Photo plate 50: (A, B) sample of *Russula mairei*(C)Spores of *R. mairei*

51.*Lactarius piperatus*(L.) Pers.

Family- Russulaceae **Ecology**- Mycorrhizal **Habitat-**Leaf litter

Elevation- 1500 m **Lattitude**- 27º35'59" N **Longitude**- 85º32'56" E

Collection date: 2080-3-16 **Collection site**- Chaukot community forest

Pileus: White or cream, smooth, sometimes wrinkled, Convex then flattened with a central depression.

Gills: White or cream, crowded, thin, forked, decurrent.

Stipe: Same colour as pileus, cylindrical, tapering towards base, hollow.

Spores: 4 µm, ellipsoidal. Spore Print: White

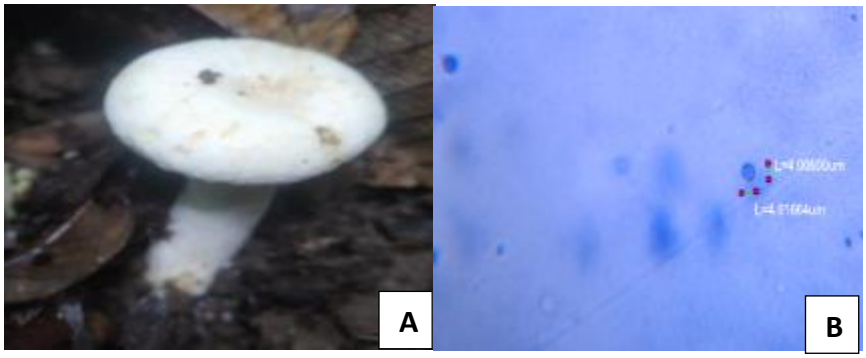

Photo plate 51: (A)*Lactarius piperatus* in natural habitat (B) Spores of *L. piperatus*

52. *Russula ochroleuca*Fr.

Family- Russulaceae **Ecology**- Mycorrhizal

Habitat-found in grassy areas beneath pine trees in deciduous woods

Elevation- 1609 m **Lattitude**- 27°35'47" N **Longitude**- 85°32'32" E

Collection date: 2080-6-1 **Collection site**- Chaukot community forest

Pileus: 4 to 10cm in diameter, ochre-yellow convex to flat, slight depression, striate margin and the cuticle easily peels back over.

Gills: creamy-white, adnexed or adnate, narrow and brittle.

Stipe:15 - 25mm in diameter, 4 - 7cm tall, white, tapers inwards slightly towards the apex.

Spores: 4-7 µm, elliptical or rounded. Spore Print: White

Photo plate 52: (A, B)*Russula ochroleuca* in natural habitat (C) Spores of *R. ochroleuca*

53. *Russula foetens*Pers. - Stinking Brittlegill

Family- Russulaceae **Ecology**- Mycorrhizal **Habitat-**On deciduous forest, soil.

Elevation- 1601 m **Lattitude**- 27°35'55" N **Longitude**- 85°32'53" E

Collection date: 2080-4-29 **Collection site**- Chaukot community forest

Pileus: golden brown, hemispherical, 5–12 cm in diameter, viscous, and notably blotchy on the surface.

Gills: Cream-colored, fragile, and narrow.

Stipe: 4 cm tall and 1.5 cm in diameter, the brittle white, solid Stipes turn brownish with age and get interior cavities.

Spores- Globose, 5 µm Spore print- Pale to mid cream.

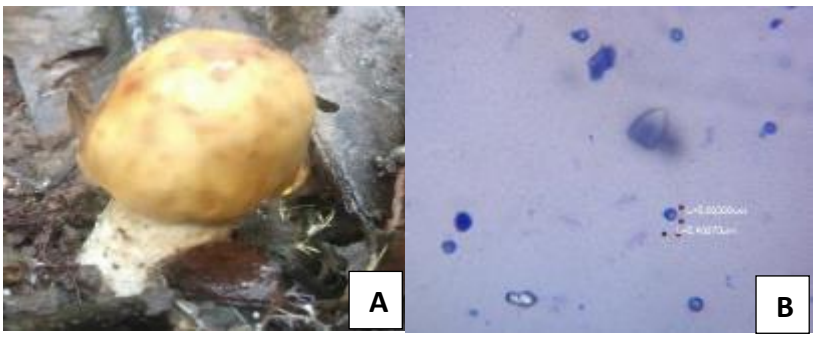

Photo plate 53: (A) *Russula foetens* in natural habitat (B) Spores of *R. foetens*

54. *Russula mariae* Peck.

Family- Russulaceae **Ecology**- Mycorrhizal **Habitat**- Soil

Elevation- 1699 m **Lattitude**- 27°35'45" N **Longitude**- 85°32'30" E

Collection date: 2080-6-1 **Collection site**- Chaukot community forest

Pileus: 2-7 cm, dry, shallowly depressed, widely convex to flat, with a whitish bloom or dusting when new; purple to purplish red, or reddish, pinkish; the edge is typically lined by maturity.

Gills: Usually white or cream in color, but occasionally reddish at the edges from touch with the Stipe during the button stage; connected to the Stipe, close or crowded, rarely forking.

Stipe: white, dry, smooth, tapering towards base, 2-6 cm long, 1-3 cm thick.

Spores: 4.6µm, globose or subglobose.Spore Print: Creamy

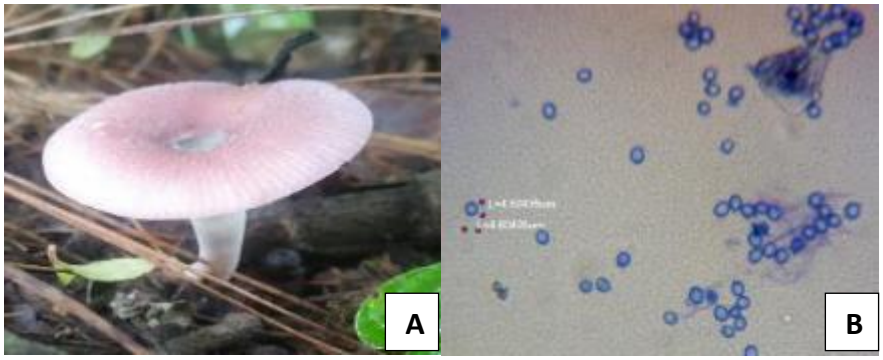

Photo plate 54: (A)*Russula mariae* in natural habitat (B) Spores of *R. mariae*

55. *Russula nigricans* (Bull.) Fr. - Blackening Brittlegill

Family-Russulaceae **Ecology**- Mycorrhizal

Habitat-forest floor of both coniferous and broadleaf forests.

Elevation- 1607 m **Lattitude**- 27°35'54" N **Longitude**- 85°32'51" E

Collection date: 2080-4-28 **Collection site**- Chaukot community forest

Pileus: 6 to 20 cm in diameter, with a central depression and a flatter, grey-brown color.

Gills: thick and brittle, with a dull black color.

Stipe: The cylindrical, smooth, blackening Stipes ranging in diameter from 1 to 4 cm and height from 4 cm.

Spores- ovoid,4.6µmSpore print- White.

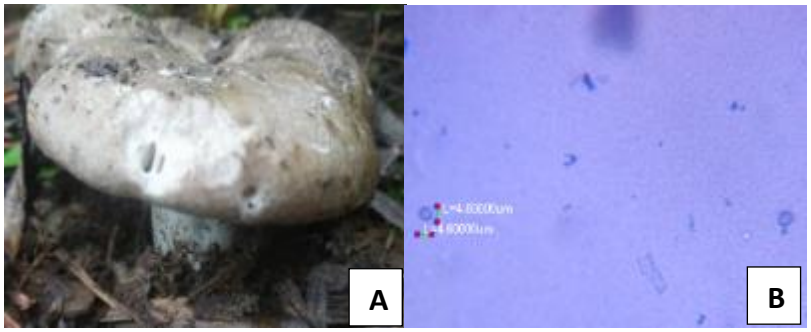

Photo plate 55:(A) *Russula nigricans* in natural habitat (B) Spores of R. nigricans

56. *Russula nitida* (Pers.) Fr.

Family- russulaceae **Ecology**- Mycorrhizal **Habitat-** Soil.

Elevation- 1505 m **Lattitude**- 27°35'59" N **Longitude**- 85°32'47" E

Collection date: 2080-3-15 **Collection site**- Chaukot community forest

Pileus: measures from 3 to 11 cm, funnel-like shape, hemispherical, sulcate, and umbrella-like. The fruit body is bleaching.

Gills: narrow. Stipe: brittle and hollow

Spore: Subgloboge, 5.6-6.4µm Spore print: white

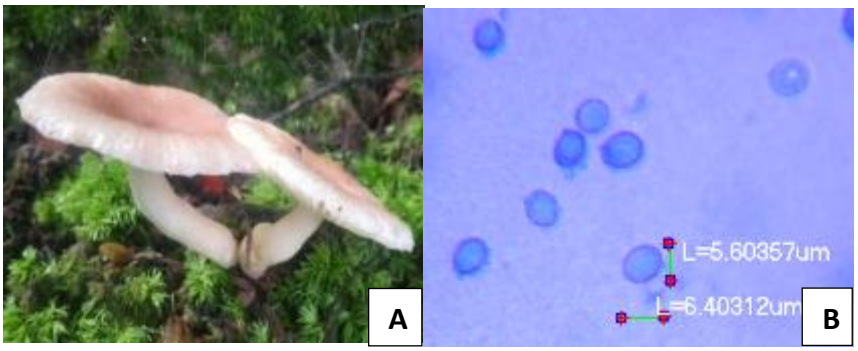

Photo plate56: (A)*Russula nitida* in natural habitat (B) Spores of *R. nitida*

57.*Russula rose*Fr.

Family - Russulaceae**Ecology**- Mycorrhizal **Habitat -** Soil

Elevation- 1601 m **Lattitude**- 27°35'54" N **Longitude**- 85°32'48" E

Collection date: 2080-5-1 **Collection site**- Chaukot community forest

Pileus: Blood red, convex to flat, sticky when moist, Pileus skin peels only at the edge, Ten centimeters or more.

Gills: close, whitish, adnate to slightly decurrent.

Stipe: 4–10 cm tall, 1.5–3 cm thick, white, reddish-purple at the base.

Spores -5.2-5.4µm, warts, ovoid. Spore print - creamy,

Photo plate 57: (A,B)*Russula rose* in natural habitat (C) Spores of *R. rosa*

58. *Scleroderma cepa*Pers.

Family -Sclerodermataceae **Ecology**- Mycorrhizal**Habitat -** Soil

Elevation- 1604 m **Lattitude**- 27º35'55" N **Longitude**- 85º32'55" E

Collection date: 2080-4-29 **Collection site**- Chaukot community forest

Fruiting body - Yellow-brown with a rougher texture and patterns that resemble scales.

Spores - Globose to slightly flattened, brown, 2µm in diameter.

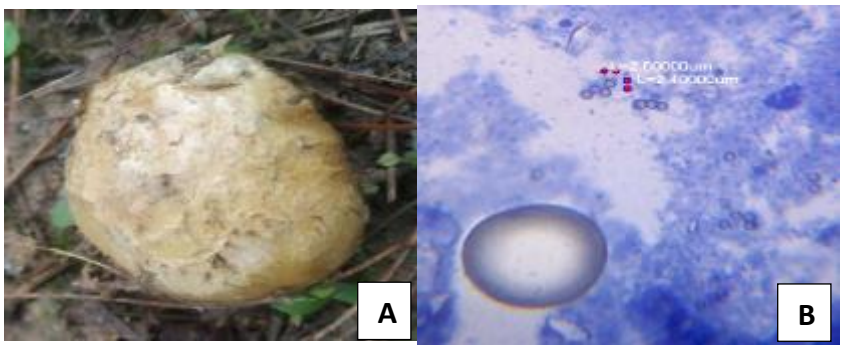

Photo plate 58: (A) *Scleroderma cepa* in natural habitat (B) Spores of *S. Cepa*

59. *Strobilomyces strobilaceus* (Scop.) Berk.

Family -Boletaceae **Ecology**- Mycorrhizal **Habitat -**Soil

Elevation- 1600 m **Lattitude**- 27º35'55" N **Longitude**- 85º32'53" E

Collection date: 2080-4-29 **Collection site**- Chaukot community forest

Pileus: Convex, dark grey to black pyramidal scales, 3.1–12 cm broad.

Pore: white, flesh white, hexagon-shaped.

Stipe: up to 14 cm tall and 1-2 cm in diameter; scaly.

Spores - ellipsoidal, smooth, 8-12 × 7 -10 µm. Spore print - blackish brown,

Photo plate 59: (A,B) *Strobilomyces strobilaceus* in natural habitat (C) Spores of S. strobilaceus

60. *Tapinella panuoides* (Batsch) E.-J.Gilbert

Family-Tapinellaceae**Ecology**- Saprobe**Habitat-** Leaf litter

Elevation- 1560 m **Lattitude**- 27º35'59" N **Longitude**- 85º32'57" E

Collection date: 2080-3-17 **Collection site**- Chaukot community forest

Pileus: 3-8 cm, bald, fan- or shell-shaped, yellow–brown or orangish brown, with an inrolled border

Gills: Close, dull, cross-veined, orange to yellow in color, often forked.

Stipe: Nonexistent

Spores: 2.9-3.9 µm, ellipsoid, smooth. Spore Print: Yellowish brown

Photo plate 60:(A,B) *Tapinella panuoides* in natural habitat (C) Spores of *T. panuoides*

61. *Trametes hirsuta*(Wulfen) Lloyd

Family-Tremellaceae **Ecology**- Saprobic**Habitat-**fallen firewood.

Elevation- 1606 m **Lattitude**- 27º35'59" N **Longitude**- 85º32'53" E

Collection date: 2080-4-29 **Collection site**- Chaukot community forest

Pileus: Semicircular, irregularly bracket- or kidney-shaped, up to 10 cm across and 6 cm deep; frequently fusing horizontally with other Pileuss; extremely densely hairy; frequently finely, radially furrowed; concentric zones of texture; zones with gray, whitish, and brownish shades, but usually not contrasting notably; margin frequently brownish to brown or blackish.

Pore Surface: Whitish, turning somewhat brown, gray, or yellow as it ages. Has three to four circular to angular pores per mm; tubes have reasonably thick walls and a maximum depth of 6 mm.

Spores: Spores 6 x 2µm, smooth, cylindricSpore Print: White.

Photo plate 61:(A, B) *Trametes hirsuta* in natural habitat (C) Spores of *T. hirsuta*

62. *Tremella fuciformis*Berk.

Family-TremellaceaeEcology- Saprobic**Habitat-**On the dead wood of hardwoods.

Elevation- 1502 m **Lattitude**- 27°35'59" N **Longitude**- 85°32'47" E

Collection date: 2080-3-16 **Collection site**- Chaukot community forest

Fruiting Body: Soft and glossy surface, smooth and somewhat hard, formed of lobes that are translucent and whitish, up to 7 cm broad and 4 cm tall.

Spores: 5-8 μm, ovoid, smooth.Spore Print: White.

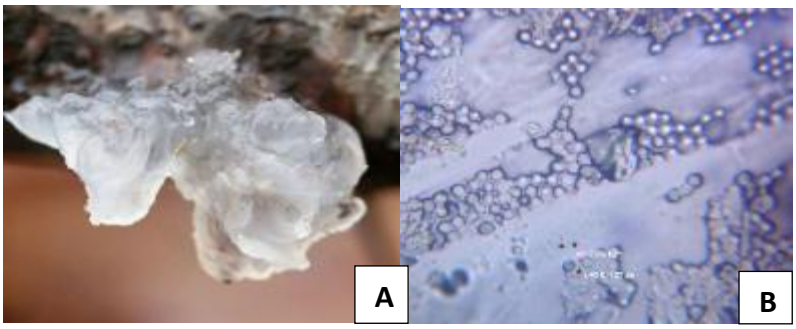

Photo plate 62:(A) *Tremella fuciformis* in natural habitat (B) Spores of *T. fuciformis*

63. *Tremella mesenterica* Retz.

Family- Tremellaceae **Ecology**- Mycorrhizal **Habitat-** Tree stump

Elevation- 1500 m **Lattitude**- 27°35'59" N **Longitude**- 85°32'50" E

Collection date: 2080-3-17 **Collection site**- Chaukot community forest

Fruiting body: orange, jelly-like, with a diameter of up to 7 cm and no stipe.

Spore- globose, 2.5- 3.8 μm

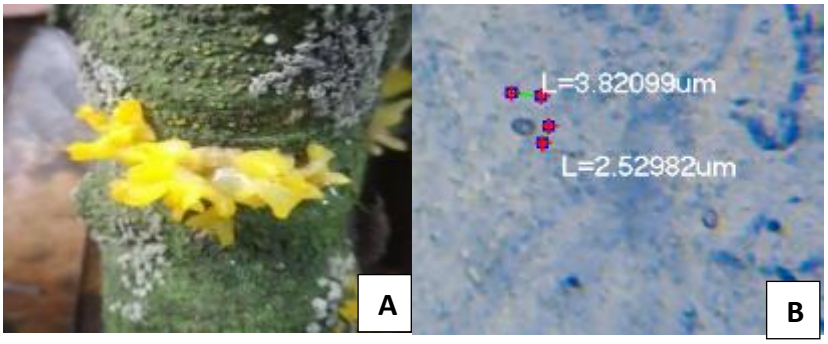

Photo plate 63:(A) *Tremella mesenterica* in natural habitat (B) Spores of *T. mesenterica*

64. *Tremellodendropsis tuberosa*(Grev.) D.A.Crawford

Family-Tremellodendropsidaceae**Ecology**- Saprobic**Habitat-** Leaf litter

Elevation- 1509 m **Lattitude**- 27º35'59" N **Longitude**- 85º32'53" E

Collection date: 2080-3-16 **Collection site**- Chaukot community forest

Fruiting Body: A 4-6 cm high and 2-3 cm wide, sparingly branching structure growing from a common Stipe.

Branches: round or slightly flattened in cross-section, bald, dry, smooth, and dull yellowish white, with starker white tips when young; as they age, the tips start to turn a bit brownish.

Stipe: White to brownish, smooth and bald.

The tough, white flesh that does not change color when cut.

Spores:2-7µm, elongated-amygdaliform, smooth.Spore Print**:** White.

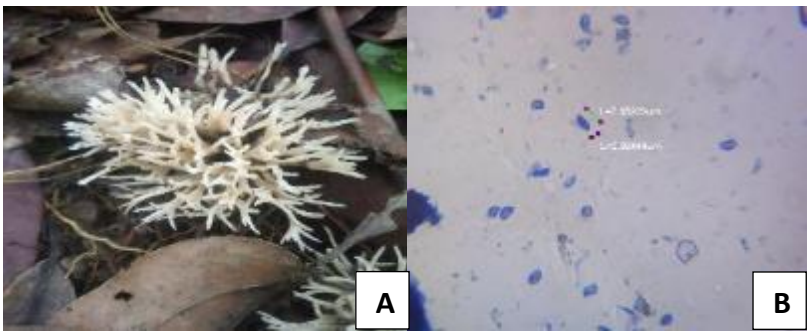

Photo plate 64: (A)*Tremellodendropsis tuberosa* in natural habitat (B) Spores of *T.tuberosa*

65. *Collybia confluence*(Pers.) P.Kumm.

Family-Omphalotaceae**Ecology**- Saprobe**Habitat-**Pinus leaf litter.

Elevation- 1602 m **Lattitude**- 27º35'55" N **Longitude**- 85º32'48" E

Collection date: 2080-4-28 **Collection site**- Chaukot community forest

Pileus: 2-4cm; convex with an incurved margin, bell-shaped, or nearly flat; moist or dry; bald or minutely silky; reddish brown.

Gills: Narrowly attached to the stem, crowded or close; whitish.

Stipe:3-5 cm long; 2-7 mm thick; more or less equal; dry;finely hairy; pale cinnamon.

Spores: 4.6 µm, globose.Spore Print: Creamy white.

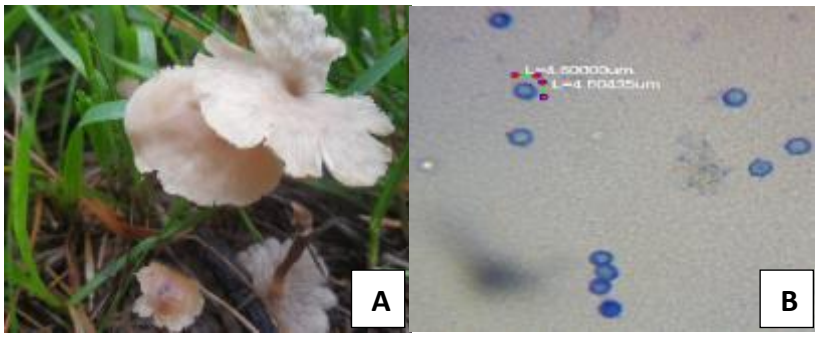

Photo plate 65: (A)*Collybia confluence* in natural habitat (B) Spores of *C. confluence*

66. *Xylaria polymorpha*(Pers.) Grev.

Family: Xylariaceae**Ecology**-Saprobe**Habitat-** - Decaying wood.

Elevation- 1500 m **Lattitude**- 27°35'43" N **Longitude**- 85°32'28" E

Collection date: 2080-3-16 **Collection site**- Chaukot community forest

Fruiting Body: 5-12cm tall; 1-4 cm thick, more or less like a club, with a rounded tip, dark brown to black; surface dry, and sometimes finely wrinkled.

Spores-Elongated fusiform, smooth, 2-8µm.Spore print- Black.

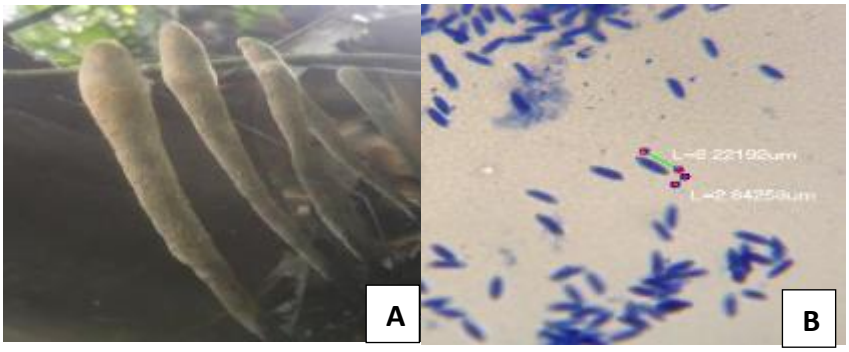

Photo plate 66: (A)*Xylaria polymorpha* in natural habitat (B) Spores of *X. polymorpha*

67. *Xylaria hypoxylon*(L.) Grev.

Family- Xylariaceae**Ecology**- Saprobe**Habitat-**On decomposing leaves.

Elevation- 1606 m **Lattitude**- 27°35'56" N **Longitude**- 85°32'48" E

Collection date: 2080-4-29 **Collection site**- Chaukot community forest

Fruiting Body: Small, erect stroma that taper from top to bottom, commonly in masses, with a base diameter of 2 to 8 mm and a height of 3 to 5 cm. As the ascospores ripen within asci that form within flask-like perithecia imbedded in the surface, the entire stroma finally turns black.

Spores- 4-7 µm, ellipsoid

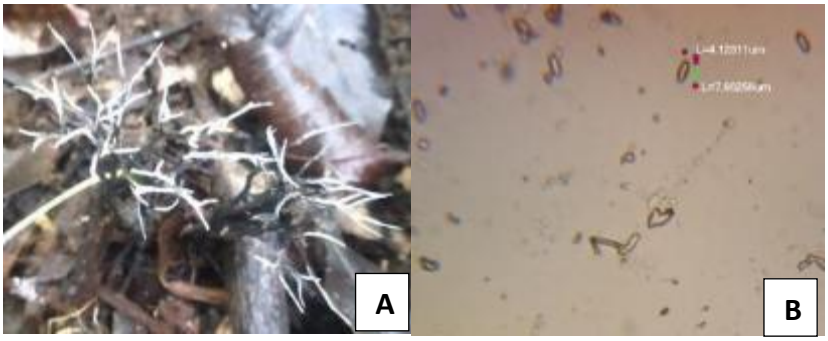

Photo plate 67: (A)*Xylaria magnoliae* in natural habitat (B) Spores of *X. magnoliae*

68.*Xylaria*oxyacanthae Tul. et C. Tul.

Family-Xylariaceae **Ecology**- Saprobe**Habitat-** Growing gigariously on leaf liter

Elevation- 1600 m **Lattitude**- 27°35'55" N **Longitude**- 85°32'50" E

Collection date: 2080-4-29 **Collection site**- Chaukot community forest

Stromata erect, branched or unbranched at the base, 3-7 cm in length, 1-2 mm diameter, cylindrical, soft.

Spore: 6 µm, globose to subglobose

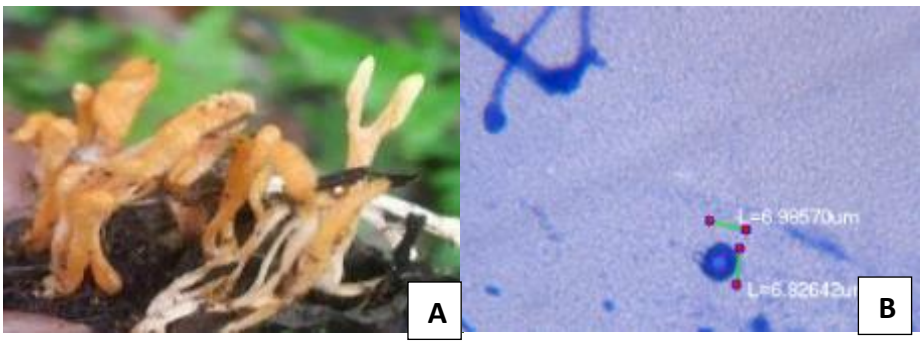

Photo plate 68:(A)*Xylariaoxyacanthae*in natural habitat (B) Spores of *X. oxyacanthae*

4.2 Macrofungal diversity

The Russulaceae and Agaricaceae family has the highest number of resembled species among the twenty eight families that were collected from the sites; this is followed by the Amanitaceae family with eight species and the Boletaceae family with five species according to figure 5. Most of the families with the lowest number of species, i.e., only one species, were Cantharellaceae, Clavariaceae, Coprinaceae, Cordycipitaceae, Cortinariaceae, Dacrymycetaceae, Hapalopilaceae, Hydnangiaceae, Leotiaceae, Omphalotaceae, Panaceae, Phallaceae, Sclerodermataceae, Tapinellaceae, and Tubariaceae.

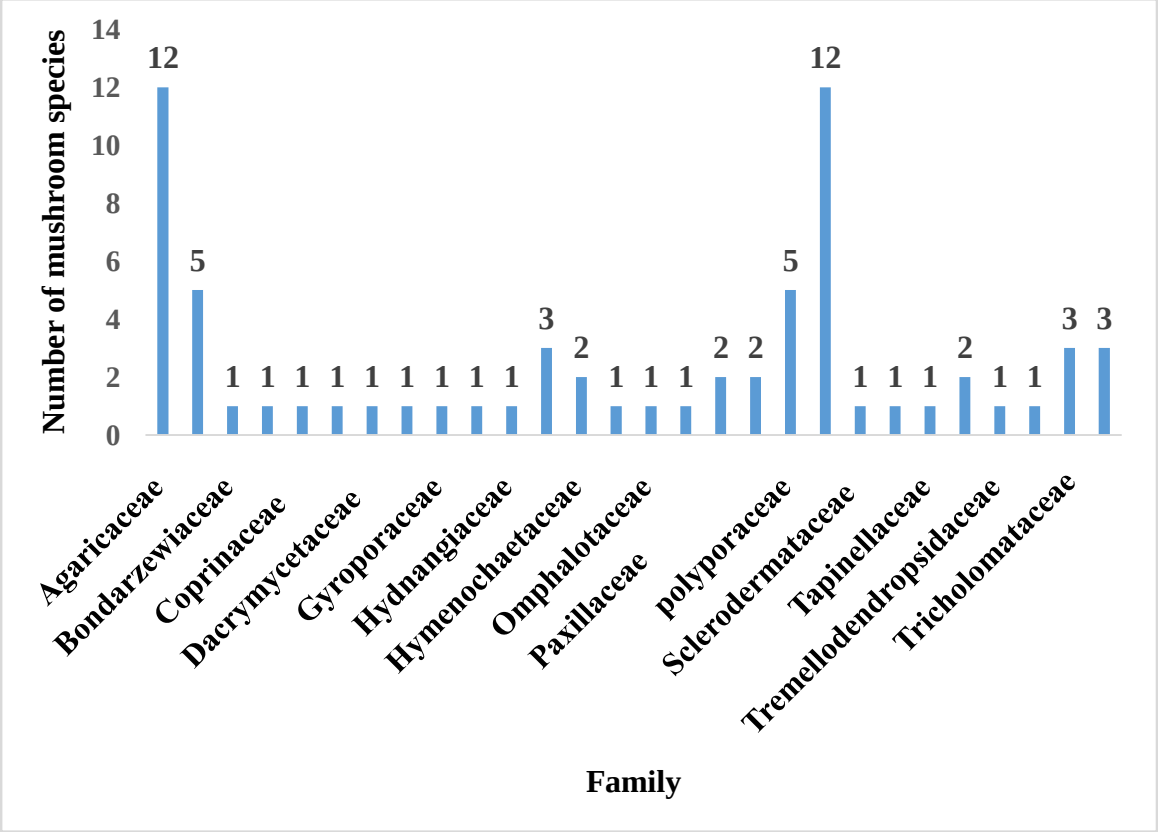

Figure 5: Family wise distribution of mushroom

The figure 6 shows the order with the highest number is agricales, which is followed by russulales, boletales, and others. Polyporales, Leotiales, Phallales, and other orders have less species.

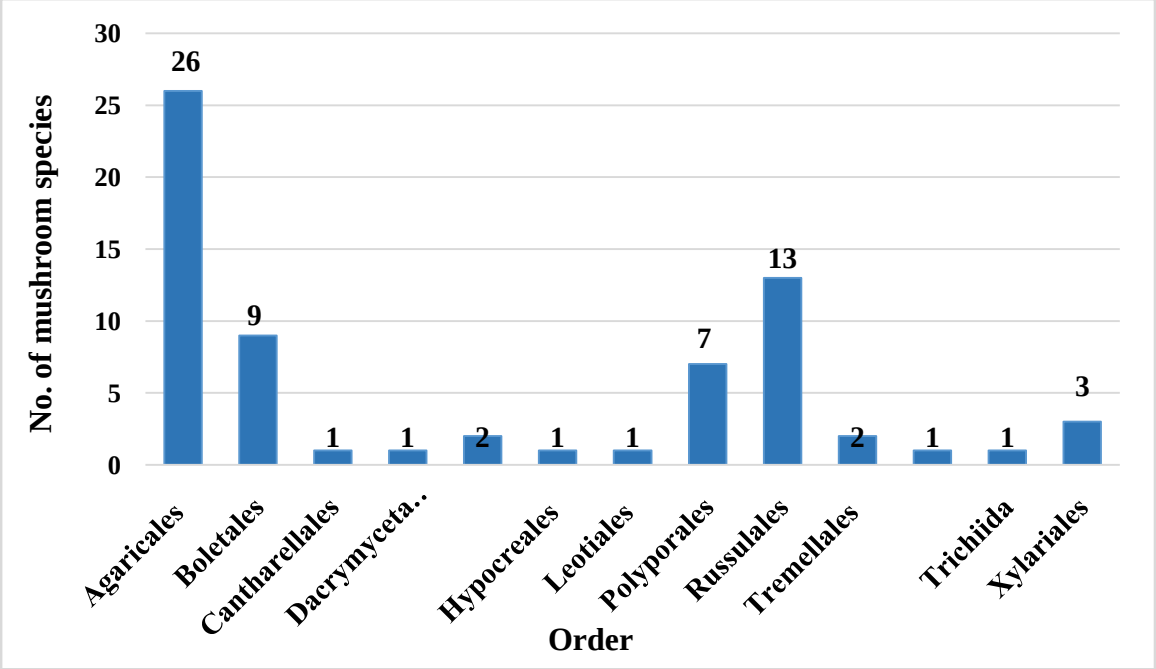

Figure 6: Species richness by order

Mushrooms from a variety of habitats, including soil, wood, leaf litter, and animal dung, were gathered during the field visit. Soil is home to the majority of the kinds of mushrooms. Fourteen species of mushrooms were collected in leaf litter, ten in dead wood, six in tree stumps, two in grasslands, and a single species in each of the fallen tree and animal dong.This illustration was shown on figure figure 7.

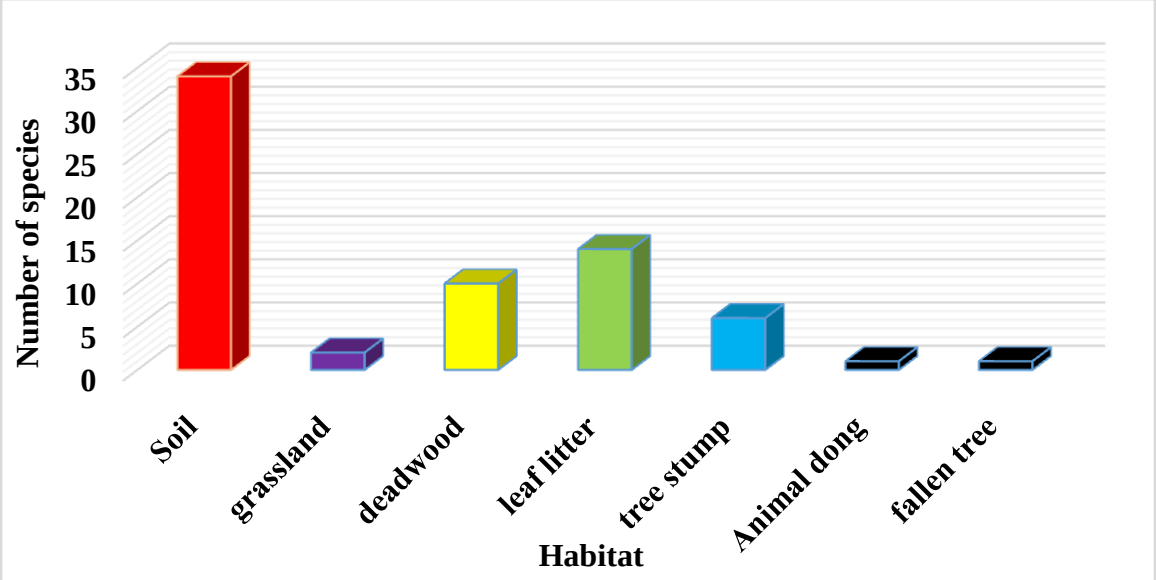

Figure 7: Habitat wise mushroom distribution

Ecology wise mushroom distribution was shown in figure 8. Saprobe mushroom constituted the majority of the mushrooms found at collecting sites followed by 47% mycorrhizal and 2 % parasitic mushroom.

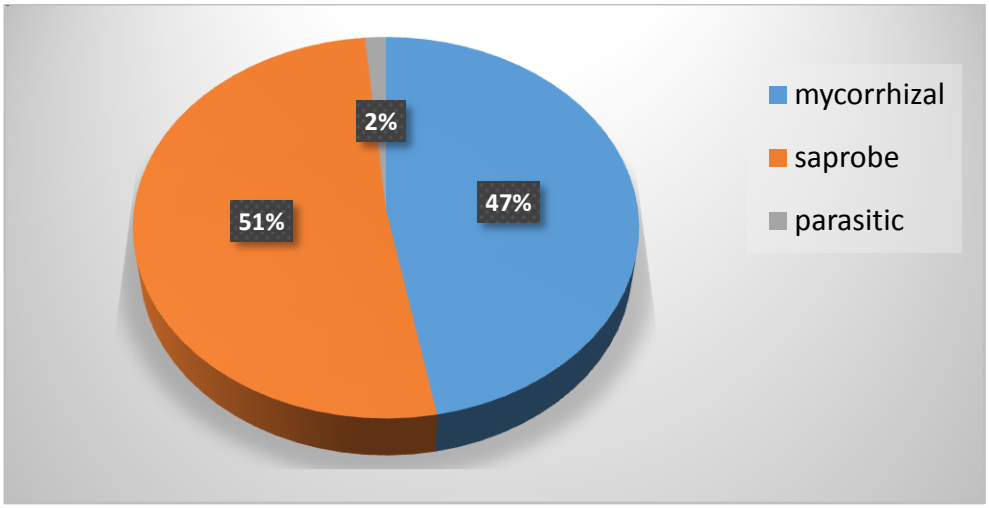

Figure 8: Ecologically mushroom distribution

The edible quality of mushrooms varies (figure 9). In total, there were 34 species of mushrooms that could be eaten. Mushroom of 19 species were inedible, 10 poisonous and 5 having unknown edibility.

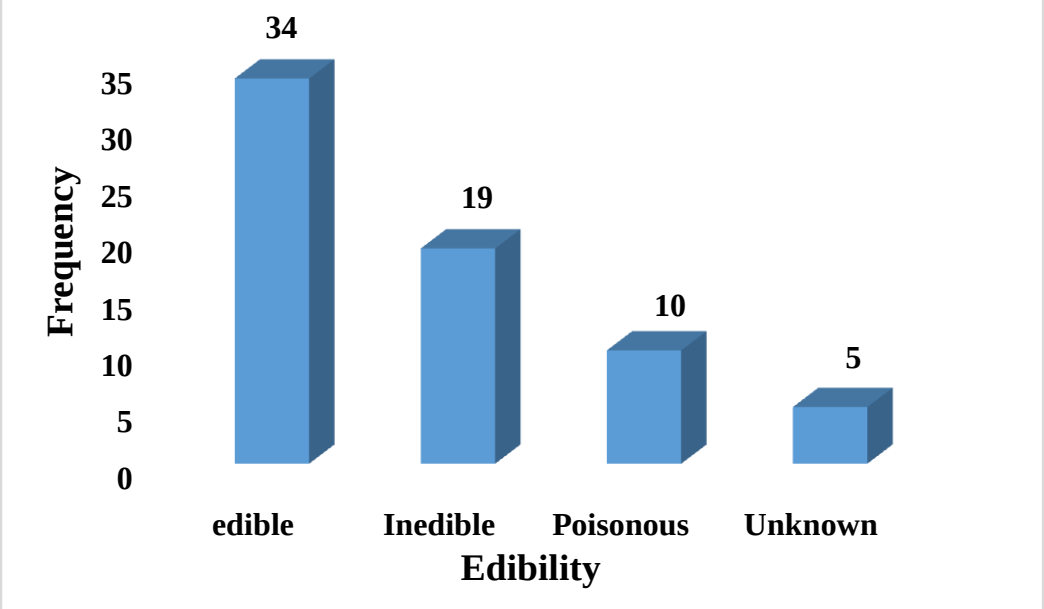

Figure 9 : Edibility of Mushroom

4.3 Frequency, density, abundance and diversity index

Out of the 68 species identified in the study site, the species *Bjerkandera adusta* was found to have the highest frequency (55.56%), while the species *Arcyria denudate*, *Leccinum*

crocipodium and other some species were found to have the lowest frequency (5.56%). In the same way, the species *Laccaria laccata* had the highest density (10.83%), while the species *Paxillus cuprinus*, *Lactarius corrugis*and others had the lowest density (0.06%). Furthermore, the species abundance of *Hymenochaete rubiginosa* was determined to be the highest at 30.50%. A high importance value index is found in *Laccaria laccata*.The Shannon diversity index was 3.78, and the Simpson diversity index was 0.97, indicating high species richness and dominance of the study area (Table 4).

4.4 Relationship between macrofungal species richness with three different environmental variables

The linegraph (figure 10, 11, 12) shows that species richness is correlated with soil pH, moisture content, and tree canopy cover. There is a range of 14.9–66.7% for soil moisture, 18–61% for tree canopy cover, and 5.1-6.1% for soil pH values.Soil moisture and tree canopy cover have significant relationship with species richness i.e., ($P < 0.05$) whereas soil p-value greater than 0.05 indicates soil pH have not significant relationship with species richness. In comparison to soil pH and soil moisture, tree canopy cover had the strongest correlation with species richness among the three variables. The independent variable tree canopy cover accounts for around 62% of the variance in the dependent variable, species richness, whereas soil moisture and pH account for approximately 41% and only 5% of the variance in species richness, respectively.

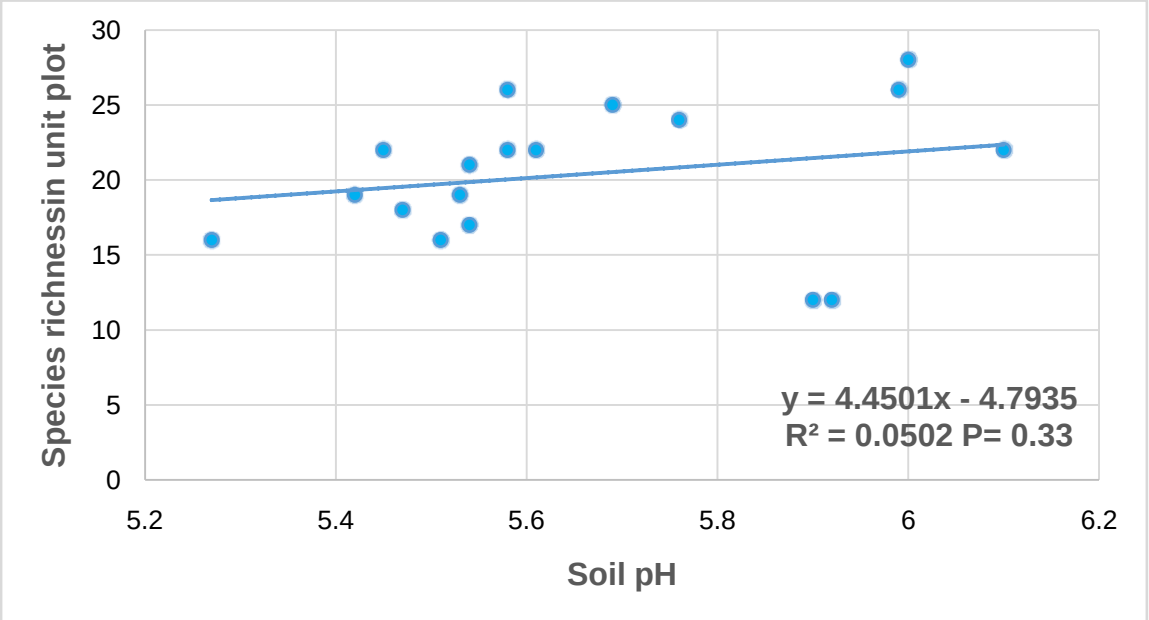

Figure 10: Relationship between macrofungal species richness with Soil pH

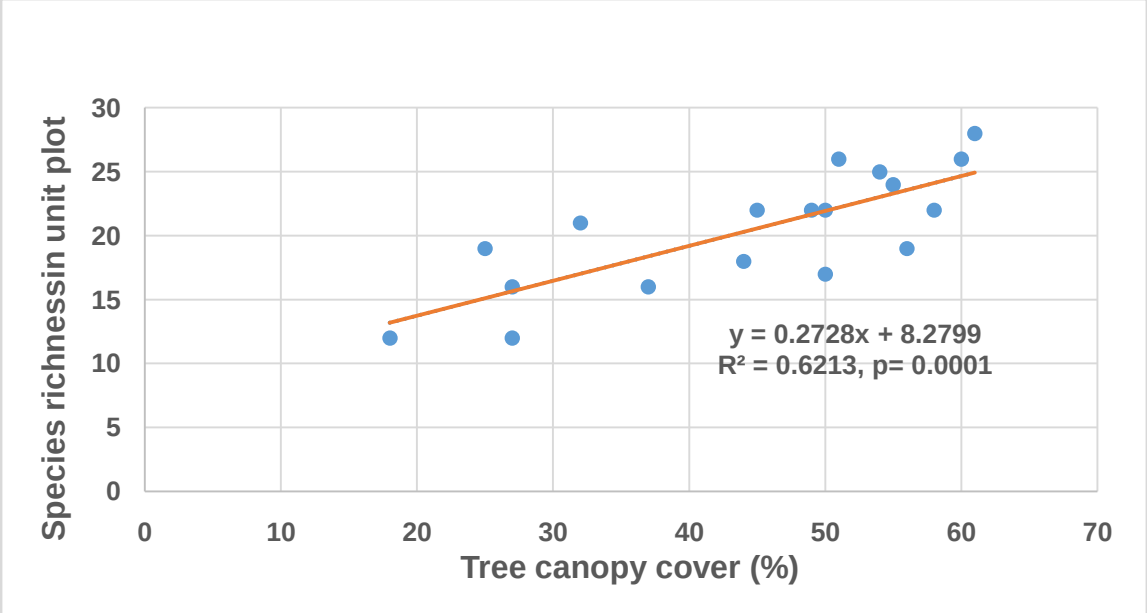

Figure 11: Relationship between macrofungal species richness with Tree canopy cover

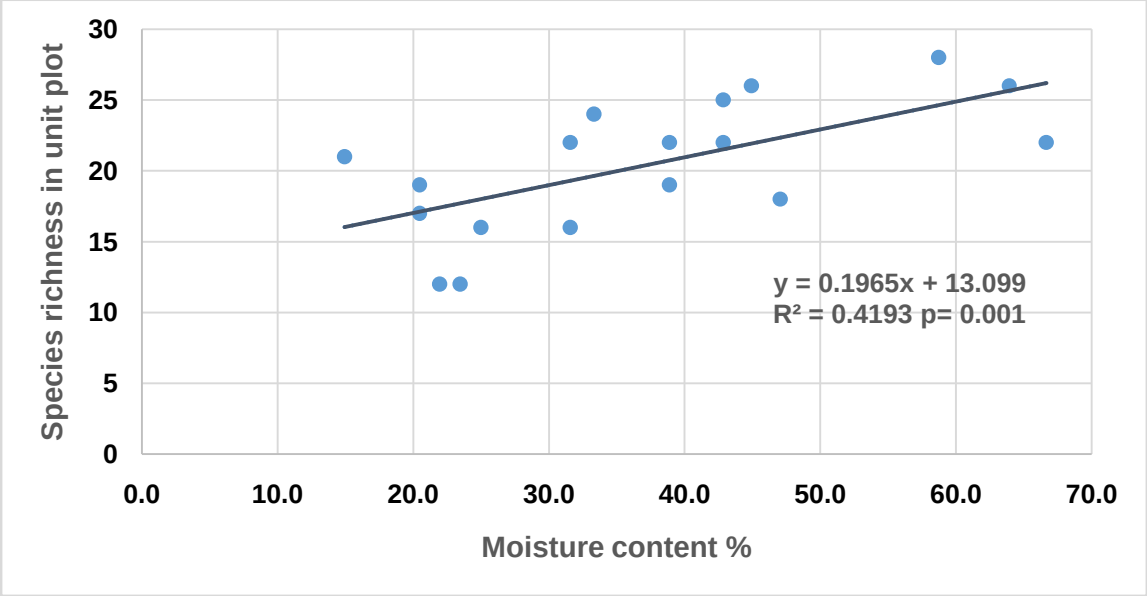

Figure 12: Relationship between macrofungal species richness with Soil moisture

4.5 Nutrient analysis

Mushroom with higher species richness were selected for the nutrient analysis. Two species namely, *Laccaria laccata* and *Scleroderma cepa* were edible mushroomswhose nutrientsanalyzed (Figure 13, 14).The study estimated six macronutrients (fiber, protein, fat, ash, carbohydrates and moisture) and three micronutrients (iron, phosphorous and calcium). All nutrient analysis was carried out on dry weight basis.

Macronutrient profile

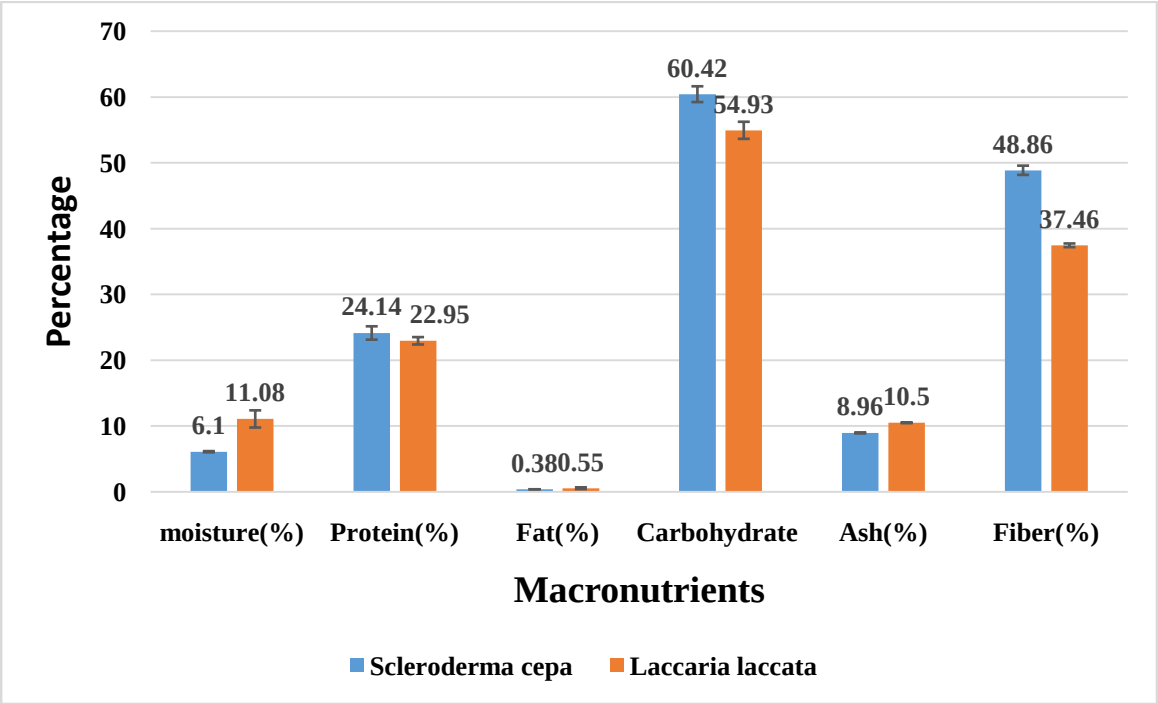

Figure 13: Macronutrient constituent in two species of mushroom

Mushroom contained highest percentage of carbohydrate (54.93-60.42) % followed by fiber (37.46-48.86) % and protein (22.95-24.14) % and lowest fat (0.38-0.55) % (Figure 13). Null hypothesis was rejected from the independent sample t-test and shows a difference between the *Scleroderma cepa* and *Laccaria laccata* with respect to the dependent variable Moisture %, Carbohydrate %, and Fiber %. There was sufficient evidence to say that the result is statistically significant. However the independent sample t-test with unequal variances results acceptance of null hypothesis in case of Protein %, Fat% and Ash % of samples. The $p>0.05$ illustrates that there was not significant difference in protein, fat and ash of two species.

Micronutrients profile

Phosphorus (424.9–507.72 mg/100 g) was the most prevalent micro element in all samples. It was followed by calcium (182.83-243.16 mg/100 g) and iron (43.25–48.14 mg/100 g) (Figure 14). There is difference in calcium and phosphorus, between the mushrooms *Laccaria laccata* and *Scleroderma cepa*. There was a significant differences ($P<0.05$) between these mushrooms in term of phosphorus and calcium. In terms of iron, there is no significant difference ($P>0.05$) between *Scleroderma cepa* and *Laccaria lacata*.

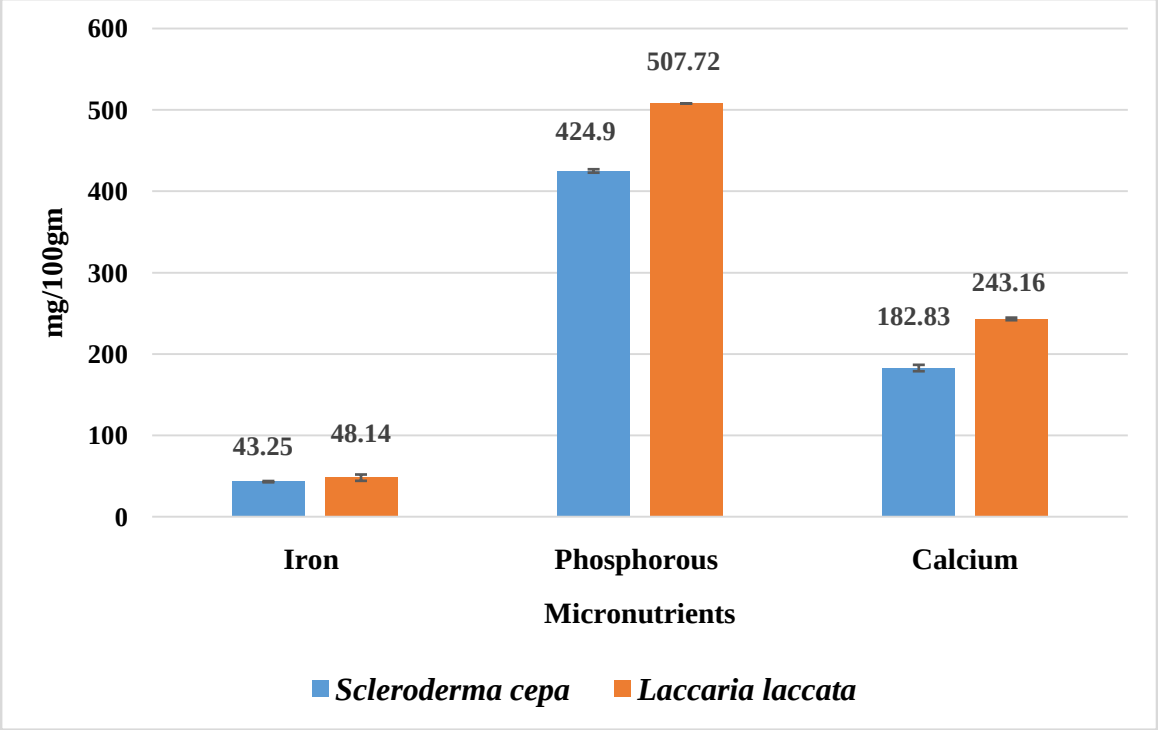

Figure 14: Micronutrient constituent in two species of mushroom

CHAPTER 5: DISCUSSION

5.1 Macrofungal diversity

The variations in the distribution of mushrooms are caused by many variables such as forest type, rainfall, substrate, and moisture and air humidity (Hu*et al.*, 2022). According to our findings, the dominant family were Russulaceae and Agaricaceae this may be due to the various environmental factors such as soil moisture, pH favoring the growth which aligns with the findings of Li*et al.* (2018) who conducted research in the Himalayas and Mekong subregion stating that forest areas with rich organic layers (Wang *et al.*, 2015), high rainfall (Shrestha *et al.*, 2021) and diverse host plants provide favorable conditions for macrofungal diversity, however findings from Ullah *et al.*, (2022) states that plantation or degraded forests often show a decline in the dominance of these families due to reduced ectomycorrizal hosts and altered soil conditions. The primary habitat for the growth of mushrooms was determined to be soil, followed by leaf litter. This result is consistent with previous research conducted by Bhandari and Jha (2017). The observed variations in the habitat of mushroom species are because of mode of nutrition(Parveen *et al.*, 2017) and the associations of mushroom with distinct plant and tree species (Hawkworth, 2001). According to Yamanaka (2003), saprotrophic species grew best at pH 7 or 8 which is in contrast with current result because moisture and canopy cover also plays significance role in growth of saprophytic mushroom (Joshi *et al.*, 2022).The Shannon diversity index and Simpson index were 3.78 and 0.97. These values indicate that the study area had high diversity of macrofungal species. The great diversity of mushroom identified in the research area may have been influenced by the favorable ecological conditions for macrofungal growth and development(Rudolf *et al.*, 2013).

5.2 Relationship between macrofungal species richness and environmental variables

Fungal development is mostly determined by abiotic variables such as soil pH, light, canopy cover, soil nutrition, leaf litter, and soil moisture content (Thapa *et al.*, 2022).Soil pH values that are either slightly basic, slightly acidic, or nearly neutral are ideal for the growth and survival of most mushrooms (Khan *et al.*, 2013; Kalaw *et al.* 2016; Ge *et al.*,2017). According to ourstudy, higher moisture was associated with higher species richness supporting growth of ectomycorrhizal fungi supported by the findings of Priyamvada et al., (2017) who conducted research in the tropical dry evergreen biome

found that, macrofungal richness peaked during monsoon seasons, enhancing fungal reproduction and species diversity, however, excessive soil moisture reduces oxygen availability in the soil, negatively impacting fungal activity instead, factors like soil type, vegetation structure and microhabitat heterogeneity might play stronger roles in fungal diversity (Trudell and Edmonds, 2004; Zhang *et al*., 2010; Bhandari and Jha, 2017; Shah *et al*., 2020; Paredes *et al*., 2021).The outcome of our result concluded that the species richnesswas highest at dense tree canopy may be due to consistent moisture levels and microclimatic stability, consistent with the findings of Han *et al*., (2023) who conducted research on Shaluli mountain in China found that macrofungal diversity was highest in dense forests dominated by species like *Abies* and *Picea* as these areas provided stable humidity and organic material crucial for fungal growth and symbiosis. Zhu *et al*., (2023) also reported that particularly mixed dense forests, significantly influenced macrofungal diversitry, with soil and climate playing secondary roles.Santos-Silva *et al*., (2011) reported that saprotrophic productivity was reduced and mycorrhizal richness was elevated in areas with a denser canopy cover.Forest thinning reducedspecies richness(Lin *et al*., 2015). The development of habitat is significantly influenced by the tree canopy (Nakamura *et al*., 2017). Because of the increased canopy cover, there is more litter on the forest floor, which minimizes the loss of moisture, fosters the growth of fungus, and offers shade (Gabel and Gabel, 2007; Baral *et al*., 2015).

5.3 Analysis of nutrients

Nutrient contents of two edible mushrooms,*Laccaria laccata* and *Scleroderma cepa*, were sampled for determination ofmacro and micro nutrients such as ash, carbohydrate, fat, moisture, protein, calcium, phosphorus, iron, and fiber.

Macronutrients

Depending on the kind of mushroom, nutrient level differed because of their ability to bioaccumulate the nutrientsinto their cells (Mshandete and cuff, 2007). Mushrooms that have been air-dried may have as little as 5–20% moisture whereas fresh mushrooms typically have 85–95% moisture (Crisan and Sands, 1978). The current study found out that the moisture content of *Scleroderma cepa* was lesser (6.1%) than that of *Laccaria laccata*(11.08%) resembles with the findings of Wu *et al*., (2023) which states that the dense basidiome structure of *Scleroderma cepa* contributes to lower moisture content compared to other fungi because the compact morphology limits water retention.

Mushrooms having more moisture spoil quickly due to susceptibility to enzymatic and microbiological degradation (Bano, 1976; Djamila *et al*., 2020).Crude protein content in edible mushrooms usually ranges from 19 to 40% (Kurtzman, 1978). According to our finding, *Laccaria* lacc*ata*had lower protein content (22.95%) than *Scleroderma cepa* (24.14%), as protein content fluctuates depending on the growing environment supported by the research of EC *et al*., (2011) stating that denser fungi like *Scleroderma* cepa tend to accumulate more protein due to their compact structures. Ash contents in two wild mushrooms range from 8.96% to 10.5% of the total weight of the mushroom. These results were similar to those published by (Singha et al., 2017 and Shresthaet al.,2021) and lesser than as reported by those of (Panday and budhathoki, 2007 and Egwim *et al*., 2011). Ash content varies in mushrooms may be due to substrate composition (Boadu*et al*., 2023). Mushrooms appear to be an excellent source of energy in the diet based on the measured content of carbohydrate. The results showed that *Laccaria laccata* had 54.93% carbohydrates in its total weight which is almost identical to the data from Shrestha *et al*.,(2021).A substantial amount of carbohydrate is diatery fiber (Hamano, 1997). Mushrooms contain both soluble and insoluble dietary fiber (Park and Nile, 2014). According to Egwim *et al*., (2011), *Laccaria laccata* has a crude fiber content of more than 11% and a comparable outcome with 37% fiber was found in the current investigation. Dietary fiber content in *Scleroderma cepa* was 48.86%. Fiber in both mushroom differ in their content due to the fiber composition of edible mushrooms changes substantially depending on their morphological phases, such as the fruit body, mycelium, and sclerotium(Cheung, 2013).Mushrooms are consumed in large quantities due to low fat with several lipid molecules (Manzi *et al*. 1999). *Scleroderma cepa* and *Laccaria laccata* had fat contents of only 0.38% and 0.55%, respectively which indicate they may be an appropriate healthy diet for local people of Chaukot (Jequier and Bray 2002).

Micronutrient contents

According to Duarte *et al*., (2006), concentration of micronutrients are influenced by the physiology of the species and by its ecological pattern. The study revealed high content of phosphorus as compared to iron and calciumwhich is in line with the result from Colak *et al*., (2009). It may be due to higher accumulation capacity of phosphorusby these mushroom as it was recorded in Zuo (2022) that ectomycorrhizal mushroom S*cleroderma* species improve plant growth and can replace the use of phosphate fertilizer in nursery. In comparison to *Scleroderma cepa*, *Laccaria laccata*had a greater calcium concentration. *Laccaria laccata* have a 395.5 mg/100g concentration (Egwim *et al*., 2011) which is higher

in comparison to calcium content analysed in current investigation. The higher calcium in *Laccaria Laccata* in comparison with *Scleroderma cepa* is attributed by their effective nutrient uptake capability which is higher in comparison to calcium content analysed in current investigation. The higher calcium in *Laccaria Laccata* in comparison with *Scleroderma cepa* is attributed by their effective nutrient uptake capability (Gu*et al*., 2019). In *Scleroderma cepa*, the iron concentration was approximately 43 mg/100g, while in *Laccaria laccata*, it was 48 mg/100g. (Egwim *et al*., 2011) reported that the iron nutritional content was 177.69 mg/100g. Different varieties of mushrooms caused varying differences in iron concentration.These mushrooms have a mineral content range comparable to that of farmed species as noted by Crisan and Sands (1978).

CHAPTER 6: CONCLUSION AND RECOMMENDATION

6.1 Conclusion

Data and information about the distribution of wild mushrooms as well as some edible mushrooms that the locals utilize and their nutritional value are provided by this research. A total of 68 specimens were collected at various elevations. The pH of the soil was somewhat acidic, and more than half of the mushrooms that were foundmycorrhizal. In this area, the agricales order is predominant. The species with the highest frequency, *Bjerkandera adusta*, was determined to had frequency (F= 55.56%) and *Laccaria laccata* had highest density (D= 10.83%) in the study area. The diversity index values of studied area shows high species richness and dominance. Because of little fat content in mushroom, they are regarded as highly nutritious vegetable that is easily digestible. Furthermore, it functions as a decomposer and aids in the equilibrium of the ecosystem, providing many other plants with sustenance.Large amounts of very low-fat carbohydrates, proteins, and fiber are among the highly nutritious substances found in mushrooms. Therefore, eating mushrooms on multiple occasions is highly healthful provided they are edible. It also contains both macrominerals and microminerals.

6.2 Recommendation

1. Laccaria laccata and Scleroderma cepa should be cultivated in a farm as well.
2. Mushrooms should be investigated further in terms of edibility so that people feel comfortable eating wild mushrooms as well.
3. Exploration of underexplored area should be done to know actual diversity

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APPENDICES

APPENDIX 1: Equipments

- Android phone (Redmi note 5 pro)
- Collecting basket or bag
- GPS to note geographic location
- Pocket knife for uprooting entire specimens
- Brush for cleaning specimens
- Envelopes for storing dried specimens
- pens/pencils
- Reference books
- Ruler for measuring mushrooms
- Small notebook for recording data
- White/ black paper for spore prints

APPENDIX 2: Format of the macroscopic field observation sheet

Scientific name……..

Ecology: Saprophyte / Parasite / Mycorrhizal

Habitat: Soil / leaves / dung /humus / tree / stump / wood / branch.

Growth pattern: Alone / Clusters / Ring

Pileus: Present / Absent.

Size: ……cm / …….mm

Color: ……..

Shape: Ovoid / hemispherical / conical / convex / campanulate / Infundibuliform / turbinate or other

Surface: dry / sticky / smooth / powdery / scaly / cracked /hairy / wrinkled or others

Margin: straight / incurved / entire / torn / wavy

Gill

Attachment: free / adnate / decurrent

Color:…….

Stipe: Present / absent.

Size: …….cm / …….mm

Colour: ……..

Shape: straight / curved / cylindrical / swollen below / tapering above or below / short / long / thick / thin / fleshy / brittle /solid / hollow

Surface: smooth / scaly / powdery / hairy / dotted / lined

Annulus: Skirt / pendent / sheathing / cobwebby / superior / inferior / smooth / straight / single / double / entire / lobed /

Color: ……..

Volva: Present or absent.

Colour: …….

Spore Print: Round/ elliptical

Colour: …….

APPENDIX3: Sample used for Nutrient analysis

APPENDIX3Figure 1: Air dried two edible mushroom samples

Fig: (A) Air dried *Scleroderma cepa* and (B)Air dried *Laccaria laccata*

APPENDIX3 Figure 2: Steps following to determine protein content of Scleroderma cepa and Laccaria laccata

Fig: (A-B)Pipetting digested material into distillation flask (C) Pouring boric acid into conical flask (D) Titration of mixture of boric acid and ammonia with hydrochloric acid

APPENDIX3 Figure 3: Photoplates related mjushrooms

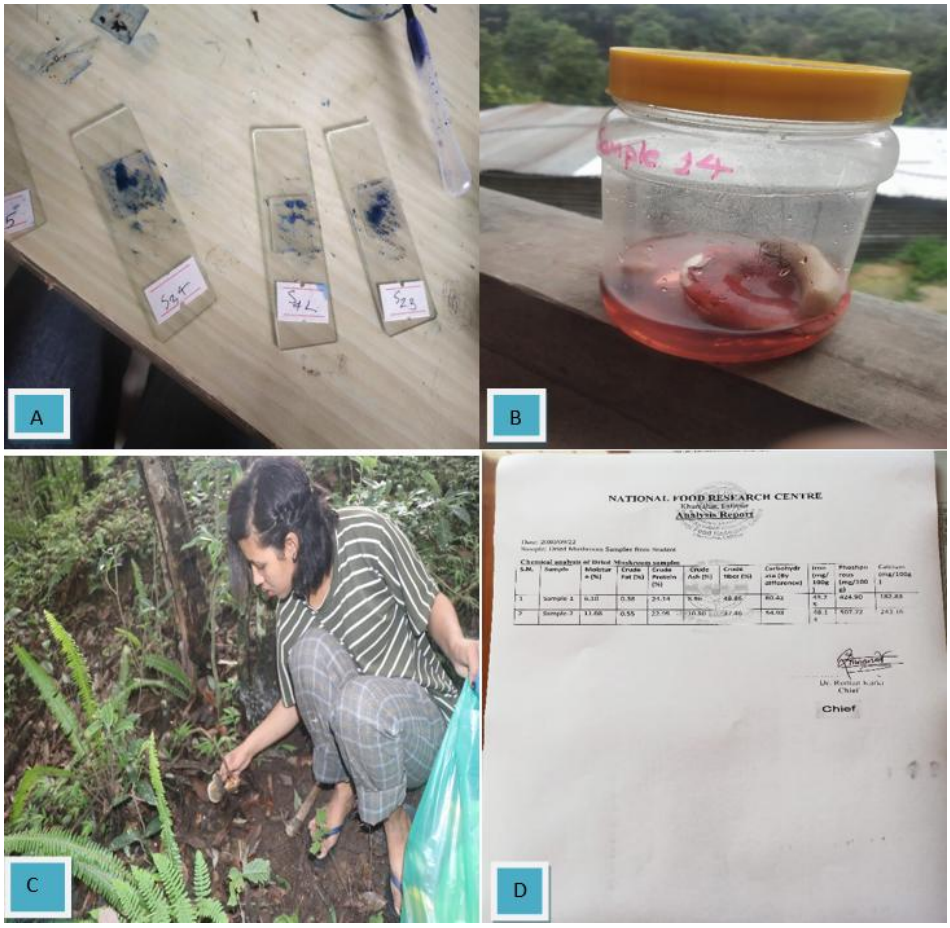
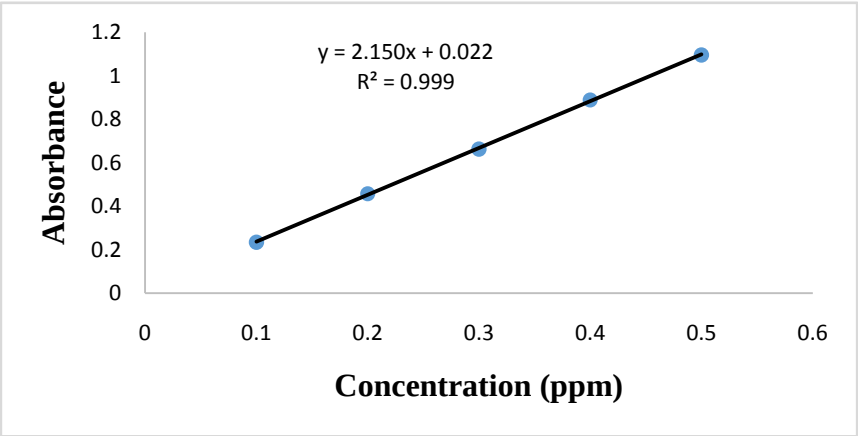


Fig: (A) prepared slide for observation of spores under microscope (B) Liquid preservation of sample (C) Collection of mushroom (D) Nutrient content of mushroom provided by NARC

Appendix 4

Standard curve of Phosphorus



Appendix 5

Appendix 6 Table 1: Station detail

Station Index	Name	District	Latitude	Longitude	Elevation
1024	Dhulikhel	Kavre	27.61	85.56	1552

Appendix 6 Table 2: Temperature, precipitation and humidity of studied area

Time	Maximum Air Temp. (Avg)	Minimum Air Temp.(Avg)	Precipitation	Relative Humidity(Avg)
Jan	15.79	4.13	7.96	74.47
Feb	18.55	6.21	22.07	70.16
Mar	22.63	9.63	28.2	64.66
Apr	25.09	12.5	63.9	61.5
May	25.64	14.9	130.5	73.4
June	26.74	18.01	169.18	82.4
July	25.77	18.8	364.17	90.09
Aug	25.62	18.62	324.34	90.64
Sep	24.84	16.46	182.42	89.31
Oct	23.28	13.42	60.13	83.56
Nov	19.87	8.61	0.40	78.39
Dec	16.44	5.29	8.08	77.06

Appendix 6 Table 3: Soil pH, moisture, tree canopy cover and species richness

Quadrats	Fresh wt.(g)	Dry wt. (g)	Moisture content (%)	Soil pH	Species richness
1	10	6.3	58.7	6.0	28
2	10	7.2	38.9	5.5	22
3	10	8.3	20.5	5.5	17
4	10	7.2	38.9	5.5	19
5	10	7.5	33.3	5.8	24
6	10	7.6	31.6	5.6	22
7	10	7.6	31.6	5.5	16
8	10	6.8	47.1	5.5	18
9	10	6.1	63.9	6.0	26
10	10	6.9	44.9	5.6	26
11	10	7	42.9	5.6	22
12	10	7	42.9	5.7	25
13	10	6	66.7	6.1	22
14	10	8.7	14.9	5.5	21
15	10	8.3	20.5	5.4	19
16	10	8	25.0	5.3	16
17	10	8.2	22.0	5.9	12
18	10	8.1	23.5	5.9	12

Appendix 6 Table 4: List of mushroom with their ecology, habitat, class, order, family, edibility, frequency, density and abundance

S.N	Scientific Name	Ecology	Habitat	Phylum	order	Family	Edibility	Frequency (%)	Density	Abunndance	IVI
1	*Russula fragilis*	mycorrhizal	Soil	Basidiomycota	Russulales	Russulaceae	Inedible	16.67	0.22	1.33	1.3
2	*Amanita farinose*	mycorrhizal	grassland	Basidiomycota	Agaricales	Amanitaceae	Poisonous	16.67	0.28	1.67	1.5
3	*Amanita fulva*	mycorrhizal	Soil	Basidiomycota	Agaricales	Amanitaceae	edible	27.78	2.06	7.40	5
4	*Amanita caesarea*	mycorrhizal	soil	Basidiomycota	Agaricales	Amanitaceae	edible	33.33	1.78	5.33	4.5
5	*Amanita veginata*	mycorrhizal	soil	Basidiomycota	Agaricales	Amanitaceae	edible	33.33	2.28	6.83	5.3
6	*Amanita phalloides*	mycorrhizal	soil	Basidiomycota	Agaricales	Amanitaceae	Poisonous	27.78	1.83	6.60	4.6
7	*Amanita rubrovolvata*	mycorrhizal	soil	Basidiomycota	Agaricales	Amanitaceae	Poisonous	44.44	3.78	8.50	7.4
8	*Amanita sine var. sinensis*	mycorrhizal	soil	Basidiomycota	Agaricales	Amanitaceae	Poisonous	16.67	0.39	2.33	2
9	*Amanita strobiliformis*	mycorrhizal	grassland	Basidiomycota	Agaricales	Amanitaceae	Unknown	16.67	0.17	1	1.2
10	*Armillaria tabescens*	saprobe	soil	Basidiomycota	Agaricales	Physalaciaceae	edible	33.33	3.89	11.67	5.3
11	*Arcyria denudate (L.) wettst.*	saprobe	Leaf litter	Mycetozoa	Trichiida	Trichiidae	Inedible	5.56	0.06	1	0.6

12	*Aureoboletus flaviporus*	mycorrhizal	soil	Basidiomycota	Boletales	Boletaceae	edible	27.78	1.5	5.4	4
13	*Leccinum crocipodium*	mycorrhizal	soil	Basidiomycota	Boletales	Boletaceae	edible	5.56	0.06	1	0.6
14	*Bjerkandera adusta*	Saprobic	deadwood	Basidiomycota	Polyporales	Hapalopilaceae	Inedible	55.56	5.94	10.70	10.2
15	*Boletellus emodensis*	mycorrhizal	soil	Basidiomycota	Boletales	Boletaceae	Inedible	11.11	0.22	2	1.3
16	*Clitocybe odora*	saprobe	leaf litter	Basidiomycota	Agaricales	Tricholomataceae	edible	33.33	1.28	3.83	3.7
17	*Coltricia cinnamomea*	mycorrhizal	soil	Basidiomycota	Hymenochaetales	Hymenochaetaceae	Inedible	33.33	5.44	16.33	7.7
18	*Boletus edulis*	mycorrhizal	soil	Basidiomycota	Boletales	Boletaceae	Edible	33.33	0.89	2.67	3.1
19	*Craterellus cornucopioides*	mycorrhizal	soil	Ascomycota	Cantharellales	Cantharellaceae	edible	33.33	1.89	5.67	4.6
20	*Cuphophyllus virgineus*	saprobe	deadwood	Basidiomycota	Agaricales	Hygrophoraceae	unknown	22.22	0.89	4	2.9
21	*Dacrymyces spathularia*	saprobe	pine dead wood	Basidiomycota	Dacrymycetales	Dacrymycetaceae	edible	33.33	1.28	3.83	3.7
22	*Heterobasidion annosum*	saprobe	tree stump	Basidiomycota	Russulales	Bondarzewiaceae	Inedible	22.22	6.22	28	10.3
23	*Ganoderma lucidum*	saprobe	tree stump	Basidiomycota	Polyporales	Ganodermataceae	edible	33.33	1.78	5.33	4.5
24	*Hygrocybe cantharellus*	mycorrhizal	soil	Basidiomycota	Agaricales	Hygrophoraceae	edible	22.22	3.39	15.25	7.9
25	*Hygrocybe miniata*	mycorrhizal	soil	Basidiomycota	Agaricales	Hygrophoraceae	edible	38.89	3.44	8.86	7
26	*Hymenochaete rubiginosa (Dicks.) Lev.*	saprobe	firewood	Basidiomycota	Hymenochaetales	Hymenochaetaceae	Inedible	22.22	6.78	30.5	6.6
27	*Hypholoma fasciculare*	saprobe	leaf litter	Basidiomycota	Agaricales	Strophariaceae	Inedible	33.33	6.11	18.33	8.1

28	*Gyroporous castaneus*	mycorrhizal	Soil	Basidiomycota	Boletales	Gyroporaceae	edible	11.11	0.11	1	0.9
29	*Isaria sinclairii*	parasitic	soil	Ascomycota	Hypocreales	Cordycipitaceae	Unknown	33.33	6.06	18.17	11.3
30	*Laccaria laccata*	mycorrhizal	soil	Basidiomycota	Agaricales	Hydnangiaceae	edible	50	10.83	21.67	13.8
31	*Lactarius corrugis*	mycorrhizal	soil	Basidiomycota	Russulales	Russulaceae	edible	5.56	0.06	1	0.6
32	*Lactarius lilacinus*	mycorrhizal	soil	Basidiomycota	Russulales	Russulaceae	Inedible	27.78	1.28	4.6	3.6
33	*Clitocybe gibba*	saprobe	leaf litter	Basidiomycota	Agaricales	Tricholomataceae	edible	38.89	2.33	6	5.3
34	*Leotia lubrica*	saprobe	leaf litter	Ascomycota	Leotiales	Leotiaceae	Inedible	50	5.50	11	9.7
35	*Lepiota cristata*	Micorrhizal	Soil	Basidiomycota	Agaricales	Agaricaceae	poisonous	16.67	0.44	2.67	1.9
36	*Leucocoprinus birnbaumii*	saprobe	Animal dong	Basidiomycota	Agaricales	Agaricaceae	Inedible	27.78	1.94	7	4.8
37	*Leucocoprinus fragilissimus*	saprobe	leaf litter	Basidiomycota	Agaricales	Agaricaceae	Inedible	44.44	5.56	12.5	8.3
38	*Lycoperdon pyriforme*	saprobe	leaf litter	Basidiomycota	Agaricales	Agaricaceae	edible in young	55.56	3.44	6.2	6.6
39	*Megacollybia platyphylla*	saprobe	leaf litter	Basidiomycota	Agaricales	Tricholomataceae	poisonous	33.33	1.39	4.17	3.8
40	*Microporus xanthopus*	saprobe	wood	Basidiomycota	Polyporales	Polyporaceae	Inedible	61.11	6.89	11.27	10.7
41	*Nigroporus vinosus*	saprobe	tree stump	Basidiomycota	Polyporales	Polyporaceae	Unknown	33.33	1.89	5.67	4.6
42	*Oudemansiella radicata*	saprobe	soil	Basidiomycota	Agaricales	Physalacriaceae	edible	16.67	0.17	1	1.2
43	*Panus conchatus*	saprobe	wood	Basidiomycota	Polyporales	Polyporales	Inedible	38.89	1.39	3.57	4
44	*Paxillus involutus*	saprobe	fallen tree	Basidiomycota	Boletales	Paxillaceae	deadly	5.56	0.06	1	0.6

							poisonous				
45	*Paxillus cuprinus*	mycorrhizal	soil	Basidiomycota	Boletales	Paxillaceae	deadly poisonous	5.56	0.06	1	0.6
46	*Polyporus arcularius*	saprobe	wood	Basidiomycota	Polyporales	Polyporaceae	Inedible	44.44	1.72	3.88	4.6
47	*Psathyrella candolleana*	saprobe	wood	Basidiomycota	Agaricales	Coprinaceae	edible	50	6.33	12.67	10.4
48	*Rhodocollybia butyracea*	saprobe	leaf litter	Basidiomycota	Agaricales	Omphalotaceae	edible	27.78	0.61	2.2	2.4
49	*Russula aeruginea*	mycorrhizal	soil	Basidiomycota	Russulales	Russulaceae	edible	16.67	0.22	1.33	1.4
50	*Russula mairei*	mycorrhizal	soil	Basidiomycota	Russulales	Russulaceae	Inedible	27.78	0.89	3.2	2.9
51	*Lactarius piperatus*	Macrorhizal	leaf litter	Basidiomycota	Russulales	Russulaceae	edible	38.89	1.11	2.86	3.5
52	*Russula ochroleuca*	mycorrhizal	soil	Basidiomycota	Russulales	Russulaceae	edible	11.11	0.22	2	1.3
53	*Russula foetens*	mycorrhizal	soil	Basidiomycota	Russulales	Russulaceae	Poisonous	5.56	0.06	1	0.6
54	*Russula mariae*	mycorrhizal	soil	Basidiomycota	Russulales	Russulaceae	edible	33.33	0.78	2.33	2.9
55	*Russula nigricans*	mycorrhizal	soil	Basidiomycota	Russulales	Russulaceae	edible	33.33	1.06	3.17	3.3
56	*Russula nitida*	mycorrhizal	soil	Basidiomycota	Russulales	Russulaceae	edible	27.78	0.89	3.20	2.9
57	*Russula rose*	mycorrhizal	soil	Basidiomycota	Russulales	Russulaceae	Inedible	44.44	3.94	8.88	6.8
58	*Scleroderma cepa*	mycorrhizal	soil	Basidiomycota	Boletales	Sclerodermataceae	edible	50	8.28	16.56	9.9
59	*Strobilomyces strobilaceus*	mycorrhizal	soil	Basidiomycota	Boletales	Boletaceae	edible	38.89	1.61	4.14	4.3
60	*Tapinella panuoides*	saprobe	stump	Basidiomycota	Agaricales	Tapinellaceae	Poisonous	22.22	0.67	3	2.4
61	*Trametes hirsuta*	saprobe	wood	Basidiomycota	polyporales	polyporaceae	Inedible	44.44	2.33	5.25	5.4
62	*Tremella fuciformis*	saprobe	wood	Basidiomycota	Tremellales	Tremellaceae	edible	22.22	0.22	1	1.5
63	*Tremella mesenterica*	Mycorrhizal	Tree stump	Basidiomycota	Tremellales	Tremellaceae	edible	27.78	0.72	2.60	2.6
64	*Tremellodendropsis*	saprobe	debris of	Basidiomycota	Tremellodendrops	Tremellodendrops	poorly edible	22.22	0.83	3.75	2.8

	tuberosa		wood		idales	idaceae					
65	*Collybia confluence*	saprobe	Pinus leaf litter	Basidiomycota	Agaricales	Omphalotaceae	Inedible	33.33	2.56	7.67	5.7
66	*Xylariapolymorpha*	Saprobe	DeadTree stump	Ascomycota	Xylariales	Xylariaceae	Inedible	11.11	0.5	4.50	2.2
67	*Xylaria hypoxylon*	saprobe	decaying leaves	Ascomycota	Xylariales	Xylariaceae	Inedible	44.44	1.89	4.25	4.8
68	*Xylaria oxyacanthae*	saprobe	decaying leaves	Ascomycota	Xylariales	Xylariaceae	Unknown	16.67	1.06	6.33	3.4