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SPECIES LISTING OF NATURALLY OCCURING MUSHROOMS IN CENTRAL LUZON STATE UNIVERSITY, SCIENCE CITY OF MUÑOZ, NUEVA ECIJA, PHILIPPINES

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ABSTRACT

A total of 35 wild mushrooms species were collected and identified inside the campus of Central Luzon State University, Science City of Munoz, Nueva Ecija, Philippines. They were under 15 families and 26 genera. Nine mushrooms were identified down to genera while 26 mushrooms were identified down to species taxa. There were 16 leaf litter-, soil- and dung-decomposing mushrooms and these are *Oudemansiella canarii*, *Panaeolus* sp., *Volvariella volvacea*, *Coprinus niveus, Panaeolus antillarium, Lepiota cristata, Leucocoprinus birnbaumii, Tricholoma flavovirens, Panaeolus foenisecii, Termitomyces clypeatus, Pluteus* sp., *Marasmius siccus, Chrolophyllum* sp., *Amanita onusta, Chlorophyllum molybdites, Boletus* sp. and 19 wood-rotting mushrooms including *Pleurotus* sp., *Formitopsis* sp., *Limacella illinita*, *Leucocoprinus cepaestipes*, *Pleurotus djamor*, *Ganoderma lucidum*, *Agaricus* sp., *Trametes vesicolor*, *Auricularia auricula*, *Schizophyllum commune*, *Polyporus grammocephalus*, *Ganoderma sinense*, *Lentinus* sp., *Lentinus tigrinus*, *Lentinus squarrosulus*, *Stropharia squamosa*, *Conocybe lactae*, *Trametes* sp., and *Lentinus sajor-caju*. Most of the mushrooms were collected from Lingap Kalikasan Park (62.86%) and are known to exhibit promising medicinal properties.

Keywords: Philippine wild mushrooms, CLSU, wood-rotters, bracket fungi, medicinal mushrooms

INTRODUCTION

Mushrooms are ascomycetous and basidiomycetous, epigeous and hypogeous fungi, which have fruiting bodies large enough to be seen with the naked eye and to be picked up by hand. They are saprophytic which obtain their food by absorption from the medium which may be soil, wood, and wastes such as dung, fallen leaves and grasses, twigs and so on. They can be poisonous and non-poisonous (edible), palatable and non-palatable. Edible mushrooms have long been appreciated for their aroma, flavor, and texture and recognized for their biologically active compounds with medicinal importance.

In the Philippines, most of the mushrooms remain to be in the wild. Thus, there is a need to search, document, and rescue the cell lines of those naturally occurring mushrooms in order to harness their promising potentials for different purposes. Some studies reported the taxonomic identification and listing of Philippine wild mushrooms. For instance, Dulay and Maglasang (2017) reported a total of 30 naturally occurring mushroom species (under 18 families and 21 genera) from the four collection sites in agro-ecosystem of Brgy. Bambanaba, Cuyapo, Nueva Ecija. However, a total of 20 species (under 17 genera and 15 families) are listed and described in the taxonomic checklist in multistorey agroforestry systems in Mt. Makiling Forest Reserve, Los Baños, Laguna and the most abundant family are Polyporaceae and Ganodermataceae (De Castro and Dulay 2015). Moreover, in six Aeta tribal communities in Central Luzon, 53 macrofungi are identified down to species level and 23 are identified down to genus level only (De Leon et al., 2013).

The Central Luzon State University (CLSU) is one of the largest universities in the Philippines. It has forest areas and many trees between buildings that generate vast lignocellulosic residues which favors the proliferation of diverse mushroom species. Thus, this present work reported the collection and identification of naturally occurring mushrooms found in the different collection sites inside CLSU campus. Specimens were identified and classified based on their morphological characteristics. The description, substrate, and location of each collected mushroom were summarized in a taxonomic checklist.

MATERIALS AND METHODS

Study Site

The study was conducted in CLSU Campus, Science City of Munoz, Nueva Ecija, Philippines. This is situated 151 kilometers

north of Manila and 26 kilometers from Cabanatuan City. The average annual temperature is 26.9 °C and about 1866 mm of precipitation falls annually. The topographic map and the different collection sites are shown in Figure 1.

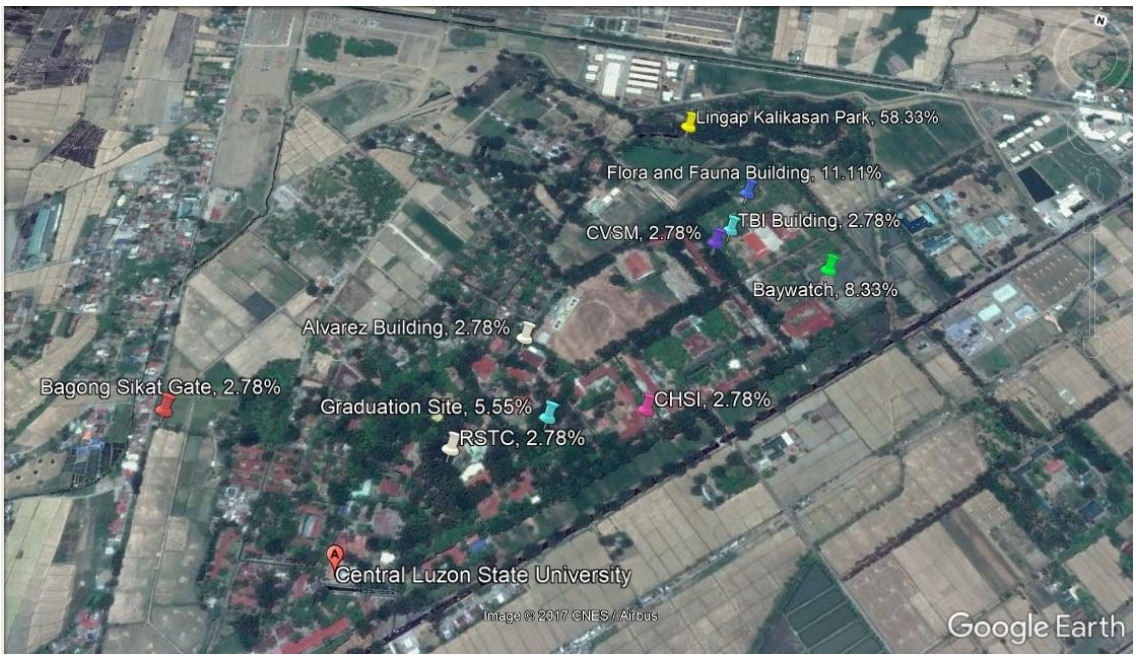

Figure 1: Topographic map of Central Luzon State University and the different collections sites

Mushroom Collection

The survey, inventory and collection of mushrooms were done in the month of October 2017. Mushrooms were photo-documented and were carefully collected using shovel obtaining part of the substrate to ensure that they were not damaged. Collected specimens were properly labeled and individually placed in a box and brought to the laboratory for identification. Fleshy fruiting bodies were pickled in 10% formalin solution while those wood rotters were air-dried for 3-5 days and placed in specimens' box in order to preserve the specimens.

Morphological Characterization and Identification

Macrofungi were taxonomically classified and identified based on the Peterson Field Guides on Mushrooms by McKnight and McKnight (1987). Morphometric data such as the different features of the stipe, pileus, and gills of the fruiting bodies were gathered while spore shape, size and color were observed. A taxonomic checklist of different macrofungi found in CLSU was prepared.

RESULTS AND DISCUSSION

Mushrooms are important source of food and medicines. However, several mushroom

species are still in the wild waiting to be rescued and harnessed their full potential for human benefits. In this study, the different naturally occurring mushrooms in CLSU were surveyed and assessed. A total of 35 wild mushrooms species were collected and identified in the entire campus of CLSU. They were under 15 families and 26 genera. Nine mushrooms were identified down to genera while 26 mushrooms were identified down to species taxa. The family names were alphabetically listed for their taxonomic checklist with description, substrate type, and location. Mushrooms were group according to their substrate type. There were 16 leaf litter-, soil- and dung-decomposing mushrooms and these are *Oudemansiella canarii*, *Panaeolus* sp., *Volvariella volvacea*, *Coprinus niveus, Panaeolus antillarium, Lepiota cristata, Leucocoprinus birnbaumii, Tricholoma flavovirens, Panaeolus foenisecii, Termitomyces clypeatus, Pluteus* sp.*, Marasmius siccus, Chrolophyllum* sp., *Amanita onusta, Chlorophyllum molybdites, Boletus* sp. and 19 wood-rotting mushrooms including *Pleurotus* sp., *Formitopsis* sp., *Limacella illinita*, *Leucocoprinus cepaestipes*, *Pleurotus djamor*, *Ganoderma lucidum*, *Agaricus* sp., *Trametes vesicolor*, *Auricularia auricula*, *Schizophyllum commune*, *Polyporus grammocephalus*, *Ganoderma sinense*, *Lentinus* sp., *Lentinus tigrinus*, *Lentinus squarrosulus*, *Stropharia squamosa*, *Conocybe lactae*, *Trametes* sp., and *Lentinus sajor-caju*.

Leaf litter, soil-, dung- decomposing mushrooms
Agaricaceae
***Lepiota cristata* P. Kummer (1871)** **Description : Has a cap with a white to cream base, covered with concentrically arranged reddish- brown scales** **Substrate : Decaying leaves** **Location : Lingap Kalikasan**
***Leucocoprinus birnbaumii* R. Singer (1961)** **Description : Has bright yellow pileus and stipe** **Substrate : Decaying leaves** **Location : Flora and Fauna building**
Amanitaceae
***Amanita onusta* (Howe) Sacc. (1891)** **Description : Pileus is crowded with gray-brown irregularly shaped warts. It has unpleasant odor** **Substrate : Soil** **Location : Graduation site**
Bolbitaceae
***Panaeolus* sp.** **Description : White to grayish convex pileus; brownish stalk with no ring** **Substrate : Soil** **Location : Lingap Kalikasan**
***Panaeolus antillarium* Dennis, R.W.G. (1961)** **Description : The caps are thick, smooth, often with fine wrinkles and acquire a silver white shiny color in age**

Substrate : Carabao manure **Location : Japanese Park**
Panaeolus foenisecii **Description :**
Boletaceae
***Boletus* sp.** **Description : Thick, dry, red to brown cap, with red to yellow tubes on underside, it has stubby stalk** **Substrate : Soil** **Location : CVSM compound**
Coprinaceae
***Coprinus niveus* Fries, E. (1838)** **Description : Egg-shaped to bell-shaped cap; pure white before it dissolves. Surface of cap powdery, with a dense coating of granules** **Substrate : Soil** **Location : Lingap Kalikasan**
Lapiotaceae
***Chlorophyllum* sp** **Description : Cap color varies—bright red to orange, yellow, or white, with soft, white to yellowish warts** **Substrate : Soil** **Location : Graduation site**
***Chlorophyllum molybdites* (G. Mey.) Massee (1898)** **Description : Large, white cap; may have pinkish brown tinge on disc (center) and on tips of scales** **Substrate : Soil** **Location : Baywatch**
Lyophyllaceae
***Termitomyces clypeatus* R. Heim (1951)** **Description : Umbo-shaped grayish to brown succulent pileus with pinkish spores.** **Substrate : Soil** **Location : Baywatch**
Physalacriaceae
***Oudemansiella canarii* (Jungh.) Höhn. (1909)** **Description : Flat, brown, streaked cap; surface sticky. Wide, white gills. Stalk spindly, rigid, brittle; deeply rooted in soil** **Substrate : Soil** **Location : Back of Flora and Fauna Building**
Pluteaceae
***Volvariella volvacea* (Bull.) Singer (1951)** **Description : Fruiting body is round to egg-shaped at young and has bell-shape fibrillose pileus attached to shiny white stipe arises from tiny membranous sheath called volva** **Substrate : Soil** **Location : RSTC**
Pluteus sp. **Description : Gray, brittle, streaked cap; cap separates readily from stalk. Stalk thin; white, sometimes flushed with pink at base** **Substrate : Soil** **Location : Lingap Kalikasan**
Tricholomataceae
***Tricholoma flavovirens* Lundell, S.; Nannfeldt, J.A. (1942)** **Description : Cap vivid yellow, brown at center; no black streaks or fibrils. Gills yellow. Stalk thick, yellow; no ring** **Substrate : Soil** **Location : Lingap Kalikasan**
***Marasmius siccus* Fries (1838)** **Description : Dull orange to brown, very thin cap; folds or grooves radiate from center. Stalk long and wiry, tough** **Substrate : Soil with decaying leaves** **Location : Lingap Kalikasan**
Wood rotting mushrooms

Agaricaceae
***Leucocoprinus cepaestipes* Patouillard (1889)** **Description : Egg-shaped or nearly round when young, becoming broadly convex with a shallow central hump, or nearly flat. (Fig. 3D)** **Substrate : Decayed Log** **Location : Lingap Kalikasan**
Agaricomycetidae
***Phyllotopsis nidulans* Singer (1936)** **Description : Small to medium, fan-shaped, dry, orange caps with a disagreeable odor (Fig. 3A)** **Substrate : Decayed Acacia Tree** **Location : Bagong Sikat gate**
***Agaricus placomyces* Peck (1878)** **Description : Medium-sized, thin cap, with a flattened, dark brown center. Odor unpleasant (creosote-like), but mild (Fig. 3G)** **Substrate : Decayed Log** **Location : In front of College of Home Science and Industry**
Amanitaceae
***Limacella illinita* H.V. Smith (1871)** **Description : Cap and stalk white, heavily coated with colorless slime. No ring on stalk except in very young specimens (Fig. 3C)** **Substrate : Decayed Log** **Location : Lingap Kalikasan**
Auriculariaceae
***Auricularia auricular* (Bull.) J. Schröt (1888)** **Description : Brown, gelatinous or rubbery; shaped like a shallow cup or an ear-lobe (Fig. 3I)** **Substrate : Decayed log** **Location : Lingap Kalikasan**
Bolbitiaceae
***Conocybe lactae* Métrod (1940)** **Description : Delicate whitish, conic to bell-shaped cap on a spindly stalk. Common in lawns on summer mornings (Fig. 3Q).** **Substrate : Decayed log** **Location : Lingap Kalikasan**
Fomitopsidaceae
Fomitopsis sp. **Description : Large size, thick woody bracket with mostly brown to gray upper surface (Fig. 3U)** **Substrate : Decayed wood** **Location : Lingap Kalikasan**
Ganodermataceae
Ganoderma sp. **Description : White to grayish brackets; overlapping, grows in dead logs (Fig. 3B)** **Substrate : Decayed Log** **Location : TBI Building**
***Ganoderma lucidum* (Curtis) P. Karst (1881)** **Description : It has corky, flat, kidney-shaped cap with a red-varnished at the middle and white margin at young (Fig. 3F)** **Substrate : Decayed Log** **Location : Lingap Kalikasan**
***Ganoderma sinense* J.D. Zhao, L.W. Hsu & X.Q. Zhang (1979)** **Description : Medium to large, flat corky, brown to black fruiting body** **Substrate : Decayed log** **Location : Lingap Kalikasan**
Pleurotaceae
***Pleurotus djamor* (Rumph. ex Fr.) Boedijn (1959)** **Description : Gilled, light pink fan-shaped pileus laterally attached to dead wood (Fig. 3E)** **Substrate : Decayed Log**

Location : Lingap Kalikasan
Polyporaceae
***Trametes vesicolor* Lloyd (1921)** **Description : Thin, leathery caps (brackets), often overlapping; laterally attached to wood (Fig. 3H)** **Substrate : Decayed Log** **Location : Garden near to the Lingap Kalikasan**
Lentinus sp. **Description : Clumps of smooth, white caps with dingy whitish gills. White to dingy whitish stalks. Odor pleasant or lacking, rarely disagreeable (Fig. 3M)** **Substrate : Decayed log** **Location : Lingap Kalikasan**
***Lentinus tigrinus* (Bull.) Fr. (1825)** **Description : Gray, rounded to flat cap; surface dry, forms small scales. Gills whitish. Firm, smooth to fibrillose, dingy white stalk (Fig. 3N)** **Substrate : Decayed log** **Location : Lingap Kalikasan**
***Lentinus squarrosulus* Montagne (1842)** **Description : Cap round at first, later shallowly funnel-shaped. Surface dry, with brown scales. (Fig. 3O)** **Substrate : dead wood** **Location : Baywatch compound**
Trametes sp. **Description : Pink, soft to leathery, overlapping crusts or brackets (Fig. 3R)** **Substrate : Decayed log** **Location : Flora & Fauna Building compound**
***Lentinus sajur-caju* Fries (1838)** **Description : Cap round at first, later shallowly funnel-shaped. Surface dry. Flesh tough (Fig. 3S)** **Substrate : Decayed wood** **Location : Lingap Kalikasan**
Schizophyllaceae
***Schizophyllum commune* Fries (1815)** **Description : Small size light gray to light brown, tough, hairy fan-shaped pileus with split-edged gills (Fig. 3J)** **Substrate : Decayed Log** **Location : Lingap Kalikasan**
Strophariaceae
***Naematoloma fasciculare* P. Karsten (1879)** **Description : Small to medium, greenish yellow to orange-yellow cap on a slender stalk. Grows in clusters on Decayed logs or stumps (Fig. 3L)** **Substrate : Decayed Log** **Location : Lingap Kalikasan**
***Stropharia squamosal* Quélet 1873** **Description : Shiny, reddish brown to orange or yellow cap, but more slender and more orange (Fig. 3P)** **Substrate : Decayed wood** **Location : Lingap Kalikasan**
Tremellaceae
***Pseudohydnum gelatinosum* P. Karsten 1868** **Description : White to grayish, tongue-like caps; attached at one side or off center. Gelatinous (Fig. 3K)** **Substrate : Decaying log** **Location : Lingap Kalikasan**

They were collected from all over the parts of the University but most abundantly in Lingap Kalikasan Park of the University. The photo-document of the mushrooms with their natural habitat can be seen in Figure 2 and Figure 3. All these mushrooms belong to Basidiomycota. Polyporaceae has the most number of collected species having seven genera of mushrooms under it namely Trametes which has two species under, Lentinus with four species, and Polyporus with one species, followed by Bolbitaceae which was found to have four genera of mushrooms from the collected species. Most of the mushrooms were collected from Lingap Kalikasan that comprises the 62.86% of the collection or 21 species. While Flora and Fauna building and Baywatch comes next each having 8.57% of the total collection or four species whereas the remaining species were found from College of Home Science and Industry, Bagong Sikat gate, College of Veterinary Science and Medicine, Graduation Site Vicinity Alvarez building vicinity and RSTC hostel compound. Among the 35 collected mushrooms, 16 were found to be edible, while four of the mushrooms were found poisonous while the rest were not recommended to be eaten.

Many of the mushrooms collected were also found to be medicinal such as *G. lucidum, S. commune, V. volvacea, L. tigrinus, P. antillarium* and *P. djamor*. Aside from health benefits of V. volvacea it is also found to be teratogenic when tested with Zebra fish [7]. G. lucidum, one of the most important mushrooms collected is used to treat chronic hepatitis, hypertension, arthritis, insomnia, bronchitis, asthma, gastric ulcer, diabetes and cancer. It possesses anti-tumor activity and has also been found to inhibit platelet aggregation and to lower blood pressure, cholesterol and blood sugar [1]. While breads containing AAP flour can broaden the utilization of the fruit bodies of Auricularia auricula and may be regarded as possible health-promoting functional foods [9]. Nine elements (magnesium, nitrogen, sodium, potassium, chlorine, sulfur, phosporus, silicon and oxygen) were detected in the fruiting bodies of P. djamor grown on sawdust-based formulation while six elements (magnesium, nitrogen, potassium, sulfur, phosporus and oxygen) were present in fruiting bodies harvested on rice straw – based formulation [11]. P. antillarium is another potential source of substances and nutrients with functional attributes such as antioxidant which strongly influenced by different media and pH levels [6]. L. tigrinus

and P. djamor possess antibacterial and antioxidant activities [8].

CONCLUSION

Central Luzon State University was proven to be rich in flora and fauna, especially in mushroom diversity. It is found to be natural habitat of several mushrooms which were found to have medicinal, nutraceutical and pharmaceutical properties. Most of the mushrooms can also be a source of bioactive compounds and can demonstrate biological activities. These are also potent for cultivation. Even so, there are still places and locations in the Philippines that are unexplored thus, there is a need to discover more wild mycological resources that can be used for various purposes.

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