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Macrofungi Species in Lavezares, Northern Samar, Philippines

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Keywords

macrofungi, inventory, anthropogenic activities, secondary metabolites, medical applications

Abstract

This study employed the descriptive research method and purposive sampling technique to conduct a comprehensive analysis of macrofungi species. Its primary objectives were to gather and classify macrofungi species, examine environmental factors, assess their economic significance, and identify human activities that affect macrofungi in the study area. Samples were collected from different barangays in Lavezares, Northern Samar, Philippines, each representing a distinct ecosystem. A total of forty-five (45) species were gathered, with only three (3) found to be edible, making them economically valuable as human food. The sampling sites, which varied in elevation from plain to moderately elevated terrain, experienced warm air temperatures ranging from 28.3oC to 30.3oC, along with humidity levels between 72.5% and 82%. The soil pH in the area ranged from 7.1 to 7.3, indicating a slightly alkaline nature. Although rainfall was observed during the sampling period, macrofungi predominantly appeared on sunny days following the rain. The study sites exhibited similar vegetation, characterized by coconut plantations, grasslands, and shrubs, where macrofungi were primarily found on coconut and banana trunks, decaying logs, and other decomposing organic matter. However, the researchers noted the presence of anthropogenic activities such as swidden farming (slash-and-burn or "kaingin"), deforestation, and conversion of land to non-agricultural purposes within the study sites. The results indicated a diverse range of macrofungi species in the study area, highlighting the crucial role of environmental conditions in their growth and development. While the impact of anthropogenic activities on macrofungi appeared to be minimal, there is still a need to protect and conserve these organisms. Consequently, the researchers recommend conducting further studies on macrofungi, particularly focusing on their economic relevance and potential as sources of secondary metabolites or constituents with potential medical applications.

1. Introduction

Often confused with plants, fungi are categorized as a distinct kingdom separate from plants due to their lack of chlorophyll, a pigment responsible for absorbing light and converting it into energy through photosynthesis. Consequently, fungi do not produce their own energy and instead release digestive enzymes to break down matter and absorb dissolved substances.

Due to its geographical isolation and favorable climate, the Philippines boasts one of the most diverse ecologies in the world, leading to a high prevalence of endemic plants, animals, and macrofungi species (Bhatt et al., 2018). However, macrofungi remain relatively understudied in many regions globally, as highlighted by Mueller et al. (2006). Out of an estimated 1.5 million fungus species worldwide, only approximately 6.7 percent have been identified, with a majority found in temperate climates (Kinge et al., 2017). Notably, Hawksworth and Lücking (2017) estimate that there could be between 2.2 million to 3.8 million fungal species, and the Philippines alone has documented over 3,000 species belonging to 818 genera (Tadiosa, 2011).

Within biodiversity hotspots like the Philippines, conducting biodiversity surveys is a crucial initial undertaking preceding the exploration for novel compounds suitable for pharmaceutical, nutraceutical, or agricultural purposes. The search for potential remedies for existing ailments or valuable products with societal significance begins with identifying unexplored species and their potential. Moreover,

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biodiversity plays a vital role in driving ecosystem services (Palmer & Di Falco, 2012).

The researchers were interested to inventory, collect, identify, and determine the environmental parameters affecting different fungi species to better understand the diversity and potentials of macrofungi, and the anthropogenic activities existing in selected barangays of Lavezares, Northern Samar, Philippines.

2. Methodology

Locale of the Study

Lavezares is a municipality in the province of Northern Samar, Philippines, in the northwestern section of the province at 12° 34'13" North latitude, 124°19'45" East longitude. The municipality of Allen borders it on the west, the San Bernardino Strait on the northwest, the municipality of Victoria on the south and southwest, the municipality of Rosario on the east, and the municipality of Biri on the north (MPDO, 2011).

Covering an estimated land area of 11,950 hectares, Lavezares in Northern Samar comprises 26 barangays, with 12 inland and 14 coastal barangays. The coastal barangays can be further categorized into 5 island barangays and 9 mainland coastal barangays. The land topography is predominantly characterized by rough terrain, featuring numerous steep and mountainous areas that are classified as undulating to hilly. As per the most recent Modified Coronas Classification, Lavezares, Northern Samar falls under the Type II climate category, characterized by the absence of a dry season and exceptionally high maximum rainfall occurring from November to January (MPDO, 2011).

The study was specifically conducted in selected barangays of the municipality, namely Barangay Chansvilla, located at an estimated elevation of 33.0 meters or 108.3 feet above mean sea level; Barangay Datag, situated at an estimated elevation of 98.3 meters or 322.5 feet above mean sea level; Barangay Maravilla, with an approximate elevation of 6 meters or 19.69 feet above mean sea level; Barangay San Juan, an island barangay with an elevation estimated at 47 meters or 154.2 feet above mean sea level; and Barangay Villa, a sampling site situated at an approximate elevation of 32 meters or 104.99 feet above mean sea level (www.philatlas.com).

Research Design and Sampling Technique

This study employed a descriptive research design to investigate various aspects related to macrofungi, including their collection and identification, assessment of environmental parameters, examination of economic uses, and analysis of anthropogenic activities. The study utilized a purposive sampling technique, whereby representative species from each sampling site in selected barangays of Lavezares, Northern Samar were collected as samples.

Research Instrument and the Respondents

This study used as an interview guide to obtain relevant data about the different macrofungi species. The guide was prepared in English and translated into Ninorte-Samarnon so that the respondents were have a clear idea of the needed information. Fifteen (15) elderly residents who lived in the selected sampling sites for most of their lives, regardless of status and sex, were identified as respondents.

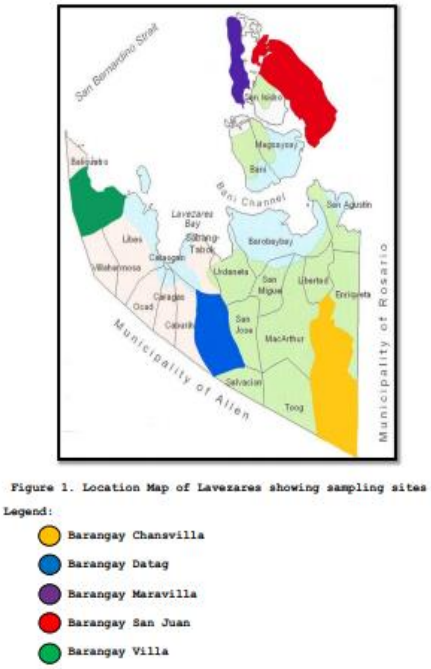

Figure 1. Location Map of Lavezares showing sampling sites

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Data Gathering Procedure

A. Collection of Specimens

Macrofungi specimens were collected in the sampling areas by the researchers with the help of an assistant. Photographs were taken for each specimen before they were cut or carefully dug out using a knife or a trowel to avoid damage. Measurements of environmental parameters such as air temperature, substrate, soil pH, vegetation, and humidity were noted in a field notebook. All specimens were properly tagged, with needed information recorded in a field notebook, and the specimens were stored in a container to avoid damage.

B. Determination of Environmental Parameters

Air temperature

To determine the air temperature, a thermometer was set in a place not too shady nor sunny, approximately one meter above the macrofungi. It was repeated thrice at 5-minute intervals, and the average was computed.

Humidity

In determining humidity, a digital thermo-hygrometer was used; measurements were taken thrice, and then averaged.

Soil pH

To determine soil pH, a digital soil pH tester was used. Readings were taken thrice, and then averaged.

Substrate

The type of substrate for the macrofungi species in each sampling site was examined, photographed, and categorized either as decaying logs or banana trunks, fences, living trees, or other organic matter.

Rainfall intensity

n improvised rain gauge was used to measure rainfall intensity in each sampling site. The device consisted of a plastic bottle, with a funnel, and a ruler calibrated in millimeters.

Elevation

Elevation in each sampling site was approximated using the eGPS applications of smartphones, which was then validated through a topographic map from Google Earth application.

Vegetation

The vegetative cover of the area where macrofungi species were found was photographed, and the dominant type of vegetation was recorded.

C. The Interview Guide

A researcher-made interview guide was used to gather major information about the macrofungi species, their economic uses, and the anthropogenic activities that the residents in the selected barangay know of. Responses were recorded in a field notebook.

D. Preservation of the Specimens

For woody specimens, it underwent air drying process, while fragile and soft specimens were immersed in 10% formalin solution to make them rigid and firm. After one or two days, they were removed and washed with water and then transferred into jars containing 70% ethyl alcohol where they can be kept and preserved indefinitely.

E. Labeling of the Specimen

Labeling of the specimen followed the procedures similar to the one used by *"Mycoflora of the Philippines"* containing important data taken from the field notebook and tags attached to the specimens during the collection, and printed on paper.

F. Identification of the Specimen

The macrofungi specimens were preliminarily identified using references from web pages on the internet, electronic guidebooks, internet applications, books, and spore print. Preliminary identification was verified and authenticated by an expert mycologist of the College of Science, University of Eastern Philippines.

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Spore print procedure

To gather the spore print, cut off the stem and place the cap, with the gills or spores facing down, on either a white or black piece of paper, cover it with a glass and leave for 2-24 hours. The spores falling onto the paper presents a pattern that helps in the identification of the species.

3. Results and Discussion

Species Composition of Macrofungi Species in Lavezares, Northern Samar, Philippines

Data presented in Table 1 depicts the forty-five (45) macrofungi species collected from the study site. These species belongs to six (6) classes (*Agaricomycetes, Ascomycetes, Basidiomycetes, Dacrymycetes, Pezizomycetes,* and *Sordariomycetes*): eight (8) orders (*Agaricales, Auriculariales, Pezizales, Boletales, Dacrymycetales, Polyporales, Russulales, and, Xylariales*): twenty two (22) families (*Agaricaceae, Auriculariaceae, Cortinariaceae, Dacrymytaceae, Fomitopsidaceae, Ganodermataceae, Hygrophoraceae, Hypoxylaceae, Marasmiaceae, Meculiaceae, Omphalotaceae, Paxillaceae, Polyporaceae, Pluteaceae, Psathyrellaceae, Russullaceae, Sarcoscyphaceae, Schizophyllaceae, Stereaceae, Strophariaceae, Tricholomataceae, and Xylariaceae*): and, thirty-seven (37) genera (*Agrocybe, Auricularia, Bjerkandera, Cookienia, Clitocybe, Coprinellus, Coprinus, Cortinarius, Cystoagaricus, Dacryopinax, Daedalopsis, Daldinia, Entonaema, Fomes, Fomitopsis, Ganoderma, Hygrocybe, Lentinus, Lenzites, Lepiota, Marasmius, Mycetinis, Omphalotus, Parasola, Paxillus, Piptopuros, Pleurocybella, Pluteus, Polyporus, Psathyrella, Pycnoporellus, Pycnoporus, Russula, Schizophyllum, Stereum, Trametes, Trogian,* and *Xylaria*.

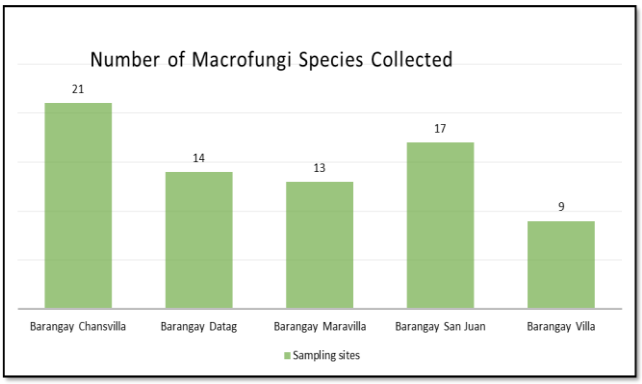

Figure 2. Species Collected

Within the sampling sites, Barangay Chansvilla exhibited the highest abundance of macrofungi species, with a total of twenty-one (21) species. Barangay Datag had fourteen (14) species, Barangay Maravilla had thirteen (13) species, Barangay San Juan had seventeen (17) macrofungi species, while the lowest number of species was recorded in Barangay Villa, where only nine (9) macrofungi species were observed.

These results imply that population pressure may affect the abundance of macrofungi species in an area. Barangay Chansvilla has the largest macrofungi species since it has a population of only 72 individuals, while Barangay Villa, which is populated by 2,179 individuals registered the least number of macrofungi species recorded.

Table 1. Species Composition of Macrofungi in Lavezares, Northern Samar, Philippines

FAMILY	SCIENTIFIC NAME	SAMPLING SITES				
		1	2	3	4	5
Agaricaceae	*Coprinus comatus* (O.F. Mull) Pers	×	✓	×	×	×
	Lepiota decorata Zeller	×	✓	×	×	×

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Auriculariaceae	*Auricularia auricula-judae* (Bull.) J. Schrot.	✓	✓	✓	✓	✓
	Auricularia polytricha Mont.	×	×	✓	×	×
Cortinariaceae	*Cortinarius rubellus* Cooke	✓	×	×	×	×
Dacrymytaceae	*Dacryopinax sphatularia* (Schwein) G. W.	×	✓	×	×	×
Fomitopsidaceae	*Fomitopsis pinicola* (Sw.) P. Karst.	×	×	✓	✓	×
	Piptoporus bitulinus (Bull.) B.K. Cui. M.L. Han & Y.C. Dai	×	✓	×	×	×
	Pynoporellus fulgens (Fr.) Donk	✓	×	×	×	×
Ganodermataceae	*Ganoderma lucidum* Karst.	✓	✓	×	×	✓
	Ganoderma tornatum (Pers.) Bress	✓	×	✓	×	×
Hygrophoraceae	*Hygrocybe laetus* (Pers.) Herink	×	×	✓	×	×
Hypoxylaceae	*Daldinia vernicosa* (Schwein) Ces and De Not.	×	×	×	×	✓
Marasmiaceae	*Marasmius delectans* Morgan	✓	✓	✓	✓	×
	Omphalotus nidiformis (Berk.) O.K. Mill.	×	×	×	×	✓
	Pleurocybella porrigens (Pers.) Singer	×	×	×	✓	✓
	Trogian infundibuliformis Berk & Broome	✓	×	×	×	×
Meruliaceae	*Bjerkandera adusta* (Willd.) P. Karst	✓	×	×	×	×
Omphalotaceae	*Mycetinus scorodinus* (Fr.) A.W. Wilson & Dejardin	×	×	✓	✓	×
Paxillaceae	*Paxillus involutus* (Batsch) Fr.	×	×	✓	×	×
Polyporaceae	*Daedalopsis tricolor* (Bull.) Bondartsev & Singer	×	×	×	✓	✓
	Fomes fomentarius (L.) Fr.	✓	×	×	×	×
	Lentinus tigrinus (Bull.) Fr.	×	×	×	✓	×
	Lentinus sajor-caju (Fr.) Fr.	✓	✓	✓	✓	×
	Lentinus squarrosulus Mont.	×	✓	×	×	×

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	Polyporus tuberaster (Jacquim ex. Person) Fries	×	×	×	✓	×
	Pycnoporus coccineus (Fr.) Bondartsev & Singer	×	×	×	×	✓
	Pycnoporus sanguines (L. Murill)	✓	×	✓	✓	×
	Trametes gibbosa (Pers.) Fr.	×	×	×	✓	×
	Trametes pubescens (Schumach) Pilat	×	✓	×	✓	×

Table 1. Species Composition of Macrofungi. . . . . (continuation)

Pluteaceae	*Pluteus podospileus* Sacc. & Cab	✓	×	×	×	×
Psathyrellaceae	*Coprinellus disseminatus* (Pers.) J. E. Lange	×	×	×	✓	×
	Coprinellus micaceus (Bull.: Fr.) Vilgalys, Hopple & Jacq. Johnson	✓	×	×	×	×
	Cystoagaricus trisulphuratus	×	✓	×	×	✓
	Lenzites elagans (Spreng.) Pat.	✓	×	×	×	×
	Parasola plicatilis (Curtis) Redhead et al.	✓	×	×	×	×
	Psathyrella conopilus (Fr.) A. Pearson & Dennis	×	×	×	✓	×
Russulaceae	*Russula rosea* Pers.	×	✓	×	×	×
Sarcoscyphaceae	*Cookeina tricholoma* (Mont.) Kuntze	✓	×	✓	✓	×
Schizophyllaceae	*Schizophyllum commune* Fr.	✓	✓	✓	✓	✓
Steraceae	*Stereum ostrea* (Blume & T. Need ex Fr.)	×	✓	×	×	×
Strophariaceae	*Agrocybe pediades* (Fr.) Fayod	✓	×	×	×	×
Tricholomataceae	*Clitocybe geotropa* (Bull.) Fr.	✓	×	×	×	×
Xylariaceae	*Entonaema liquescens*	✓	×	×	×	×
	Xylaria polymorpha	✓	×	✓	✓	×
TOTAL SPECIES		**21**	**14**	**13**	**17**	**9**

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Legend:

✔ = Present

× = Absent

Sampling sites

1 - Barangay Chansvilla

2 - Barangay Datag

3 - Barangay Maravilla

4 - Barangay San Juan

5 - Barangay Villa

Environmental Parameters in Study Areas

Environmental parameters in the sampling areas using a digital thermo-hygrometer, digital soil tester, and an improvised rain gauge to measure rainfall intensity. Photo-documentation of the vegetation and substrate where macrofungi species grow was also done, and data collected is presented in Table 2, which shows air temperatures ranging from 28.3˚C (Barangay Maravilla) and 30.3˚C (Barangay Villa). Relative humidity in the area ranged from 72.5% (Barangay Villa) to 82% (Barangay Maravilla). Many of the macrofungi species thrived in slightly alkaline soils (pH 7.1 to 7.3).

During the sampling, the weather conditions were mostly sunny or shady, although rainfall was recorded in the improvised rain gauge, which amounted to only about 1.6 mm. Based on the interviews with respondents, they averred that macrofungi usually appear in sunny days after rain showers, or thunderstorms. These conditions were similar to those reported by Mallari, *et al*., (2020).

Elevation in the study areas ranged from 19.69 feet above sea level (Barangay Maravilla) to 322.5 feet above sea level (Barangay Datag). Vegetation in the sampling areas where macrofungi species were present were mostly coconut plantations, grasslands, and shrublands.

Table 2. Environmental conditions in the Sampling Areas

Site	AT (˚C)	H (%)	Soil pH	RI (mm.)	Elevation (*fasl*)	Vegetation
1	29.2	76.6	7.1	0	108.8	Coconut plantation, shrubland, and grassland
2	28.8	81.9	7.3	1.5	322.5	Coconut plantation with shrubland
3	28.3	82.0	0	1.7	19.69	Coconut plantation, shrubland, and grassland
4	29.5	75.4	0	0	154.2	Coconut plantation, shrubland, and grassland
5	30.3	71.5	7.1	0	104.99	Coconut plantation and shrubland

Legend:

1 – Barangay Chansvilla

AT – Air temperature

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2 – Barangay Datag H – Humidity

3 – Barangay Maravilla RI – Rainfall intensity

4 – Barangay San Juan

5 – Barangay Villa

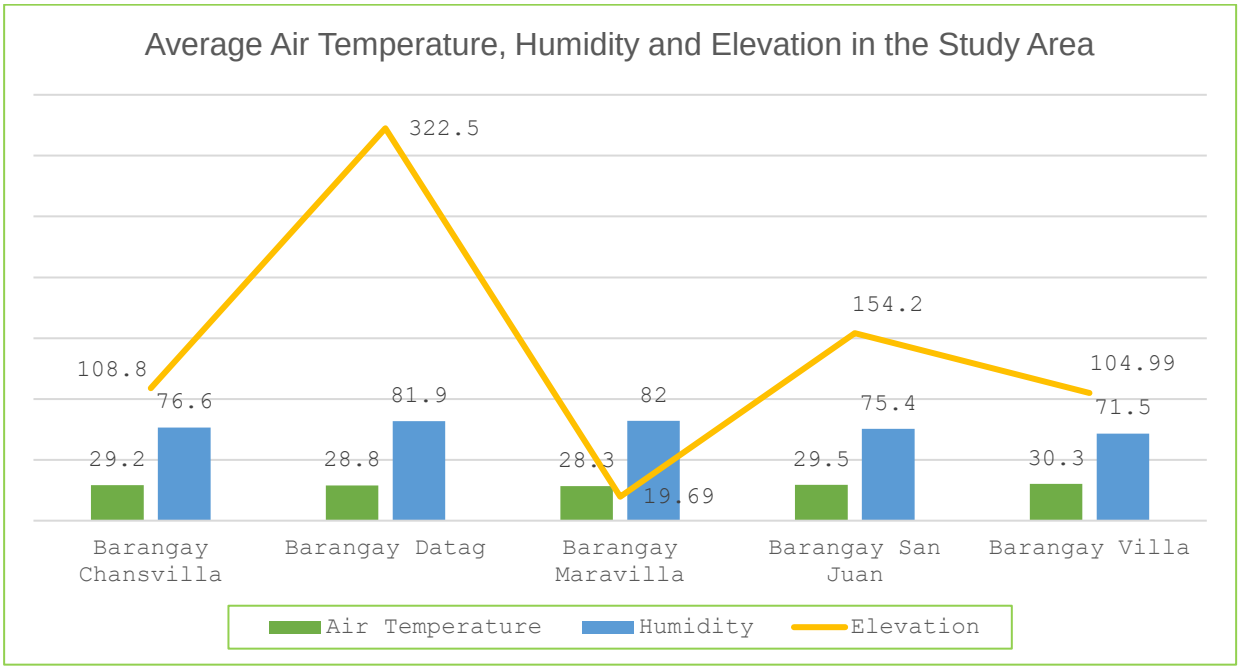

Figure 3. Average Air Temperature, Humidity, and Elevation in the Sampling Area

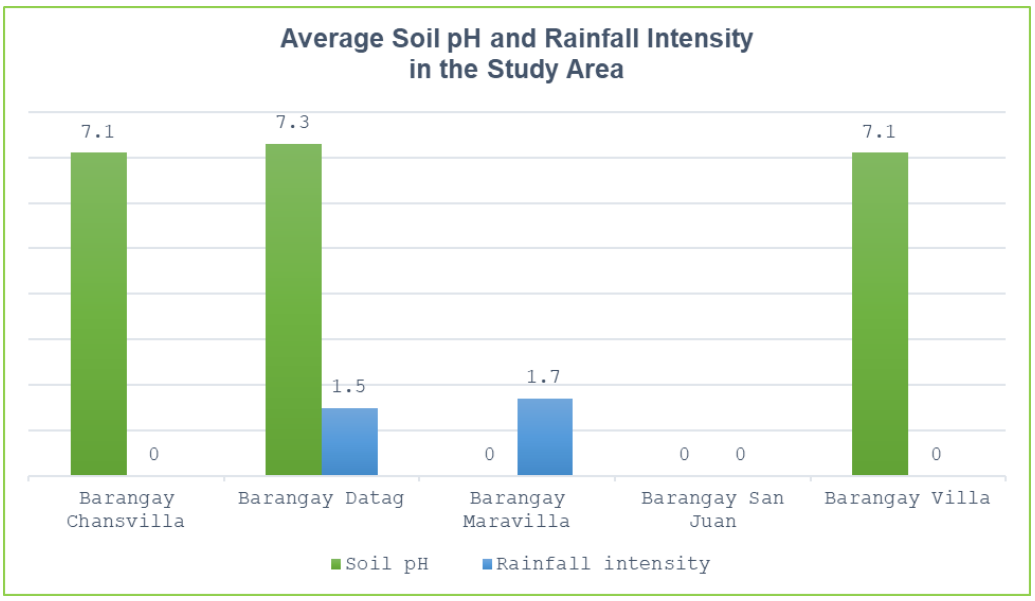

Figure 4. Average Soil pH and Rainfall Intensity in the Sampling Area

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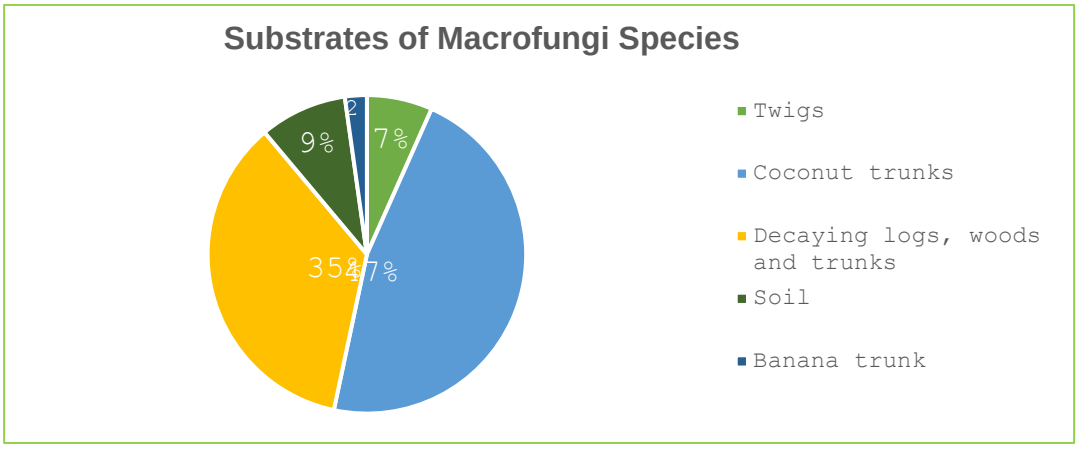

Figure 5. Substrate of the Macrofungi species

Economic Uses of Different Macrofungi Species

In the interviews made by the researchers, utilizing a researcher-made interview guide, it was found that only three (3) macrofungi species (*Lentinus sajor-caju* (Fr.) Fr., locally known as "banay"; *Auricularia auricula-judae* (Bull.) J. Schrot., known locally as "taingang-daga"; and, *Schizophyllum commune* Fr. locally known as "kurakding"), are edible. Other respondents did not have any idea of the economic uses of macrofungi species but they are familiar with the species. These results are supported by the studies of Flores, *et al.* (2014), Cabides (2019) and Marcelino (2012), which show that only *Schizophyllum commune* ("kurakdot"), *Cantharellus cibarius* ("banay"), and *Auricularia polytricha* ("taingang daga") are edible. and known sources of food.

Anthropogenic Activities in the Study Areas

According to the researchers' interviews with local residents in the area, the most common anthropogenic activity was swidden farming ("kaingin" or slash-and-burn), a technique of clearing land involving cutting and burning underbrush and trees, then plowing the ashes under for fertilizer. Root crops or other plants that provide economic benefits to the residents necessary for their survival, are planted. Secondly, deforestation was also observed by the respondents where trees are felled for wood and sold or clearance of wooded land for a specific purpose. Urban expansion, which consumes immeasurable tracts of forests, farmlands, and woodlands, was also an issue of concern among the respondents.

These anthropogenic activities may affect macrofungal diversity in a way that it can cause climate change and depletion of the forest; air pollution, ecosystem degradation, and urban extension also has negative effects on fungal communities (Zervakis & Venturella, 2007). Brown (2006) also reported that habitat degradation and forest fragmentation were threats to macrofungal diversity.

4. Conclusions and Recommendations

This inventory, conducted in January 2022, focused on collecting and identifying different species, together with an evaluation of environmental parameters, the economic uses, and the anthropogenic activities affecting macrofungi species in five selected barangays of Lavezares, Northern Samar.

A total of forty-five (45) macrofungi species were collected and identified, and these belonged to six (6) classes; eight (8) orders; twenty-two (22) families and thirty-seven (37) genera, with Barangay Chansvilla having the largest number of species collected (21), while Barangay Villa had the least number (9).

During the sampling period, it was at times sunny, with intermittent rains, and sometimes thunderstorms. The air temperature was generally warm (28.3˚C to 30˚C), with relative humidity ranging from 72.5% to 82%. Soil pH was slightly alkaline (7.1 to 7.3), rainfall intensity was almost nil (1.5 mm to 1.7 mm), and based on interviews with local residents, they affirmed

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that macrofungi often grow on sunny days after the rainy season, especially when there is lightning and thunder. The places where sampling was done ranged from a plain elevation to moderately highly elevated, with all sampling sites showing similar vegetation cover (coconut plantation, grassland, and shrubs). Twigs, fences, decaying logs, coconut trunk, soil, and banana trunks were the common substrate for these species.

Swidden farming ("kaingin" or slash-and-burn agriculture), deforestation or clearance of woodland for a specific purpose, and urban area expansion are the most commonly observed anthropogenic activities in the area.

Of the forty-five (45) species collected and identified, only three (3) are known to have economic value as food items. These results imply that there is a diversity of macrofungi species in the municipality and it is imperative that conservation of these oftentimes neglected resource be undertaken, and that inedible species should be subject to physicochemical characterization to determine its pharmaceutical potentials or nutraceutical applications.

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Conflict Of Interest Declaration

The researchers declare no conflict of interest whatsoever in the conduct of this research.