

Macroscopic Fungal Diversity in Oil Palm Plantations in Buasom Village, Unurum Guay District, Jayapura Regency, Jayapura Papua

Edoward Krisson Raunsay^{1*}, Dorsila Iwanembut², Supeni Sufaati³, Dolfina Costansah Koirewoa⁴, Apriani Herni Rophi⁵
Universitas Cenderawasih, Jayapura Papua

Corresponding Author: Edoward Krisson Raunsay edowardraunsay@gmail.com

ARTICLE INFO

Keywords: Diversity, Mold, Macroscopic

Received : 3 February
Revised : 15 February
Accepted: 20 March

©2024 Raunsay, Iwanembut, Sufaati, Koirewoa, Rophi: This is an open-access article distributed under the terms of the [Creative Commons Atribusi 4.0 Internasional](https://creativecommons.org/licenses/by/4.0/).



ABSTRAK

One of the unidentified fungi that occupy habitats or are found in oil palm lands. The importance or urgency of this research is carried out so that various types of fungi in Papua can be properly identified so as to enrich mushroom research data in various types of habitats. This study aims to determine the types and diversity of macroscopic fungi (fungi) found in oil palm plantations in Buasom Village, Unurum Guay District, Jayapura Regency. This study used 5 transects and each transect consisted of 5 observation plots which would be placed in oil palm plantations. The total number of observation plots is 25 with a size of 20 m x 20 m. The collected data will be analyzed using the K, KR, F, FR, INP and H' approach. The results showed that the composition of macroscopic mushroom species in the oil palm plantation of Buasom village, Unurum Guay District, Jayapura Regency as a whole was 24 species of mushrooms in 13 families. The number was distributed in the observation transect, namely, in the first transect 11 species with (H' 2.01) moderate category, in the second transect 7 species with (H' 1.81) low category, in the third transect 12 species with (H' 2.19) medium category, transect fourth 7 species with (H' 1.71) low category and fifth transect 5 species with (H' 1.31) low category

INTRODUCTION

Indonesia is a tropical country that has natural resources rich in biodiversity. One such biodiversity is mushrooms. Fungi generally occupy various types of habitats, namely soil, wood, litter, animal waste, and so on (Sayektiningsih et al., 2020). The type of ecosystem that can grow mushrooms is forest because the forest has a high humidity level so that the fungus adapts easily. The ecological function of fungi in forest ecosystems is as a decomposer and can control the nutrient cycle chain which is important for maintaining soil fertility, maintaining soil structure, absorbing toxic materials, carbon cycle, and affecting vegetation (Niego et al., 2023). It is estimated that there are 1.5 million species of fungi in the world, of which 28,700 species were identified macroscopic fungi (having fruiting bodies), 24,000 microscopic fungi (not having fruiting bodies) and 13,500 types of lichens (a symbiotic association between fungi and algae). Meanwhile, there are 1,433,800 types of fungi that have not been identified, both macro and micro.

Mushrooms are low-level plants that have a mushroom green substance that acts as a mushroom saprophyte (Bellettini et al., 2019) has a characteristic in the form of a single thread and the branches are hyphae, which form a mycelium and have spores reproduce by sexual means divided into two groups of mold fungi which are filamentous and have mycelium, yeast fungi are single-celled fungi and are not filamentous (Augustina Egbuta et al., 2016). Macroscopic fungi usually live on dead trees such as dead trees, tree trunks, livestock manure and this macroscopic fungus also grows a lot on oil palm land and is saprophytic and mutually beneficial (Ding et al., 2020).

LITERATURE REVIEW

Based on data on the number of mushrooms that have not been identified according to (Arko et al., 2021) several types of mushrooms have habitat or are found in oil palm lands. The importance or urgency of this research is carried out so that the various types and diversity of macroscopic fungi in Papua can be properly identified so as to enrich mushroom research data in various types of habitats. Macroscopic mushroom research that has been carried out by (Putra et al., 2019) in Warmare District, Manokwari, West Papua Province with samples collected at low altitudes of 15 and 290 m asl. with a temperature of 20o-29oC and humidity of 83-95%. The pooled and identified samples yielded 62 species representing 19 families (29 genera), and the four dominant families were as follows: Polyporaceae (14 species), Agaricaceae (11 species), Tricholomataceae (9 species) and Clavariaceae (7 species).

Research on macroscopic fungi in oil palm plantations in Buasom Village, Unurum Guay District, Jayapura Regency, Jayapura Papua has never been done. Based on the information obtained from observations of macroscopic fungi used as a food ingredient by the community, namely jangkos which is commonly found in piles of empty oil palm bunches. The types of macroscopic fungi found in the oil palm plantations are unknown. This study aims to determine the types

and diversity of macroscopic fungi (fungi) found in oil palm plantations in Buasom Village, Unurum Guay District, Jayapura Regency.

METHODOLOGY

This study uses the Transect method, the method in this study uses 5 transects and each transect consists of 5 observation plots which will be placed in oil palm plantations. The total number of observation plots is 25 with a size of 20 m x 20 m. Furthermore, the collected data will be analyzed using the K, KR, F, FR, INP and H' approaches.

Population and Research Sample

The population in this study were all types of mushrooms found in oil palm plantations, while the samples were all types of mushrooms found in the observation plots in Buasom village, Unurum Guay District, Jayapura Regency.

Research procedure

The data collection procedure is as follows following:

Station Determination

Station data collection that is determined as the location or place of data collection is oil palm plantation land.

Determination of Transect Lines and Mapping Plots

Determination of transect lines and plot mapping is done by making transect lines which are carried out vertically as many as 5 transect lines and adjusted to the conditions of the oil palm land. On each transect, 5 observation plots are placed with a size of 20 m each, with the distance between one plot and another plot being the same or uniform, so that in the end, each data collection station will have 25 observation plots. The observation plot transect design can be shown in Figure 1.

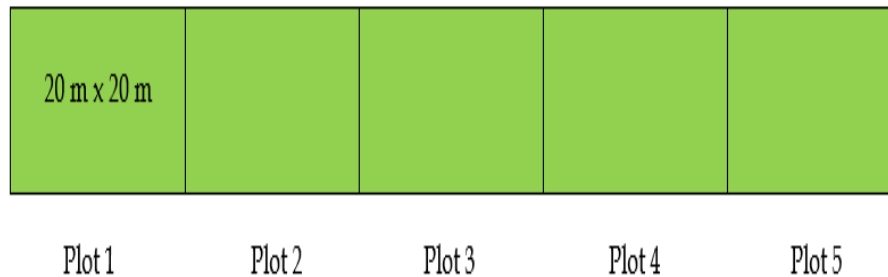


Figure 1. Plot Plot Method

Data analysis

The data in this study were then analyzed quantitatively. According to (Solikhatusun et al., 2020) Vegetation analysis was carried out to obtain the structure and composition of the vegetation at the study site. From the results of data collection by means of transect plot plots of observation can be analyzed with the following formula:

$$\text{Density (D)} = \frac{\text{Number of individuals of a kind}}{\text{Observed sample plot area}}$$

$$\text{Relative Density (RD)} = \frac{\text{Density of a kind}}{\text{Density of all types}} \times 100\%$$

$$\text{Frequency (F)} = \frac{\text{The number of sampling units that have a type}}{\text{The total number of sampling units}}$$

$$\text{Relative frequency (Fr)} = \frac{\text{frequency of a kind}}{\text{frequency of a kind}} \times 100\%$$

The diversity of a mushroom species can be determined by using the Shannon-Wiener diversity index with the following equation:

$$H' = - \sum P_i \cdot \ln(P_i)$$

Information:

H': Shannon-Wiener diversity index, and

P_i: The proportion of the number of i-th individuals (n) to the number whole individual (N), where n_i/N is the value used as a parameter to determine the diversity index of a level as follows:

1. The value of H' > 3 indicates that the diversity of species on the transect is highly abundant.
2. The value of H' 1 ≤ H' ≤ 3 indicates that the diversity of species on the transect is currently abundant.
3. The value of H' < 1 indicates that the diversity of species on a transect is low.

RESULT AND DISCUSSION

The composition of macroscopic fungal species found in five transects in the oil palm plantation in Buasom village, Unurum Guay District, Jayapura Regency as a whole was 24 species of fungi in 13 families. On the first transect, 11 species belonging to 6 families were obtained. The second transect obtained 7 species belonging to 7 families. The third transect obtained 12 species belonging to 9 families. The fourth transect obtained 7 species belonging to 6 families. The fifth transect obtained 5 species belonging to 5 families. The acquisition of the number of families and species on each transect has a different value, shown in Figure 2.

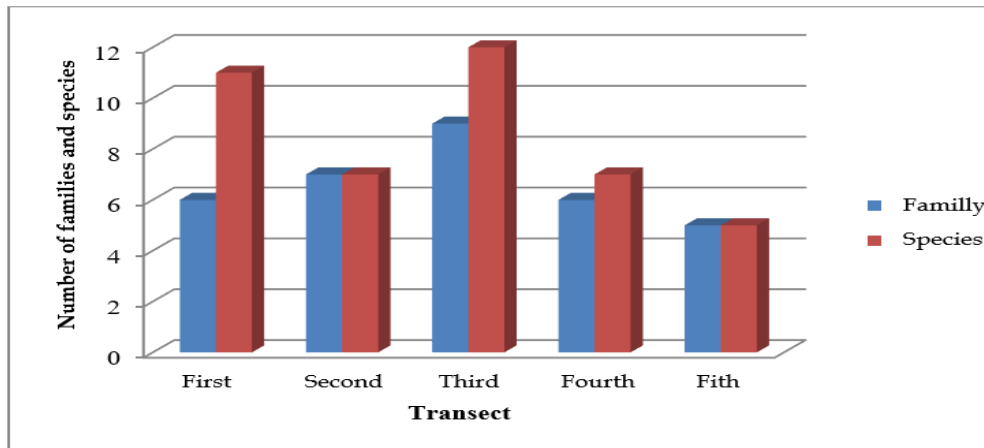


Figure 2. Family and Species Composition in The Five Transects

Each mushroom species has a different life span and adaptability in its habitat or transect. Some species have high adaptability but some have low adaptation. According to (Naranjo-Ortiz & Gabaldón, 2019), Habitat similarity and adaptation of a species of fungus will be important factors for the presence of a species. The species of fungus that has high adaptability and is present in all transects is *Volvariella* sp. Species *Volvariella* sp. While some species of macroscopic fungi have the lowest adaptation or are only on one transect. The first transect consisted of *Chlorophyllum* sp, *Amanita* sp, *Lentinus* cf and *Lepiota* sp. The second transect consists of the species *Xeromphalina* sp, *Cantharellus* sp, *Pycnoporus* sp. The third transect consisted of *Ganoderma lucidum*, *Ganoderma* sp and *Leucocoprinus cepistipes* species. The fourth transect consisted of *Gliophorus psittacine* and *Favolus* spp. The fifth transect contains the species *Pluteus cervinus*.

Structure and Composition of Macroscopic Fungi on the First Transect

The first transect consists of 11 species and belongs to 6 families, where each family consists of a different number of species which can be shown in Figure 3. The composition of families and individuals per species can be shown in Table 1.

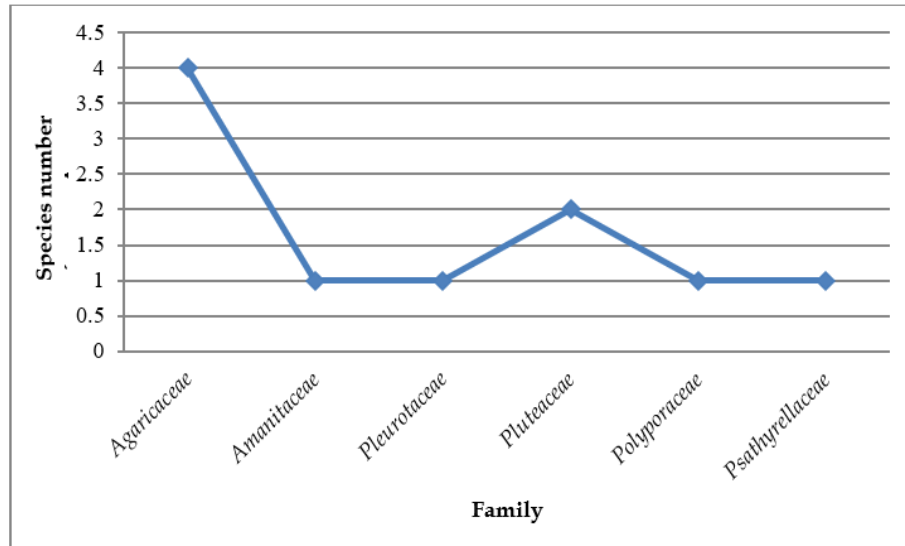


Figure 3. The number of Species in Each Family in The First Transect

Table 1. Families and Species on the First Transect

Family	Species
Agaricaceae	<i>Lentinus</i> cf
	<i>Chlorophyllum</i> sp
	<i>Lepiota</i> sp
	<i>Leucocoprinus</i> cf
Amanitaceae	<i>Amanita</i> sp
Pleurotaceae	<i>Pleurotus ostreatus</i>
Pluteaceae	<i>Pluteus cervinus</i>
	<i>Volvariella</i> sp
Polyporaceae	<i>Trametes gibbosa</i>
Psathyrellaceae	<i>Coprinellus micaceus</i>
Sarcoscyphaceae	<i>Cookeina</i> cf

Several macroscopic mushroom species have varying numbers of individuals and can be shown in Figure 4. There are 5 species that have more dominant individuals, including *Cookeina* cf (18 individuals), *Amanita* sp and *Chlorophyllum* sp (13 individuals), *Pluteus cervinus* (8 individuals) and *Coprinellus micaceus* (7 individuals).

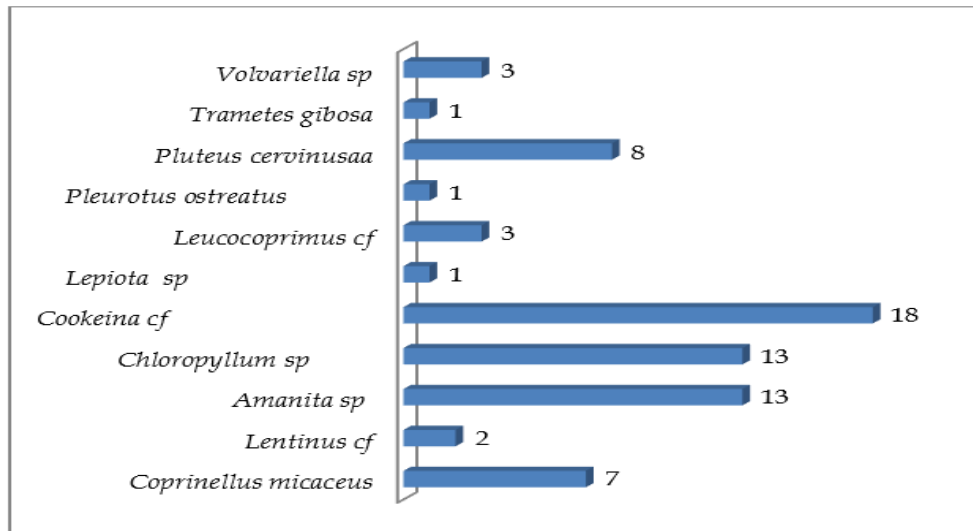


Figure 4. Numbe of Perspecies Individuals in the First Transect

Density of species is the number of individuals per unit area or the number of individual organisms per unit area (Aguilar-Trigueros et al., 2017). Density value calculations are performed to determine the number of individual mushrooms in a certain area (Ghanbari et al., 2016). The value of species density can be categorized into high and low, where the high or low density of a species can be seen from the number of species found and also based on the sample plots or the area of the study area. (Prayudi et al., 2019).

Table 2 shows that 11 species have various macroscopic mushroom density values, 5 of which have the highest density values compared to other species. The five species include *Cookeina cf* (90 individuals/ha), *Amanita sp* and *Chlorophyllum sp* (65 individuals/ha), *Pluteus cervinus* (40 individuals/ha) and *Coprinellus micaceus* (35 individuals/ha). the high density value is caused by the large number of individuals found in order to obtain a large density value as well. The abundance of some of these species is due to the availability of abundant substrates such as twigs, leaf litter and weathered wood. This is in line with opinion (Yusran et al., 2023) which states that the fungus has a habitat or can be found on the substrate or attached to dead and weathered wood. In addition, environmental factors also support the abundance of mushrooms in these locations. According to (Lailiyah et al., 2019), Environmental factors play an important role in the growth of macroscopic fungi. Important value index is used to find out type mastery level. The highest IVI on the first transect was dominated by 5 species of fungi including *Cookeina cf* (30.26%), *Amanita sp* (45.84%), *Chlorophyllum sp* (32.21%), *Pluteus cervinus* (20.52%) and *Coprinellus micaceus* (23.64%) shown in Table 2 Obtaining a type of mushroom with a high mastery level has a separate role for its habitat, as well as for humans. Macroscopic fungi that dominate in the habitat function as decomposers for the forest floor. (Floudas et al., 2020), the fungus will decompose forest litter which

will be converted into nutrients which will be used as natural fertilizer for the environment.

Macroscopic fungal species diversity in the first transect in the oil palm plantation in Buasom village, Unurum Guay district, Jayapura district was categorized as moderate ($H' = 2.01$). Five species of fungi that have the highest diversity index consisting of *Cookeina* cf ($H' = 0.35$), *Amanita* sp and *Chlorophyllum* sp ($H' = 0.31$), *Pluteus cervinus* ($H' = 0.25$) and *Coprinellus micaceus* ($H' = 0.23$) are shown in Fig. Table 2. The diversity index of a species is influenced by the presence of the number of individuals in a place (Bakray et al., 2020). There are 70 individuals in an area of 400 m² or equal to 350 individuals/ha. Macroscopic diversity of fungi which is categorized as medium is influenced by the number of individual fungi present in the first transect.

Table 2. Family, Species, Number, K, KR, F, FR, INP and H' on the First Transect

Family	Species	Σ	K	KR (%)	F	FR (%)	INP (%)	H'
Agaricaceae	<i>Lentinus</i> cf	2	10	2.86	0.20	4.55	7.40	0.10
Agaricaceae	<i>Chlorophyllum</i> sp	13	65	18.57	0.60	13.64	32.21	0.31
Agaricaceae	<i>Lepiota</i> sp	1	5	1.43	0.20	4.55	5.97	0.06
Agaricaceae	<i>Leucocoprinus</i> cf	3	15	4.29	0.40	9.09	13.38	0.13
Amanitaceae	<i>Amanita</i> sp	13	65	18.57	1.20	27.27	45.84	0.31
Pleurotaceae	<i>Pleurotus ostreatus</i>	1	5	1.43	0.20	4.55	5.97	0.06
Pluteaceae	<i>Pluteus cervinus</i>	8	40	11.43	0.40	9.09	20.52	0.25
Pluteaceae	<i>Volvariella</i> sp	3	15	4.29	0.20	4.55	8.83	0.13
Polyporaceae	<i>Trametes gibbosa</i>	1	5	1.43	0.20	4.55	5.97	0.06
Psathyrellaceae	<i>Coprinellus micaceus</i>	7	35	10.00	0.60	13.64	23.64	0.23
Sarcoscyphaceae	<i>Cookeina</i> cf	18	90	25.71	0.20	4.55	30.26	0.35
Amount		70	350	100	4.40	100	200	2.01

Structure and Composition of Macroscopic Fungi on the Second Transect

Macroscopic fungi found on the second transect consist of 7 species and belong to 7 families. The seven families each consist of 1 species and can be shown in Figure 5 and Table 3

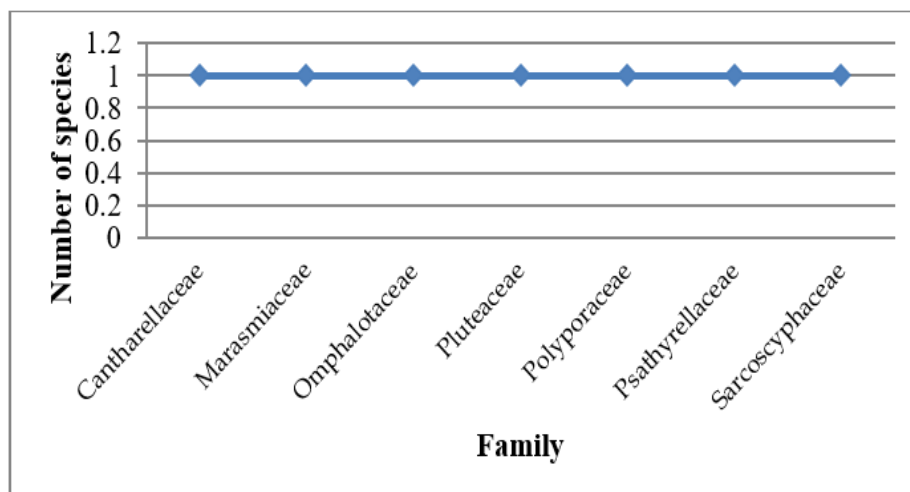


Figure 5. Number of Perspecies Individuals on The Second Transect

Table 3. Families and Species on the Second Transect

Family	Species
Cantharellaceae	<i>Cantharellus</i> sp
Marasmiaceae	<i>Xeromphalina</i> sp
Omphalotaceae	<i>Marasmiellus</i> sp
Pluteaceae	<i>Volvariella</i> sp
Polyporaceae	<i>Pycnopus</i> sp
Psathyrellaceae	<i>Coprinellus</i> sp
Sarcoscyphaceae	<i>Cookeina</i> cf

Each macroscopic fungal species found in the second transect had a different number of individuals as shown in Figure 6. Five of these species had a higher number of individuals compared to the others. Species *Coprinellus* sp and *Volvariella* sp (5 individuals), *Cantharellus* sp, *Marasmiellus* sp, *Marasmiellus* sp and *Cookeina* cf (4 individuals).

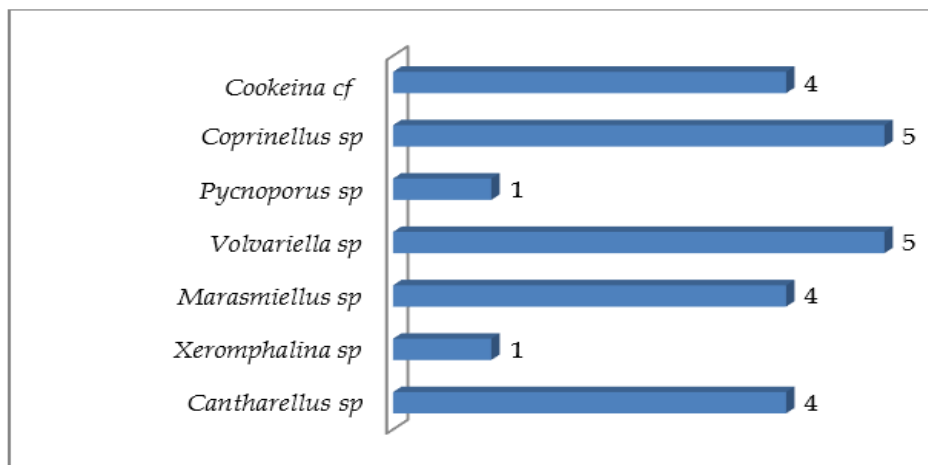


Figure 6. Number of Perspecies Individuals on the Second Transect

Macroscopic mushroom density values in oil palm plantations in Buason Village, Unurum Guay District, Jayapura Regency differed between species in the plot area. The results showed that among the 7 species found in the study area, 5 of them had a higher number of individuals compared to the others in the area of ha. *Coprinellus* sp and *Volvariella* sp (25 individuals/ha), *Cookeina* cf, *Marasmiellus* sp and *Cantharellus* sp (20 individuals/ha).

Species with low density values indicated by the presence of the least number of individuals in the observation transect were *Pycnoporus* sp (1 individual/ha) and *Xeromphalina* sp (1 individual/ha). One of the macroscopic mushroom species found, namely *Xeromphalina* sp, apparently inhabits or grows on weathered wood. The lack of species and also individual fungi found at the study site is thought to be influenced by the conditions of the study site which are too open or lack of vegetation, especially shade from oil palm. This results in too high light intensity which affects the presence of macroscopic fungi. Light intensity is a very important supporting factor for growth mold (Zawadzka et al., 2022). Mushrooms are very sensitive to direct sunlight. This is in line with opinion from (Ellison et al., 2017) who said that the lack of trees to shade the forest floor would cause the light intensity to be higher which had an impact on dry floor litter resulting in the fungus not being able to grow and develop.

Substrates, especially litter, weathered wood, soil and wood on the forest floor greatly affect the number of species and individual macroscopic fungi. This is in accordance with what was stated by (Suwannarach et al., 2022) that in general, fungi are saprophytic, so the substrate or place to grow will be important to be used as a food source.

The magnitude of the important value index indicates the role of the species in the community or at the research location. The higher the IVI value of a species, the greater the level of mastery over the community and vice versa (Gustia Wibowo et al., 2021). Species *Marasmiellus* sp (47.44%), *Cookeina* cf (39.74%), *Coprinellus* sp (36.22%), *Volvariella* sp (28.53%) and *Cantharellus* sp (24.36%) are the 5 species that dominate the second transect in the oil palm plantation of Buason Village District Unurum Guay Jayapura Regency because it has the highest important value index. Each type of fungus has an important role for the sustainability of the ecosystem in oil palm plantations.

The high IVI in a mushroom community indicates that the fungus has a role or level of importance in the community. This fungus has the ability to adapt to the habitat and a wide tolerance to environmental conditions. Mushroom species that have a high IVI are those that are able to adapt to their habitat with little light intensity. Species that have a large (dominant) role in the community will have a high IVI. In Table 4 it can be seen that 5 species have the highest IVI and role compared to other species.

Tabel 4. Family, Species, Amount, K, KR, F, FR, INP and H' on the Second Transect

Family	Species	Σ	K	KR (%)	F	FR (%)	INP (%)	H'
Cantharellaceae	<i>Cantharellus</i> sp	4	20	16.67	0.20	7.69	24.36	0.30
Marasmiaceae	<i>Xeromphalina</i> sp	1	5	4.17	0.20	7.69	11.86	0.13
Omphalotaceae	<i>Marasmiellus</i> sp	4	20	16.67	0.80	30.77	47.44	0.30
Pluteaceae	<i>Volvariella</i> sp	5	25	20.83	0.20	7.69	28.53	0.33
Polyporaceae	<i>Pycnoporus</i> sp	1	5	4.17	0.20	7.69	11.86	0.13
Psathyrellaceae	<i>Coprinellus</i> sp	5	25	20.83	0.40	15.38	36.22	0.33
Sarcoscyphaceae	<i>Cookeina</i> cf	4	20	16.67	0.60	23.08	39.74	0.30
Amount		24	120	100	2.60	100	200	1.81

The Shannon-Wiener Diversity Index (H') is used to measure the stability of a community so that it remains stable despite disturbances. The diversity index on the second transect in the oil palm plantation in Buasom village was in the low category (H'=1.81), shown in Table 4. Species diversity was classified as moderate, meaning that the diversity of fungal species found in the study area was adequately represented from each family/ ethnic group. Most of the mushroom substrate grows on dead wood (trees), only a few mushrooms that grow on living trees and some grow on the ground.

Structure and Composition of Macroscopic Fungi on the Third Transect
 Based on the research data, it can be seen that macroscopic fungi found on the third transect in the oil palm plantation of Buasom village consist of 12 species and belong to 9 families as shown in Figure 7.

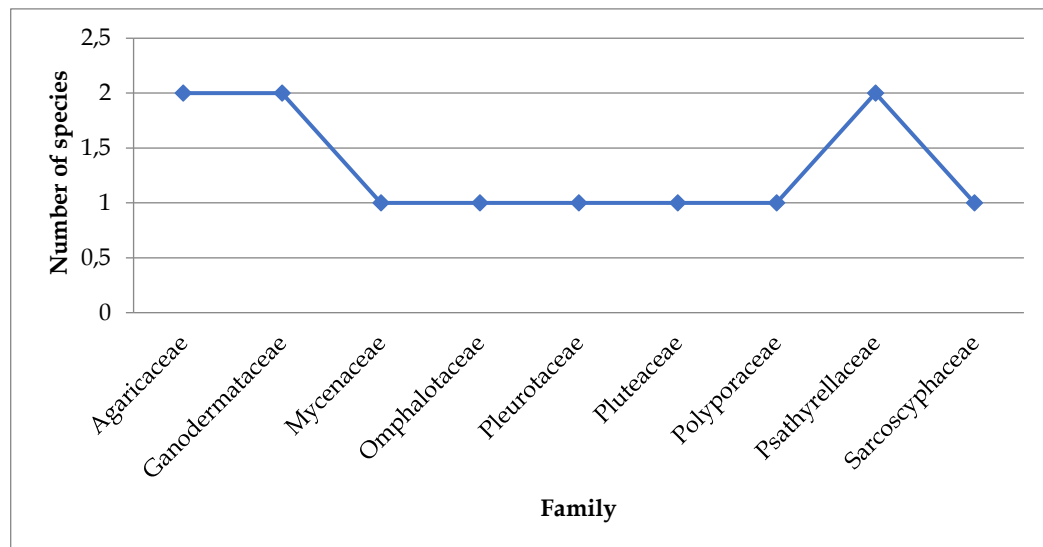


Figure 7. Number of Perspecies Individuals on the Third Transect

Each macroscopic mushroom species found at the study site has a different number of individuals. Several species have high individual numbers but also low ones and can be seen in Figure 8.

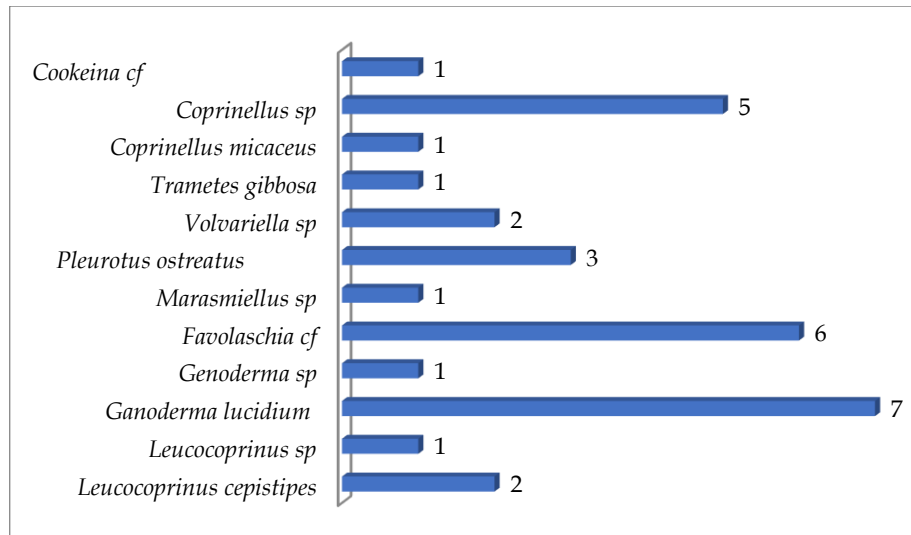


Figure 8. Number of Perspecies Individuals on the Third Transect

There are 4 species that have a more dominant number of individuals than the others including *Ganoderma lucidium* (7 individuals), *Favolaschia cf* (6 individuals), *Coprinellus sp* (5 individuals) and *Pleurotus ostreatus* (4 individuals). The presence of a mushroom species is strongly influenced by environmental factors. Environmental factors that have an important role are: temperature, water demand, oxygen demand and pH, substrate (Ren et al., 2023). The number of species and individuals is greatly influenced by presence of substrate, especially litter at the study site. The substrate or place to grow is important to be used as a food source for the growth and development of fungal species.

The density value is indicated by the presence of the number of individuals of each species in a certain area (Ruiz-Almenara et al., 2019). Research conducted in the Buasom village of oil palm plantations showed that of the 12 species found, 5 species were more dominant than the others or had higher density values. Species with higher density values include *Ganoderma lucidium* (35 individuals/ha), *Favolaschia cf* (30 individuals/ha), *Coprinellus sp* (25 individuals/ha) and *Pleurotus ostreatus* (15 individuals/ha) and are shown in Table 6. This indicated that the five macroscopic fungal species had higher densities and dominated the third transect. The presence of individual perspecies in the hectare area shows that this mushroom species dominates.

The Shannon-Wiener Diversity Index (H') is used to measure the stability of a community so that it remains stable despite disturbances. (Gu et al., 2023). The diversity index on the third transect in the oil palm plantation of Buasom village was moderate ($H'=2.19$), shown in Table 6. Moderate diversity means that the diversity of fungal species found in the study area is adequately represented from each family/tribe.

Structure and Composition of Macroscopic Fungi on the Fourth Transect
 The results showed that the macroscopic fungi found on the fourth transect in the oil palm plantation of Buasom village consisted of 7 species and belonged to 6 families as shown in Figure 9.

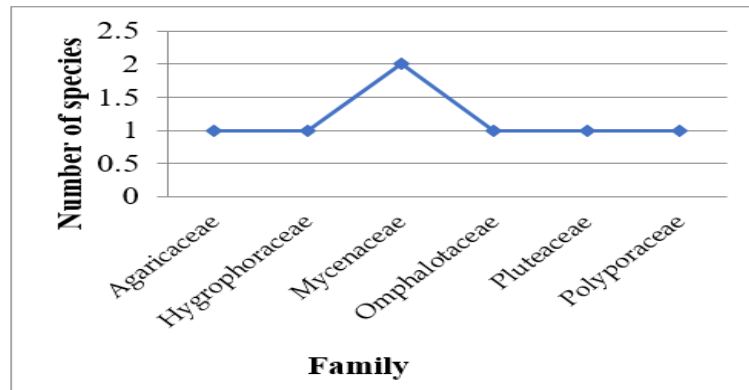


Figure 9. Number of Perspecies Individuals on the Fourth Transect

Each macroscopic mushroom species in the study area consisted of a different number of individuals. *Mycena* sp (10 individuals), *Favolus* spp (8 individuals), *Volvariella* sp and *Leucocoprinus* sp (7 individuals), *Favolaschia* cf (3 individuals) and shown in Figure 10. the number of species and individuals is strongly influenced by the presence of substrate, especially litter on the forest floor at the study site.

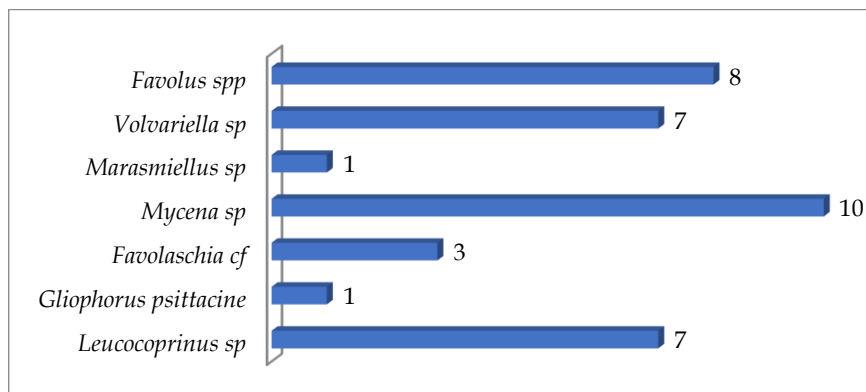


Figure 10. Number of Perspecies Individuals on the Fifth Transect

Species density is the number of individuals per unit area or the number of individual organisms per unit area. Density value calculations are performed to determine the number of individual mushrooms in a certain area. Species density values can be categorized as high and low if a species can be seen from the number of species found (Walsh et al., 2018). The results showed that macroscopic fungal species density was dominated by *Mycena* sp (50 individuals/ha), *Favolus* spp (40 individuals/ha), *Volvariella* sp and *Leucocoprinus* sp (35 individuals/ha), *Favolaschia* cf (15 individuals/ha) and can show in Table 7.

Table 7. Family, Species Name, Number, K, KR, F, FR, INP and H' on the Fourth Transect

Family	Species	Σ	K	KR (%)	F	FR (%)	INP (%)	H'
Agaricaceae	<i>Leucocoprinus</i> sp	7	35	18.92	0.20	8.33	27.25	0.32
Hygrophoraceae	<i>Gliophorus psittacine</i>	1	5	2.70	0.20	8.33	11.04	0.09
Mycenaceae	<i>Favolaschia</i> cf	3	15	8.11	0.40	16.67	24.77	0.20
Mycenaceae	<i>Mycena</i> sp	10	50	27.03	0.60	25.00	52.03	0.35
Omphalotaceae	<i>Marasmiellus</i> sp	1	5	2.70	0.20	8.33	11.04	0.09
Pluteaceae	<i>Volvariella</i> sp	7	35	18.42	0.60	23.08	41.50	0.31
Polyporaceae	<i>Favolus</i> spp	8	40	21.62	0.20	8.33	29.95	0.33
Amount		37	185	100	2.40	100	200	1.71

Important value index (INP) is to see how big the role of a plant in the ecosystem. The Important Value Index (INP) is used to describe the level of mastery given by a species to the community, the greater the IVI value of a species, the greater the level of control over the community and vice versa. oil palm in the village of Buasom Dustrik, Unurum Guay, Jayapura Regency. Mushroom species with high important index values (INP) indicate that mushrooms have a large role in an area. While species that have a low IVI indicate that the lack of ability to adapt and compete makes this mushroom species grow less optimally.

Results of macroscopic mushroom species diversity index calculations in village oil palm plantations Buasom, Unurum Guay District, Jayapura Regency obtained a low diversity index value ($H'=1.71$) and is shown in Table 7. The low diversity of fungi in the fourth transect indicates that the fungal community in this transect has low complexity and environmental factors do not support the fungus to grow, so causing a lack of interaction. Structure and Composition of Macroscopic Fungi on the Fifth Transect

Macroscopic fungal species found on the fifth transect in the oil palm plantation of Buasom village consist of 5 species and belong to 5 families shown in Figure 11.

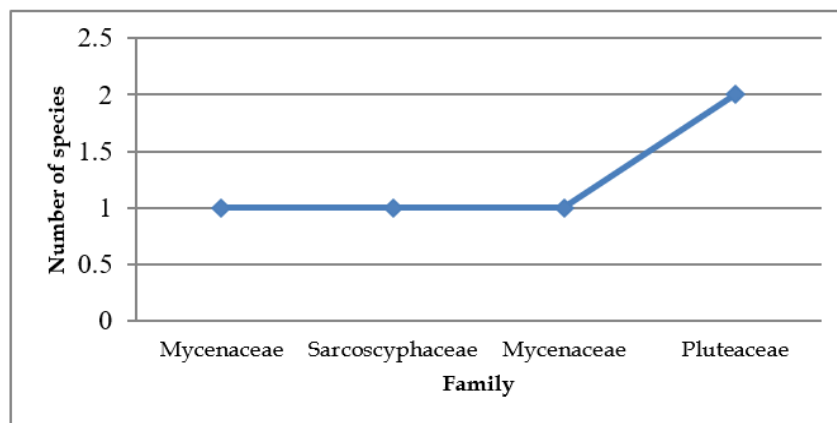


Figure 11. Number of Perspecies Individuals on the Fifth Transect

There are differences in the number of individuals for each mushroom species found in the study area. Of the five species, three of them had a more dominant number of individuals, such as *Mycena* sp (8 individuals), *Favolaschia* cf and *Volvariella* sp (3 individuals), shown in Figure 12. The dominance of macroscopic fungal species in the fifth transect or at the study site was thought to be influenced by environmental factors or habitat where the fungus grows. This relates to the litter or place to grow as well as lighting. The dominance of a species or individual fungus can be influenced by the presence of substrate, especially litter on the forest floor at the study site.

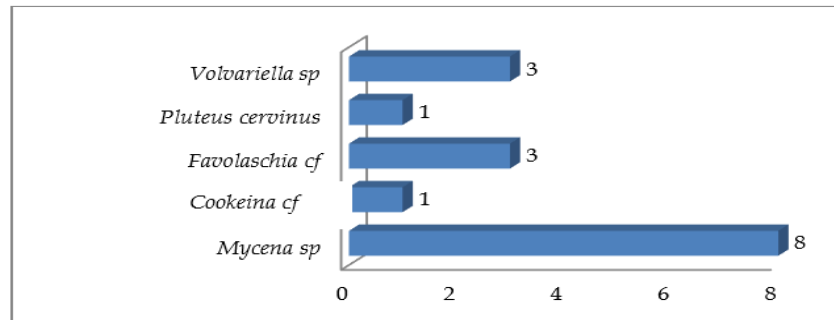


Figure 12. Number of Perspecies Individuals on the Fifth Transect

The density value is calculated to determine the number of individual mushrooms in a certain area. Species density values can be categorized as high and low if a species can be seen from the number of species found (Anusiya et al., 2021). The results showed that macroscopic fungal species density was dominated by *Mycena* sp (8 individuals/ha), *Volvariella* sp and *Volvariella* sp (3 individuals/ha) which can be shown in Table 8. Species that have low density values indicated by the presence of the fewest individuals in the observation transect are *Cookeina* cf and *Pluteus cervinus* (1 individual/ha). The lack of species and also individual fungi found at the study site is thought to be influenced by the conditions of the study site which are too open or lack of vegetation, especially shade from oil palm. This results in too high light intensity which affects the presence of macroscopic fungi. Light intensity is a very important supporting factor for the growth of mushrooms.

Table 8. Family, Species Name, Number, K, KR, F, FR, INP and H' on the Fifth Transect

Family	Species	Σ	K	KR (%)	F	FR (%)	INP (%)	H'
Mycenaceae	<i>Mycena</i> sp	8	40	50.00	0.80	36.36	86.36	0.35
Sarcoscyphaceae	<i>Cookeina</i> cf	1	5	6.25	0.20	9.09	15.34	0.17
Mycenaceae	<i>Favolaschia</i> cf	3	15	18.75	0.60	27.27	46.02	0.31
Pluteaceae	<i>Pluteus cervinus</i>	1	5	6.25	0.20	9.09	15.34	0.17
Pluteaceae	<i>Volvariella</i> sp	3	15	18.75	0.40	18.18	36.93	0.31
Amount		16	80	100	2.20	100	200	1.32

Analysis of the Important Value Index (IVI) is carried out to describe the level of mastery given by a species to a community, in which the greater the IVI value of a species, the greater the level of control over the community and vice versa. Based on the results of the study, the macroscopic mushroom species *Mycena* sp (86.36%) had a very high role in the research location, namely the oil palm plantation in Buasom District, Unurum Guay, Jayapura Regency because it had a higher percentage value compared to the others. Mushroom species with high important index values (INP) indicate that mushrooms have a large role in a forest area. While the species that had the lowest IVI were *Pluteus cervinus* and *Cookeina* cf (15.34%), where this percentage indicated that the lack of ability to adapt and compete made these mushroom species grow less optimally.

The diversity index value of macroscopic fungal species in the fifth transect obtained a low diversity index value ($H'=1.32$) and is shown in Table 8. The low diversity indicates that the fungal community in this transect has low complexity and environmental factors do not support the fungus to grow, so causing a lack of interaction. overall the index of diversity of macroscopic fungal species found in each transect in the oil palm plantation of Buason Village, Unurum Guay District, Jayapura Regency can be shown in Figure 13.

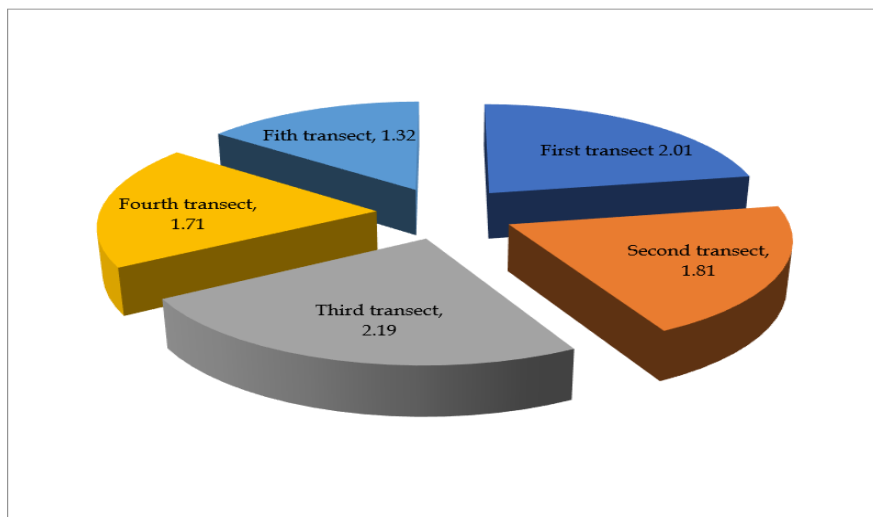


Figure 13. Index of Macroscopic Fungi Species Diversity in Each Transect

From the figure it can be explained that in fact the diversity of macroscopic fungal species on the five transects varied in the low to medium category. This is evidenced by the diversity obtained in the first transect (2.01), the second transect (1.81), the third transect (2.19), the fourth transect (1.71) and the fifth transect (1.32).

CONCLUSIONS AND RECOMMENDATIONS

The composition of macroscopic mushroom species found in the among Buasom oil palm plantation, Unurum Guay District, Jayapura Regency as a whole was 24 species of mushrooms in 13 families. On the first transect 11 species with moderate H' category, second transect 7 species with low H' category, third transect 12 species with moderate H' category, fourth transect 7 species with low H' category and fifth transect 5 species with H' category low.

REFERENCES

- Aguilar-Trigueros, C. A., Rillig, M. C., & Crowther, T. W. (2017). Applying allometric theory to fungi. *The ISME Journal*, 11(10), 2175–2180. <https://doi.org/10.1038/ismej.2017.86>
- Anusiya, G., Gowthama Prabu, U., Yamini, N. V., Sivarajasekar, N., Rambabu, K., Bharath, G., & Banat, F. (2021). A review of the therapeutic and biological effects of edible and wild mushrooms. *Bioengineered*, 12(2), 11239–11268. <https://doi.org/10.1080/21655979.2021.2001183>
- Arko, P., Sudirman, L., & Qayim, I. (2021). Changes in landscape ecology between nature reserve and palm oil plantation in West Java, Indonesia based on the observations of macrofungal population. *Biodiversitas Journal of Biological Diversity*, 22(10). <https://doi.org/10.13057/biodiv/d221046>
- Augustina Egbuta, M., Mwanza, M., & Oluranti Babalola, O. (2016). A Review of the Ubiquity of Ascomycetes Filamentous Fungi in Relation to Their Economic and Medical Importance. *Advances in Microbiology*, 06(14), 1140–1158. <https://doi.org/10.4236/aim.2016.614103>
- Bakray, A., S. Nurjannah, S. Salleh, Z. Ahmad Fitri, M. Mohd Khairul Faizi, K.M. Haja Maideen, & M.S. Nizam. (2020). Elevation influence the macrofungi diversity and composition of Gunung Korbu, Perak, Malaysia. *Biodiversitas Journal of Biological Diversity*, 21(4). <https://doi.org/10.13057/biodiv/d210453>
- Bellettini, M. B., Fiorda, F. A., Maieves, H. A., Teixeira, G. L., Ávila, S., Hornung, P. S., Júnior, A. M., & Ribani, R. H. (2019). Factors affecting mushroom *Pleurotus* spp. *Saudi Journal of Biological Sciences*, 26(4), 633–646. <https://doi.org/10.1016/j.sjbs.2016.12.005>
- Ding, S., Hu, H., & Gu, J.-D. (2020). Diversity, Abundance, and Distribution of Wood-Decay Fungi in Major Parks of Hong Kong. *Forests*, 11(10), 1030. <https://doi.org/10.3390/f11101030>

- Ellison, D., Morris, C. E., Locatelli, B., Sheil, D., Cohen, J., Murdiyarso, D., Gutierrez, V., Noordwijk, M. van, Creed, I. F., Pokorny, J., Gaveau, D., Spracklen, D. V., Tobella, A. B., Ilstedt, U., Teuling, A. J., Gebrehiwot, S. G., Sands, D. C., Muys, B., Verbist, B., ... Sullivan, C. A. (2017). Trees, forests and water: Cool insights for a hot world. *Global Environmental Change*, 43, 51–61. <https://doi.org/10.1016/j.gloenvcha.2017.01.002>
- Floudas, D., Bentzer, J., Ahrén, D., Johansson, T., Persson, P., & Tunlid, A. (2020). Uncovering the hidden diversity of litter-decomposition mechanisms in mushroom-forming fungi. *The ISME Journal*, 14(8), 2046–2059. <https://doi.org/10.1038/s41396-020-0667-6>
- Ghanbari, A., Dehghany, J., Schwebs, T., Müsken, M., Häussler, S., & Meyer-Hermann, M. (2016). Inoculation density and nutrient level determine the formation of mushroom-shaped structures in *Pseudomonas aeruginosa* biofilms. *Scientific Reports*, 6(1), 32097. <https://doi.org/10.1038/srep32097>
- Gu, X., Xiong, K., Wu, C., & Luo, D. (2023). Study on Soil Moisture Characteristics in Southern China Karst Plant Community Structure Types. *Forests*, 14(2), 384. <https://doi.org/10.3390/f14020384>
- Gustia Wibowo, S., Mardina, V., & Fadhliani, F. (2021). Exploration and Identification of HighLevel Fungus Species in The Protected Forest Area City of Langsa City. *BIOLOGICA SAMUDRA*, 3(1), 1–13. <https://doi.org/10.33059/jbs.v3i1.3197>
- Lailiyah, S. F., Arifin, M. Z., Firmansyah, F. S., Tanjung, W. F., Oktavianto, P., Hamzah, A. A., & Herliyana, E. N. (2019). Studying macroscopic mushroom diversity at Bandalit Resort, Meru Betiri National Park, Jember, East Java. *IOP Conference Series: Earth and Environmental Science*, 394(1), 012009. <https://doi.org/10.1088/1755-1315/394/1/012009>
- Naranjo-Ortiz, M. A., & Gabaldón, T. (2019). Fungal evolution: Major ecological adaptations and evolutionary transitions. *Biological Reviews*, 94(4), 1443–1476. <https://doi.org/10.1111/brv.12510>
- Niego, A. G. T., Rapior, S., Thongklang, N., Raspé, O., Hyde, K. D., & Mortimer, P. (2023). Reviewing the contributions of macrofungi to forest ecosystem processes and services. *Fungal Biology Reviews*, 44, 100294. <https://doi.org/10.1016/j.fbr.2022.11.002>
- Prayudi, D. P., Kurniawati, J., Mutiarani, Y. P., Salim, I., & Aminatun, T. (2019). Considering Sampling Methods for Macrofungi Exploration in Turgo Tropical Forest Ecosystem. *Journal of Tropical Biodiversity and*

Biotechnology, 4(1), 1. <https://doi.org/10.22146/jtbb.38381>

- Putra, I. P., Nasrullah, M. A., & Dinindaputri, T. A. (2019). Study on Diversity and Potency of Some Macro Mushroom at Gunung Gede Pangrango National Park. *Buletin Plasma Nutfah*, 25(2), 1. <https://doi.org/10.21082/blpn.v25n2.2019.p1-14>
- Ren, W., Huang, T., & Wen, G. (2023). Quantity, Species, and Origin of Fungi in a Groundwater-Derived Water Source. *Water*, 15(6), 1161. <https://doi.org/10.3390/w15061161>
- Ruiz-Almenara, C., Gándara, E., & Gómez-Hernández, M. (2019). Comparison of diversity and composition of macrofungal species between intensive mushroom harvesting and non-harvesting areas in Oaxaca, Mexico. *PeerJ*, 7, e8325. <https://doi.org/10.7717/peerj.8325>
- Sayektiningsih, T., Sitepu, B. S., Yassir, I., Sari, U. K., Mukhlisi, M., & Ma'arif, A. (2020). Vegetation Structure, Composition, and Soil Properties of Dry Land on Islands in Balikpapan Bay, East Kalimantan. *Jurnal Biodjati*, 5(2), 199–213. <https://doi.org/10.15575/biodjati.v5i2.6434>
- Solikhatun, I., Maridi, M., & Sri Budiastuti, M. T. (2020). Analysis of Vegetation and Community Attitude as the Reforestation Efforts at Greenbelt Area of Multipurpose Reservoir of Wonogiri. *Caraka Tani: Journal of Sustainable Agriculture*, 35(2), 228. <https://doi.org/10.20961/carakatani.v35i2.34616>
- Suwannarach, N., Kumla, J., Zhao, Y., & Kakumyan, P. (2022). Impact of Cultivation Substrate and Microbial Community on Improving Mushroom Productivity: A Review. *Biology*, 11(4), 569. <https://doi.org/10.3390/biology11040569>
- Walsh, J. R., Pedersen, E. J., & Vander Zanden, M. J. (2018). Detecting species at low densities: A new theoretical framework and an empirical test on an invasive zooplankton. *Ecosphere*, 9(11), e02475. <https://doi.org/10.1002/ecs2.2475>
- Yusran, Y., Erniwati, E., Khumaidi, A., Pitopang, R., & Jati, I. R. A. P. (2023). Diversity of substrate type, ethnomycology, mineral composition, proximate, and phytochemical compounds of the *Schizophyllum commune* Fr. In the area along Palu-Koro Fault, Central Sulawesi, Indonesia. *Saudi Journal of Biological Sciences*, 30(4), 103593. <https://doi.org/10.1016/j.sjbs.2023.103593>

Zawadzka, A., Janczewska, A., Kobus-Cisowska, J., Dziędziński, M., Siwulski, M., Czarniecka-Skubina, E., & Stuper-Szablewska, K. (2022). The effect of light conditions on the content of selected active ingredients in anatomical parts of the oyster mushroom (*Pleurotus ostreatus* L.). *PLOS ONE*, 17(1), e0262279. <https://doi.org/10.1371/journal.pone.0262279>