

Diversity of Fungi in the Mount Rinjani National Park (TNGR) Kembang Kuning Resort, Jeruk Manis Village, Sikur District, East Lombok Regency

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Received: 09 March 2024, Revised: 29 May 2024, Accepted: 28 June 2024

Abstract. Mount Rinjani National Park (TNGR) is one of the ecosystems with mountain rainforest and savanna types located on Lombok Island, West Nusa Tenggara with a variety of fungal diversity. This research was conducted in the Jeruk Manis area, this area is one of the many areas included in the Mount Rinjani National Park (TNGR) area. This study aims to observe the diversity of fungi in the Mount Rinjani National Park area. The research was conducted from 08.00 - 10.00 WITA. The method used in this study is the exploration method. The exploration method is one method where researchers conduct direct exploration in the Jeruk Manis TNGR (Mount Rinjani National Park) area. Fungi are eukaryotic organisms that do not have chlorophyll, grow as hyphae, have cell walls containing chitin, are heterotrophic, absorb nutrients through their cell walls, excrete extracellular enzymes into the environment through spores, and reproduce sexually and asexually. *Ganoderma lucidum*, also known as reishi or lingzhi, is a fungus that has long been used in traditional medicine in Asia. *Neofeolus alveolaris* is a wood fungus that grows saprophytically in forests. *Stereum hirsutum* is a fungus that is usually found on dead wood in forests. *Ramariopsis kunzei* is a fungus that has a body shape that resembles a cone-shaped mushroom with a yellow or orange color. *Entoloma abortivum*, also known as the "lobster mushroom", is a unique fungus because it is the result of parasitism on other fungi, namely *Russula* or *Lactarius* fungi. *Baeospora myosura* is a fungus that is usually found in forests, growing saprophytically on decaying organic matter such as leaf litter or dead wood.

Keywords: Diversity, Fungi, Mount Rinjani National Park.

INTRODUCTION

Mount Rinjani National Park (TNGR) is an ecosystem with a type of mountain rainforest and savanna located on Lombok Island, West Nusa Tenggara. TNGR was designated as the Mount Rinjani National Park area by Decree of the Minister of Forestry No. 280/Kpts-VI/1997 dated May 23, 1997 with a definitive area of $\pm 41,330$ Ha. TNGR Center. (2011). TNGR is a tourist attraction that is crowded with tourists, both local and foreign. Interesting tourist attractions to visit in TNGR include: the natural panorama of Lombok Island from the peak of Mount Rinjani, Lake Segara Anak, Goa susu, Gunung Baru Jari, hot springs (aiq kalaq), animals and waterfalls (Raytodi, 2020).

One of the developing tourist villages on Lombok Island is Jeruk Manis Village. The name of Jeruk Manis Village itself is taken from one of the waterfalls in the conservation forest area

of Mount Rinjani National Park (TNGR) which is the icon of the village. It is said that this village can be pinned as a paradise. tourism. This is because of the potential possessed by Jeruk Manis Village, Tourist attractions in Jeruk Manis Village also often fill social media homepages (Pariwisata NTB, 2021; Poros Lombok, 2022). However, there are several obstacles, such as the lack of public awareness regarding the tourism potential in Jeruk Manis Village. so that these tourist destinations are not managed properly by the surrounding community. Therefore, through this community service program, it is hoped that it can help reduce obstacles, and can improve management and maximize the potential in Jeruk Manis Village (Suripto, 2023).

Indonesia is one of the countries known as the world's leading mushroom warehouse. Mushrooms that have been cultivated and have become popular or popular as food, vegetables and medicines and are widely traded in the market are straw mushrooms (*Volvariella volvacea*), champignon mushrooms (*Agaricus bisporus*), ear mushrooms (*Auricularia auricula*), umbrella mushrooms (*Lentinus edodes*), white oyster mushrooms (*Pleurotus ostreatus*) and *Ganoderma* species (Jusana, et al., 2013). One of the areas in Indonesia, especially in NTB, which is widely overgrown with various plants and mushrooms is the Mount Rinjani National Park area, including the *Ganoderma* genus of mushrooms, but this type of mushroom has not been identified and described well. (Dharmawibawa, et al., 2019)

Mushrooms are one of the horticultural plants that have food functions, economic functions, and health functions. Mushrooms that have food functions are edible mushrooms. In the world, there are 600 types of mushrooms that can be consumed by humans. However, only 200 types of mushrooms are consumed and 35 of them have been commercially cultivated. These edible mushrooms include wood ear mushrooms, oyster mushrooms, and straw mushrooms (Pratiwi and Sekar. 2010). Wood ear mushrooms are one of the commodities that are currently in demand by the public to meet food needs. This can be seen from the demand that continues to increase every year (Subali, 2023)

Fungi are also heterotrophic organisms that have a cosmopolitan distribution in various niches ranging from natural ecosystems or places that are in contact with anthropogenic activities in Indonesia (Putra et al., 2017; Putra et al., 2018; Putra, 2020). In addition, fungi have ecological and economic functions because of their important role as reliable decomposers and their fruit bodies are widely utilized by humans. All macroscopic fungi are known to be members of the Basidiomycota group and a few Ascomycota (Putra, 2021)

Fungi are eukaryotic, heterotrophic organisms, generally have chitin cell walls, reproduce with spores, and can live in various habitats (Retnowati et al., 2019). The ability of fungi to colonize various habitats is closely related to the various life mechanisms they have such as parasites, endophytes, and saprophytes. Mushrooms come in various shapes and sizes, from microscopic to macroscopic, dominated by the Basidiomycota and Ascomycota groups (Panjaitan, et al., 2022)

Fungi live in various habitats including soil, wood, garbage and animal waste. Fungi are creatures that do not photosynthesize and have long been used as a food source. Mushrooms have many benefits. so they can be consumed as food and as medicine. Edible mushrooms have a better mineral salt content than beef or lamb (Mulyana, 2024).

Wood fungus is a fungus that sticks to trees that are undergoing a weathering process, but some types of wood fungus grow on living trunks, namely by attaching to the outer layer of the trunk. The role of wood fungus in the forest includes as decomposers, food ingredients, and medicines. As decomposers, fungi are able to decompose organic materials such as cellulose, hemicellulose, lignin, protein, and starch compounds with the help of enzymes. Fungi decompose organic materials into compounds that are absorbed and used for their growth and development. Some types of wood fungus can be used as food ingredients because they have a good taste and high nutritional value, while as medicines fungi produce certain antibiotics that are effective in preventing diseases such as tumors and cancer (Hasanudin, 2014).

Mushrooms are a form of fungi that are macroscopic in size and their fruit bodies can be seen without using special tools. Fungi are also heterotrophic organisms that have a cosmopolitan distribution in various niches ranging from natural ecosystems or places that are in contact with anthropogenic activities in Indonesia (Putra et al., 2017;) In addition, fungi have ecological and economic functions because of their important role as reliable decomposers and their fruit bodies are widely utilized by humans. All macroscopic fungi are known to be members of the Basidiomycota group and a few Ascomycota (Putra, 2021) For the life and development of fungi, they require a source of nutrients or food in the form of chemical elements, such as Nitrogen, Phosphorus, Sulfur, Potassium, Carbon which are already available in wood tissue, although in small amounts. Therefore, additional external input is needed; for example in the form of fertilizers used as a mixture for making plant substrates or mushroom growing media (Suriawiria, 2016).

RESEARCH METHOD

This research was conducted in the Jeruk Manis area, this area is one of the many areas included in the Mount Rinjani National Park (TNGR) area. This area is known for its natural beauty, regional fertility and the diversity of its various animals. In the Jeruk Manis area there are so many animals that can be found, one example of which is the diversity of types of Mushrooms (Fungi). The research time was carried out from 08.00 - 10.00 WITA. The method used in this study is the exploration method. The exploration method is one method where researchers conduct direct exploration (Lige and Anggo, 2022). in the Jeruk Manis TNGR (Mount Rinjani National Park) area and researchers recorded the results of the Mushrooms (Fungi) found at each location in the area using simple tools and materials in the form of knives, specimen bottles, 70% alcohol as a material for preserving the Mushrooms. The stages in conducting this research start from determining the observation location point, tracing the observation location point, looking for mushrooms at that location, taking mushrooms at that location point, preserving the mushrooms with 70% alcohol, observing and recording the characteristics of the mushrooms, taking pictures as documentation, and presenting data in the form of pictures and tables of observation results (Wahyudi, 2022).

RESULTS AND DISCUSSION

Fungi are one of the kingdoms in the classification system of living things. Fungi are heterotrophic living things or decomposers in the environment. Fungi have a high level of diversity, but not all of them have been identified. There are still many species of fungi that have not been identified because fungi only grow at certain times with limited conditions and abilities to live (Norfajrina, 2021).

Mushroom coral is a type of coral species that lives solitary (free-living) and can live on various substrates. Most of these species can be found on reef slopes that have coral fracture substrates (Hoeksema 2012). This species can also be found on reef flats and sandy waters (Hoeksema 2012). In the juvenile phase (anthocaulus), mushroom corals live by attaching themselves to hard substrates, but will detach from the substrate when they are 1 cm in size (anthocyanthus) (Yamashiro and Yamazato 1996). At the beginning of the anthocyanus phase, the mortality rate of mushroom coral is very high and only a small portion can survive to adulthood (Gofredo and Chadwick-Furman, 2000). Several species of the mushroom coral genus (Podabacia and Lithophyllon) do not have anthocyanus phase Hermanto, the number of species is approximately 41 species (1992). The waters of the South Spermond Islands have quite high coral diversity, consisting of 34 mushroom species from 11 genera (Ho 2012). In the waters of Gangga Island, Sula, 16 species of mushroom coral from seven genera were found (Hermanto 2014).

Mushrooms require humidity for growth ranging from 80-85% (Hasanuddin, 2018). Mushrooms are one of the kingdoms in the classification system of living things. Mushrooms are heterotrophic living things or become decomposers in the environment. The level of mushroom diversity is classified as high, but not all of them have been identified. There are still many species of mushrooms that have not been identified because mushrooms only grow at certain times with limited environmental conditions and their ability to live (Campbell, 2013)

Here are some specimens of Mushrooms (Fungi) from the results of this study that have been obtained and observed in the Laboratory, including:

Table 1. Inventory of fungal diversity in the Mount Rinjani National Park area

No.	Division	Species	Habit
1	Basidiomycota	<i>Ganoderma lucidum</i>	Dead wood or dying tree trunks, especially in tropical and subtropical forests.
2	Basidiomycota	<i>Neofeovus alveolaris</i>	Dead wood or organic matter in damp forests
3	Basidiomycota	<i>Stereum hirsutum</i>	Dead wood in the forest, both deciduous and coniferous trees
4	Basidiomycota	<i>Ramariopsis kunzei</i>	Moist forest soil, among moss and leaf litter, in broadleaf and coniferous forests
5	Basidiomycota	<i>Entoloma abortivum</i>	Broadleaf forest soil
6	Basidiomycota	<i>Baeospora myosura</i>	Dead wood, especially rotting conifer trunks and twigs

Source: results of observations in Mount Rinjani National Park.

Ganoderma lucidum

Ling zhi mushroom (*Ganoderma lucidum*) has begun to be intensively cultivated in Indonesia. *Ganoderma lucidum* usually grows on wood or tree trunks (Dube, 2003). In Indonesia it is known as wood fungus or red fungus. Ling zhi mushroom contains various active compounds such as polysaccharide compounds, amino acids. Ascorbic acid, sterols, alkaloids, ganoderic acids, triterpenoids and oleic acid (Alexopoulos et al., 1996). Ling zhi mushroom in the form of mycelium or fruiting body can be used as a basic ingredient for medicine for various diseases. One factor that influences the success of ling zhi mushroom cultivation is the availability of seeds. The process of making ling zhi mushroom seeds is usually done conventionally by inoculating in sawdust medium (Aryantha, 1989). Making seeds conventionally takes a long time so that it affects the production of mycelial biomass. In addition, the possibility of contamination and degeneration of genetic traits is also relatively greater. If degeneration of traits can be avoided, then the resulting ling zhi mushroom will have good genetic traits with high viability. (Sulistyaningsihtias, 2017).

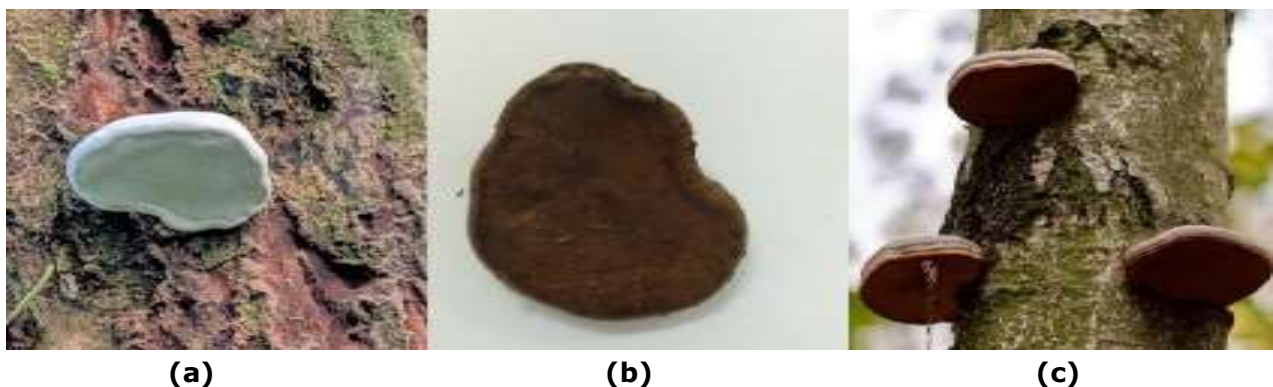


Figure 1. *Ganoderma lucidum*

a. Observation Image, b. Lab Image, c. Literature Image

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In this observation, namely *Ganoderma lucidum*, also known as ling zhi mushroom or red mushroom, has several significant morphological characteristics. The following are some

known morphological details, namely Fruit Body Shape, namely *Ganoderma lucidum* fruit body is fan-shaped, with a wavy surface and has annual rings. The edges are white, while the bottom is white and has pores. The color, namely *Ganoderma lucidum* has a red color, which is caused by the red and shiny color of the fruit body. Cell Wall, namely *Ganoderma lucidum* cell walls consist of cellulose or chitin, in the form of filaments or threads. Hyphae, namely The body of the fungus consists of filaments called hyphae, which consist of cells with one nucleus (uninucleate) or two (binucleate). Isolate Morphology, namely Morphological characteristics of *Ganoderma* sp. isolates. white with a rough texture and wavy surface texture. Thus, *Ganoderma lucidum* has several unique morphological characteristics that are different from other types of mushrooms. memiliki beberapa ciri morfologi yang unik dan berbeda dengan jenis jamur lainnya.

Neofeolus alveolaris

Neofavolus sp. was found growing attached to the trunk of a cempedak tree. This mushroom has a yellow fruit body and has a smooth surface texture. The upper part of the fruit body has fine hairs. *Neofavolus* has a hard fruit body. The edges or margins are flat and smooth (entire). *Neofavolus* has pores at the bottom of the fruit body. The fruit body of mushroom 4 has an average diameter of 1.6 to 2.2 cm. *Neofavolus* sp. in the picture was found in the primordia phase. *Neofavolus* is a polyporoid fungus that plays an important role in pharmacology such as immunomodulator, antitumor, antiviral and antihyperlipidemic (Zmitrovich and Kovalenko, 2016). *Neofavolus* is known as an edible mushroom or mushroom that is not harmful if consumed by humans (Mahardhika, 2022).

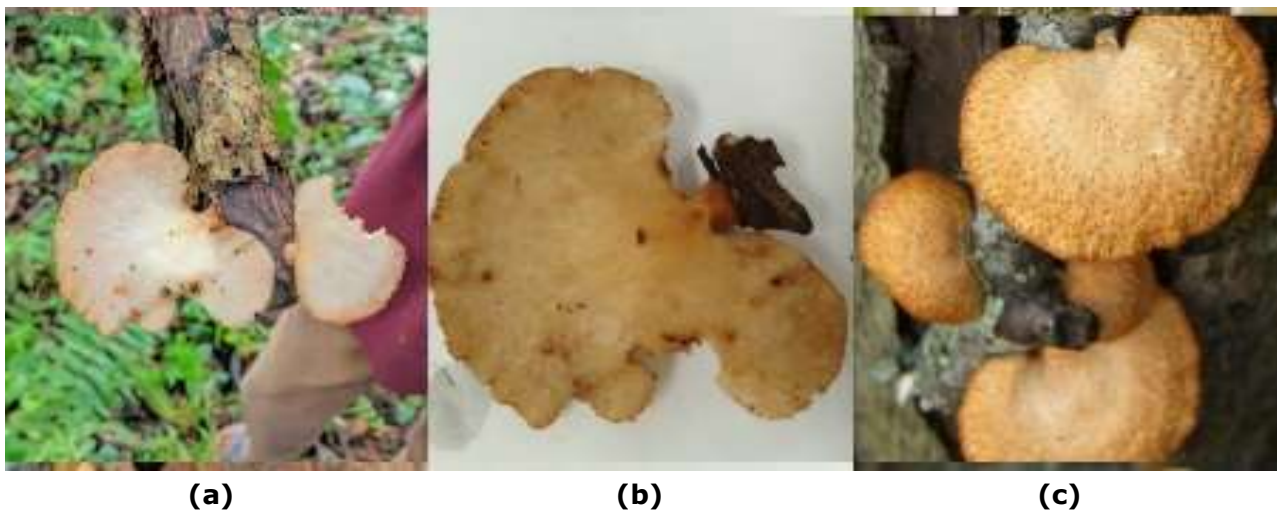


Figure 2. *Neofavolus alveolaris*

a. Observation Image, b. Lab Image, c. Literature Image

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In the second observation, *Neofavolus alveolaris* has a fruit body, namely the fruit body of *Neofavolus alveolaris* is annual, with a cylindrical stem that is usually located sideways. The cap is kidney-shaped to semicircular, circular in central specimens. The cap surface is covered with flat or smooth, azonate, white to cream or brownish scales. Pores The pores on the underside of the cap vary in size but are usually diamond-shaped and may extend radially. The surface of the pores is broken, that is, they descend to the stem. Stipe The stipe is glabrous, and the fruiting body sometimes has a stem but is also found attached directly to the growing surface. Spore print The spore print is white. Ecology *Neofavolus alveolaris* is saprotrophic, growing on dead wood and small hardwood logs, causing white rot. It is widely distributed in North America, Asia, Australia, and Europe. Description The fruiting body is 1-10 cm in diameter, rounded to kidney-shaped or fan-shaped. It is dry, covered with flat scales, and has

a whitish to pale orange porous surface. The flesh is white, firm, and does not change shape when sliced. Microscopic Characteristics: Spores are cylindrical, thin-walled, smooth, hyaline, and non-amyloid. Basidia are club-shaped with four sterigmata. The cap cuticle consists of a cuticle made of hyaline to brown generative hyphae that are agglutinated and parallel. The contextual hyphae are mostly non-agglutinated framework-binding hyphae. These characteristics help identify *Neofavolus alveolaris*, also known as hexagonal porous polypore, which is a species of fungus in the family Polyporaceae.

Stereum hirsutum

Stereum hirsutum is a fungus that has individual fruiting bodies measuring 0.5-3 cm, but often merges with several other fruiting bodies, fan-shaped, semicircular or irregular fruiting bodies, hairy fruiting bodies resembling dense velvet or with neatly arranged hairs. This fungus has a variety of colors, but generally ranges from yellow to brown, brown; attached to the substrate laterally, without a stem (Ramadanty, 2022).

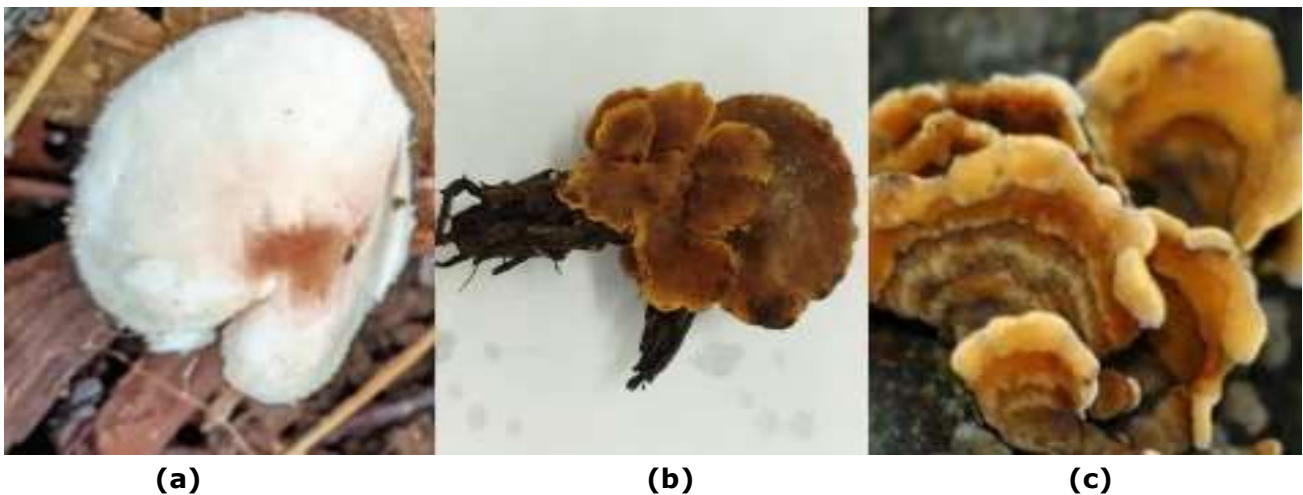


Figure 3. *Stereum hirsutum*

a. Observation Image, b. Lab Image, c. Literature Image

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In the third observation on *Stereum hirsutum* which is also known as the Hairy Curtain Crust fungus, it has the following characteristics: The cap is offset or unclear, usually 1-4 cm wide, and the edges are irregularly wavy. Hymenium, namely Smooth and irregular hymenium, meaning it extends down the stem. Stipe, namely There is no stipe (stem). Spore Mold: The spore mold is white in color, Spores: The spores are ellipsoidal, smooth, and amyloid, measuring 6-7.5 x 3-3.5µm. Flesh: The flesh is 0.5-1 mm thick. Odor and Taste: The fungus is odorless and tasteless. Habitat: It is saprobic, growing on dead hardwood trees and fallen branches, especially on oak and beech trees, and occasionally on coniferous wood. Season: Found throughout the year, with spore release in the fall. These characteristics help distinguish *Stereum hirsutum* from other species in the genus.

Ramariopsis kunzei

Ramariopsis kunzei also known as white coral mushroom, is a macroscopic mushroom species belonging to the Clavariaceae family and the genus Ramariopsis. The fruit body is upright or creeping, branched, like coral 2.5-10 cm high, and 3-8 cm wide. Branches are white to cream, white, smooth surface, texture is not dense blunt tip. Short stalk, brittle hairy base, white, brittle. Habitat on soil/litter, living rotten wood scattered to dense in groups. Edibility is not dangerous, not fleshy and tasteless (Amin, 2019).



Figure 4. *Ramariopsis kunzei*

a. Observation Image, b. Lab Image, c. Literature Image

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In the fourth observation, namely *Ramariopsis kunzei*, namely Form, namely *Ramariopsis kunzei* has a fruit structure similar to sea coral, with branches that are branched and white to yellowish. Size, namely Maximum height 8 cm (3.1 inches) and width 6 cm (2.4 inches). Branches, namely The branches are 1-5 mm thick, smooth, and white with blunt tips. Branch tips: The tips of older branches may be pink. Stem: The stem, if present, is a maximum of 1 cm (0.4 in) long and is scurfy (containing small flakes). Texture: The flesh texture can vary from soft to firm. Color: It does not change color when impacted, but may turn green when 10% FeSO₄ solution is applied. Spores: The spores are white, translucent, and have an ellipsoid to spherical shape with spines on their surface. The spores are non-amyloid, do not absorb iodine when stained with Melzer's reagent.

Entoloma abortivum

Entoloma abortivum is often found fruiting on soil, humus, or rotting logs in deciduous wood. *Entoloma abortivum* was initially described as having two morphologies: the mushroom form, which has a pinkish-gray stem and pile and pink gills, and then the carpophoroid form, which is generally white and subglobose and lacks good gill shape. Initially, the carpophoroid form was assumed to be a deformed sporocarp of *E. abortivum* due to parasitism by Armillaria species of *E. abortivum* acts as a mycoparasite (Koch, 2021).

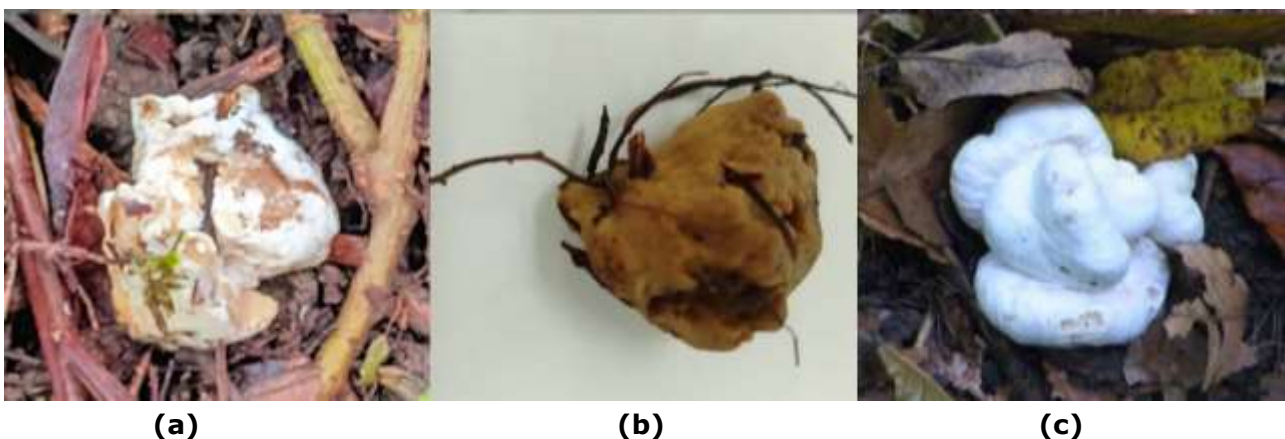


Figure 5. *Entoloma abortivum*

a. Observation Image, b. Lab Image, c. Literature Image

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In the fifth observation, namely in *Entoloma abortivum*, it has the following characteristics: The shape of the cap is convex with an inward edge, then becomes more or

less flat. The color of the cap is gray to gray-brown. The line is gray at first, then becomes pink when the spores mature. The descending line usually begins to descend towards the stem. Stem Usually has a larger base, 0.5-1.5 cm thick, and 2-8 cm long. Odor and Taste: Smells and tastes like flour. Spore Print: Pink. Spores: Heterodiametric shape, 5-8 sides, size 8-10 x 4-6 μm . Hymenial Cystidia: None. Pileipellis: Cutis with elements 4-10 μm wide, transparent to brown in 10% ammonia. Clamp Connection: None. Aborted form: Appears as an abnormal mass of tissue, usually white with pink areas inside, and has a spongy texture. Habitat: Found in areas undergoing wood decomposition, especially in the hardwood forests of eastern North America. Season: Usually found in autumn and late autumn. Parasitic Nature: Known as a parasite that infects *Armillaria* species, such as *Armillaria mellea*.

Baeospora myosura

Baeospora myosura fungus is a species of fungus that belongs to the macroscopic fungus group. This fungus has a variety of body shapes and attractive colors, such as white, bright brown, red, citron yellow, orange, and black, which can be seen directly with the naked eye. This fungus can be found in various places, such as straw piles, rotten wood, and so on. This fungus has an important role in decomposing organic materials and the availability of organic nutrients in the forest. The fruit body has a cap, convex to slightly flat convex. The surface is dry or slightly moist, slippery or very smooth. Light brown in color, fading clearly so that the Lamellae are visible from the margin inward (fibrillar), the margins are not aligned, or very faint when old. Lamellae are rather rare, attached to the stem or almost free from it, whitish. The stem is 1.5-5 cm long and 1-2 mm thick, the same size from the base. The surface of the stem is finely powdered or hairy, whitish to. The base of the stem is attached to the substrate with striking rhizomorphs. It has no ring and volva. Whitish flesh. Spore print is white. (Kusuma, 2021).

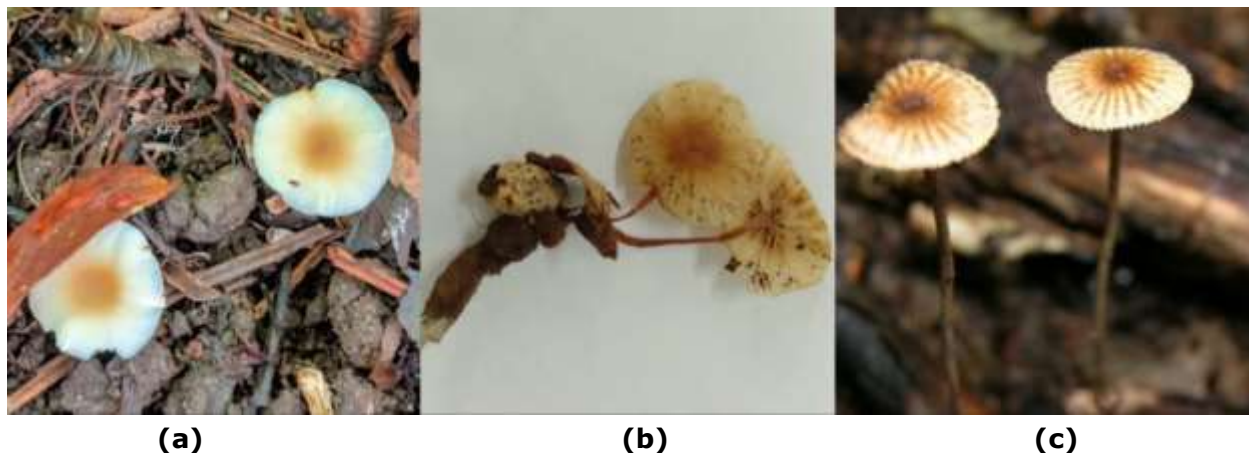


Figure 6. *Baeospora myosura*

a. Observation Image, b. Lab Image, c. Literature Image

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In the last observation, namely *Baeospora myosura*, also known as cone fungus, is a species of fungus that produces agaricoid fruits on decaying spruce and pine cones. The following is the morphology of this species, namely the Cap is convex, measuring 0.5-2 cm, rarely reaching a diameter of 3 cm, and is cream-gray in color. Lamellae are painted and very dense. Type is Hairless. Spore Print is white or cream, and amyloid. Habitat is Grows on decaying spruce and pine cones. Distribution is Found in North America and Europe. Classification is Included in the Marasmiaceae family, genus *Baeospora*, and species *Baeospora myosura*. However, it should be noted that identification of this species requires further microscopic analysis, as several other species in the genus *Strobilurus* also grow on cones and

can look similar. *Strobilurus* species can be distinguished by their larger non-amyloid spores and the hymen-like structure of the pileipellis.

In the observations that have been made, where *Ganoderma lucidum* mushroom, also known as reishi or lingzhi, is a mushroom that has long been used in traditional medicine in Asia. This mushroom has a distinctive body shape, dark brown to black with a shiny surface and sometimes shaped like a fan. *Ganoderma lucidum* is believed to have various health benefits, including improving the immune system and lowering blood sugar levels. *Neofeovolus alveolaris* mushroom is a wood fungus that grows saprophytically in forests. This mushroom is characterized by a hollow honeycomb-like structure on the bottom, which is often found attached to dead wood. Although not commonly used in traditional medicine, research into its potential pharmacological effects is underway. *Stereum hirsutum* mushroom is a mushroom that is usually found on dead wood in forests. This mushroom has a body structure that resembles a kind of rough and hairy wood crust. Although not toxic, *Stereum hirsutum* is rarely used directly by humans, but plays an important role in the natural cycle of organic matter decomposition in forests. *Ramariopsis kunzei* mushroom is a mushroom that has a body shape that resembles a cone-shaped mushroom with a yellow or orange color. This mushroom is commonly found in forests in temperate to tropical areas. Although it has not been widely studied in the context of human use, several studies have shown the potential for active compounds in *Ramariopsis kunzei* as antibacterial and anticancer agents. *Entoloma abortivum* mushroom, also known as "lobster mushroom", is a unique mushroom because it is the result of parasitism on other mushrooms, namely *Russula* or *Lactarius* mushrooms. *Entoloma abortivum* forms a body structure that resembles a lobster clump with a pink to orange color. Although originally parasitic, this mushroom is often consumed by humans and is considered a delicious food with a distinctive aroma and taste. *Baeospora myosura* mushroom is a mushroom that is usually found in forests, growing saprophytically on decaying organic matter such as leaf litter or dead wood. This mushroom has a small, umbrella-shaped fruit body with a white to cream-colored hood. Although not commonly used in traditional medicine, several species of *Baeospora* have been studied for their potential biological activity.

CONCLUSION

Fungi are eukaryotic organisms that lack chlorophyll, grow as hyphae, have cell walls containing chitin, are heterotrophic, absorb nutrients through their cell walls, excrete extracellular enzymes into the environment through spores, and reproduce sexually and asexually. The *Ganoderma lucidum* fungus, also known as reishi or lingzhi, is a fungus that has long been used in traditional medicine in Asia. The *Neofeovolus alveolaris* fungus is a wood fungus that grows saprophytically in forests. The *Stereum hirsutum* fungus is a fungus that is usually found on dead wood in forests. The *Ramariopsis kunzei* fungus is a fungus that has a body shape that resembles a cone-shaped mushroom with a yellow or orange color. The *Entoloma abortivum* fungus, also known as the "lobster mushroom", is a unique fungus because it is the result of parasitism on other fungi, namely *Russula* or *Lactarius* fungi. The fungus *Baeospora myosura* is a fungus that is usually found in forests, growing saprophytically on decaying organic matter such as leaf litter or dead wood.

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