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IDENTIFICATION OF TYPES OF FUNGI GROWING ON EMPTY OIL PALM BUNCHES IN OIL PALM PLANTATION IN TALUN KENAS PATUMBAK VILLAGE FOR MONOGRAPH BOOK MAKING

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Bunches

Abstract

Fungi are organisms whose life is parasitic or saprophytic that acts as a decomposer or decomposer of organic matter. Saprophytic fungi are a type of fungus that gets nutrients from dead organic matter or dead organic matter. The purpose of this study is to determine the diversity of fungal species obtained in empty oil palm bunches in oil palm plantations in Talun Kenas Patumbak and to find out the characteristics of fungi found in empty oil palm bunches and can produce teaching materials in the form of monograph books. Sampling was carried out at one point and used a descriptive exploration method. The results of this study were obtained 8 species of mushrooms, 8 species, namely: Orange Mushroom (*Psilocybe azurescens*), Oncom Mushroom (*Neurospora sitophilia*), Merang Mushroom (*Volvariella volvacea*), Bird's Nest Mushroom (*Cyathus olla*), Ink Cap Mushroom (*Coprinopsis nivea*), Small Umbrella Mushroom (*Mycena zephirus*), Serabut Mushroom (*Lentinus sp*), Keris Mushroom – Kerisan (*Marasmius sp*). This fungus can grow well due to supportive environmental factors. The number of mushrooms found is suspected to be influenced by the temperature of 25°C – 35°C and humidity of 56% in oil palm plantations and the rainy season.

Keywords : Identification, Types _of _Fungi, Oil_Palm_Empty_Bunches

INTRODUCTION

A. Background

Indonesia is one of the countries with a tropical climate that has high humidity so that it is possible for various plants and microorganisms to grow well. One of the microorganisms that can grow well in Indonesia is fungi (Arifin, 2006).

The role of fungi in an ecosystem is very important because it is related to the process of decomposition of complex organic compounds into simpler forms so that they can be used by other organisms (Munir, 2006). In general, fungi can be grouped into macroscopic fungi and microscopic fungi.

According to Proborini (2006), the identification of macroscopic fungi means identification carried out by means of macroscopic morphological observations. The parameters used as a reference for observing the fungus include macroscopic characteristics (shape, color and texture of the fruit body, the presence of rings and volvas, and the shape of the acrophora).

Fungi are organisms whose life is parasitic or saprophytic that acts as a decomposer or decomposer of organic matter. Saprophytic fungi are a type of fungus that gets nutrients from dead organic matter or dead organic matter. They play an important role in the decomposition of organic matter, helping to break down dead organic matter into simpler forms, and releasing nutrients back into the milieu. Some of the characteristics of saprophytic mushrooms include getting nutrients from dead organic matter, playing a role in the nutrient cycle, living in an environment rich in organic matter, diverse in shape and size, playing a role in decomposing organic matter. This series of decomposition processes involves enzymatic activity and nutrient absorption, namely in physical destruction, enzymatic digestion, nutrient absorption, nutrient cycling, increasing soil fertility, and role in the ecosystem.

The decomposition process carried out by fungi involves a group of microscopic fungi known as microorganisms. This fungus has enzymes that are able to break down complex organic compounds into inorganic compounds such as carbon dioxide, water, and minerals. This process is part of the nutrient cycle in the ecosystem.

Regarding the decomposition of organic matter, in the Qur'an in Surah Az-Zumar verse 21 Allah SWT says:

اَلَمْ تَرَ اَنَّ اللّٰهَ اَنْزَلَ مِنَ السَّمَاۤءِ مَاۤءً فَسَلَكَهٗ يَنَابِيْعَ فِى الْاَرْضِ ثُمَّ يُخْرِجُ بِهٖ
زَرْعًا مُّخْتَلِفًا اَلْوَانُهٗ ثُمَّ يَهِيْجُ فَتَرٰىهُ مُصْفَرًّا ثُمَّ يَجْعَلُهٗ حُطَامًا ۗاِنَّ فِيْ ذٰلِكَ لَذِكْرٰى
لِاُولِى الْاَلْبَابِ

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It means: "Do you not notice that Allah actually sent down water from the sky, so He arranged it into water sources on the earth, and then He grew with it and planted plants of various colors, and then it dried up, and you saw it yellowish, and then He made it scattered. Indeed, in such a thing there is indeed a lesson for those who have reason." (QS. Az-Zumar: 21).

The above verse provides a lesson, when Allah created plants of various colors, then they dried up and destroyed or scattered. This has a cause, one of which is fungus, which will also be a benefit for people who know it.

According to Gandjar (2006) fungi are eukaryotic cells that do not have chlorophyll, grow as hyphae, have a cell wall containing chitin, are heterotrophic, absorb nutrients through their cell walls, excrete extracellular enzymes into the environment through spores, and reproduce sexually and asexually.

In the agricultural sector, one of the problems faced is the abundance of waste that cannot be used optimally, such as empty oil palm bunches (TKS). Empty oil palm bunches (TKS) are waste from palm oil processing, will be piled up in the disposal area, and will be transported to the plantation area as fertilizer for oil palm plants. The humid condition of TKS is very possible to become a medium for growing various types of plants, without exception fungi. Fungi are plants that do not have green pigment leaves or chlorophyll. One of the phenomena that occurs in the TKS accumulation site is the large number of fungi that grow on the waste. The mushrooms that grow are generally edible or edible mushrooms.

The study on the use of Oil Palm Empty Bunches as a mushroom growth medium is currently still limited. In fact, mushroom cultivation with TKS media has several advantages including abundant TKS, TKS can be degraded naturally, the mushrooms produced can be consumed to increase people's nutrient intake and the remaining mushroom media waste can be used as organic fertilizer (Ningtyas and Astuti, 2010)

Microbiology is a science that studies organisms that are so small that they cannot be seen with the naked eye but must use the help of a microscope. These very small organisms are referred to as microorganisms, or often called microbes or microscopic bodies. Currently, microbiology is very widely developed in various fields of science, such as agriculture, industry, health, the environment, the food sector, and even the space sector (Waluyo, 2009).

Identification is an activity to recognize the identity or identity of plants. This identification process is related to determining the correct name of the plant and its placement in the classification system appropriately. The research on this mushroom was carried out in an oil palm plantation in Talun Kenas Village, Patumbak District, Deli Serdang Regency. Deli Serdang Regency is an area with fertile oil palm cultivators.

Related to the discussion above, this study needs to be carried out to find out the types of mushrooms that grow on empty bunches of oil palm and provide a better understanding of the diversity of fungi in the oil palm plantation environment. Certain mushrooms that grow in empty bunches of oil palm may have benefits or economic value as foodstuffs, medicines or even as industrial ingredients. The results of this research can also be the basis for further research in various fields such as microbiology, agriculture, or ecology.

In the microbiology course, especially fungal material, students still do not know much about the classification of macroscopic fungi and their role in the oil palm plantation environment. The output of this identification will be a teaching material book in the form of a monograph book which can later be used as a learning material or material in the Microbiology course.

Based on the background mentioned above, the author is interested in conducting a research entitled **"Identification of Types of Fungi Growing on Empty Bunches of Oil Palm in the Garden of Talun Kenas Patumbak Village for the Making of Monograph Books".**

METHODS

A. Location and Time of Research

a. Location

The place or location of this research is in the oil palm plantation area of Talun Kenas Village, Patumbak District, Deli Serdang Regency, North Sumatra Province and in the Biology

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Laboratory of FKIP UISU, the identification process is carried out on the land of the oil palm plantation. The oil palm plantation used as a research site covers an area of 2 hectares.

b. Research Time

This research was carried out from February to June 2024, the research schedule can be seen on the appendix 2 page.

B. Research population and sample

1. Population

The population in this study is all types of fungi that grow on Oil Palm Empty Bunches (TKS) found in several oil palm plantations in Talun Kenas Village, Patumbak District, Deli Serdang Regency, North Sumatra Province.

2. Sample

The research sample was a type of fungus found in empty oil palm bunches (TKS) in the garden of Talun Kenas village, Patumbak District, Deli Serdang Regency, North Sumatra Province.

C. Design and Research Methods

This research method is to use a descriptive exploration method that aims to collect data and information about a certain phenomenon or topic from respondents who are part of the relevant population. The purpose of this descriptive exploration method is to explore a research that is being carried out. Exploration is an exploration of topics or phenomena that are still poorly understood or not widely known. This provides an opportunity for researchers to find new findings that can be the basis for further research. The exploration carried out is to explore, search or collect a sample of the fungus to be studied.

The research conducted was to identify the type of fungus by collecting data on mushrooms growing on empty oil palm bunches carried out in the garden of Talun Kenas Patumbak Village. This sampling was carried out to identify the types of fungi found in empty oil palm bunches, to know the characteristics of these mushrooms.

Identification is an activity to recognize the identity or identity of plants. This identification process is related to determining the correct name of the plant and its placement in the classification system appropriately.

Research design is the activity of collecting, processing, analyzing, and presenting data that is carried out systematically and objectively, to solve a problem or test a hypothesis to develop general principles (Ministry of Education and Culture, 1990: 920). The main purpose of the research design is for the researcher to easily ensure that the conclusions drawn can be justified and that the design of this research achieves an accurate understanding of what topic is being discussed, being able to explain the topic to others. For the design itself in this study, see below.

RESULTS AND DISCUSSION

A. Research Results

Based on the results of exploration from research carried out in the Oil Palm Plantation in Talun Kenas Village, Patumbak District, Deli Serdang Regency, North Sumtera Province, 8 species of macroscopic mushrooms were found in empty oil palm bunches. This fungus can grow well in empty oil palm bunches because it is affected by the moisture conditions of the oil palm plantation and the moisture of the empty bunches that supports the growth of the mushroom. The temperature in oil palm plantations is also supportive for fungal growth.

Mushrooms obtained in oil palm plantations covering an area of 2 hectares there are 8 species that grow in empty bunches of oil palm, including: Orange Mushroom (*Psilocybe azurescens*), Oncom Mushroom (*Neurospora sitophilia*), Merang Mushroom (*Volvariella volvacea*), Bird's Nest Mushroom (*Cyathus olla*), Inkcap Mushroom (*Coprinopsis nivea*), Small Umbrella Mushroom (*Mycena zephirus*), Serabut Mushroom (*Lentinus* sp), Keris Mushroom – Kerisan (*Marasmius* sp).

It is known that the types of macroscopic mushrooms found in oil palm plantations and growing on empty bunches of oil palm are obtained of 8 types. The number of mushrooms found is suspected to be influenced by the temperature of 25ºC – 35ºC and the humidity of 56% in oil palm plantations and the rainy season.

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Table 3. Types of Fungi Found in Empty Bunches of Oil Palm

Sample Code	Mushroom Species Name	Sampling Location	Description of Fungal Morphology			
			Veil	Texture	Color	Diameter
J1	Jamur Orange (*Psilocybe azurescens*) 	Oil Palm Plantation, Talun Kenas Village, Patumbak District, Deli Serdang Regency, North Sumatra Province	The surface of the lid is smooth and slightly sticky or slimy when wet. When dry, the surface becomes shinier and less sticky. Wavy or notched edges of the hood	Hood Texture : The lid *of Psilocybe azurescens* has a smooth texture and is slightly sticky or slimy when wet Stalk Texture (Stipe) : The stalks of this mushroom have a smooth and slightly chewy texture. The stalk is often hollow on the inside, providing a light sensation when held.	Hood: dark brown Stem : White or yellowish, bluish when damaged.	Lid : 1 cm The size of the hood can vary depending on environmental conditions and the growth stage of the fungus. Younger hoods tend to be smaller, while mature hoods can reach a maximum size of about 10 cm. Stalk : 4 cm The stalk is between 4 cm to 20 cm long, thus giving it a relatively slender appearance compared to the size of the hood. This size It depends on the environmental conditions and the stage of fungal growth.

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J2	Jamur Oncom (*Neurospora sitophilia*) 	Oil Palm Plantation, Talun Kenas Village, Patumbak District, Deli Serdang Regency, North Sumatra Province	*Neurospora sitophilia* caps usually do not have a hood like fungi in general, as these fungi are better known as microscopic fungi that form orange mycelium on the substrate.	Mycelium Neurospora sitophilia has a smooth texture and is slightly hairy. This happens because the hyphae that make up the mycelium have a smooth cell wall and produce conidia (asexual spores) that give the impression of being hairy. Mycelium tends to be soft and pliable, which allows these fungi to spread easily on the substrate	Mycelium Neurospores sitophilia are usually bright orange. This color is quite striking and is one of the characteristics that is easy to recognize.	Mycelium Neurospora sitophilia does not have a fixed diameter like a macroscopic fungus with a cap and stem. As a filamentous fungus, its mycelium is made up of very fine and widely spread hyphae tissue. Hyphae (filaments) of this fungus have a very small diameter, usually in the range of 2-10 micrometers. These hyphae combine to form mycelium that spreads across the substrate.
J3	Range (*Volvariella volvacea*) 	Oil Palm Plantation, Talun Kenas Village, Patumbak District, Deli Serdang Regency, North Sumatra Province	In the early stages of growth, the hood of the merang mushroom is convex. As it grows, the hood develops to be flat or slightly concave. Symmetrical hood with edges that can be wavy or notched. The surface of the hood is usually smooth and slightly shiny	The surface of the hood of the merang mushroom is generally smooth and slippery when young.	The hood of the young merang mushroom is usually white or light cream. The color of the hood changes to light brown to dark brown, with the center often darker than the edges	The diameter of the hood is about 2 to 5 cm. The length of the stem can reach about 5-10 cm, depending on the size and maturity of the mushroom.

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J4	Bird's Nest Mushroom (*Cyathus olla*) 	Oil Palm Plantation, Talun Kenas Village, Patumbak District, Deli Serdang Regency, North Sumatra Province	The lid of the Cyathus olla mushroom is shaped like a cup or tube, resembling a bird's nest. On the inside of the cup, there is a peridiola (a small egg-like structure) that resembles a bird's egg in a nest. The outside of the hood is usually hairy or fluffy. The inside is smoother and often shiny.	The outer surface of the hood is rough, hairy or mottled. The inner surface of the cup is smooth and often slippery, especially after exposure to water. Peridiola, an egg-like structure inside a cup, has a hard and smooth texture, aiding in the dispersal of spores when exposed to water droplets.	The color of the outside of the cup can vary from light brown to dark brown or brownish gray. The color of the inside of the cup is usually brighter and can be a shiny silver gray or white. Peridiola is dark in color, generally black or dark brown, and is clearly visible inside the cup.	The diameter of the lid (cup) of the fungus Cyathus olla generally ranges from 0.5 to 1 cm, but can reach up to 2 cm in some specimens. The height of the cup ranges from 0.5 to 1.5 cm.
J5	Jamur Tutup Tinta (*Coprinopsis nivea*) 	Oil Palm Plantation, Talun Kenas Village, Patumbak District, Deli Serdang Regency, North Sumatra Province	The hood *of Coprinopsis nivea* is bell-shaped or oval, then opens to become convex or almost flat as it matures. Hoods often have wavy or notched ends. The hood is covered with fine or granular	The lid of this mushroom has a soft and fragile texture, often easily damaged or torn. The hood of Coprinopsis nivea tends to melt or melt into black ink as it matures, especially its gills.	The hood of Coprinopsis nivea is generally pure white when young. As it grows and ages, the edges of the hood may turn gray or brownish, especially when it begins to melt.	The diameter of the hood of Coprinopsis nivea varies between 3 to 4 cm when fully opened. The length of the stem can reach 5 to 10 cm, depending on the size and maturity of the mushroom.

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			scales that give it a textured appearance.			
J6	Small Umbrella Mushroom (*Mycena zephirus)* 	Oil Palm Plantation, Talun Kenas Village, Patumbak District, Deli Serdang Regency, Sumatra Province North	The hood of Mycena zephirus is shaped like a bell or cone in the early stages, then develops into a convex or flat with a slight protrusion in the center as an adult. The hood often has slightly wavy or grooved edges. The surface of the hood is smooth and may be slightly shiny when wet. In some specimens, the surface appears slightly ribbed or grooved.	The lid of this mushroom has a smooth and thin texture, often semi-transparent when wet. The structure of the hood is fragile and easily damaged, especially at the edges.	The color of the hood varies from white to grayish or light brown, often with a transparent hue. The color can become paler or transparent at the edges, especially when wet.	The diameter of the hood of Mycena zephirus is small, usually ranging from 0.5 to 3 cm. Trunk: The length of the stem can reach 2 to 5 cm, depending on the size and maturity of the mushroom.
J7	Silk fungus (*Lentinus* sp) 	Oil Palm Plantation, Talun Kenas Village, Patumbak District, Deli Serdang Regency, North Sumatra Province	The lid of the Lentinus mushroom is convex or flat when mature, with often wavy or notched edges. The surface of the hood is rough, often scaly or grooved, providing a clear textured look	The hood has a rough and scaly texture, especially on the upper surface.	The color of the hood varies from white to light brown or dark brown. The color may change as the fungus grows and environmental conditions.	The diameter of the *Lentinus* hood varies but generally ranges from 3 to 15 cm when mature. The length of the stem can reach 3 to 8 cm, depending on the

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					The center of the hood may be darker in color compared to the edges.	species and size of the mushroom.
J8	Keris Mushroom – Kerisan (*Marasmius* sp) 	Oil Palm Plantation, Talun Kenas Village, Patumbak District, Deli Serdang Regency, North Sumatra Province	The Marasmius hood is umbrella-shaped or convex at the initial stage, then becomes flat with slightly wavy edges. The surface of the hood is smooth and often shiny when wet. When dry, the surface may look a bit dull.	The lid has a smooth and flexible texture, allowing these mushrooms to dry out and then come back to life after getting moisture.	The color of the hood varies from white, beige, to light brown, depending on the species and environmental conditions. Some species may have a slightly darker color in the center of the hood.	The diameter of the *Marasmius* lid is small, usually around 2 cm. The length of the stem can reach 3 to 10 cm, depending on the species and size of the fungus.

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1. Description of Types of Fungi Found in Empty Bunches of Oil Palm in Talun Kenas Village Garden, Patumbak District

a. Specimen 1

Figure 4.1. Orange Mushroom (*Psilocybe azurescens*)
Source : Personal Documentation

This mushroom has a dark brown hood color and a convex or bell-shaped hood. As it ages, the hood becomes flatter with curved edges. It has a lid diameter of 1 cm and a stem of 4 cm and the surface of the mushroom is smooth, the stem is curved and the surface is smooth with a white to light brown stem color. It lives in the temperature range of 29o C with a pH of 6.5.
Scientific Classification:
Kingdom : Fungi (Jamur)
Division : Basidiomycota (Basidiomikota)
Class : Agaricomycetes (Agaricomycetes)
Order : Agaricales (Agarikal)
Familia : Hymenogastraceae (Himenogastraceae)
Genus : Psilocybe (Psilocybe)
Species : Psilocybe azurescens

b. Specimen 2

Figure 4.2. Oncom fungus (*Neurospora sitophilia*)
Source : Personal Documentation

This fungus has orange colonies, mycelium (all hyphae) consists of hyphae that are fine and shaped like threads, which grow and spread on the surface of the substrate of empty bunches of oil palm, This fungus grows on the substrate in the form of empty bunches of oil palm which is waste from the palm oil industry. This substrate contains organic fibers and other nutrient residues necessary for fungal growth. Oncom fungus (*Neurospora sitophila*) grows optimally at an ambient temperature of 25-30°C with a pH of 7 and high humidity. This condition favors the development of mycelium and spore production.

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Scientific Classification:
Kingdom : Fungi (Jamur)
Division : Ascomycota (Askomikota)
Class : Sordariomycetes (Sordariomiset)
Order : Deaf (Deaf)
Familia : Sordariaceae (Sordariaceae)
Genus : Neurospora (Neurospora)
Species : *Neurospora sitophila*

c. Specimen 3

Figure 4.3. Merang Mushroom (*Volvariella volvacea*)
Source : Personal Documentation

This mushroom has a grayish-white or light brown cap color. It has a round shape with a shape that resembles a bell when ripe. The diameter of the lid is 2 cm. has a slippery surface and sometimes a little slimy when wet The color of the gills is white and tightly arranged. These gills are attached to the stalk and have a close distance and a stalk length of 4 cm. Gills in mushrooms are thin structures in the form of blades or plates located under the lid (pileus) of the mushroom. These gills are the place where spores are produced and released. It is cylindrical in shape with an enlarged base and covered by a white layer called a volva that has a white to brownish color at the base. Grows optimally at a temperature of 25o C – 35 ºC and pH 7.
Scientific Classification:
Kingdom : Fungi (Jamur)
Divided : Basidiomycota (Basidiomikota)
Class : Agaricomycetes (Agaricomycetes)
Order : Agaricales (Agarikal)
Familia : Pluteaceae (Plutaceae)
Genus : Volvariella (Volvariella)
Species : *Volvariella volvaca*

d. Specimen 4

Figure 4.4. Bird's Nest Mushroom (Cyathus olla)
Source : Personal Documentation

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This mushroom has a grayish-brown to blackish hood color and is shaped like a small cup or bird's nest. These nests are usually about 1-2 cm in diameter. The structure of the fungus Bird's nest consists of two main parts, namely the cup (peridium) as a protective structure that houses the spores and the thread-shaped structure (funiculus) which is attached to the base of the nest and serves to attach to the substrate and help in the spread of spores. Before the bird's nest is fully developed, they initially appear as small eggs attached to a seed-like substrate, and have a white or blackish color. Grows optimally at a temperature of 25o C – 30O C and pH 5.5

Scientific Classification:
Kingdom : Fungi (Jamur)
Divided : Basidiomycota (Basidiomikota)
Class : Agaricomycetes (Agaricomycetes)
Order : Agaricales (Agarikal)
Familia : Nidulariaceae (Nidulariaceae)
Genus : Catus (Cathus)
Species : *Cyathus olla*

e. Specimen 5

Figure 4.5. Ink Cap Mushroom (*Coprinopsis nivea*)
Source : Personal Documentation

This fungus has a white lid (pileus) color, but can turn gray has an initial semi-spherical shape that then elongates and eventually widens, often bell-shaped as it matures. It has a size with a hood of 3 cm. The surface is smooth and smooth, often with slightly curved edges inwards. The diameter of the stalk is 6 cm and cylindrical and often fragile. It is white with visible vertical fibers and can turn brown at the top. It grows optimally at a temperature of 25o C – 35 ° C and pH 7 and humidity of 56%.
Scientific Classification:
Kingdom : Fungi (Jamur)
Divided : Basidiomycota (Basidiomikota)
Class : Agaricomycetes (Agaricomycetes)
Order : Agaricales (Agarikal)
Familia : Psathyrellaceae (Psathyrellaceae)
Genus : Coprinopsis (Coprinopsis)
Species : *Coprinopsis nivea*

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f. Specimen 6

Figure 4.6. Small Umbrella Mushroom (*Mycena zephirus)*
Source : Personal Documentation

This mushroom has a brownish-white hood color, its initial shape is half spherical which then elongates and finally widens. It usually has a wider hood in the middle and tapering at the edges. It has a hood diameter of 3 cm. The surface is sometimes slimy or slippery when wet, and often has a wrinkled texture on the edges. The stalk (Stipe) has a length of 4 cm. cylindrical or slightly rounded, often thinner at the top. It is white or grayish, sometimes with a light brown shade on the top. Grows optimally at a temperature of 25o C – 35 ° C and pH 7.

Scientific Classification:

Kingdom	: Fungi (Jamur)
Divided	: Basidiomycota (Basidiomikota)
Class	: Agaricomycetes (Agaricomycetes)
Order	: Agaricales (Agarikal)
Familia	: Mycenaceae (Mycenaceae)
Genus	: Mycena (Mycena)
Species	: *Mycena zephirus*

g. Specimen 7

Figure 4.7. Silk fungus (*Lentinus* sp)
Source : Personal Documentation

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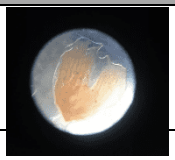
This mushroom has a white hood color, has the shape of a semi-spherical hood which then elongates and becomes convex or flat when mature. The size of the hood diameter is 3 cm. It has a wrinkled, sometimes slimy surface, especially when wet. The size on the stalk is 3 cm long and cylindrical or slightly rounded, often thinner at the top. White to grayish in color, sometimes with brown spots. Grows optimally at a temperature of 25o C – 35 ° C and pH 7.
Scientific Classification:
Kingdom : Fungi (Jamur)
Division : Basidiomycota (Basidiomikota)
Class : Agaricomycetes (Agaricomycetes)
Order : Polyporales (Poliporal)
Familia : Polyporaceae (Poliporaceae)
Genus : Lentinus (Lentinus)

h. Specimen 8

Figure 4.8. Keris Mushroom – Kerisan (*Marasmius* sp)
Source : Personal Documentation

This mushroom has a brownish-white hood color, has a convex or flat hood shape. The size of the hood diameter is 2 cm. It has a wrinkled or rough surface, sometimes slimy especially when wet. The size of the stalk is 3 cm long and cylindrical or slightly rounded, White in color, sometimes with brown spots. Grows optimally at a temperature of 25o C – 35 ° C and pH 7.
Scientific Classification:
Kingdom : Fungi (Jamur)
Division : Basidiomycota (Basidiomikota)
Class : Agaricomycetes (Agaricomycetes)
Order : Agaricales (Agarikal)
Familia : Marasmiaceae (Marasmiaceae)
Genus : Marasmius (Marasmius)

Table 4. Observations under a microscope

It	Mushroom Species Name	Observation Results	Information
1	Jamur Orange (*Psilocybe azurescens*)		The spores are brown in color, measuring 13-15 micrometers in length and 7-8 micrometers in width. The spore walls are smooth, hyphae in size range from 2 to 8 micrometers for their width.

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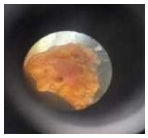
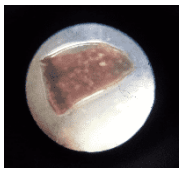
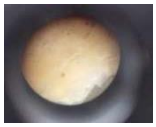
		Magnification 5.0/10	
2	Jamur Oncom (*Neurospora sitophilia*)	 Magnification 5.0/10	The spores are orange, measuring 10 – 12 micrometers long and 10 – 15 micrometers wide. The walls of fine, hyphae in oncom fungi (*Neurospora sitophilia*) form a dense tissue.
3	Range (*Volvariella volvacea*)	 Magnification 5.0/10	The spores are clear white, measuring around 6-8 micrometers in length and 4-5 micrometers in width. The spore walls are smooth, hyphae in size range from 3-10 micrometers.
4	Bird's Nest Mushroom (*Cyathus olla*)	  Magnification 5.0/10	The spores are brown in color, measuring 15-20 micrometers in length and 10-15 micrometers in width. The size of hyphae ranges from 3-8 micrometers.
5	Jamur Tutup Tinta (*Coprinopsis nivea*)	 Magnification 5.0/10	The spores are black, measuring 10-12 micrometers in length and 6-8 micrometers in width. The spore wall is smooth, The black part is the mature spore, according to the characteristics of the spores *of Coprinopsis nivea* which tend to be dark in color
6	Small Umbrella Mushroom (*Mycena zephirus)*	 Magnification 5.0/10	The spores are clear brown in color, measuring 7-10 micrometers long and 3-5 micrometers wide. The spore walls are fine, hyphae in size range from 2-5 micrometers.
7	Silk fungus (*Lentinus* sp)		The spores are clear in color, measuring 5-7 micrometers long and 2-3 micrometers wide. The spore walls are smooth, hyphae in size range from 3-10 micrometers.

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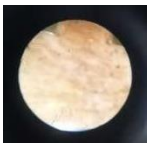
		Magnification 5.0/10	
8	Keris Mushroom – Kerisan (*Marasmius* sp)	 Magnification 5.0/10	The spores are clear brown in color, measuring 7-12 micrometers long and 3-5 micrometers wide. The spore wall is smooth, hyphae in size range from 2-8 micrometers.

Table 5. Environmental Factors in Oil Palm Plantations in Talun Kenas Village Patumbak District, Deli Serdang Regency

Environmental Factors	Measurement Results
Temperature	25o C - 35 ° C
Moisture	56 %
pH substrate (Empty bunches)	5,5 - 7

This environmental factor refers to all fungi obtained in oil palm plantations in Des Talun Kenas, Patumbak District, Deli Serdang Regency.

B. Discussion

In the research that has been carried out, empty oil palm bunches were chosen as an organic medium for mushroom growth because of the nutrient content contained in them and the moisture that supports the growth of mushroom. Environmental factors such as temperature, humidity, and pH play a significant role in determining the type of fungus that grows. The observation results showed that at a temperature of around 25 – 35o C, humidity 56% and substrate pH 5.5 -7.

From the results of this study, the mushrooms obtained were 8 species that grew in empty bunches of oil palm, 7 macroscopic mushrooms and 1 microscopic mushroom including: Orange Mushroom (*Psilocybe azurescens*), Oncom Mushroom (*Neurospora sitophilia*), Merang Mushroom (*Volvariella volvacea*), Bird's Nest Mushroom (*Cyathus olla*), Inkcap Mushroom (*Coprinopsis nivea*), Small Umbrella Mushroom (*Mycena zephirus*), Silk Mushroom (*Lentinus* sp), Keris Mushroom – Kerisan (*Marasmius* sp), and the dominant types of mushrooms are Inkcap Mushroom (*Coprinopsis nivea*) and Merang Mushroom (*Volvariella volvacea*). The discovery of this fungus is consistent with previous research which also identified Merang Mushroom (*Volvariella volvacea*) as the dominant fungus on empty bunches. The study conducted by Wardani et al. (2016) made similar findings strengthen the validity of the results of this study, in this study, it was found that the Ink Cap Mushroom (*Coprinopsis nivea*) is the dominant type of fungus at the research site as well as the merang mushroom. The study conducted by Hanifa, et., al (2022) makes similar findings strengthen the validity of the results of this study. Each mushroom has different characteristics, including:

1. Jamur Orange (*Psilocybe azurescens*)
   Psilocybe azurescens is a type of fungus in the genus Psilocybe that is well-known for its content of psychoactive compounds, such as psilocybin, psilocin, and baeocystin. This mushroom has a dark brown color and a convex

or bell-shaped hood. It has a lid diameter of 1 cm and a stem of 4 cm and the surface of the mushroom is smooth, the stem is curved and the surface is smooth with a white to light brown stem color. It lives in the temperature range of 29o C with a pH of 6.5.

2. Jamur Oncom (*Neurospora sitophilia*),
   This fungus has an orange color, mycelium consists of fine hyphae and shaped like threads, which grow and spread on the surface of the substrate of empty bunches of oil palm, grow optimally at temperatures around 25-30°C with a pH of 7 and high humidity. This condition favors the development of mycelium and spore production.
3. Range (*Volvariella volvacea*)
   Merang mushroom is a type of compost mushroom that is widely found living on the remains of plant material or living things that have undergone weathering (Sunarni et al, 2013). Merang mushrooms can grow easily on waste, especially agricultural waste. In a 2019 study, Rudi found that the use of TKS as a planting medium can increase fungal productivity. TKS is able to maintain the moisture necessary for fungal growth, as well as provide sufficient nutrients. Research shows that mushrooms grown in TKS have good nutritional content, such as protein and fiber.
   This fungus has a characteristic of grayish-white or light brown color. The diameter of the lid is 2 cm. has a slippery surface and is sometimes a little slimy when wet. The length of the stalk is 4 cm. It is cylindrical in shape with an enlarged base and covered by a white layer called a volva that has a white to brownish color at the base. Grows optimally at a temperature of 25o C – 35 ^{o} C and pH 7.
4. Bird's Nest Mushroom (*Cyathus olla*)
   Bird's nest mushroom (*Cyathus olla*) is a type of fungus that is famous for its unique shape resembling a bird's nest with eggs inside. Bird's nest mushroom is a type of basidiomycota fungus that has a unique shape resembling a cup or bird's nest with a small "egg" inside known as peridiola (Suharjono, 2018). His research shows that bird's nest mushrooms can grow well on TKS media, with a TKS structure that helps maintain the moisture that the fungus needs for optimal growth.
   This fungus has a grayish-brown to blackish color and is shaped like a small cup or bird's nest. These nests are usually about 1-2 cm in diameter. Before the bird's nest is fully developed, they initially appear as small eggs attached to a seed-like substrate, and have a white or blackish color. This characteristic, in agreement with the thinking of experts who state that bird's nest mushrooms have a cup-like shape with a diameter of about 1-2 cm. Inside the cup is a small black or brown "egg" called peridiola. This unique shape resembles a bird's nest containing eggs (Suharjono, 2018). Arora et all., (2015) explained that Cyathus olla has a distinctive cup shape, with hard and rigid walls. The diameter of the cup is usually between 1-2 cm, and the height is about 1-1.5 cm. The peridiola inside the cup is round and black or dark brown in color.
5. Jamur Tutup Tinta *(Coprinopsis nivea*)
   According to a 2017 study by Nurjanah, inkcap mold is often found in humid places and close to decaying organic matter, such as weathered wood or wet leaves. This mushroom cultivation can be done by paying attention to the right environmental conditions
   According to Suharjono (mycologist), ink cap mushrooms belong to the group of saprophytic mushrooms that grow on decaying organic matter. Suharjono explained that this mushroom has a characteristic in the form of a lid that is initially white and then turns black like ink when cooked.
   This fungus has a white hood color, but can turn gray has an initial

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semispherical shape that then elongates and eventually widens, often bell-shaped as it matures. It has a size with a hood of 3 cm. The surface is smooth and smooth, often with slightly curved edges inwards. The diameter of the stalk is 6 cm and cylindrical and often fragile. It is white with visible vertical fibers and can turn brown at the top. It grows optimally at a temperature of 25o C – 35o C with a pH of 7 and a humidity of 56%.

6. Small Umbrella Mushroom (*Mycena zephirus*)
   This mushroom has a brownish-white color, its initial shape is half spherical which then elongates and finally widens. It usually has a wider hood in the middle and tapering at the edges. It has a hood diameter of 3 cm. The surface is sometimes slimy or slippery when wet, and often has a wrinkled texture on the edges. The stalk (Stipe) has a length of 4 cm. cylindrical or slightly rounded, often thinner at the top. It is white or grayish, sometimes with a light brown shade on the top. Grows optimally at a temperature of 25o C – 35o C and pH 7.
7. Silk fungus (*Lentinus* sp)
   This mushroom has a white color, has the shape of a semi-spherical hood which then elongates and becomes convex or flat as it matures. The size of the hood diameter is 3 cm. It has a wrinkled, sometimes slimy surface, especially when wet. The size on the stalk is 3 cm long and cylindrical or slightly rounded, often thinner at the top. White to grayish in color, sometimes with brown spots. Grows optimally at a temperature of 25o C – 35o C and pH 7.
8. Keris Mushroom – Kerisan *(Marasmius* sp)
   This mushroom has a brownish-white color, has a convex or flat hood shape. The size of the hood diameter is 2 cm. It has a wrinkled or rough surface, sometimes slimy especially when wet. The size of the stalk is 3 cm long and cylindrical or slightly rounded, White in color, sometimes with brown spots. Grows optimally at a temperature of 25o C – 35o C and pH 7.

The morphological characteristics of macroscopic fungi include differences in the shape of the hood, the color of the hood, the surface of the hood, attachment, and habitat.

Based on the results of the research that has been carried out, it can be concluded that the high and low diversity of fungal species in a certain location is influenced by abiotic factors that affect the spread and growth of fungi (Priskila et al, 2018). Recording primary data in the form of temperature, air humidity, light intensity, and substrate pH is very important because macroscopic fungal growth is greatly influenced by these environmental factors. Arif et al. (2007) stated that the optimum temperature for mushroom growth is 25-35 degrees Celsius, then Sari et al. (2015) states that a good light spectrum for mushrooms is about 380-720 lux, then 48 Christita et al. (2017) stated that the fungus can grow well at a humidity of around 60%-80%.

From this study, many types of fungi from the Basidiomycota division were found. Almost 95% of the fungi found are in the Basidiomycota division. Basidiomycota is the main phylum in the Fungi kingdom and, with more than 31,000 species described today, Basidiomycota is second in number of species after Ascomycota (He et al., 2019).

Basidiomycota fungi have an important role in the human ecosystem and economy, both as decomposers, plant pathogens, and food and medicine sources. Research continues to gain a deeper understanding of their diversity and function in the environment.

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