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## The Influence of Environmental Conditions on Ecological Farming and Production of Oyster Mushroom (*Pleurotusostreatus*) in Kerinci, Indonesia

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### **Abstract:**

*The fungus is a single-celled eukaryotic organism and has no chlorophyll. Fungi is included into the organisms that obtain food from other organisms called heterotrophs, and live by decomposing organic material in food from around the neighborhood. The fungus can only grow in an environment with temperature, humidity appropriate, then pH less than 7 and an oxygenated environment although low oxygen. types of fungi that can be consumed by humans and is oyster mushrooms (*Pleurotusostreatus*). This research is a field research that is descriptive qualitative. The technique used in collecting data is through in-depth interviews, participant observation, field notes, and open questions. The initial phase of the study is to prepare the mushroom house, prepare baglog, preparation of planting medium, and enter the seed oyster mushrooms of 15-20 seeds. After baglog stacked on shelves, the first harvesting period lasts 40 days, the next harvest can be done every 7-10 days. The research times needed from preparation until the first harvest is approximately 3 months. The condition of ecology influences the growth of this oyster mushrooms are temperature, ph, water, and medium used. This fungus has good benefits for health. For those who consume this fungus can prevent anemia, immune boosting, against bad cholesterol, bacteria, and also can prevent tumor and cancer. In general, the fungus is cultivated by planting media of sterilized remains of timber which is then packaged in a white plastic bag. If specified, this fungus has a shape resembling a clam shell lid handle with the middle hollowed and white to cream. This fungus is very popular with the public, so no wonder a lot of oyster mushrooms made this as an attempt promising and profitable products.*

**Keywords:** Ecology, Aquaculture, Production of oyster mushrooms (*Pleurotusostreatus*)

### **1. Introductions**

Kerinci is a mountainous area located along Bukit Barisan stretches from Mount Kerinci up to Gunung Raya. Location area at an altitude of 3805 m, trophis temperate and cool weather with average temperatures ranging from 220C. Characters territory bumpy and hilly enclave formed a very broad and sebahagian covered with dense natural forests. Most of the area (81.22%) is located at an altitude above 1000 m above sea level, while the region with elevations between 500 -1000 m above sea level covering 72 246 ha (17,20%) and the area under 500 m asl only 6636 hectares (1.58%) which is in District Gunung Raya and BatangMerangin.

Generally, Kerinci Regency can be grouped into several units of morphology, namely the plains, hills, and mountains. From the morphology and disseminate the views of rock, the orientation towards the north will be found morphological higherthat is morphology hills of waves up to the mountains, followed by the variety and types of rocks that exist, while the orientation towards the south to be encountered morphology lowlands and rock are relatively similar. Tofografi conditions and morphology thus, causing Kerinci district has great potential resources and natural beauty is amazing (BPS Statistics of Kerinci: 2016).

Cultivation area is a region defined main functions to be cultivated on the basis of the condition or the potential of natural resources, human resources and man-made resources as well as an area outside the protected areas are physical conditions and the potential for natural resources can and should be utilized optimally for the benefit production or business activities as well as the fulfillment of human needs. Therefore, the establishment of regional emphasis on efforts to provide and support the development of aquaculture activities in accordance with the existing potential with consideration to the use of efficient and effective. DesaTanjungPauhHilir is a residential area that still has the original natural condition, so it would make the area fished and do a small business, one of which is agriculture in the cultivation of oyster mushroom (*Pleurotussp*)

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Ecology is the study of living organisms in the household or the study of the whole pattern of interrelationships between living things with each other and with other components in the vicinity. Literally, ecological roots in two Greek words that Oikos and Logos. Oikos means a home or a place to live. Then Logos is a science. So, it could be concluded that the notion of ecology is simply the study of living things in the house, or it could also be said that ecology is the science of the households living creatures. Ecology is often misinterpreted because it is equated with the environment. Ecology is dealing with the environment, but not the same as environmental studies or environmental science. It combines ecological environmental science, geology, economics, sociology and science politih. Ecology itself is a science, deals with experiments in the field and laboratory, perform a mathematical analysis of the data and statistics, testing hypotheses and drawing conclusions (Chiras, 1991). While the term ecology was first put forward by zoologist named Ernest Haeckel German nation (1969). Most scientists also agree that the notion of ecology is nothing but a science that studies the relationship between organisms and their environment. More specifically, the notion of ecology for some people is a science that attempts to understand and study the relationship between animals, plants, humans and the environment, how they live, where they live, it is also why they are in that environment.

Ecological terms are indeed diverse, but if observed, we can draw the conclusion that this is a core dati science of abiotic and biotic. Abiotok is everything that is not alive while biotic refers to organisms living creatures (Putrawan, 2014). Furthermore, in detail mentioned that ecology is actually a learning area where the subject of study is also the structure of the ecosystem function or nature including human beings in it. While the environmental carrying capacity of that growth to continue so-called capacity or carrying capacity or "carrying capacity". Carrying capacity can be described as "The maximum number of individuals that can be supported in a given habitat" (Odum, 2005).

Mushroom is a single-celled eukaryotic organism and has no chlorophyll. Mildew or fungi into the organisms that obtain food from other organisms or so-called heterotrophic and he lived by decomposing organic material in foods from around the neighborhood. In general, the fungus can live through three ways: saprophyte, parasite and mutualism. Saprophyte is a way of life to break down organic waste into inorganic. While the parasite is a way of life by obtaining organic material from its host (lift), and mutualisme which is living with other organisms in order to win-win.

Mushrooms can only grow in an environment with temperature, humidity appropriate, then a pH less than 7 and oxygenated environment although low oxygen. 70,000 kinds of fungi that exist in the world, there are some fungi that can be consumed and also dangerous for consumption. 35 of them have been cultivated, and only 8 of 35 commercialized for industrial scale.

In a simple sense of mushrooms is a simple plant, core, lacking chlorophyll, berspora, a cell or a cell in the form of threads (misellia) branching. Primordia are small clumps consisting of a collection misellia which will develop into fruiting bodies. Developing primordia and young fruit visible on the body parts of the body such as the hood and the fruit stalk is not the middle hood (Maulana 2011). Oyster mushroom (*Pleurotusostreatus*) is an edible mushroom from the group Basidiomycota and including grade Homobasidiomycetes with the general characteristics of the fruit body is white to cream and a hood-like semicircular oyster shells with the middle slightly concave. The oyster mushroom is still a relative with *Pleurotuseryngii* and often known as the King Oyster Mushroom. Based on research SunanPongsamart, biochemistry, Faculty of Pharmaceutical University Chulangkorn, oyster mushrooms contain: protein, water, calories, carbohydrates, and the rest of the fibers of iron, calcium, vitamin B1, vitamin B2, and vitamin C

In the taxonomy of oyster mushrooms can be classified as follows:

- Super Kingdom : Eukaryota
- Kingdom : Myceteeae (fungi)
- Divisio : Amastigomycota
- Subdivisio : Basidiomycotae
- Kelas : Basidiomycetes
- Ordo : Agaricales
- Familia : Agaricaceae
- Genus : *Pleurotus*
- Spesies : *Pleurotus sp*

Morphologically, the oyster mushroom (*Pleurotus* sp) is an edible mushroom with a hood similar to oyster shells with the middle slightly concave and white to beige. Hood surface slippery oyster mushrooms, a bit greasy when moist and wavy edges. Diameter reaches 3-20 cm. Rod-shaped spores measuring 8-11 x 3-4  $\mu$ m. Mycelium is white and can grow rapidly (Wiardani, 2010: 5).

Mushrooms have diverse benefits in everyday life among other things as food and as materials for drugs that can treat various chronic diseases. As food, oyster mushrooms can be consumed as a mixture of vegetable soup, mushroom krispi and mushroom chips, and can be consumed as well as a treatment. Mushrooms have many benefits for human health, plant-based protein that contains no cholesterol can be used as drugs to prevent the onset of high blood pressure and heart attacks, and can prevent diabetes and reduce weight or obese. High folic acid content that can cure anemia and anti-tumor drugs, can also be used to prevent and control malnutrition and the treatment of iron deficiency. The oyster mushroom is a fungus that can be encountered in the wild, mainly in mountainous or cool temperate regions. Oyster mushrooms usually grow with bodies piled in the trunk of a tree that has been decaying or trees that have been felled. Therefore, if we cultivate oyster mushrooms should mimic their natural habitat so that the quality is good. Generally, the medium used for the cultivation of oyster mushrooms is sawdust. The medium used for the growth of oyster mushroom is a hard straw, because straw has special characteristics needed by the growth of oyster mushrooms. Straw is also durable hard not to fast decaying.

Naturally, the oyster mushroom (*Pleurotusostreatus*) is found in the wild in the mountain forests of the area cool. Kerinci regency natural conditions especially downstream TanjungPauh village is very suitable to develop the cultivation of oyster mushrooms. Oyster mushrooms do not require a lot of sunlight, in a sheltered spot fungal mycelium will grow faster than in a bright place with abundant sunshine. Misellium growth will grow rapidly in the dark / no light. During the mycelium growth, oyster mushrooms should be placed in a dark room, but during the growth of fruit bodies require the stimulation rays. At the same place, there is absolutely no light fruit bodies cannot grow, therefore, during the formation of fruit bodies on the surface of the media must begin to get light irradiation intensity 60-70%.

There are several types of fungi that can be consumed by humans and can be added value if we grow, among types of fungi that began many cultivated oyster mushrooms. This fungus has the scientific name *Pleurotusostreatus*. This fungus has good benefits for health. For those who consume these mushrooms it can prevent anemia, immune-boosting, fight bad cholesterol, bacteria, and also can prevent the occurrence of tumors and cancer. In general, these fungi cultivated by planting medium sterilized sawdust and then packaged in a white plastic bag. If specified, this fungus has a shape resembling a clam-shell hood stalk with a concave central part and white to cream. This fungus is very popular with the public so it is no wonder many oyster mushrooms make this a promising venture profitable and processed product. It is no less important in the production of oyster mushrooms are favorable ecological conditions, including weather factors, moisture, pH, water content and the medium used. Environmental ecological conditions Kerinci district is very supportive to develop the cultivation of oyster mushrooms. Was instrumental importance of an environmental ecological conditions affecting the production and cultivation of oyster mushrooms, the authors are interested in lifting the title "The Effect of Ecological Conditions on Raising and Production of Oyster Mushroom(*Pleurotusostreatus*) in Tanjung Pauh Hilir Kerinci.

## 2. Research Methods

### 2.1. The type of Research

This research is a field research is descriptive qualitative research that is describe phenomena that exist to find patterns of relationship that is interactive, found the new theory, describes the complex realities and gain an understanding of meaning. The focus of research attention to patterns that are interconnected between the variables that had not been discovered. The design is of a general nature, and can be changed in accordance with the existing conditions in the field. In this study, the researchers involved as a participant observer to learn more about the process of research undertaken.

### 2.2. Place and Time Research

This research was conducted in the village of TanjungPauh downstream, in January to April 2016.

### 2.3. The Procedure Research

1. Prepare Kumbung, Kumbung or mushroom house is a place to care baglog and grow fungus. Kumbung usually in the form of a building, which is filled shelves to put baglog. The building must have the ability to keep the temperature and humidity. Kumbung usually made of bamboo or wood. So, that the water used to flush the fungus can be absorbed. In the mushroom house is equipped with a rack in the form of lattice graded. The shelf serves to organize baglog. Framework can rack made of bamboo or wood. Shelves lined laid. Between racks to each other are separated by a hallway for treatment. The size of the height of the space between the shelves should not be less than 40 cm, the rack can be made 2-3 level. Rack width of 40 cm and a length of 1 meter each side shelf. Each vertebra shelves this size can contain 70-80 baglog. Purposes adjustable shelves with baglog amount to be cultivated

2. Preparing Baglog, Baglog a place to put the planting medium oyster mushroom seeds. Baglog main ingredient is sawdust, because the oyster mushrooms including wood mushrooms. Baglog wrapped in plastic cylindrical, wherein one end is a hole. In the hole oyster mushrooms, will grow sticking out. There are two ways baglog arrange a rack, which is placed vertically where baglog hole facing upwards. And horizontally, baglog hole facing sideways. Both ways have their advantages. Baglog arranged horizontally safer from the water spray. If excessive watering, the water will not get into baglog. In addition, to make harvesting easier. However, the preparation of a more horizontal to make space.

3. Preparation Planting Oyster Mushroom (*Pleurotusastreatus*), Before planting, things oyster mushroom cultivation support should be readily available, including home kumbungbaglog, baglog shelves, oyster mushroom seeds and cultivation equipment. Equipment oyster mushroom cultivation is quite simple, affordable prices, we can capitalize even kitchen appliances. Before being used as a medium usually sebuk timber to be composted first in order to break down into simpler compounds that are easily digested by the fungus.

4. The process of composting sawdust, carried out by means of closed using a plastic or a tarp for 1-2 days. Composting is going well if the temperature rise to about 50 degrees C. Alternative materials that can be used to replace the sawdust is a wide variety of grounds, such as coffee grounds, paper pulp, bagasse and dregs of tea. However, based on experience and interview researchers, a good medium to use fixed sawdust.

5. Media Investment, Media in the form of bran / corn bran and flour serve as a substrate and a producer of calories for mold growth. The use of bran or cornmeal usually provide the same quality of the fungus because the nutrient content of the two materials are similar. However, the use of bran is considered more efficient because it can cut costs and tend to be easy because many used as

fodder. Limestone (CaCO<sub>3</sub>) serves as a source of minerals and pH regulator. Ca content in the lime can neutralize the acid released by the fungus that can cause the pH of the media to be low.

6. Containers, containers used to put the media mix is heat resistant clear plastic bag (PE 0,002) measuring 20 cm x 30 cm. The composition of seedling media is sawdust 100 kg; 10 kg of maize flour; fine bran or bran 10 kg; 0.5 kg of compost; limestone (CaCO<sub>3</sub>) 0.5 kg; and 50-60% water. There are two things to consider before planting seedlings mushroom, namely sterilization and sterilization material baglog

7. Harvesting Oyster Mushroom, baglog when used surface has been completely covered with mycelium, usually within 1-2 weeks of opening the lid baglog, mold will grow and can be harvested. Baglog mushrooms can be harvested 5-8 times, when good maintenance. Baglog weighs about 1 kg will produce mushrooms as much as 0.7-0.8 kg. After that baglog discarded or can be used as compost material. Harvesting is done against fungi that have bloomed and enlarged. Precisely when the edges have been seen tapered. However, the hood has not broken the color is white. When the harvest through a half-day only, the color becomes slightly browned and the hood smashed. In such a case, the fungus will quickly wither and not durable. The distance to the next harvest the first crop of around 2-3 weeks.

#### 2.4. Engineering Data Collection

Engineering is done in collecting data is through in-depth interviews, participant observation, field notes, and an open question. Qualitative research makes researchers themselves as a research instrument.

#### 2.5. Engineering Data Analysis

In qualitative research data is inductive and ultimately generate sustainable destination notions, concepts and development of a new theory, the nature of the data to be analyzed is descriptive by using relevant theories

### 3. Results and Discussion

#### 3.1. The Ecological Factors Affecting the Growth of Oyster Mushroom (*Pleurotusostreatus*)

Environment is a condition that will determine the growth of a plant, as well as the oyster mushroom (*Pleurotusostreatus*) is. Humid conditions are needed to maintain the stability of the room should have a temperature range between 18-25 0 C. Ecology is the study of the interrelationships between the living and the one with the environment in which it is located. The main role is influenced by man as a determinant of policy. Ecological state of the environment determines the success of the growth of oyster mushrooms, because the first part of which will relate to and interact directly is the environment. Therefore, good environmental conditions will give good results.

Ecological environment largely determines the growth of oyster mushrooms, which are:

ecological factors	The process is carried out
Cleanliness Kumbung	Clean the mushroom house and shelves for storing baglog of dirt. • Do liming and spraying with a fungicide on the inside kumbung. Let stand for 2 days, before baglog put into kumbung. • After missing the smell of drugs, enter baglog that are ready to be grown. The entire surface is covered with white fibers.
Temperature and Sterilization Material	• Sterilization ingredients, before mixed with other media, sawdust and bran sterilized prior to use the oven for 6-8 hours at a temperature of 100 0 C. • sterilization addition to the reduced-causing microorganisms kontaminsasi also reduces the water content in the wood sawdust. Thus, the media becomes drier. Both materials are then mixed and given a 50-60% water until the dough becomes smooth and can be clenched. • Sterilization baglog, is done by inserting baglog into the autoclave or heater / steamer with a temperature of 1210 C for 15 minutes. • After the cooling process, then planting seedlings mushroom.
Light	The incoming light into the space kumbung placement should be avoided from exposure to direct sunlight, aim to prevent excessive evaporation process of the humidity of the room.
Water	Water works in the absorption of nutrients by the mycelium. Water used to clean water to reduce the risk of contamination of other organisms in the media. The water used is preferably rainwater, because if the use of tap water usually has mixed chlorine and can affect the growth of oyster mushrooms.
Growing media	In the media into the plastic, the media must be really dense to be a lot of mushrooms produced. So make sure that the ingredients have been pretty solid in plastic by means of pressing the dough until completely solid, then the top ring mounted PVC bag and then a plastic bag closed with cotton stoppers and secured with rubber.
Soil moisture	Soil place put kumbung need to be kept moist. This is intended to keep the room temperature. Conditions were damp and wet ground will be faster menunbuhkan oyster mushroom ( <i>Pleurotusostreatus</i> ). Steps taken is the land must always be moistened, by watering every time, especially if the weather conditions in hot conditions.

Table 1

### 3.2. The Work Done in the Cultivation of Oyster Mushroom (*Pleurotusostreatus*) So that the Production Yield Increase

The effort made	stages
Prepared	<ul style="list-style-type: none"> <li>→ Before baglog structured, open the first ring and cover paper baglog. Then let stand approximately 5 days. When the floor is made of soil do the watering to add moisture.</li> <li>→ After that, cut the tip of baglog to provide growth space wider. Let stand for 3 days do not always watered. Watering enough on the floor alone.</li> <li>→ Do watering with a sprayer. Watering should form a mist and not water droplets. The more perfect carburation the better for the growth of the oyster mushroom .. The frequency of watering 2-3 times a day, depending on temperature and humidity kumbung. Keep the temperature in the range of 16-24oC.</li> </ul>
Harvesting technique	Engineering retrieval of baglog oyster mushrooms should be done by manually rotating the base / stump oyster mushrooms to be revoked, so that will be drawn throughout the roots without leaving a remainder, if any residual roots behind it will interfere with the growth of oyster mushroom next. So if there sissa roots behind, should be cleaned first so as not to interfere with the growth of oyster mushroom next.
Kumbung hygiene and how to get rid of pests	<p>Pests that commonly arise are caterpillars, ants and spiders. There are three factors causing the emergence of these pests are:</p> <ul style="list-style-type: none"> <li>a. factors humidity</li> <li>b. Manure from the rest of the base / tubers or stems mold and mildew are not harvested, and</li> <li>c. The surroundings are not clean.</li> </ul> <p>To prevent and overcome pest caterpillars, do cleaning the house and around the house mushroom house mushroom house by spraying formalin. Mechanically pest ants and spiders can be resolved by dismantling the nest and doused with kerosene.</p>
Cultivation Oyster Mushroom ( <i>Pleurotusostreatus</i> )	<p>Cultivated mushrooms grown in its own environment different from an artificial growing environment. Things that need to be considered are:</p> <ul style="list-style-type: none"> <li>a. Cleanliness Kumbung</li> <li>b. Preparation baglog used</li> <li>c. Providers nutrients for fungi, in this case is sawdust</li> <li>d. Seeds used (usually already available in the farm shop)</li> </ul>

Table 2

### 3.3. The Effect of Environment on the Ecological Conditions of Cultivation and Production of Oyster Mushroom (*Pleurotusostreatus*)

From the research conducted, it can be known that the ecological conditions greatly affect production in the cultivation of oyster mushroom (*Pleurotusostreatus*) is. It can be seen from the effects of temperature, soil moisture, cleanliness kumbung and preparations made during the research process. Especially the ecological condition is the availability of water, land humidity and the room temperature should be in a moist state. The temperature is set between 16-250C. As for the growth of fungal fruiting bodies until the harvest, the temperature is set between 18-260C. During seedling growth and the growth of fruiting bodies, the humidity is set around 90%. Because if less, then the plant will dry substrate. In order kelembababan assured, floor room is always clean water sprayed on the morning and afternoon.

## 4. Conclusion

Based on the research above, we conclude that:

1. The ecological factors affecting the growth of oyster mushroom (*Pleurotusostreatus*) is kumbung cleanliness, temperature and sterilization materials, light, water and soil moisture.
2. The work needs to be done in the cultivation of oyster mushrooms are: kumbung and baglog preparation, seeding, harvesting early stages, as well as the cleanliness kumbung rid of the pests as well as a provider of nutrients for the oyster mushroom (*Pleurotusostreatus*)
3. There is a significant ecological effect on the growth of oyster mushroom (*Pleurotusostreatus*) in the process of cultivation and production.

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