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Exploration of Cellulose Content in Oyster Mushroom (*Pleurotus ostreatus*) Media

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ABSTRACT

Increased consumption of oyster mushrooms thrives in Tarakan, it is necessary to increase the production of oyster mushrooms starting with producing quality and fast mushroom seeds. This study aims to determine the increase in growth with various fungal mycelium growing media. The media used is a group of legumes that have cellulose sources, namely green beans, corn, miled, peanuts. This study uses the method of measuring the length of mycellium growth. This study showed that corn media gave the best response with the fastest growing maximum time of 14 days 10 cm. followed by millet, peanut, rice seed and mung bean with 18, 22, 24 and 32 days, respectively, at the point of maximum growth length of 10 cm. This shows that the legume group has the potential as a producer of cellulose for mushroom growing media

Keywords:

Cellulose
Misellium
Mushroom
Pleurotus ostreatus
Tarakan

INTRODUCTION

Mushroom are plants that do not have chlorophyll so they cannot carry out the process of photosynthesis to produce their own food. Fungi are classified as heterotrophic plants, because fungi live by taking food substances, such as cellulose, glucose, lignin, protein, and starch compounds from other organisms. Mushrooms have been known and popular as a delicacy since the XIV century AD. Mushrooms are considered to contain carbohydrates, various minerals such as calcium, potassium, phosphorus, and iron as well as vitamins B, B12 and C. The protein content (10.5-30.4%) found in mushrooms is higher than other food ingredients that are also derived from from plants, mushroom protein is twice as high as asparagus and potatoes, four times higher than carrots and tomatoes and six times higher than oranges.

Oyster mushrooms have a content that is not much different from meat when compared to the second price, there is a difference that oyster mushrooms in Tarakan City have a selling value of Rp. 60,000 and while meat ranges from Rp. 100,000 to Rp. 150.00.

Based on research conducted by mushroom experts at the Science Department of the Thai Ministry of Industry, some of the substances contained in oyster mushrooms or Oyster mushrooms are 5.94% protein; carbohydrates 50.59%; fiber 1.56%; 0.17% fat and 1.14% ash.

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In addition to this content, every 100 grams of fresh oyster mushrooms also contains 45.65 calories; 8.9 mg calcium: 1.9 mg iron; 17.0 mg phosphorus. 0.15 mg Vitamin B1; 0.75 mg of vitamin B2 and 12.40 ing of vitamin C. From the results of clinical medical research, scientists suggest that the content of chemical compounds typical of oyster mushrooms is efficacious in treating various human diseases such as high blood pressure, diabetes, excess cholesterol, anemia, increasing endurance. body against polio and influenza as well as malnutrition. Socio-culturally, oyster mushrooms are a nutritious food ingredient, with medicinal properties that are cheaper than modern medicine.

The culinary world really takes advantage of the presence of mushrooms. In addition to oyster mushrooms, there are several types of mushrooms that can be consumed such as Shiitake mushrooms, button mushrooms, straw mushrooms, ear mushrooms. In the manufacture or propagation of mushroom seeds, the media used is almost the same, in general, people use corn seeds.

Seeds are a very decisive factor in the mushroom cultivation process. Seeding is a stage of cultivation that requires high accuracy because it must be carried out in a sterile state using special materials and equipment.

Based on the description above there are other offers, it is hoped that materials other than corn seeds can affect the growth speed of mushrooms and also in North Kalimantan, more precisely, Tarakan City only cultivates oyster mushrooms, so with this research there is development in the world of mushrooms other than oyster mushrooms..

METHOD

Samples and materials

The tools used are tweezers, Bunsen lamp, petri dish, ruler, camera, stationery, hand sprayer, autoclave, laminar flow, plastic bags, newsprint, and rubber bands.

The ingredients used are corn seeds, green beans, millet, peanuts, rice seeds, oyster mushrooms, spritus, alcohol.

Media

1. `Sterilization

Prepare the tools and materials to be used in the research, wash the tools thoroughly, wrap the tools tightly in plastic or press them, insert the tools to be sterilized into the autoclave, sterilize the room by spraying alcohol and irradiating it with a UV lamp.

2. Media creation

Wash 1 kg of each media with clean running water, Steam the media for 30 minutes then cool it, Put the steamed media into the bottle by filling it as high as 11 cm from 19 cm high bottle, Cover the bottle with plastic paper, Sterilize the media in the bottle into autoclave with a temperature pressure of approximately 121°C for ± 1 hour,

3. Planting F0 seedlings into F1 media media

Sterilize the tools, materials and the room where the seeds are transferred by spraying 70% alcohol and UV light, Putting the F1 media and F0 seeds into the sterile room for the inoculation process, Turning on the Bunsen lamp and then the inoculation process is carried out by bringing the

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neck of the bottle close to the fire to maintain sterilization, Dipping tweezers into alcohol and heat it over a fire for the inoculation process from F0 seeds to F1 media, but taking F0 seeds should not use hot tweezers, they must be cooled first. Cover the inoculated F1 bottle with newspaper and tie it with rubber. The newspapers used are newspapers that have been sterilized.

4. Testing stage

Incubation is the stage of standing media that has been planted with mycelium. Incubation is carried out in a closed room, the temperature is between 22 – 28°C with a humidity of 60 – 70%. Maintenance Store in a dark place to keep the media moist.

Data collection was done quantitatively by measuring from the top of the bottle that had been given a size and data was taken every 2 days until the mycelium had grown thoroughly in the bottle.

RESULT AND DISCUSSION

1. Corn Seeds

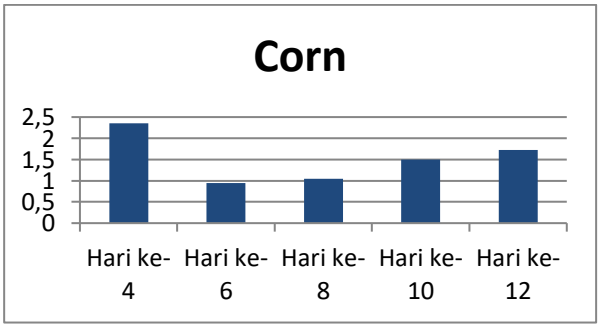

Figure 1. The difference in the growth of oyster mushroom mycelium every 2 days on corn media

In Figure 4.2 it can be seen that the average mycelium growth every 2 days of data collection is the highest in the first data collection, which is 2.35 cm and has decreased and the lowest growth is in data collection 2 which is 0.94 cm then from data 2 to data 5 is dynamically incremented (dynamically incremented?).

2. Miled Seed

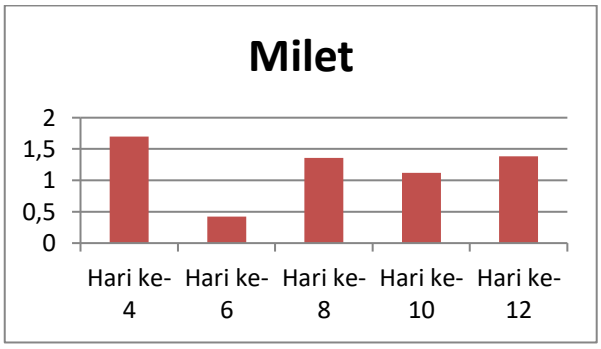

Figure 2. Difference in the growth of oyster mushroom mycelium every 2 days on miled media

In Figure 4.3, it can be seen that the average growth of mycelium every 2 days of data collection was highest in the first data collection, namely 1.7 cm and decreased and the lowest growth was in data collection 2, namely 0.42 cm.

3. Peanut Seeds

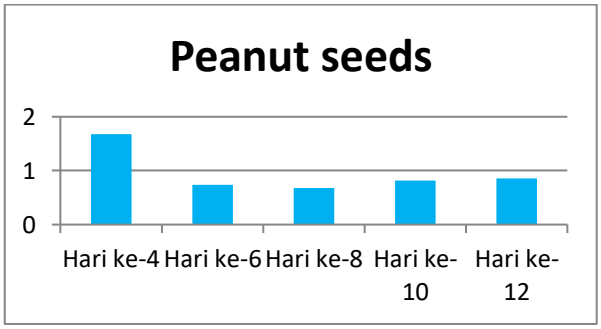

Figure 3. Difference in the growth of oyster mushroom mycelium every 2 days on peanut media

In Figure 4.4 it can be seen that the average growth of mycelium every 2 days of data collection is the highest in the first data collection, namely 1.68 cm and the lowest growth

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is in data collection 3 which is 0.74 cm then from data 2 to data 5 has a growth which is not significantly different in growth

4. Green Bean Seeds

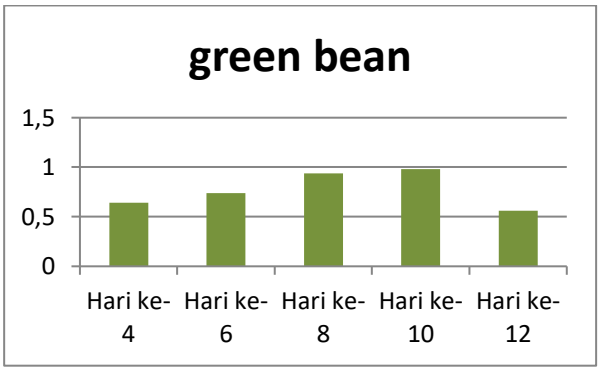

Figure 4. Differences in the growth of oyster mushroom mycelium every 2 days on green bean media

In Figure 4.5 it can be seen that the average growth of the mycelium every 2 days of data collection was the highest in the fourth data collection, namely 0.98 cm and experienced a decrease and the lowest growth in data collection 5 which was 0.56 cm then from data 1 to data 5 dynamically increasing.

5. Rice Seeds

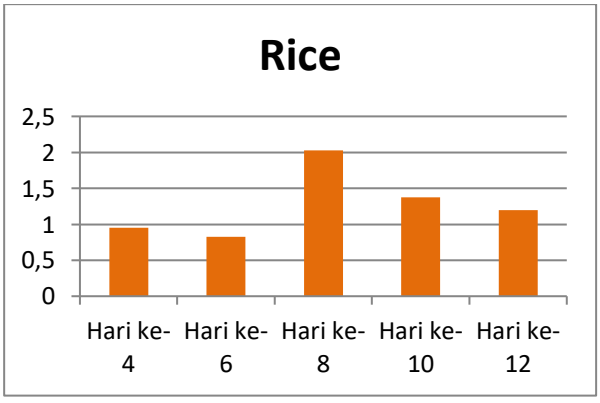

Figure 5. Average growth of oyster mushroom mycelium every 2 days on rice seed media

In Figure 4.6, it can be seen that the average growth of the mycelium every 2 days of data collection was the highest in data collection 3 which was 2.02cm and the lowest growth was in data collection 2 which was 0.82 cm then from data 3 to data 5 it decreased.

The speed of mycelium growth is one indicator of the success of inoculation, namely the emergence of mycelium. The difference in the speed of mycelium growth to reach the entire bottle can be seen in the graph (Figure 6).

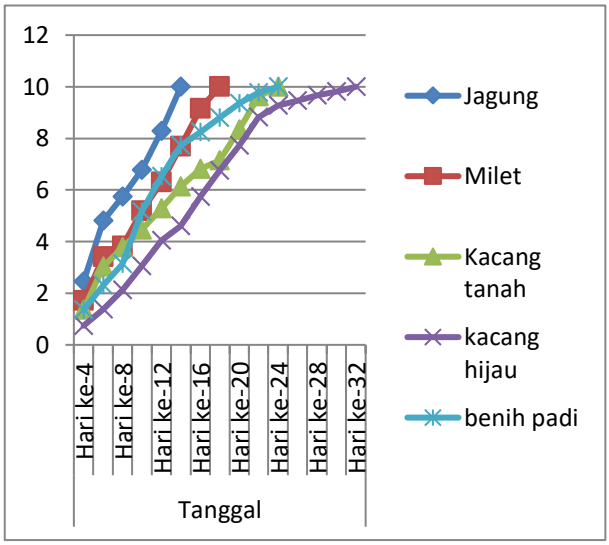

Figure 6 comparison of mycelium growth speed between planting media

From Figure 4.7 above, it can be seen that there is a difference between the five media materials if we (don't need to use our words in sentences like this) pay attention to one by one on the corn media which has a faster growth than the others, the average corn on data collection day to day. 4 has a micellar length of 2.45 cm and only takes 14 days to fill the entire bottle. while on miled planting media it takes 18 days to fill the entire bottle then on peanut and rice seed media have the same thing which takes 24 days to grow in all bottles and on the last medium and also the lowest

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in the first data is on green bean media where has a mycelium length of 0.64 cm and also requires a relatively long time of 32 days. Then at the last data collection, namely on data 6 or day 14, the corn media material still occupied the same position and managed to meet the maximum growth in the bottle. Meanwhile, green beans also have the same thing, namely occupying the position of the slowest growth and it can be seen in the 6th data that mung bean media materials have a mycelium length of 4.6 cm.

The slow growth of mycelium is caused because the growing media used does not meet the predetermined requirements, namely the water content contained in the media is not met according to needs, so that the nutrients contained in the media are difficult to absorb by the mycelium and also because when boiling it can occur. oxidation process in which the content in the growing media comes out and mixes with the cooking water. Therefore, why millet and corn are better than other media because they have thick epidermis or protective tissue compared to other media with thin epidermis. The media material used as a planting medium showed that the manufacture of media that had been carried out for the growth of mycellium F1 had problems with the water content and quality used. Factors that play a role in the growth of mycelium are carbon dioxide levels, temperature, food availability, water content and competition between other organisms. In addition, mushrooms also need nutrients contained in their substrate which is the main source of nutrients for fungi. These nutrients can only be utilized when the fungus excretes extra cellular enzymes that can break down complex compounds into simpler compounds such as complex carbohydrate compounds, namely cellulase, amylase and chitinase (Tampubolon, 2010). It can be seen in table 4.6 the nutritional value content of per 100 g (3.5 oz) of each medium used.

Table 4.6 Nutrient and mineral content of media per 100 g (3.5 oz)

No	Nutrisi dan mineral	Bahan media tanam				
		Jagung	kacang hijau	kacang tanah	padi	Millet
1	Energi	360 kJ	1.452 kJ	525 kJ	1527 kJ	1582 kJ
2	Karbohidrat	18,7 g	62,62 g	17,4 g	79 g	73 g
3	Gula	6,26 g	6,60 g	-	0,12 g	1,9 g
4	Lemak	1,35 g	1,15 g	42,7 g	0,66 g	4,2 g
5	Protein	3,27 g	23,86 g	27,9 g	7,13 g	11 g
6	Kalsium	2 mg	132 mg (13%)	315 mg	28 mg (3%)	8 mg
7	Zat Besi	0,52 mg (4%)	-	5,7 mg	0,80 mg (6%)	3 mg
8	Fosfor	89 mg (13%)	367 mg (52%)	456 mg	115 mg (16%)	285 mg

Oyster mushroom mycelium has unstable growth and it can be seen that the differences in each medium can be seen in Figure 4.8 comparison of the length of the mycelium every 2 days.

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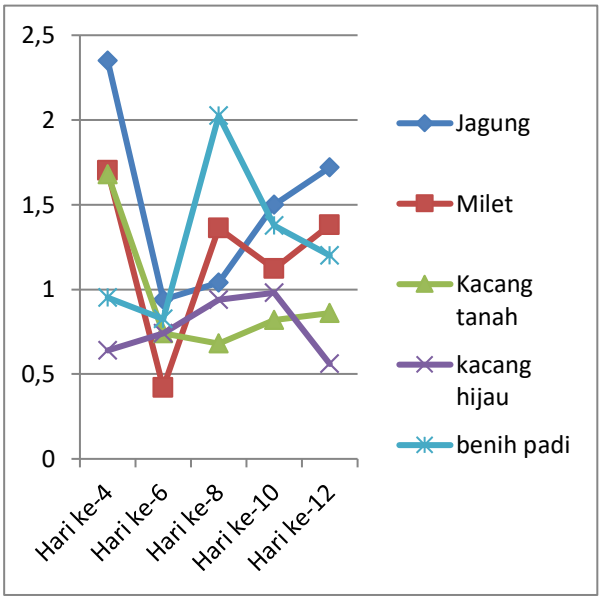

Figure 7 The difference in the length of the mycelium on the planting medium every two days

In Figure 7 the graph above shows good growth on the 4th day where at the time of the measurement process it was still in a laminar flow area with exposure to sunlight or light in normal conditions on the 5th day there was a process of transferring the media into an intensive storage oven. the light is very minimal and also the humidity is minimal then the temperature starts to increase so that the hyphae that are starting to actively grow start to stop their development because there is a process of adaptation to the environment that is why on the 6th day measurement of each medium there is a decrease in the length of the mycelium. After that, on the 8th day of measurement, there was an increase in the length of the mycelium of the oyster mushroom. So, environmental factors also greatly affect the growth of oyster mushroom mycelium such as temperature, humidity and light intensity.

A good mushroom has the characteristics of an even, thick, and white mycelium growth and there is also a thin and not dense growth which can be seen in Figure 7

when viewed in terms of density, it can be seen that the planting media for corn, miled, peanuts have good and thick density, but corn and peanuts are not better than miled. Due to the miled media material, the growth of the mycelium was very dense and thick, while the peanuts and corn had begun to show signs of the criteria for old seeds, namely the emergence of a yellowish color so that mycelium thinning began to occur. Factors that play a role in the growth of mycelium are carbon dioxide levels, temperature, food availability, water content and competition between other organisms. In addition, mushrooms also need nutrients contained in their substrate which is the main source of nutrients for fungi. These nutrients can only be utilized when the fungus excretes extra cellular enzymes that can break down complex compounds into simpler compounds such as complex carbohydrate compounds, namely cellulase, amylase and chitinase (Tampubolon, 2010).

Various factors that affect the growth of mycelium include physical, chemical, and biological factors. Efforts that can be made to maintain the pH in order to remain at optimum conditions are by adding agricultural lime. Another factor that affects the growth of mycelium, according to Sanchita, (2012) the size and texture of the seeds used by mushroom seeds made using small grain media give better results than using large grains.

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Seed media that has too much water will also cause large amounts of contaminants to occur in the seed media. The duration of soaking the seeds also affects the mycelium growth process, at the time of soaking it must also be adjusted to the size of the seeds used. According to Untung (2013),

Based on the description above, that corn seed media is a good substrate for the growth of mycelium than media derived from millet, peanuts, green beans and rice. Corn kernels have a lot of nutrients that mycelium needs to grow, the large particle size causes the pores in the media to also be large, so that it has an impact on the availability of more oxygen and the mycelium propagation becomes easier. Although other media had high levels of nutrients and minerals, mycelium growing on other media tended to spread slightly longer than corn seed media, this was because it was estimated that in other media there was a lack of oxygen, nitrogen and other carbon sources in the form of simple sugars. and starch that supports the growth of mycelium, and in other media such as green beans the pores are too small, resulting in low oxygen availability and small pores making it difficult for the mycelium to spread.

CONCLUSION

The five planting media materials used are in accordance with Figure 4.6, the corn growing medium only takes a short time of the five planting media materials, which only takes 14 days to grow maximally in the bottle while the green bean planting media material is very slow, it takes 32 days. This is due to the size of the seeds and the nutrients in them. When viewed in terms of density, millet, corn and peanut planting media are very good, dense, and thick and the growth is evenly distributed, it can be seen in Figure 4.8, while the green bean and rice media grow unevenly in only a few bottles and the growth is not as thick as the previous three media.

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