The Composition Of Coconut Fibers And Tofu Pulp As A Growing Media Of Oyster Mushrooms (*Pleurotus ostreatus*)

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Abstract. Mushrooms are one type of Non-Timber Forest Product (NTFP) that can use as an alternative food. With the growing development of mushroom cultivation, especially oyster mushrooms, it is necessary to provide an alternative planting medium other than sawdust. Lignocellulose sources other than wood should try as an alternative to growing media, such as coconut fibers. Besides lignocellulose, fungal growth also requires a source of protein. This research offers another option as a source of nutrition, namely tofu pulp. This study aims to obtain the best composition of coconut fibers and tofu pulp as an oyster mushroom growth medium. The method used in this research is mixing the raw materials (cultivation media), raw material sterilization, inoculation, maintenance, and harvesting. There are six treatments in mixing raw materials, namely coconut fibers and rice bran (P1); coconut fibers and tofu pulp (P2); sawdust and bran (P3); sawdust and tofu pulp (P4); coconut fibers, sawdust and rice bran (P5); coconut fibers, sawdust, and tofu pulp (P6). This study provides the following results: for the observation of cultivation medium closure by mycelium, treatments P2 and P4 were not significantly different, but both have significantly different from other treatments. The same results also are shown in the observation of pinhead growth and harvesting of mushrooms. Meanwhile, the weight of fresh mushrooms harvested did not significantly affect all treatments. P6 is the best treatment composition to be used as a medium for growing oyster mushrooms.

Keywords: coconut fibers, mushroom cultivation, *Pleurotus ostreatus*, tofu pulp

1. Introduction

There are various kinds of non-timber forest products, each of which has different benefits, for example, rattan, bamboo, gaharu, palm sugar, essential oils, useful insects, and mushrooms. The wood fungus is a type of non-timber forest product that can become food. Naturally, this fungus grows on weathered wood, for example, oyster mushrooms and ear mushrooms. Oyster mushroom (*Pleurotus ostreatus*) is one type of fungus that edible and, this time, also has to be cultivated.

Oyster mushroom cultivation now has the opportunity to be developed by the forest communities. According to Abdisobar et al.[1], the request oyster mushroom in Indonesia in 2014 was 1,796 tons per year. In 2015 the production of mushrooms 2.208 tons per year. In 2016 they were increased by 2,619 tons per year. In 2017 reached 3,031 tons per year, and in 2018 rose 3.442 tonnes per year. These data indicate that oyster mushrooms have a very high economic opportunity to be cultivated.

In South Sulawesi, oyster mushroom cultivation began in great demand by the community, especially in Maros and Soppeng district. For oyster mushroom cultivation, the mushroom growing medium should resemble their...
natural habitat. One innovation that can do is to make a mushroom growing medium (baglog). The main ingredient in making this baglog is sawn waste. Mushroom farmers in Maros and Soppeng cultivate oyster mushrooms also use sawdust waste.

Several studies can do in order to find other alternatives in making growing media from oyster mushrooms. For example by using rice bran and tofu pulp [2], water hyacinth [3], bagasse [4], coconut fibers [5], sago pulp and rice bran [6], bamboo waste [7], and mulberry waste [8]. The research conducted by Mufarrihah [2]; and Suparti and Purnamasari [5] is exciting because they use the waste from making tofu and coconut fiber. The use of 25% tofu pulp as the main ingredient is the best medium for making mushroom growing media. As for the coconut fiber, 66% fiber as the main ingredient is the best medium.

Tofu pulp and coconut fiber, the raw materials, are readily available in the region and sub-Bontomaranu Sungguminasa, Gowa. According to Astuti and Wardani [9] for the utilization of solid waste out only as animal feed and raw materials in the manufacture of tempeh gembus. Meanwhile, many people use water and coconut flesh. The community used coir from coconut as a material for making doormats. According to Saleh et al. [10], coconut coir contains 525 grams of fiber (75% of coir) and 175 grams of cork (25% of coir). Meanwhile, according to Rahmawati and Kurnia [11], tofu pulp contains protein with a value of 26.6 grams per 100 grams of tofu pulp. If these two ingredients are combined, both can be used as raw materials to make mushroom growing media. This study aims to obtain the best composition from coconut fiber and tofu pulp as a growth medium for oyster mushrooms as an alternative in making planting media.

2. Materials and Methods

2.1 Preparation of the Main Media Growth of Oyster Mushroom

The main media for fungal growth in this study were tofu pulp, coconut fibers, and sengon sawdust. Before the material is applied, subject to treatment to the three media. The pretreatment in this primary medium is coconut fibers cut into small pieces and milled using a hammer mill; the tofu pulp squeezed until the water content is reduced and aerated, while the powder sengon is soaked for two days and then aerated.

2.2 Making Media Growth Stages Oyster Mushrooms

Oyster mushroom growing media consists of the main ingredients (tofu pulp, coconut fibers, and sawdust), lime, bran. The main media consisted of six treatments, as follows: Coconut fibers and rice bran (P1); Coconut fibers and tofu pulp (P2); Sawdust and rice bran (P3); Sawdust and tofu pulp (P4); Coconut fiber, sawdust, and rice bran (P5); Coconut fiber, sawdust, and tofu pulp (P6). All the ingredients are mix until homogeneous. After that, the media composted. After composting, the material is put into the plastic to make a baglog. Baglog then sterilized and ready to be inoculated.

2.3 Maintenance Oyster Mushrooms

The inoculated baglog is then put in the incubation room and placed on baglog storage shelves for ± 40 days until the mycelium covers the entire baglog. This stage coincides with observing mycelium's growth, mushroom pinhead, and harvesting oyster mushrooms. Data were analyzed using a completely randomized design (CRD), which repeated ten times.

3. Results and Discussion

The three most essential things in the cultivation of oyster mushroom mycelium are closing time, pinhead growth, and harvesting time. All three of these indicators can be a factor in the cultivation of oyster mushrooms. In oyster mushroom cultivation, farmers can expect baglog covered by mycelium fungus in a short time. Similarly, when the appearance of a pinhead. The sooner both of these indicators are met, then the oyster mushroom harvesting activities will be implemented, which means that the cultivation time will be shorter.
3.1 Maintenance Oyster Mushrooms

After the inoculation process is complete, a baglog was containing oyster mushroom seeds in incubated. Generally, this process takes approximately 40 days. In this process, the mushroom mycelium will cover the surface of the baglog. In this study, Figure 1 shows the time required to cover the entire baglog mycelium surface. The composition of coconut fiber, sawdust, and tofu pulp (P6) is treated with mycelium closing speed of the fastest (35 days), while the treatment with a closing speed of mycelium most extended duration (59 days) is the composition of coconut fibers, sawdust, and rice bran (P5). The media range covered the entire surface mycelium grows between 20-38 days [12-14]. Some of the treatments in this study have mycelium closing range, which is not much different from previous studies.

Figure 1 also shows the composition of the raw materials in making baglog has a significant difference (p <0.05) with mycelium's growth time. Tukey's Honest Significant Difference Test showed that the composition of coconut fiber and tofu pulp (P2); and sawdust and tofu pulp (P4) was different from other treatments. In this study, rice bran and tofu pulp as a protein source result in differences when closing the mycelium. All treatments that use tofu pulp as a protein source, the process of closing the mycelium baglog faster than the use of rice bran. So the speed of mycelial growth on media use of 100% coconut fiber or 100% sawdust or a combination of both is highly dependent on the addition of protein sources (rice bran/tofu pulp). According to Mufarrihah [2], rice bran and tofu in the research states that both the source of this protein has a real effect on mycelium growth time. Meanwhile, according to Suparti and Purnamasari [5], the composition of sawdust and coconut fiber also affects mycelium's growth in cover baglog.

3.2 Growth of Oyster Mushroom Pinhead

Pinhead will grow after the mycelium covers the entire baglog. In this study, the calculation starts from the pinhead growth baglog seedlings inoculated by the fungus (Figure 2). Just as in the mycelium growth in baglog surface cover, the composition of coconut fiber, sawdust, and tofu pulp (P6) is treated with pinhead fastest growth at 42 days or seven days after baglog the entire surface is covered by mycelium. The composition of coconut fiber, sawdust, and rice bran (P5) treated with pinhead's slowest growth is 69 days or ten days after baglog, and the entire surface is cover by mycelium.
Figure 2. Pinhead growth time of white Pleurotus ostreatus in various treatment (days) [Coconut fibers and rice bran (P1); Coconut fibers and tofu pulp (P2); Sawdust and rice bran (P3); Sawdust and tofu pulp (P4); Coconut fiber, sawdust, and rice bran (P5); Coconut fiber, sawdust, and tofu pulp (P6)]

The composition of the raw material in making baglogs has a significant difference (p <0.05) with the pinhead's growing time (Figure 2). Tukey's Honest Significant Difference Test showed that the composition of coconut fiber and tofu pulp (P2) and sawdust and tofu pulp (P4) was different from other treatments. In this study, growth is directly proportional to the closing pinhead baglog by mycelium. The results are consistent with research conducted by Ilyas et al. [15].

3.3 Oyster Mushroom Harvesting

3.3.1 Oyster mushroom harvesting time.

This study took 45-72 days from seed inoculation until the fungus could be harvested (Figure 3). The fastest harvest time obtained on media with the composition of coconut fiber, sawdust, and pulp (P6) is 45 days. Meanwhile, the longest harvest time (72 days.) is the composition of coconut fiber, sawdust, and rice bran (P5).

The mushrooms bloom entirely and can be harvested 2-4 days after the appearance of the pinhead [12-14]. This statement is in line with this study's results, where the average time to harvest, since the pinhead's growth is three days.

Figure 3 also shows that the raw material's composition in making baglog has a significant difference (p <0.05) to harvest time. Tukey's Honest Significant Difference Test showed that the composition of coconut fiber and tofu pulp (P2) and sawdust and tofu pulp (P4) was different from other treatments. In this study, the mycelium's baglog closure is directly proportional to pinhead growth and harvest time.
3.3.2 Wet weight Oyster Mushroom Fruit Body.
Figure 4 shown fresh mushroom fruit body weight at first harvest. In baglog with sawdust and rice bran composition (P3), mushrooms harvested on average 31.8 g per baglog. Meanwhile, the composition of baglog with coconut fiber, sawdust, and tofu pulp (P6) mushrooms harvested as much as 28.4 g per baglog. For a baglog with coconut fiber and tofu pulp (P2) composition, 19.6 g of mushrooms is harvest per baglog. The composition of sawdust and rice bran (P3) is the composition of the raw material widely used by mushroom growers. However, this study's results indicate that the composition of the raw material has no significant difference (p < 0.05) to the weight of fresh mushrooms. That is if we use the composition of coconut fiber, sawdust, and tofu pulp (P6) or coconut fibers and pulp (P2), the fresh mushrooms produced relatively similar.

![Figure 4](image-url) The weight of the fruiting body (g) [Coconut fibers and rice bran (P1); Coconut fibers and tofu pulp (P2); Sawdust and rice bran (P3); Sawdust and tofu pulp (P4); Coconut fiber, sawdust, and rice bran (P5); Coconut fiber, sawdust, and tofu pulp (P6)]

4. Conclusion

Coconut fiber and tofu pulp can be used as raw material for mushroom growing media to diversify the raw material for mushroom growing media (Baglog). Coconut fiber can replace sawdust. Meanwhile, the tofu pulp can replace bran. In this study, baglog with raw materials of coconut fiber, sawdust, and tofu pulp (P6) is the best composition. Baglog P6 takes only 45 days since baglog inoculated until ready for harvest. The average yield for this treatment was 28.4 g per baglog.

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