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Effect of Substrate Composition and Liquid Organic Fertilizer from Kepok Banana Peels on Growth and Yield of White Oyster Mushroom (*Pleurotus ostreatus*)

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ABSTRACT

This study aims to determine the impact liquid organic fertilizer (LOF) from kepok banana peels on the growth and yield of white oyster mushrooms under different substrates. The study was performed under factorial completely randomized design (4 x 4) with two factors. First factor was substrate (sawdust + rice husk) composition consisting of four levels with 25% to 100% sawdust. Second factor was concentration of LOF consisting of four levels (0; 100; 150; and 200 mL/L). Observation variables included early appearance of fruit bodies, number of caps, cap diameter, and fresh weight. The experimental data were analyzed using ANOVA followed by HSD test at α = 5%. Results showed that interaction of substrate composition and concentration of LOF significantly affected the early appearance of fruit bodies and number, diameter, and fresh weight of caps at harvest period 1 and 2. Substrate composition (50% sawdust + 50% rise husk) and concentration of LOF 200 mL/L resulted the highest fresh harvest weight with a total 249.70 g/baglog for thre harvest periods. The results of this study confirm that proper substrate composition and LOF concentration is required to achieve optimal growth and yield of white oyster mushroom.

1. INTRODUCTION

White oyster mushroom (*Pleurotus ostreatus*) is one type of consumption mushroom that is widely cultivated in Indonesia because it has high economic value, good nutritional content, and increasing market demand. White oyster mushroom is one of edible mushrooms with antioxidant activities and high nutritional content important for human health (Vieira *et al*., 2013). Oyster mushroom consists of three primary anatomical parts: a fleshy, spatula-shaped cap (pileus), long ridges underneath called gills (lamellae) that produce spores, and a short, lateral or central stalk (stipe) (Miles & Chang, 2004). The mushroom often grows in stacked, oyster-shaped clusters on wood. The growth and yield of white oyster mushrooms are influenced by various factors, both environmental and internal factors. Environmental factors include temperature, humidity, light, aeration, and pH of the growing media (Bellettini *et al*., 2019). In general, mushrooms can grow at temperatures of 24–28 °C. This temperature will produce optimal growth for oyster mushrooms. Less sterile growing media at temperatures below 20 °C will accelerate the composition of other microbes that will inhibit mushroom growth. During fruit body formation, oyster mushrooms require lower temperatures, specifically between 16–22 °C (Imron & Mahmuri, 2022). Internal factors that affect the growth and yield of white oyster mushrooms include the type of growing media, the availability of nutrients, and the quality of seeds. The practice of cultivating white oyster mushrooms needs to pay attention to several things such as the composition of the growing media used and additional sources of nutrients that can help produce optimum products both in terms of quality and quantity.

Growing media is one of the factors that determine success in white oyster mushroom cultivation. Growing media has a very crucial role in providing the nutrients needed for the growth of white oyster mushrooms. The media commonly used to cultivate oyster mushroom is sawdust (Herliyana *et al*., 2015), but its increasingly limited availability encourages the search for alternative planting media that are more environmentally friendly and sustainable. This is in accordance with the research of Nugraha & Hasan (2024), that the use of sawdust as the only media has several limitations, such as dependence on one type of raw material whose availability can fluctuate, and the potential for nutritional imbalance; Research by Trisanti *et al*. (2018) shows that although the production of sawn timber is very high, leading to a high production of wood sawdust, the utilization or processing of wood sawdust in Indonesia is generally very limited, especially when considering mass utilization with modern technology, resulting in lower production of products with higher benefits or prices. Currently, in Indonesia, the utilization or processing of sawdust from sengon wood is only as raw material for fuel briquettes, mushroom growing medium, and particle board. Rice husk, which contains several important elements, is important alternative media for growing mushrooms. Rice husk is a waste material from milling that is generally merely disposed of by burning. This waste is widely available and always replaceable source of raw material, consisting of fiber with a main composition of 33–44% cellulose, 19–47% lignin, 17–26% hemicellulose, and 13% silica (Kusumawardani *et al*., 2021). Rice husk also contains high silica and other organic nutrients that support the growth of white oyster mushrooms. The addition of rice husk for mushroom media is expected to fulfill the nutrient needs and increase the production of white oyster mushrooms.

Meanwhile, liquid organic fertilizer (LOF) contains many complex organic ingredients compared to inorganic fertilizers. LOF contains essential nutrients and macros (N, P, K, S, B, Mo, Cu, Fe, Mn, Cl, and Zn) which are good for plant growth and yield. Banana peels is among the materials that can be used to produce good quality LOF. Banana peel is an organic material that contains chemical elements such as magnesium, sodium, phosphorus, and sulfur that can be used as organic fertilizer. Banana peel waste is commonly found in traders and is not reprocessed and just thrown away without being used. According to Nurcholis *et al*. (2021), the nutrients contained in banana peels include macro elements nitrogen N (0.18%), phosphorus P (0.043%), potassium K (1.13%), and organic carbon C (0.55%). In addition, microelements such as Ca, Mg, and Zn are also present. The kepok banana peels contain higher nitrogen. The nutrients contained in LOF of kepok banana peel are N (1.3%), P (0.02%), K (3.01%), Magnesium Mg (0.16%) (Azzahra *et al*., 2023).

Research on the cultivation of white oyster mushrooms using a combination of substrate media and LOF made of kepok banana peel is still rare. The purpose of this study was to determine the response of white oyster mushroom to substrate media and LOF kepok banana peel. The expected benefits of this research are to increase the productivity and quality of white oyster mushrooms and can be used by farmers as a reference in optimizing white oyster mushrooms cultivation.

2. MATERIAL AND METHODS

2.1. Materials

This research took place in Januari to April 2025, on Bobosan Hamlet, Kemiri Village, Kandangan District, Kediri Regency, East Java Province. The geographical location is at an altitude of 16–30 m above sea level with rainfall of 1.800–2.400 mm per year, average humidity of 74%–86%, and average air temperature of 23–31 °C. This research was conducted in a mushroom cultivation room. The materials used in this study included F2 seedlings white oyster mushroom, sawdust, rice husk, rice bran, dolomite lime, liquid organic fertilizer made of kepok banana peel, brown sugar, EM4, and water.

2.2. Design of Experiment

The experiment was performed using a factorial Completely Randomized Design (CRD) with the treatment of planting media and the concentration of liquid organic fertilizer (LOF) of kepok banana peel. The treatment of planting media combination (M) consisted of 4 levels, namely M0 (control, 100% sawdust), M1 (75% sawdust + 25% rice husk), M2 (50% sawdust + 50% rice husk), and M3 (25% sawdust + 75% rice husk). The second factor was LOF concentration (P) consisted of 4 levels, namely P0 (control, 0 mL/L), P1 (100 mL/L), P2 (150 mL/L), P3 = 200 mL/L.

Each treatment combination was repeated 3 times to obtain 48 experimental units. Each experimental unit consisted of 3 baglogs, so that a total 144 mushroom baglogs were used in this study.

2.3. Measurements and Method

Parameter observed during this study included the early appearance of fruit bodies in day after inoculation (DAI), the number of caps or pileus (pieces), pileus diameter (cm), and fresh harvest weight (g). Harvesting was carried out manually up to three harvest periods.

2.4. Analysis Method

Observational data were analyzed using ANOVA through the linear additive model as presented in Equation (1):

$$Y_{ijk} = \mu + \alpha_i + \beta_j + (\alpha\beta)_{ij} + \varepsilon_{ijk} \quad (1)$$

where Y_{ijk} is the observation value at the i^{th} level treated with substrate composition of planting media, j^{th} level treated with concentration of LOF, k is the replication, μ is the general mean, α_i is the effect of the i^{th} level on the main factor, β_j is the effect of the j^{th} level to the second factor, $(\alpha\beta)_{ij}$ is the interaction effect between the i^{th} level treated with planting media and the j^{th} level treated with concentration of LOF, ε_{ijk} is the experimental error. Data analysis using SPSS software. The Tukey's Honest Significant Difference (HSD) test was conducted when there was a significant impact at significance level of $\alpha = 5\%$.

3. RESULT AND DISCUSSION

Figure 1 reveals white oyster mushroom produced from some treatments performed in this research. Growth and yield parameters are discussed in the following.

3.1. Early Appearance of Fruit Bodies

The results of the analysis of variance showed that the interaction between the ratio of sawdust to rice husk significantly affected the appearance of fruiting bodies of white oyster mushroom fruit bodies (p-value = 0.00) (Table 1). The best treatment interaction for the early appearance of fruiting bodies is the combination of substrate composition M2 (50% sawdust + 50% rice husk) and the LOF concentration of P0 (0 mL/L) with the fastest early appearance of fruiting bodies at 43 DAI. Other treatment combinations those are not significantly different with M2P0 include M0P0, M0P1, and M1P1. The treatment combination resulted in the early appearance of fruiting bodies at 43.4 DAI; 43.7 DAI; 43.8 DAI; and 45.9 DAI, respectively. Table 1 shows that increasing rice husk composition together with the increase in LOF concentration tend to retard the early appearance of white oyster mushroom fruiting bodies. These findings differ somewhat from those of other studies. Juwaningsih *et al*. (2021) reported that the addition of LOF made from fruit scraps at concentrations of 20 to 100 mL/L significantly accelerated the fruiting period, from 31.88 DAI to 27.75 DAI. Meanwhile, Pamungkas (2018) concluded that LOF fertilizer doses between 0 and 9 mL/bag had no significant effect on any observed parameters, including the fruiting period. The effect of LOF appears to depend heavily on the type and concentration of LOC used, as well as its interaction with other environmental factors such as temperature and humidity.

Figure 1. Oyster mushroom produced from some treatments during the experiment

Table 1. Effect of treatment on the average early appearance (DAI) of white oyster mushroom fruit bodies

Substrate Media Composition	**Concentration of LOF (mL/L)**			
	P0 (0)	**P1 (100)**	**P2 (150)**	**P3 (200)**
M0 (100% Sawdust)	43.4a	43.7a	51.6bc	52.9bc
M1 (75% Sawdust + 25% Rice Husk)	50b	43.8a	58.3c	54.9bc
M2 (50% Sawdust + 50% Rice Husk)	43a	51.3bc	50.6b	57.2c
M3 (25% Sawdust + 75% Rice Husk)	45.9ab	52.6bc	49.9b	55.4bc
HSD 5%	5.96			

Note: Numbers followed by the same letter indicate no significant difference in the HSD test at significance level 5%.

According to Wahidah & Saputra (2015), the growth of fruiting bodies requires material containing nutrients supplied to the mycelium, such as starch compounds, carbon, protein, nitrogen, hydrogen, vitamins, and oxygen must be available in the media. These nutrients are contained in sawdust and rice husk. This causes the white oyster mushroom mycelium to grow well and quickly. The time of the first harvest is in line with the beginning of the appearance of fruiting bodies. The sooner the fruiting bodies appear, the faster the first harvest. Good mycelium growth will affect the speed of fruit body formation and the first harvest, because the fruit or mushroom body is formed starting with the formation of mycelium. The lignin content in sawdust and rice husk plays a role in accelerating the process of mushroom formation. The results of lignin degradation are utilized for the formation of hyphae and mycelium. This is in accordance with the research of Pamungkas (2018) that good fruiting body formation is influenced by optimal growing media and humidity.

The addition of rice husks in sawdust can facilitate the aeration inside the media. Lignocellulose, which consists of cellulose, hemicellulose, and lignin, is a complex material and difficult to degrade naturally, especially lignin. To accelerate the degradation process, effective aerobic microbial activity is required, which can only thrive with sufficient oxygen availability through aeration. Optimal aeration will maintain favorable environmental conditions for microbes, such as humidity, temperature, and oxygen availability, so that the lignocellulose decomposition process can proceed smoothly. Conversely, insufficient aeration will create anaerobic conditions that slow degradation, while excessive aeration can dry out the medium and reduce microbial activity. Table 1, however, indicates that the emergence of mushroom fruits is inhibited by the increasing rice husk. The higher the percentage of rice husk added to the growing medium, the longer it takes for the first fruiting bodies to appear. This finding is in line with Muchsin *et al*. (2017) who reported that the addition of rice husks up to 20% significantly slowed the emergence time of white oyster mushroom fruit bodies from 43.38 days (without the addition of rice husks) to 49.10 days (with the addition of 20% rice husks). Rice husks contain high levels of silica (Si) that makes the medium harder, making it difficult for the oyster mushroom mycelium (especially its enzymes) to penetrate and degrade the medium, ultimately inhibiting mycelium growth and fruiting body formation.

3.2. Number of Caps

The results of the analysis of variance showed that there was a very significant (*p*-value = 0.01) interaction between the treatment of substrate media and the concentration of LOF on the number of fruit caps per clump of white oyster mushrooms at the 1st harvest. While, in the 2nd and 3rd harvest period, there was no interaction between the combination of substrate media treatment and the concentration of LOF on the number of caps of white oyster mushroom (Table 2). The M2P2 treatment (substrate media composition of 50% sawdust + 50% rice husk and the concentration of LOF 150 mL/L) gave the highest results during the first harvest period with an average number of caps of 7.9 pieces. The treatment combination that gave the lowest average number of caps with the result of 3 pieces was found in the treatment combination of M3 (25% sawdust + 75% rice husk) with concentration of LOF 0, 150, and 200 mL/L.

The balanced ratio of sawdust and rice husk substrate media together with the application of LOF at the right concentration triggered the formation of more pinheads. Pinheads that grow well will develop into mushroom caps, so the number of fruiting body caps per clump increases. This is in line with the research of Sitorus (2024) that the number of pinheads growing correspond to the number of fruiting body caps formed, because the nutrients contained in the growing medium are spread to each pinhead forming a fruiting body. The application of LOF at the correct dose

Table 2. Effect of treatment on the average number of caps (pieces) of white oyster mushroom for three harvest periods

Harvest period	Substrate Media Composition	Concentration of LOF (mL/L)			
		P0 (0)	P1 (100)	P2 (150)	P3 (200)
1	M0 (100% Sawdust)	5.70ab	3.20ab	4.30ab	4.10ab
	M1 (75% Sawdust + 25% Rice Husk)	5.00ab	5.40ab	6.30b	3.60ab
	M2 (50% Sawdust + 50% Rice Husk)	5.10ab	3.90ab	7.90b	5.10ab
	M3 (25% Sawdust + 75% Rice Husk)	3.00a	5.80ab	3.00a	3.00a
	HSD 5%.	3.1			
2	M0 (100% Sawdust)	5.30	4.10	3.60	4.30
	M1 (75% Sawdust + 25% Rice Husk)	5.20	5.10	5.40	4.60
	M2 (50% Sawdust + 50% Rice Husk)	4.60	3.70	6.30	4.70
	M3 (25% Sawdust + 75% Rice Husk)	3.80	4.80	2.40	2.80
	HSD 5%.	ns			
3	M0 (100% Sawdust)	3.80	3.20	2.70	2.70
	M1 (75% Sawdust + 25% Rice Husk)	4.10	3.90	4.10	4.10
	M2 (50% Sawdust + 50% Rice Husk)	3.30	3.00	4.80	4.30
	M3 (25% Sawdust + 75% Rice Husk)	2.60	3.00	1.80	1.90
	HSD 5%.	ns			

Note: Numbers followed by the same letter indicate no significant difference in the HSD test at significance level 5%, ns= not significance.

can accelerate and strengthen the growth of mycelium, thus forming more primordia. A large number of primordia has the potential to produce more fruiting bodies in a single baglog (Ngaing *et al*., 2024).

3.3. Cap Diameter

The results of the analysis of variance showed a very significant interaction in the combination of the treatment of substrate media and the concentration of LOF on the diameter of the fruit caps of white oyster mushrooms in the 1st (*p*-value = 0.029) and 2nd harvest periods (*p*-value= 0.039). While in the 3rd harvest period, there was no interaction between the combination of substrate media treatment and the concentration of LOF on the diameter of white oyster mushroom fruit caps (Table 3). The treatment combinations of M0P1 (100% sawdust with LOF concentration of 100 mL/L) and M1P0 (75% sawdust + 25% rice husk without LOF) resulted the largest cap diameters. Both treatments showed the best oyster mushroom cap diameter in the 1st and 2nd harvest periods with an average of 14.11 cm and 14.28 cm, respectively.

The diameter of the fruiting body is influenced by the number of fruiting body stalks per clump of white oyster mushrooms. If one mushroom clump has more stalks, the diameter of the fruit cap will be relatively lower. This is due

Table 3. Effect of treatment on the average diameter of caps (cm) of white oyster mushroom for three harvest periods

Harvest period	Substrate Media Composition	Concentration of LOF (mL/L)			
		P0 (0)	P1 (100)	P2 (150)	P3 (200)
1	M0 (100% Sawdust)	12.22a	14.78b	12.11a	13.78ab
	M1 (75% Sawdust + 25% Rice Husk)	14.78b	12.33a	12.22a	12.67ab
	M2 (50% Sawdust + 50% Rice Husk)	12.56ab	13.00ab	12.78ab	13.44ab
	M3 (25% Sawdust + 75% Rice Husk)	11.44a	12.67ab	11.56a	11.56a
	HSD 5%.	2.4			
2	M0 (100% Sawdust)	11.56ab	13.78b	11.22ab	12.78b
	M1 (75% Sawdust + 25% Rice Husk)	13.44b	11.33ab	11.22ab	11.33ab
	M2 (50% Sawdust + 50% Rice Husk)	11.56ab	12.00ab	11.78ab	12.44ab
	M3 (25% Sawdust + 75% Rice Husk)	10.44a	11.67ab	10.44a	10.56a
	HSD 5%.	2.2			
3	M0 (100% Sawdust)	9.56	11.44	8.78	10.44
	M1 (75% Sawdust + 25% Rice Husk)	10.78	9.33	9.56	9.33
	M2 (50% Sawdust + 50% Rice Husk)	9.56	9.67	9.78	10.44
	M3 (25% Sawdust + 75% Rice Husk)	8.44	9.67	8.44	8.56
	HSD 5%.	ns			

Note: Numbers followed by the same letters indicate no significant difference in the HSD test at significance level 5% (ns = not significance).

to the nutrients obtained by each fruiting body with more stalks per clump will be less when compared to fruiting bodies with a small number of stalks. This is in line with Sitorus's statement (2024) that the fewer fruit bodies that grow, the wider the diameter that will form. Sawdust contains lignocellulose which is the main nutrient for the growth of mycelium and the development of fruit bodies. This is in line with the statement of Hidayah *et al*. (2017) that the diameter of the mushroom cap is influenced by the concentration of the content of the mushroom growing media substrate which will be used for the physiological needs of the fungus.

High lignin levels are also not good because they can inhibit the growth and formation of oyster mushroom fruiting bodies, so the resulting mass will be smaller. LOF made from kepok banana peels contains macronutrients such as N, P, and K, which each play important roles in vegetative growth, root formation, and fruit body maturation. In effective LOF, the optimal nitrogen content is between 0.2 – 0.5%, phosphorus around 0.1 – 0.3%, and potassium around 1-3%. The content of these nutrients can support optimal growth without causing nutrient excess that could damage the growing medium (Criswantara, 2021).

3.4. Harvest Weight

The results of the analysis of variance showed that there was a very significant interaction in the combination of substrate media treatment and concentration of LOF on the fresh weight of white oyster mushroom fruit bodies in the 1st (*p*-value= 0.07) and 2nd (*p*-value = 0.046) harvest periods. While in the 3rd harvest period, there was no interaction between the combination of substrate media treatment and the concentration of LOF on the fresh harvest weight of white oyster mushroom (Table 4). The best treatment combination is the treatment of sawdust + rice husk planting media (50% : 50%) and the LOF concentration of 200 mL/L, which gives the highest average fresh weight of fruit bodies in the 1st harvest period which is 107 g/baglog and in the 2nd harvest period which is 88 g/baglog.

Sawdust serves as the main source of lignocellulose needed for mycelium growth, while rice husk improves aeration and porosity of the media, facilitating mycelium the growth and fruit body formation. This is in line with the statement of Nurjasmi & Banu (2024) that the use of a mix of sawdust and rice husk in the appropriate ratio can significantly increase the yield of white oyster mushrooms compared to the use of single materials. The application of LOF from banana peels with a concentration of 200 mL/L can only be optimal in the generative phase of oyster mushrooms, because in this phase the fungal tissue has developed sufficiently strong to tolerate high nutrient concent-

Table 4. Effect of treatment on the average harvest weight (g/baglog) of white oyster mushroom

Harvest period	Planting Media (%)	Concentration of LOF (mL/L)			
		0	100	150	200
1	M0 (100% Sawdust)	82.7 b	63 ab	62.4 ab	72.4 ab
	M1 (75% Sawdust + 25% Rice Husk)	82.4 b	90.3 b	62.4 ab	55.7 ab
	M2 (50% Sawdust + 50% Rice Husk)	90.2 b	70.8 ab	70.3 ab	**107 b**
	M3 (25% Sawdust + 75% Rice Husk)	49.1 ab	82.6 b	60.6 ab	42.4 a
	HSD 5%.	35.7			
2	M0 (100% Sawdust)	70.4 ab	71.8 ab	49.6 ab	66.4 ab
	M1 (75% Sawdust + 25% Rice Husk)	80.9 b	78.4 ab	54.8 ab	54.7 ab
	M2 (50% Sawdust + 50% Rice Husk)	79.4 b	58.1 ab	78.8 ab	**88 b**
	M3 (25% Sawdust + 75% Rice Husk)	47.4 ab	69.8 ab	59.2 ab	45.3 a
	HSD 5%.	34.0			
3	M0 (100% Sawdust)	48.33	48.22	31.56	53.67
	M1 (75% Sawdust + 25% Rice Husk)	52.44	64.22	42.11	38.67
	M2 (50% Sawdust + 50% Rice Husk)	53.00	34.22	52.11	54.67
	M3 (25% Sawdust + 75% Rice Husk)	36.00	47.56	44.78	35.22
	HSD 5%.	ns			
Total	M0 (100% Sawdust)	201.40 c	111.20 ab	143.60 b	192.50 c
	M1 (75% Sawdust + 25% Rice Husk)	214.70 cd	232.90 cd	159.30 bc	149.10 bc
	M2 (50% Sawdust + 50% Rice Husk)	222.60 cd	163.10 bc	122.40 b	**249.70 d**
	M3 (25% Sawdust + 75% Rice Husk)	132.50 b	200.00 c	164.60 bc	77.60 a
	HSD 5%.	43.56			

Note: Numbers followed by the same letters indicate no significant difference in the HSD test at significance level 5% (ns = not significance).

rations without being disturbed by osmotic pressure or potential toxicity as may happen in the early phase of mycelial growth. Meanwhile, in the vegetative phase, high concentrations can actually be inhibiting because the mycelial tissue is still sensitive to the environment. The combination of treatments with a balanced proportion provides an optimal environment for white oyster mushrooms. This is consistent with the research of Pratiwi *et al.* (2025) that the balance between nutrients and the physical structure of the planting media is very important in mushroom cultivation.

The results of the analysis of variance also showed that there was a very significant interaction (*p-value* = 0.036) in the combination of substrate media treatment and the concentration of LOF of kepok banana peel on the total harvest weight of white oyster mushroom fruit bodies. The best combination treatment is M2P3 (50% substrate media of sawdust + 50% rice husk) and the concentration of LOF 200 mL/L which gives a total fresh weight of 249.70 g/ baglog. Meanwhile, the treatment combination with the lowest average total harvest weight of 77.60 g/baglog, was found in the treatment of M1P3 (25% sawdust + 75% rice husk) and concentration of LOF 200 mL/L.

Our finding is in accordance with the research results by Costa *et al*. (2023), where substrates with 25% and 50% of rice husk mixtured with eucalyptus sawdust improving the fresh oyster mushroom production compared to the substrate of 100% eucalyptus sawdust. Furthermore, using raw rice husk in a mixture of up to 50% eucalyptus sawdust is recommended for *P. ostreatus* production. Oyster mushrooms require sufficient nutrient sources for their development process in the form of essential elements such as nitrogen, phosphorus, carbon, and several other elements. However, the nutrient content found in the sawdust and rice husk planting media is still relatively low, so additional nutrients from external sources need to be added. LOF made from kapok banana peels is one of the additional nutrients that can be used. This is in line with the statement of Fitriani *et al*. (2025) that the use of LOF made from kepok banana peels can accelerate the growth of mycelium and increase the yield of white oyster mushrooms when used in the right proportions. The lignin content in rice husks causes a hindered supply of nutrients for oyster mushrooms and leads to a low number of fruiting bodies of oyster mushrooms. This is consistent with the statement of Kusumawardani *et al*. (2021) that when there is too much husk in the growing medium, the silica content in the medium also increases, thus hindering the lignocellulose degradation process. Growing media that have high lignin and cellulose content may take longer to initiate the formation of pinheads and the development of fruiting bodies, as well as the fresh weight of the fruiting bodies. Wulandari & Suparti (2022) also reported that the optimal substrate composition for oyster mushrooms was 40% rice husk + 60% sawdust, which produced the highest number of mushroom fruiting bodies (10.17) and a fresh mushroom weight of 80.75 g/baglog.

4. CONCLUSION

The addition of rice husk in sawdust as the growing media for white oyster mushroom cultivation significantly affects all observed parameters, including the early emergence of fruiting bodies, the number of caps, the diameter of caps, and the harvest weight. The treatment combination M2P3 (substrate composition 50% sawdust and 50% rice husk with 200 mL/L of LOF made of banana peel) revealed as the most effective treatment for enhancing the yield of white oyster mushrooms. This treatment produced the highest number of caps (13.1 pieces), and total harvest weights (249.70 g/baglog). Number of caps correlate with total weights of mushrooms, indicating that this number can serve as a predictor of mushroom yield. Further studies are recommended to test this treatment under different environmental conditions and with other mushroom species to confirm its broader applicability.

AUTHOR CONTRIBUTION STATEMENT

Author	C	M	So	Va	Fo	I	R	D	O	E	Vi	Su	P	Fu
NNL	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓		✓	✓
FDD		✓		✓			✓			✓		✓		✓
NT		✓		✓			✓			✓		✓		

C: Conceptualization	Fo: Formal Analysis	O: Writing - Original Draft	Fu: Funding Acquisition
M: Methodology	I: Investigation	E: Writing - Review & Editing	P: Project Administration
So: Software	D: Data Curation	Vi: Visualization	
Va: Validation	R: Resources	Su: Supervision	

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