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Assessment of Mixed Cultivation Substrate (Burnt Husk-Sawdust-Bagasse) and NPK Fertilizer on Growth Performance of Oyster Mushroom (*Pleurotus ostreatus*)

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Abstract

Background: *Oyster mushroom cultivation generally uses sawdust as the primary rowin medium. Limited availability and fluctuating prices require innovation for mushroom planting media. The use of bagasse and burnt husk waste as an alternative medium in an effort to maximize abundant but underutilized agroindustrial resources has the potential to become a medium for growing oyster mushrooms, as the cellulose and lignocellulose content can support optimal mycelium growth. Therefore, this study aims to analyze the effect of using burnt husk as planting media, bagasse, and NPK fertilizer on the growth of oyster mushrooms (Pleurotus ostreatus).* **Methodology:** *This study employed a factorial Group Random Design method, consisting of two factors: the combination factor of substrate media (M) and NPK fertilizer dosage (N). The observed parameters included mycelial growth, cap dimeter and fresh weight of the mushroom. Data were analyzed by using Analisys of Variance (ANOVA) with SPSS v.25.* **Findings:** *The results of the data analysis showed the optimization of fungal growth in a combination of 1000 gr of sawdust and 80 gr burnt husk without the addition of NPK fertilizer with f calculated > f table (7.08>3.63). The ANOVA test confirmed that NPK fertilizer did not have a significant effect on the quality of mushrooms, possibly even negatively, because NPK creates nutrient-rich conditions that favor competing microorganisms that develop faster than oyster mushrooms. The combination of burnt husk and sawdust without NPK (M1N0) resulted in the highest mycelial growth, reaching 21.3 cm, while the lowest growth was observed in the sawdust and bagasse media with the addition of NPK (15 g) (M2N1), which was 16 cm. Meanwhile, the highest cap diameter was obtained in the Sugarcane bagasse and sawdust media without NPK (M2N0), with an average value of 8 cm. In contrast, the lowest diameter was observed in the bagasse media with an NPK of 20 g (M2N2), which was 5 cm.* **Contribution:** *This research confirms that burnt husk and sugarcane bagasse substrates, without NPK fertilizer, can serve as an effective and environmentally friendly alternative medium for oyster mushroom cultivation.*

Keywords: *Fertilizer; Oyster Mushroom; Planting Medium*

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INTRODUCTION

Oyster mushrooms are an organic food source with high nutritional value and have become an essential part of consumption that is in great demand in various circles of society. Increasing consumption and people's needs for food fulfillment create a great opportunity for horticultural commodities such as oyster mushrooms to be developed commercially (Bukit et al., 2025). Based on data from the Central Statistics Agency (BPS), oyster mushroom production in North Sumatra Province in 2023 reached 623 kg, while in 2024 it will increase significantly to 1,487,592 kg (BPS North Sumatra Province, 2024).

Mushrooms contain high-quality protein due to their complete essential amino acid profile. In addition, mushrooms are also easy to cultivate because, as it can grow and adapt to various types of media and environmental conditions (Inayah et al., 2022). Oyster mushrooms contain nine types of essential amino acids, such as isoleucine, arginine, threonine, histidine, lysine, valine, methionine, phenylalanine and tryptophan. Additionally, approximately 72% of its fat content consists of unsaturated fat. Mushrooms also contain niacin, vitamins B1 (thiamine), B2 (riboflavin), and biotin, as well as other essential micronutrients (Susilo et al., 2017).

This mushroom is one of the sources of vegetable protein, in addition to nuts, which are quite popular with the public. Its nutrient composition includes vitamins B1, B2, and C, as well as biotin, along with various minerals such as potassium, magnesium, phosphorus, calcium, and sodium. The economic value of white oyster mushrooms continues to show improvement, with promising prospects as a non-oil and gas export commodity (Suryani et al., 2017).

On the other hand, the high volume of agricultural waste that has not been optimally utilized is unfortunate, even though the waste can be used as an alternative medium for growing mushrooms, serving as a substitute for sawdust, which is now increasingly expensive and difficult to obtain. In 2018, the demand for wood raw materials in North Sumatera reached 6.2 million m^3. Based on these data, it can be concluded that the increase in demand for raw materials in the wood industry sector will be directly proportional to the increase in waste volume (PT. Universal Eco Pacific, 2025). Proper waste management can help reduce the level of environmental pollution that results (Devotion et al., 2021). The abundant availability of agricultural waste presents a significant opportunity, as it not only reduces waste but also serves as a medium for mushroom cultivation, such as using rice husks or bagasse (Kurniawan, 2022).

Previous research has shown that various organic materials, such as burnt husks, sawdust, and bagasse, have great potential as a mushroom-growing medium due to their volatile properties and nutrient content, which support the growth of mycelium (Hapida, 2019). Rice husks contain fiber that is useful as a complementary material for planting white oyster mushrooms, because these fibers are needed in the mushroom growth process. Based on research (Suparti and Marpuah (2015), it is proven that the addition of rice husks of up to 15% is able to increase the fresh weight of white oyster mushrooms, the number of fruit bodies, and accelerate the development of mycelium. Additionally, husks play a crucial role in the development of mycelium.

Based on the significance of the results from previous research, this study aims to explore and verify the effectiveness of certain organic materials as an alternative medium for increasing the growth and productivity of oyster mushrooms (Kurniati et al., 2020).

Sawdust, which is a by-product of the wood processing industry, is available in large quantities in Indonesia but has not been utilized optimally. If left unchecked, this waste has the potential to pollute the environment. Therefore, the use of sawdust as the main medium of oyster mushrooms. The main ingredients in sawdust, such as carbohydrates and fiber, make it a suitable medium for the growth of oyster mushrooms (Wahyuddin, 2021).

Bagasse is also an agricultural waste rich in lignocellulose, which is essential for the growth of oyster fungal mycelium. This pulp contains high levels of lignin, which is about 46.5% and 14%. The addition of bagasse waste as a planting medium treatment can increase the number of fruit bodies and the fresh weight of oyster mushrooms, thereby contributing positively to their productivity (Ramdhoani et al., 2025). The application of sugarcane bagasse can have a positive impact on increasing the growth and production of white oyster mushrooms. The growth of mycelium and the formation of oyster mushroom fruit bodies in bagasse media are influenced by the higher sugar content. In addition, the relatively low lignin content of bagasse (24.2%) compared to sengon sawdust (26.8%) makes nutrients more easily absorbed by oyster mushrooms, It is said that high levels of lignin can inhibit the growth and formation of mushroom fruit bodies (Erlinda et al., 2021)

Based on Suriawiria's 2002 research, it was stated that mushrooms can grow in waste media because they are able to degrade organic waste. With this ability, white oyster mushrooms have the potential to be utilized in increasing the value of organic waste. Fungi are simple organisms that lack chlorophyll, and therefore, they are incapable of photosynthesis. Therefore, the Pleurotus cannot produce its own food and obtain nutrients from the medium in which it grows through hyphae and mycelium (Horticulture, 2018). This fungus is a type that grows on dead organic substrates and is able to decompose the substrate into simpler, more easily absorbable compounds. The fulfillment of plant nutrient needs can be achieved by providing fertilizer in appropriate doses. The application of NPK fertilizer in the right amount has been proven to be able to increase the growth and quality of oyster mushrooms (Sholihah et al., 2025)

To support its growth, white oyster mushrooms require a source of essential nutrients, including nitrogen (N), phosphorus (P), and potassium (K). The addition of fertilizer to the planting medium has been proven to increase mushroom production. Increased fungal growth occurs due to the support of physiological processes that are a response to the sufficiency of essential nutrients, especially macronutrients such as nitrogen, phosphorus and potassium, which play a role in the process of cell division and elongation (Pradana et al., 2024). This is supported by research (Widyaningsih, 2023), which indicates that fertilizer can enhance the production of white oyster mushrooms. Furthermore, a lack of NPK can inhibit fungal growth. Similar results were also found by Nurkameria et al., (2016) where the addition of NPK fertilizer has a significant influence on the development of the fresh weight of white oyster mushrooms and the growth of the number of fruit bodies. The addition of nutrients to the planting medium can enhance the fungus's ability to absorb nutrients, thereby affecting its body weight (Choliq et al., 2021). The application of fertilizer has been proven to significantly increase the productivity of oyster mushrooms, including the size and diameter of the mushroom hood (Tangdilintin et al., 2024).

Based on the description above, the author will conduct research to determine the growth of Oyster Mushrooms (*Pleurotus ostreatus*) on various types of planting media and the application of NPK fertilizers. The purpose of this study is to find out the influence of burnt husk planting media, the influence of sugarcane bagasse planting media, and the effect of a combination of burnt husk planting media, sawdust and sugarcane bagasse as well as the application of NPK fertilizer on the growth of oyster mushrooms (*Pleurotus ostreatus*). Using local organic waste as a planting medium can be a more effective and environmentally friendly alternative. This research is expected to make a new contribution by exploring the combination of local organic waste, namely burnt husks and bagasse, with NPK fertilizers, thereby increasing the efficiency of oyster mushroom cultivation through accelerated mycelium growth, enhanced fruit body weight, and optimized nutritional content of the planting media.

METHOD

This study used a Group Randomized Design (RAK) with a factorial arrangement as the experimental design. The design involves two main factors, namely: A combination of planting media consisting of several treatments, such as a combination of burnt husks, sawdust, and bagasse. The second factor is the application of NPK fertilizer, which can also have several dosage levels, including no fertilizer, low-dosage fertilizer, and high-dosage fertilizer.

The samples used in this study were planting media in the form of sawdust, burnt husks and bagasse with different concentrations and NPK fertilizers

Factor M (Planting Media) consisted of several treatment media, namely:
M1: Sawdust + Baked husk (1000 gr + 80 gr)
M2: Sawdust + Bagasse (1000 gr + 40 gr)
M3: Sawdust + Baked husk + Bagasse (1000 gr + 40 gr + 40 gr)

Factor N (NPK Fertilizer Administration), which consists of 3 treatments, namely:
N0: No NPK Fertilizer
N1: NPK Fertilizer (15 gr)
N2: NPK Fertilizer (20 gr)

From the two factors above, there are 9 combinations, namely: M1N0, M1N1, M1N2, M2N0, M2N1, M2N2, M3N0, M3N1, M3N2. Each combination of planting medium (M) and fertilizer (N) dose will be applied in a random experiment. There are three treatments of planting media and three treatments of fertilizer application, so the total number of treatments tested is $3 \times 3 = 9$ combinations of treatments. The number of combinations was 9, the number of treatments was 27 baglogs and the total number of baglogs was 81 baglogs.

Research Time and Location

This research was conducted at Mukur Ginsa Jaya, Jl. Glugur Rimbun, Tj. Anom, Pancur Batu District, Deli Serdang Regency, North Sumatra. The type of cultivation room found in the ginsa jaya mushroom is a kumbung house (traditional) with a simple structure, made of woven bamboo. Temperature and humidity follow the outside environment, no special microclimate control. This research was carried out from June 2025 to July 2025.

Materials and Tools

The material used in this study is F2 oyster mushroom seeds (Oyster mushroom variety (*Pleurotus ostreatus*) which comes from oyster mushroom spores from the first strain cross, this mushroom seed is obtained from the ginsa jaya mushroom cultivation site. The following materials are sawdust, bagasse, burnt husks, dolomite lime, which functions to neutralize the pH of the media; bran to accelerate mycelium colonization and improve the texture of the media; water; NPK fertilizer; alcohol; cotton; newspaper; rubber bands; plastic; and label paper. The equipment used in this study includes autoclaves, metal spatulas, knives, pipe rings, scales, masks, shovels, spray bottles, rulers, scissors, storage racks, buns, and stationery supplies.

Observation Parameters

The parameters observed in this study included; Mycelium growth (the growth rate of mycelium is measured using a ruler, by calculating the diameter of the mycelium colony in the planting medium for two weeks. Measurement of this closure percentage was carried out in the seventh week after the inoculation process.), the diameter of the fruit hood (the measurement of the diameter of the mushroom hood was carried out after the mushroom bloomed.) and the fresh weight of the fruit body (the weighing of the fresh weight of the mushroom fruit body was carried out immediately after harvest. The harvested mushrooms are directly weighed using a digital scale to determine the fresh weight or fresh weight of the oyster mushrooms.)

Research Procedure

1. Preparation of Planting Media

   The media is composed of a mixture of burnt husks, sawdust, and bagasse, depending on the treatment. NPK fertilizer is added according to the dose, as well as $CaCO_3$ and $CaSO_4$. All ingredients are mixed until homogeneous, and water is added until the humidity level of the medium reaches 90%. The mixture is then composted for 48 hours.
2. Packaging and Sterilization

   The media is placed into a PP plastic bag (baglog), covered with sterile cotton, and tied. Sterilization is carried out through 100°C pasteurization for 8 hours or hot steam 120–150°C for 8 hours. After that, the baglog is cooled for about 24 hours until it reaches a temperature of 35–40°C.
3. Inoculation and Incubation

   Mushroom seedlings are inserted into the baglog asepsis. The baglog is re-closed and incubated at 22–28°C and 60–70% humidity. After 30–40 days, when the mycelium is fully developed, the baglog is transferred to the beetle under temperature conditions of 16–22°C and humidity of 80–90% for pinhead formation.

4. Stage of Fruit Body Enlargement

   In 3–4 weeks, the baglog will be covered in white mycelium. The baglog cover is opened to stimulate the growth of the fruit body at an ideal temperature of 16–28°C. The fully colonized baglogs are then stimulated by opening or cutting the plastic mouth.

5. Oyster Mushroom Harvest

   Mushrooms are harvested when they are 6–11 cm in size by uprooting the entire clump. After cleaning and cutting the base, the mushrooms are weighed.

6. Observation and Measurement

   Observations included mycelium germination time from the first to third week, measurement of mushroom hood diameter and measurement of fresh weight at harvest.

7. Data Analysis

   After the observation was completed, the data were analyzed using a variance analysis test (ANOVA) to determine if there was a significant difference between the treatments applied.

RESULTS AND DISCUSSION

Mysellium Growth Results

The growth of mushroom mycelium in the first, second and third weeks has significant differences. This is illustrated in Table 1.

Table 1. Mysellium Growth Observation

		Treatment									
		Week I									
Replication		**M1N0**	**M2N0**	**M3N0**	**M1N1**	**M2N1**	**M3N1**	**M1N2**	**M2N2**	**M3N2**	**Total**
	1	9	7	8	8	7	7	7	10	7	70
	2	10	7	8	8	7	7	10	11	8	76
	3	11	10	9	8	10	8	11	12	8	87
	Total	30	24	25	24	24	22	28	33	23	233
	Average	10	8	8,3	8	8	7.3	9.3	11	7.6	8.6
		Week III									
	1	16	16	15	12	12	12	11	13	13	120
	2	17	16	15	13	13	13	13	14	14	128
	3	18	18	16	16	18	13	14	15	16	144
	Total	51	50	46	41	43	38	38	40	43	390
	Average	17	16.6	15.3	13.6	14.3	12.6	12.6	13.3	14.3	14.4
		Week III									
	1	21	18	20	16	16	15	16	19	15	156
	2	22	20	20	17	15	17	17	18	17	163
	3	21	23	21	17	17	17	17	20	18	171
	Total	64	61	61	50	48	49	50	57	50	490
	Average	21.3	20.3	20.3	16.6	16	16.3	16.6	19	16.6	18.1

This is evident from the results of data analysis on the observation of mycelium growth. Mycelium growth can be analyzed using analysis of variance (ANOVA).

Table 2. Mycelium growth variant analysis

SK	DB	JK	KT	F count	F Table 0.05	F Table 0.01	Ket
Group	2	12.52	6.26	7.08	3.63	6.23	**
Treatment	8	104.74	13.09	14.81	2.59	3.89	**
N	2	91.19	45.59	51.56	3.63	6.23	**
M	2	2.07	1.04	1.17	3.63	6.23	Mr
M*N	4	11.48	2.87	3.25	3.01	4.77	*
Error	16	14.15	0.88				
Total	26	131.41	5.05				

Code MR: Different Not Real, ** : Very Real Difference, * : Real Difference

In the third week, there was a significant difference between the f-count and the f-table in mycelium growth. This can be proven by the finding that the value of f count group (7.08) > greater than the f table (3.63). Therefore, it can be obtained that there is an effect of the use of burnt husks, sawdust and bagasse on the growth of oyster mushroom mycelium. This can be seen in the table 3.

Table 3. Tukey HSD Test Results on Mushroom Mysellium

Multiple Comparisons

Dependent Variable	(I) ex.	(J) kel	Mean Difference	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Mysellium growth	k 1	k 2	.778	1.049	.742	-3.40	1.84
		k 3	1.667	1.049	.270	-4.29	.95
	k 2	K1	.778	1.049	.742	-1.84	3.40
		k 3	.889	1.049	.678	-3.51	1.73
	k 3	K1	1.667	1.049	.270	-.95	4.29
		k 2	.889	1.049	.678	-1.73	3.51

Figure 1. Mycelium growth from the first week to the third week

The growth and spread of mycelium is the activity of mycelium in fulfilling the baglog that has been determined based on treatment. The mycelium's ability to fulfill the baglog is one of the benchmarks for the success of fungal inoculation. This statement aligns with Elfandari et al., (2021) opinion, which states that the faster

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the mycelium spreads, the faster the process of fruit body formation will also occur. If a baglog is not overgrown with mycelium, the inoculation can be declared a failure (Azzahra et al., 2022). The mycelium is able to grow on the surface of a lignin-containing substrate through the activity of extracellular enzymes produced by the fungus, thus forming a lysis zone around the medium.

Therefore, when mushroom seeds are inoculated into the medium, the enzyme can easily decompose the macromolecules it contains. The planting inoculation method is one of the innovations that has the potential to increase the productivity of oyster mushroom cultivation (Jumriani et al., 2023). Based on the analysis results, it was demonstrated that the treatment of sawdust and bagasse (M2N2) media had a significant impact on the growth time of white oyster mushroom mycelium (*Pleurotus ostreatus*). In line with research (Fajar et al., 2020) that the addition of molasses or bagasse that is high in calories and rich in various vitamins can stimulate the branching of the mycelium through increased activity of cells in the mycelium, thus having an impact on increasing the body weight of the mushroom fruit.

In this study, it was found that the fungus undergoes varied changes every week, from the first to the third week. The growth of mycelium with the highest average value occurred in the M2N2 treatment, which was 11 cm. In contrast, the lowest mycelium growth was recorded in the M3N2 treatment with an average of 7.6 cm. In the second week, the M1N0 treatment showed the highest mycelial growth, with an average of 17 cm, while the M3N1 and M1N2 treatments had the lowest growth, at 16.6 cm. In the third week, the highest mycelium growth was again found in the M1N0 treatment with an average of 21.3 cm. This is due to the nutrients that oyster mushrooms obtain from sawdust and other materials such as rice husks. The addition of rice husks with sawdust contributes positively to the spread of mycelium, the fresh weight of the fruit body, and the number of oyster mushroom fruit bodies. Meanwhile, the lowest average mycelium growth was found in the M2N1 treatment sample with an average value of 16 cm. Mycelium growth, according to Hariri et al., (2025) It affects indirectly the formation of fungal fruit bodies, because fruit bodies develop from mycelium tissue. If the growth of mycelium is inhibited, the formation of fruit bodies will also not take place optimally.

Fruit Cap Diameter

In testing the diameter of the mushroom fruit cap, data was found as listed in the following table 4.

Table 4. Observation of Fruit Cap Diameter (cm)

Treatment	Replication			Total	Average
	1	2	3		
M1N0	4	7	9	20	6.6
M2N0	6	9	9	24	8
M3N0	4	6	8	18	6
M1N1	4	6	7	17	5.6
M2N1	5	7	6	18	6
M3N1	4	6	7	17	5.6
M1N2	4	5	7	16	5.3
M2N2	4	6	5	15	5

Treatment	Replication			Total	Average
	1	2	3		
M3N2	3	6	6	15	5
Total	38	66	64	160	5.9

The ANOVA test carried out to determine the effect of the planting medium on the mushroom fruit cap is presented in Table 5.

Table 5. Anova test on the diameter of the mushroom fruit cap

SK	DB	JK	KT	F count	F Table		Ket
					0.05	0.01	
Group	2	151.41	75.70	23.91	3.63	6.23	**
Treatment	8	21.19	2.65	0.84	2.59	3.89	MR
N	2	14.52	7.26	2.29	3.63	6.23	MR
M	2	2.74	1.37	0.43	3.63	6.23	MR
M*N	4	3.93	0.98	0.31	3.01	4.77	MR
Error	16	50.67	3.17				
Total	26	71.85	2.76				

Code MR: Different Not Real, ** : Very Real Difference, * : Real Difference

In Table 5, it was found that the value of f calculated (23.91) is greater than the value of f in the table (3.63) by a significant 5%. It can be concluded that the planting medium does not have a significant effect on the diameter of the oyster mushroom fruit cap. The growth of the fruit hood can be concluded in the third week. The growth of oyster mushroom fruit caps in this study had different results in each treatment. The diameter of the oyster mushroom fruit cap varies in each treatment. The fruit cap with the highest diameter was found in the M2N0 treatment with an average value of 8 cm, while the fruit cap with the lowest diameter was found in the M2N2 and M3N2 treatment samples with an average value of 5 cm.

Figure 2. Measurement of the fruit cap

The size of the diameter of the mushroom cap is influenced by the number of fruit bodies that grow. The more fruit bodies develop, the smaller the diameter tends to be. This occurs because the nutrients in the medium are evenly distributed throughout the growing fruit body. Based on the results of the study (Nuradellia et al., 2023), then the larger the size of the fruit cap, the larger the body of the oyster mushroom, which is directly proportional to the increase in fresh weight. If all prospective fruit bodies succeed in developing into perfect oyster mushrooms, then the nutrients in the media will be distributed to support the growth of each fruit body. On the other hand, if the number of prospective fruit bodies is small, then the available nutrients will accumulate and be allocated more for the formation of the cap, so that the diameter of the fruit cap becomes Larger (Tangdilintin et al., 2024).

The size of the diameter of the mushroom cap is influenced by the temperature and nutrient content in the planting medium. Some essential nutrients that play a role in the formation of mushroom fruit bodies include moisture content, pH, and cellulose, hemicellulose, and lignin. Cellulose will be broken down into carbohydrates and oxygen which are then absorbed by fungi as a source of nutrients for the formation of fruit bodies.

Overall, the diameter of the mushroom cap in this study is quite large compared to the average size of the oyster mushroom cap in general. This is due to the abundant availability of nutrients and a relatively small number of fruit bodies. With a smaller number of fruit bodies, each individual mushroom gets more nutrients, so the size of the cap formed tends to be larger. This opinion aligns with the statement by Siska et al. (2015), which states that the smaller the number of fruit bodies that grow, the larger the size of the cap produced. This is because mushroom caps that grow in small numbers have enough space and access to nutrients to develop optimally without experiencing competition or pressure from other caps. On the other hand, if the number of caps is too high, then the space becomes limited, causing the development of the cap to be suboptimal. Each cap needs nutrients from the medium. If there are too many caps, the nutrients are divided, resulting in insufficient amounts to support the optimal growth of each cap. The cap that is squeezed together makes the surface of the cap depressed and cannot widen normally, so the final size is smaller.

Fresh weight

In the fresh weight test of mushroom fruits, the data are listed in Table 6.

Table 6. Weight of the Fruit (gr)

Treatment	Replication			Total	Average
	1	2	3		
M1N0	56	86	134	276	92
M2N0	48	79	125	252	84
M3N0	58	86	112	256	85,3
M1N1	46	88	108	242	80,6
M2N1	52	90	118	260	86,6
M3N1	43	76	97	216	72
M1N2	23	56	102	181	60,3
M2N2	36	68	80	184	61,3
M3N2	22	66	92	180	60
Total	384	725	968	2047	75,78

The ANOVA test carried out to determine the effect of planting media on the fresh weight of mushroom fruits is presented in Table 7.

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Table 7. Anova test on fresh weight of mushroom fruit

SK	DB	JK	KT	F count	F Table		Ket
					0,05	0,01	
Group	2	12,52	6,26	7,08	3,63	6,23	**
Treatment	8	104,74	13,09	14,81	2,59	3,89	**
N	2	91,19	45,59	51,56	3,63	6,23	**
M	2	2,07	1,04	1,17	3,63	6,23	Mr
M*N	4	11,48	2,87	3,25	3,01	4,77	*
Error	16	14,15	0,88				
Total	26	131,41	5,05				

Code MR: Different Not Real, ** : Very Real Difference, * : Real Difference

In the above test, it was found that the value of f calculated (0.95) < than the value of f table (3.63) by a significant 5%. It can be concluded that the planting medium does not have a significant effect on the fresh weight of oyster mushroom fruits, another supporting factor is the additional nutrients from NPK.

Figure 3. Measurement of the fresh weight of mushrooms

The fresh weight of the fruit in oyster mushrooms can be determined in the fourth week, which corresponds to a 28 HSI. The fresh weight of oyster mushroom fruit has different values in each treatment and repetition. The fresh weight of the fruit in the mushroom with the highest value was in the M1N0 treatment with an average value of 92 grams. High levels of cellulose and lignin are crucial for supporting the growth of mycelium and enhancing mushroom productivity (Rosnina, 2017). Meanwhile, oyster mushrooms with the lowest fresh weight were found in the M3N2 treatment sample, with an average value of 60 grams.

The combination of burnt husks, sawdust and bagasse as a growing medium for oyster mushrooms resulted in several different ANOVA values in each treatment. Based on the results of variant analysis (ANOVA) on the combination of burnt husk, sawdust and bagasse planting media in the third week of the study had a significant influence on the growth of oyster mushroom mycelium. This is marked by the value of f. calculating anova, which is 7.08 greater than f. calculating (3.65) with sig. 0,05.

This makes it clear that the treatment of M1N0 (burnt husks, sawdust without the addition of NPK fertilizer) is the most influential medium on the growth of oyster fungal mycelium. Meanwhile, M2N1 treatment (sawdust, bagasse with the addition of 15 grams of NPK fertilizer) is the planting medium that has the least impact on the growth of oyster mushroom mycelium. The diameter of the mushroom fruit cap could be measured in the third week of the study. The results of the ANOVA test on the diameter of the oyster mushroom cap showed an F value of 23.91, which is greater than the F of the table of 3.63. This indicates that the combination of sawdust, burnt husks, and bagasse has a significant influence on the diameter of the oyster mushroom fruit cap.

The M2N0 treatment resulted in the highest fruit cap diameter with an average of 8 cm, while the lowest cap diameter was found in the M2N2 and M3N2 treatments, with an average of 5 cm, respectively, thus it was found that the samples that used burnt husks and bagasse (M2N0) as their planting medium had the highest cap diameter values. Meanwhile, samples using burnt husks and bagasse with the addition of 20 grams of NKP fertilizer (M2N2) and samples using burnt husks, sawdust, and bagasse with the addition of 20 grams of NPK fertilizer had the lowest diameter value of oyster mushroom fruit caps.

The fresh weight of the fruit can be determined by weighing the oyster mushrooms to determine the fresh weight value. Based on the results of the ANOVA test in Excel, it was found that the fresh weight of the fruit was smaller than the value of the table F, which was $0.95 < 3.63$. It can be concluded that in this study, the combination of burnt husks, sawdust, and bagasse planting media did not have a significant effect on the fresh weight of oyster mushroom fruits.

The fresh weight of the fruit in the M1N0 treatment was the highest value in the treatment with an average value of 92 grams. Meanwhile, oyster mushrooms with the lowest fresh weight were found in the M3N2 treatment sample, with an average value of 60 grams. The combination of burnt husk and sawdust planting media without the addition of NPK fertilizer was the heaviest sample. In contrast, the combination of burnt husk, sawdust, and bagasse planting media with the addition of NPK fertilizer, at a rate of 20 g, was the lightest sample in terms of fresh weight. Based on the statement of Siska et al., (2015) that the fresh weight of fungi is related to the growth of mycelium, but is more influenced by the availability of nutrient sources in the substrate, such as cellulose, protein, starch, as well as the elements carbon, nitrogen, hydrogen, and oxygen.

The media that has the most influence on mycelium growth, especially on fungal mycelium growth and fresh fruit weight, is a combination of burnt husk and sawdust planting media without the application of NPK fertilizer. Research by Criswantara (2021) suggests that during its development, the size of the mushroom fruit body appears to adjust to the carrying capacity of the available substrate. Although the number of fruit bodies that grow is large, it does not necessarily produce a high total biomass weight. On the one hand, the combination of sawdust and bagasse as a planting medium, without the addition of NPK fertilizer, is the most influential medium for the growth of fruit caps.

Effect of NPK fertilizer on the growth of Oyster Mushrooms Growth of Oyster Mushroom Mycelium

The application of NPK fertilizer to support the growth of oyster mushroom mycelium is evident in the average value of the sample data. The highest value was in the treatment of M1N0 without the addition of NPK fertilizer. Meanwhile, the lowest value was observed in the treatment of M2N1 with the addition of 15 grams of NPK fertilizer.

The addition of 15 grams of NPK fertilizer produced mycelium with a fairly high value, while the application of 20 grams of NPK fertilizer yielded a value in the middle group. However, in the treatment group without the addition of NPK fertilizer, the average value was the highest. Therefore, it can be concluded that NPK fertilizer does not increase the growth value of mushroom myceium, and the addition of NPK fertilizer of 15 grams makes the mycelium value low compared to the addition of 20 grams. Based on the description by Nugroho et al. (2019), it is stated that the higher the nutrient composition in the growing medium, the slower the growth of mycelium tends to be. This is because the mycelium is more active in looking for sources of nutrients in baglogs with lower nutrient content. The application of NPK fertilizer has a significant effect on the growth of mycelium, characterized by a higher value of f calculated than the f table (7.08 > 3.63). The more NPK fertilizer is added to the sample, the lower the growth of the mycelium.

Table 8. Application of NPK fertilizer

Table N	Value
N0 (0 %)	186
N1 (15 %)	147
N2 (20 %)	157

Diameter of Oyster Mushroom Fruit Cap

The effect of NPK fertilizer application on fungi can be assessed by looking at the diameter of the mushroom fruit cap. In this study, it was found that the diameter of the fruit cap with the highest value was found in the sample. The application of NPK fertilizer does not support the growth of the diameter of the oyster mushroom cap, and does not have a real effect on the diameter of the cap. This is evidenced by the f-calculated value of NPK fertilizer being smaller than the f table value (0.43 < 3.63). NPK fertilizer does not have a real effect can also be seen from the average value of each treatment, the unstable value increases or decreases.

Fresh Weight Oyster Mushroom

The application of NPK fertilizer to oyster mushrooms has no effect on the fresh weight of the mushrooms. This is due to data showing that the higher the NPK fertilizer levels, the lower the weight of oyster mushrooms. Excessive fertilizer application can reduce oyster mushroom production. This is because compound fertilizers, such as NPK, leave residues that are acidic. According to Afief et al., (2015), almost all compound fertilizers, unless treated in a certain way, tend to produce acidic residues due to the nitrogen element being carried in the form of ammonia. As a result, the pH of the sawdust medium decreases and becomes more acidic, whereas oyster mushrooms need an optimal pH between 5.5 to 7 for good growth. The most ideal medium pH for oyster mushroom growth is between 5.5 to 7. Media with a pH of less than 5 or more than 7 can inhibit the growth of mold (Puspita et al., 2020).

CONCLUSION

The burning husk planting medium has an impact on the growth of oyster mushrooms, particularly on the development of mycelium. M1N0 treatment with an average value of 92 grams without NPK fertilizer of 0 grams. Meanwhile, the lowest value was observed in the M3N2 treatment, which involved the application of NKP fertilizer, with an average value of 60 grams. The planting medium of bagasse affects the growth of mycelium and the fresh weight of fungi without the addition of NPK fertilizer. The planting medium of sugarcane bagasse (M2N0) has the highest value of the cap diameter with an average value of 8 cm, while the fruit cap with the lowest diameter is found in the M2N2 and M3N2 treatment samples with an average value of 5 cm. The combination of planting media, consisting of burnt husks, sawdust, and bagasse, has a significant influence on the growth of oyster mushroom mycelium, especially in media that use burnt husks and sawdust without the addition of NPK fertilizers. This combination medium enables the mycelium in oyster mushrooms to grow tall, with an average height of 21.3 cm. The highest value was in the treatment of M1N0 without the addition of NPK fertilizer. Meanwhile, the lowest value was observed in the treatment of M2N1 with the addition of 15 grams of NPK fertilizer. The cause of the ineffectiveness of NPK fertilizer is that it contains residues with acidic properties, which decrease the pH of the planting medium. This study demonstrates that organic planting media composed of burnt husks, sawdust, and bagasse can enhance mycelium growth and body weight of oyster mushrooms, eliminating the need for NPK fertilizer, while supporting efficient, environmentally friendly, and sustainable cultivation.

REFERENCES

Afief, M. F., Lahay, R. R., & Siagian, B. (2015). Growth and Production Response of White Oyster Mushroom (*Pleurotus ostreatus)* On Various Sawdust Media and NPK Fertilizer Response to Growth and Production of White Oyster Mushroom (*Pleurotus ostreatus*) To Various Media sawdust and giving NPK Fe. *Online Journal of Agroecotechnology*, *3*(4), 1381–1390. **[*In Indonesian language*]**

Azzahra, Y. R., Toharmat, T., & Prihantoro, I. (2022). Evaluation of the Physical Characteristics of Mushroom Fermented Media (*Pleurotus ostreotus)* as an Alternative Animal Feed for Ruminants. *Indonesian Journal of Agricultural Sciences,* 27(3), 351–58. https://doi.org/10.18343/jipi.27.3.351. **[*In Indonesian language*]**

BPS North Sumatra Province. (2024). North Sumatra Province in 2024 Figures. In *BPS North Sumatra Province*. https://sumut.bps.go.id/id/publication/2024/02/28/a2b9ed5089227612befc7827/provinsi-sumatera-utara-dalam-angka-2024.html **[*In Indonesian language*]**

Bukit Fikri, Andika et al. (2025). Test Several Planting Media Mixtures on the Growth and Production of Oyster Mushroom (*Pleurotus Ostreatus*). *Journal of Agroplasm*, *10*(1), 170–181. **[*In Indonesian language*]**

Choliq Kurniawan, Widodo, I., & Abbas, B. (2021). Growth and Development of White Oyster Mushrooms (*Pleurotus ostreatus*) in Sago Pulp Media. *Cassowary*, *4*(1), 28–38. https://doi.org/10.30862/casssowary.cs.v5.i1.92 **[*In Indonesian language*]**

Criswantara, D. (2021). Effect of applying bagasse and liquid organic fertilizer (POC) of banana peels on the growing medium of oyster mushrooms (*pleurotus astreatus). Scientific Journal of Agricultural Students*, *1*, 1–47. http://jurnalmahasiswa.umsu.ac.id/index.php/jimtani/article/view/941%0A **[*In Indonesian language*]**

Devotion, J., Vol, M., & Issn, O. (2021). Training on Making Organic Fertilizer from Baglog Waste to Increase Income in Oyster Mushroom Farmer Groups in Medan Denai Village, Medan Denai District. *Ihsan: Journal of Community Service*, *3*(1), 73–81. https://doi.org/10.30596/ihsan.v3i1.6817

Elfandari, H., Yusanto, & Septiana. (2021). Growth And Productivity Of Oyster Mushroom (*Pleurotus Ostreatus*) In Media Composition Of Sengon And Straw Plant. *Journal of Tropical Agrotechnology*, *9*(2), 301–305.

Erlinda, C., Prasetyaningsih, A., & Madyaningrana, K. (2021). The Effect of Sugarcane Bagasse Composting as an Alternative Media and Its Effect on the Productivity of White Oyster Mushroom (*Pleurotus ostreatus). LenteraBio : Scientific Periodical of Biology*, *11*(1), 161–173. https://doi.org/10.26740/lenterabio.v11n1.p161-173 **[*In Indonesian language*]**

Fajar, R., Siregar, S., Pane, E., & Mardiana, S. (2020). The Test Of Some Oyster Mushroom Varieties On The Media Combination Of Bagasse And Sawdust By Adding Molasses And Tofu Dregs. *Scientific Journal of Agriculture (JIPERTA), 1*(1), 106–111. http://jurnalmahasiswa.uma.ac.id/index.php/jiperta

Hapida, Y. (2019). The use of sugarcane bagasse in increasing the growth of white oyster mushrooms *(Pleurotus ostreatus)* in Palembang City and its contribution to biology subjects in high school. *Bioscience: Journal of Education*, *5*(1), 23–28. https://doi.org/10.19109/bioilmi.v5i1.3508 **[*In Indonesian language*]**

Hariri, A. M., Saraswati, K. D., Dirmawati, S. R., & Fitriana, Y. (2024). Egg Laying and Development of the Whitefly Paracoccus marginatus Williams & Granara de Willink on Three Types of Food Crop Hosts. *Jurnal Agrotek Tropika*, *12*(2), 259–269. https://doi.org/10.23960/jat.v12i2.8936 **[*In Indonesian language*]**

Horticulture, D. J. (2018). *Tips for Cultivating Oyster Mushrooms*. Bogor: Center for Library and Dissemination of Agricultural Technology. *39-65* **[*In Indonesian language*]**

Inayah, T., & Prima, E. (2022). Oyster Mushroom Cultivation and Processing as an Effort to Improve the Creative Economy of Beji Village. *Agricultural Friday: Journal of Community Service*, *3*(2), 96–99. https://doi.org/10.32764/abdimasper.v3i2.2881 **[*In Indonesian language*]**

Jumriani, S., Wahyuni, S., Afifah Rahmadinah, N., Manguntungi, B., & Puspita Sari, A. (2023). Optimization of Oyster Mushroom Mycelium Growth (*Pleurotus* *astreatus*) with the Addition of Rice Straw Nutrition Integrated with the Inoculation Model. *Journal of Biology Education Undiksha*, *10*(3), 14–24. **[*In Indonesian language*]**

Kurniati, F., Sunarya, Y., & Nurajijah, R. (2020). Growth and Yield of White Oyster Mushroom (*Pleurotus Ostreatus* (Jacq) P. Kumm) in Various Planting Media Compositions. *Agricultural Media,* *4*(2), 59–68. https://doi.org/10.37058/mp.v4i2.1358 **[*In Indonesian language*]**

Kurniawan, F. (2022). The use of various types of agricultural waste as a medium for growing mushrooms. *Bioedunis Journal*, *1*(2), 51–58. https://doi.org/10.24952/bioedunis.v1i2.6634 **[*In Indonesian language*]**

Nugroho, S. P. W., Baskara, M., & Moenandir, J. (2019). The Effects of Three Kind dnd Three Composition Planting Media Nutrient on White Oyster Mushroom. *Journal of Plant Production*, *7*(9), 1725–1731. **[*In Indonesian language*]**

Nuradellia, M., Putri, F. D., Saputra, T. S., Amrullah, M. I., Syahriar, F. F., & Amin, R. (2023). Morphological characteristics and extent of oyster mushroom pileus due to differences in baglog media placement. *Proceedings of the 2023 National Biology Seminar XI FMIPA Semarang*, 183–189. **[*In Indonesian language*]**

Nurkameria, Imam Mahadi, Evi Suryawati. (2016). Effect of Npk Complex Fertilizers to the Growth and Protein Content of White Oyster Mushrooms (*Pleurotus Ostreatus*) as Module Development of Biology Learning of Concept Mushrooms (Fungi) in Class X Senior High School on Growth and Protein Levels. *Agricultural Dynamics*, *32*(1), 1–15.

Pradana, H., Subardja, V. O., & Pirngadi, K. (2024). Effect of Organic Fertilizers, Merang Mushroom Waste and Biofertilizers on the Growth and Yield of Soybean Plants (*Glycine max* L. Merril) Grobogan Variety. *Journal of Agroplasm*, *11*(2), 276–288. https://doi.org/10.36987/agroplasma.v11i2.5898 **[*In Indonesian language*]**

PT. Universal Eco Pacific. (2025). *B3 Waste Management in the Wood Industry*. Universaleco.Id.https://r.search.yahoo.com/_yltFuniversaleco.id%2Fpengelolaan-limbah-b3-industri kayu%2F/RK=2/RS=22A7svgarBlzGjTqFDVqg.xHL8w-

Puspita, D., & Widaryanto, E. (2020). The Effect of Oyster Mushroom Planting Media Waste as Planting Media and NPK Fertilizer on Potted Sunflowers *(Helianthus annuus L .). Journal of Plant Production, 8*(9), 816–822. **[*In Indonesian language*]**

Ramdhoani, Widyastuti, L.P.Y., & Pratiwi, N.P.E. (2025). Growth and Production Yield of White Oyster Mushroom (*Pleorotus ostreatus)* in Organic Waste-Enriched Growth Media Variations. *Indonesian Journal of Horticulture*, *16*(1), 24–31. https://doi.org/10.29244/jhi.16.1.24-31 **[*In Indonesian language*]**

Rosnina. (2017). The Effect of Adding Rice Husks to Various Planting Media on the Growth and Yield of White Oyster Mushroom (*Pleurotus ostreotus*). *Journal of Agrium*, *14*(2), 18–25. **[*In Indonesian language*]**

Sholihah, N. H., Satyana, A., Department, K., Agriculture, B., Agriculture, F., Brawijaya, U., Veteran, J., & Timur, J. (2025). Effect of Composition of Oyster Mushroom Baglog Waste and NPK Fertilizer on the Growth and Quality of Marigold Plants (*Tagetes erecta* L.). *Journal of Crop Production*, *13*(3), 191–201. http://dx.doi.org/10.21776/ub.protan.2025.013.03.06 **[*In Indonesian language*]**

Siska Apriyani, Budiyanto, H. B. (2015). Production and characteristics of white oyster fungus *(Pleurotus ostreatus)* in oil palm empty bunches (TKKS) media. *32*, 1–9. **[*In Indonesian language*]**

Suparti., & Marfuah, L. (2015). Productivity of White Oyster Mushrooms (*Pleurotus Ostreatus*) on Rice Husk Waste and Dried Banana Leaves as Alternative Media. *Bioexperiment Journal* 1 (2), 37-44. **[*In Indonesian language*]**

Suryani, T., & Carolina, H. (2017). Growth and yield of white oyster mushrooms in some nursery media materials. *Bioexperiments: Journal of Biological Research*, *3*(1), 73. https://doi.org/10.23917/bioeksperimen.v3i1.3674 **[*In Indonesian language*]**

Susilo, H., Rikardo, R., & Suyamto, S. (2017). Utilization of sawdust waste as a cultivation medium for oyster mushrooms (*Pleourotus ostreatus* L.). *Journal of Community Service*, *2*(1), 51–56. https://doi.org/10.30653/002.201721.16 **[*In Indonesian language*]**

Tangdilintin, F. N., Toyang, S. L., Mariones, J., Risal, Y., Pasampang, G., Limbongan, Y. L., Galla, E. A., Pata'dungan, A. M. (2024). Revitalization of Oyster Mushroom Growing Media with Gamal Leaf Liquid Organic Fertilizer. *Journal of Agricultural Science and Technology*, *4*(2), 126–144. **[*In Indonesian language*]**

Wahyuddin., Syam, M.R., Firjatullah, A., Romo, W., Hasbannur., Rahmayanti, S., & Dita, D.F. (2021). Study of the Utilization of Sawdust as a Cultivation Medium for White Oyster Mushrooms. *Lepa-lepa Journal, 1*(1), 461-421. https: //ojs.unm.ac.id/JLLO/index **[*In Indonesian language*]**

Widyaningsih, E. (2023). Effect of NPK Fertilizer on the Growth and Yield of Various Rice Varieties (*Oryza Sativa* L.) with the Salibu System. *Journal of Agros Agriculture*, *25*(3), 2823–2831. **[*In Indonesian language*]**

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