

Effect of Composition and Duration of Media Fermentation on Components and Yield of Merang Mushrooms (*Volvariella volvacea*)
Pengaruh Komposisi dan Lama Fermentasi Media terhadap Komponen dan Hasil Jamur Merang (*Volvariella volvacea*)

Harri Hanafi¹⁾, Elly Roosma Ria¹⁾, Ai Komariah¹⁾, Nunung Sondari¹⁾

¹⁾Departement of Agriculture Winaya Mukti University

Korespondensi: arrayhanaffy@gmail.com

Diterima: 01 Mei 2024 **Disetujui:** 25 Mei 2024 **Dipublikasi:** 28 Mei 2024

DOI: [10.24198/zuriat.v%vi%i.54564](https://doi.org/10.24198/zuriat.v%vi%i.54564)

ABSTRACT

In the cultivation process, the composition of growing media and the length of composting of growing media affect the yield of merang mushrooms. This research was conducted in June 2023. Aiming, to determine the effect of the interaction of composition and duration of media composting on the components of yield and yield of mushroom. This research was conducted in the mushroom experiment barn of the Faculty of Agriculture, Winaya Mukti University, with an altitude of 898 meters above sea level. Using a randomised group design (RAK) factorial pattern, consisting of two factors. The first factor is media composition. m1 (100% cotton + 0% rice husk), m2 (75% cotton+25% rice husk), m3 (50% cotton+50% rice husk), m4 (25% cotton+75% rice husk), m5 (0% cotton+100% rice husk), m5 (0% cotton+100% rice husk). The second factor is the length of media composting of 5 days (m1) and 10 days (m2). The results showed that the media composition of 75% cotton and 25% rice husk with a composting time of 5 days gave an effect on the components of the results of the diameter of the average yield of 3.1 cm and affected the yield of 160 fruits with a total harvest weight of 1.5 kg per plot.

Kata kunci: Merang mushroom; Media composition; Media fermentation time

ABSTRAK

Dalam proses budidaya, komposisi media tanam dan lama pengomposan media tanam mempengaruhi hasil panen jamur merang. Penelitian ini dilakukan pada bulan Juni 2023. Penelitian ini bertujuan untuk mengetahui pengaruh interaksi komposisi dan lama pengomposan media terhadap komponen hasil dan hasil jamur merang. Penelitian ini dilaksanakan di kumbung percobaan jamur Fakultas Pertanian Universitas Winaya Mukti, dengan ketinggian tempat 898 m dpl. Menggunakan rancangan acak kelompok (RAK) pola faktorial, yang terdiri dari dua faktor. Faktor pertama adalah komposisi media, yaitu m1 (100% kapas + 0% sekam padi), m2 (75% kapas + 25% sekam padi), m3 (50% kapas + 50% sekam padi), m4 (25% kapas + 75% sekam padi), m5 (0% kapas + 100% sekam padi), m6 (0% kapas + 100% sekam padi). Faktor kedua adalah lama pengomposan media yaitu 5 hari (m1) dan 10 hari (m2). Hasil penelitian menunjukkan bahwa komposisi media 75% kapas dan 25% sekam padi dengan lama pengomposan 5 hari memberikan pengaruh terhadap komponen hasil diameter hasil rata-rata 3,1 cm dan berpengaruh terhadap hasil panen 160 buah dengan total berat panen 1,5 kg per petak.

Keywords: Jamur merang; Komposisi media; Waktu fermentasi media

INTRODUCTION

Mushroom cultivation has a relatively short harvest of about one month to three months so that the turnover of capital invested in this business takes place quite quickly. In addition, the raw materials for making media for the production of merang mushrooms are relatively easy to obtain, and the business does not require a large area of land. Therefore, this mushroom commodity can provide more employment opportunities in an effort to improve the economy. Economy community farmers, so as to improve the standard of living and welfare of farmers in general (Sani, 2018).

Adult Nowadays needs and public awareness of nutritious foodstuffs is increasing, which is caused by the improvement of public understanding of nutritious food for health. This condition is also supported by the increasing purchasing power of the community towards an agricultural product such as merang mushroom (*Volvariella volvaceae*). According to Chen and Buswell, (2004), the minerals contained in merang mushrooms are higher than those contained in beef and lamb. The protein content of merang mushrooms is higher than the protein content in other plants in general.

In Indonesia, merang mushroom has prospects is very good to be developed. The need for merang mushrooms in the domestic market also has very bright prospects. The need for merang mushrooms for: Jakarta, Bogor, Sukabumi, Bandung, and surrounding areas average 15 tonnes per day (Widyastuti, 2016). The demand for merang mushroom in the city of Denpasar is around 500 kg per day, but the production of merang mushroom produced in Denpasar and Badung only 300kg per day (Manan, 2018).

Cultivation mushroom merang generally using a growing medium of rice straw, especially in Cilamaya Wetan, Karawang Regency. According to the data report from the Food Security of Karawang Regency (2019), rice yields in Cilamaya Wetan sub-district from March to December reached 154.95 tonnes per season, producing 46 tonnes of rice husk and 116 tonnes of straw. The high amount of rice straw generated from rice farming waste is still have not been able to fulfil the needs for making merang mushroom growing media. This is because the availability of rice straw is only available during the harvest season, and is also influenced by weather conditions. This causes rice straw to not be utilised by merang mushroom farmers, resulting in a shortage of rice straw availability as a growing medium for merang mushrooms. Therefore, the process of mushroom cultivation in Karawang Regency has recently begun to use cotton waste and rice husks, as alternative media. Rice husk and cotton are agricultural wastes that are available in abundance in the surrounding environment with stable continuity and have not been utilised and can be used as an alternative medium for growing merang mushrooms.

The process of cultivating merang mushrooms, apart from being influenced by the use of the type of organic material in the growth media, is also influenced by the fermentation of the organic material in the growth media. This is because the fermentation process of organic materials affects the quality of mushroom growing media. The purpose of this organic material fermentation process is to convert unutilised materials into useful materials. In the fermentation process, the thing that affects the availability of nutrients is the length of fermentation of organic materials for growing mushroom media (Kurniawan, 2018). Fermentation time of organic matter for media this merang mushroom, too, converts organic matter in addition, the length of fermentation affects the amount of nutrient availability for the growth and development of mushroom. In addition, the length of fermentation affects the amount of nutrient availability for the growth and development process of merang mushrooms. This is because the length of the fermentation process changes complex compounds into simpler compounds. However, due to limited information and no standard rules related to the length of fermentation of

media for growing merang mushrooms, resulting in the small application of the length of opposting carried out by farmers. Therefore, it is necessary to conduct research related to media composition and the length of time of media composting, which affects the optimal production of merang mushroom. The objectives of this study were: To determine the interaction of composition and length of media fermentation time that affects the components of yield and yield of merang mushroom.

MATERIAL AND METHODS

The materials used were 300 kg cotton waste, 15 kg rice husk, 50 kg rice bran. The method used in this research is experimental so that experiments are carried out in the field. The experiment was carried out in the merang mushroom cultivation barn of the Faculty of Agriculture, Winaya Mukti University, with an altitude of 890 m above sea level, in Tanjungsari District, Sumedang Regency (the type of barn is in Appendix 1). The experiment started from June 2023 to August 2023.

The experimental approach used in this study was a factorial pattern Randomised Group Design (RAK) with two factors and 3 replications. The first factor is media composition (M) consisting of 5 levels, namely: m1 = 100% cotton, m2 = 75% cotton media + 25% rice husk, m3 = 50% cotton + 50% rice husk, m4 = 25% cotton + 75% rice husk, m5 = 0% cotton + 100% rice husk. The second factor is the length of fermentation time (W), consisting of 2 factors, namely: w1= media fermentation time for 5 days, and w2= media fermentation time for 10 days. The size of each plot was 30 cm X 50 cm and the thickness of the media was 30 cm, so there were a total of 30 experimental plots.

RESULTS AND DISCUSSION

Generally, the growing medium for merang mushrooms is straw, but in this experiment, alternative growing media were used, namely cotton media, husk media and a mixture of cotton and husk media. This research on alternative growing media for merang mushroom obtained a fairly good response to the yield and yield components of merang mushroom. Measurement of merang mushroom yield, there are two stages of measurement. The first stage is measuring the mushroom yield in the first harvest period, and the second stage is measuring the yield. in the second harvest period of merang mushroom. While the yield component and the total weight of the harvest were collected in the first harvest period and the second harvest period until it did not bear fruit again. The observed yield components are: weight per fruit (g) and the number of mushroom fruits. Measurement of the yield of merang mushroom, there are two stages measurement.

Stage The first measurement of mushroom yield in the first harvest period, and the second measurement of yield in the second harvest period. While the components of yield and the total weight of the harvest are carried out in the first harvest period and the second harvest period until it does not bear fruit again. The observed yield components are: weight per fruit (g) and the number of mushroom fruits. Table 1 descibe about Effect of Media Composition and Media Fermentation Duration on Weight per Fruit.

Table 1. Effect of Media Composition and Media Fermentation Duration on Weight per Fruit Merang Mushroom (g).

Media Composition (m)		Rata-rata	
m1	100% waste cotton + 0% rice husk	7,85	b
m2	75% waste cotton + 25% rice husk	7,32	a
m3	50% waste cotton + 50% rice husk	7,35	a
m4	25% waste cotton + 75% rice husk	7,17	a
m5	0% waste cotton + 100% rice husk	7,23	a
Duration Fermentation (w)			
w1	5 days	7,41	a
w2	10 days	7,36	a

Note : Treatment mean values followed by the same letter and in the same column show no significant difference based on Duncan's multiple range test at 5% level.

Media composition has a significant effect on the weight per fruit of merang mushroom. Media composition m1 (100% cotton + 0% rice husk), gave the highest results and was significantly different from the weight per fruit of merang mushroom with other media composition treatments. Media composition m2 (75% cotton + 25% rice husk) gave no significant effect with the treatment of media composition m3 (50% cotton + 50% rice husk), m4 (25% cotton + 75% rice husk), and m5 (0% cotton + 100% rice husk) on the weight of mushroom fruit.

Fermentation duration of 5 days (w1) with 10 days (w2), was not significantly different from the weight per fruit of mushroom. Fermentation time of 5 days (w1) with 10 days (w2) gave the same response to the weight per fruit of mushroom, so there is no real difference between the two. Table 2 Effect of Media Composition and Media Fermentation Duration on Weight per Merang Mushroom Fruit (g). Table 2 describe about fruit total.

Table 2. Effect of Media Composition and Media Fermentation Duration on Fruits Totally Merang Mushroom Fruit (g)

Factors	w1 (5 hari)		w2 (10 hari)	
m1 (100% waste cotton + 0% husk rice.)	128,67	b	133,33	b
	A		A	
m2 (75% waste cotton + 25% husk rice)	1,17	c	0,93	b
	B		A	
m3 (50% waste cotton + 50% husk rice)	0,91	b	0,87	b
	A		A	
m4 (25% waste cotton + 75% husk rice)	0,86	b	0,90	b
	A		A	
m5 (0% waste cotton + 100% husk rice)	0,78	a	0,76	a
	A		A	

Note : Treatment mean values followed by the same letter and in the same column show no significant difference based on Duncan's multiple range test at 5% level.

The first stage of measurement took place in the first harvest period, starting at 14 hsi to 18 hsi. Measurement of the number of fruits in the first harvest on 100% rice husk media resulted in an average of 100 fruits, and produced a harvest weight of 0.7 kg. Measurement of the number of fruits on 100% cotton media resulted in an average number of 120 fruits, with an average harvest weight in the first harvest period reaching 1 kg. So it was found that cotton media was 2-3% superior to 100% rice husk media. Measurement of yield in the first harvest period on mixed media with a composition of 75% cotton + 25% rice husk, is 4% superior to the number of fruits and harvest weight in the first harvest period, from the 50% cotton + 50% rice husk media composition, and 25% cotton + 75% rice husk media composition.

The yield ratio of the first harvest period on 100% cotton media, which is superior to 100% rice husk media, is influenced by the nature of the media. Cotton is composed of cellulosic fibres, has a relatively close distance between particles, with a particle density that is not dense, so it is hygroscopic, so it can accumulate moisture in the barn, and cause the media not to dry (Mulyawan et al, 2015). Rice husk has a high particle density with a long distance between particles, so rice husk tends to be drier. The difference between the two opposing properties of this growth medium, resulting in a positive reaction on mixed media.

The second measurement stage of the yield of merang mushrooms takes place in the second harvest period. This second harvest period takes place after the first harvest period ends, and the mushroom enters the incubation period again, and takes place from 18 hsi to 23 hsi. This incubation period occurs when all the fruit is finished because it is harvested, and the growing medium is still intact or not destroyed, so that it re-forms the fruiting body of the merang mushroom which is then harvested in the second harvest period. The second harvest period itself takes place from 24 hsi to 30 hsi. measurement of the harvest results of the second fruit period, obtained 75% cotton media composition + The 25% rice husk was 5% superior to the 100% cotton, 100% rice husk, and other media compositions. In addition to the type of media, the length of composting and environmental factors also affect the yield of merang mushroom. The two stages of measurement then obtained the overall weight of the mushroom harvest (kg). Table 3, describe about totally weight fruits.

Table 3. Effect of Media Composition and Media Fermentation Duration on Total Fruit Weight (kg)

Factors	w1 (5hari)		w2 (10hari)	
m1 (100% waste cotton + 0% husk rice)	1,13 A	b	1,18 A	c
m2 (75% waste cotton + 25% husk rice)	1,34 B	c	1,08 A	bc
m3 (50% waste cotton + 50% husk rice)	1,03 A	a	0,99 A	a
m4 (25% waste cotton + 75% husk rice)	0,99 A	a	1,03 A	b
m5 (0% waste cotton + 100% husk rice)	0,89 A	a	0,86 A	a

Note : Treatment mean values followed by the same letter and in the same column show no significant difference based on Duncan's multiple range test at 5% level.

Table 3. Indicates that, the length of media fermentation of 5 days (w1) media composition significantly affects the overall weight of the mushroom harvest.

Fermentation time of 5 days (w1) in the composition of m2 (75% cotton + 25% rice husk) is significantly different and gives the highest weight of the overall harvest of merang mushroom fruit from other treatments. The treatment of media composition m3 (50% cotton+50% rice husk), m4 (25% cotton+75% rice husk), and m5 (0% cotton+100% rice husk) were not significantly different, but significantly different from the treatment of composition m1 (100% cotton+0% rice husk). with higher results than the three media composition treatments.

Duration of fermentation for 10 days (w2) media composition gave a significant effect on the overall weight of the harvest of merang mushroom. Duration of fermentation 10 days (w2) media composition treatment m1 (100% cotton + 0% rice husk) was significantly different from treatment m5 (0% cotton + 100% rice husk) and m3 (50% cotton + 50% rice husk) gave higher overall harvest weight, but the treatment of composition m1 (100% cotton + 0% rice husk) was different but not significantly different from the treatment of media composition m2 (75% cotton + 25% rice husk) and m4 (25% cotton + 75% rice husk). The m2 media composition treatment which was not significantly different from m4 gave higher results and was different from the m1(100% cotton + 0% rice husk) and m5 (0% cotton + 100% rice husk) treatments. 5 days fermentation time (w1) and 10 days (w2) had a significant effect on the overall weight of the mushroom harvest. Fermentation time of 5 days (w1) on media composition m2 (75% cotton+ 25% rice husk) gave the highest results on the overall weight of the mushroom harvest. Length of media fermentation process, effect on the yield of merang mushroom. Duration of In the fermentation process, the media can determine the availability of nutrients that will be utilised by the mushroom. Because in the process of media fermentation, there is a reaction of degrading complex carbohydrate compounds into simpler compounds (Suwatanti and Widiyaningrum, 2017). In this degradation process, it takes place enzymatically, by the enzyme xylanase secreted by *Aspergillus fumigus*, and this event is called carbohydrate hydrolysis. (Mazidah, et al. 2016). Carbohydrate hydrolysis events, during fermentation of merang mushroom media, generally occur partially, resulting in hemicellulose which is marked by the sweet aroma of sugar. Then it is utilised by the mushroom as its nutrients. However, not only the type of media and the length of media fermentation, but other factors also affect the weight of the mushroom overall harvest of merang mushrooms. Another influential factor is environmental factors.

An influential environmental factor is environmental temperature. At the time of the study, the environmental temperature was in a state of extreme weather. Based on data quoted from the BMKG Bulletin (2023), that extreme weather triggers the average daily temperature to tend to be colder or hotter than usual, which is the cause of the temperature drop.

CONCLUSIONS

The composition of the media significantly influenced the yield of mushroom, but did not significantly affect the components of mushroom yield. The composition of the media and the duration of composting affect the overall yield of the mushroom harvest. Composition and length of composting showed a positive interaction on the yield of mushroom with a fairly high level of confidence. The results of this study obtained the optimal media composition, namely, 75% cotton + 25% rice husk, and the optimal composting time was obtained 5 days of composting.

ACKNOWLEDGEMENTS

Thanks to those who participated in the preparation of this research Prof. Dr. Ir. Ai Komariah, M.S., Chair of the Supervisory Commission. Prof. Dr. Ir. Elly Roosma Ria, M.Si., Member of the Supervisory Commission. Prof. Dr. Ir. Lia Amalia, M.P., Head of Agrotechnology-S2 Study Programme, Faculty of Agriculture, Winaya Mukti University. Prof Dr Ir Nunung Sondari, M.P., Dean of the Faculty of Agriculture, Winaya Mukti University. Parents who never stop giving encouragement and material.

REFERENCES

- BMKG (2023). Seasonal Monitoring Bulletin April-August 2023. in. Bulletin.
- Chen, S., Ge, W. and Buswell, J.A. 2004. Biochemical and molecular characterisation of a laccase from the edible straw mushroom, *Volvariella volvacea*. 328, pp. 318-328. doi:10.1046/j.1432-1033.2003.03930.x.
- Kurniawan, A. 2018. Mol Production (Local Microorganisms) With Organic Ingredients Utilisation Around Mole Production (Local Microorganisms) with Utilisation. *Hexagro Journal*, 2(2), pp. 36-44. Available at: <https://www.e-journal.unper.ac.id/index.php/hexagro/article/view/130>.
- Manan, I. 2018. *Merang Mushroom Cultivation*. Jakarta: Penebar Swadaya.
- Mazidah, I . N., Ambarsari, L. Meryandini, A. 2016. Characterisation of Xylanase from Xylanolytic Bacteria XJ20 from Forest Soil of Bukit Duabelas National Park, Jambi Indonesia. *Journal of Biological Resources*, 2(1), pp. 25-30. doi:10.29244/jsdh.2.1.25-30.
- Mulyawan, A.S., Sana, A.W. and Kaelani, Z. 2016. Identification of Physical and Thermal Properties of Cellulose Fibres for Composite Manufacturing. *Arena Tekstil*, 30(2), pp. 75-82. doi:10.31266/at.v30i2.1955.