BIS HEALTH AND ENVIRONMENTAL SCIENCE
Volume 1 2024 | DOI: 10.31603/bishes.23
5th Borobudur International Symposium on Science and Technology (BIS-STE) 2023
UNIMMA PRESS

Test results and characteristics mycelium oyster mushroom (*pleurotus ostreatus*) with proportion substitution organic plant media of Karawang District agriculture waste

R A Laksono[1*], G L Sari[2], T Safira[1], F Muhammad[1] and A Pertiwi[3]

[1] Faculty of Agriculture, Singaperbangsa University of Karawang, Karawang, Indonesia
[2] Faculty of Engineering, Singaperbangsa University of Karawang, Karawang, Indonesia
[3] Faculty of Psychology, Buana Perjuangan University of Karawang, Karawang, Indonesia
*Corresponding author email: rommy.laksono@faperta.unsika.ac.id

Abstract

The main problem with agriculture in Karawang is the difficulty of achieving a zero-waste agriculture production system, so that agricultural waste such as rice farming waste in the form of rice husks or husks, and coconut fibers from coconut plantation waste have not been utilized and tend to disturb the environment. The aim of this research is to produce alternative nutrients from organic agricultural waste and produce substitutes for the proportion of organic planting media from agricultural waste in the form of husks and coconut fiber which can reduce the use of sawdust. The experiment was carried out in Pinayungan Village, East Telukjambe District, Karawang Regency, West Java. The research method used was an experimental method with a single factor Randomized Block Design (RBD), consisting of 3 replications and 9 treatments so that there were 27 experimental units, each experimental unit consisting of 5 Baglogs. Data were analyzed using the F test at the 5% level. If it has a significantly different effect, then use the Duncan Multiple Range Test (DMRT) at a significance level of 5%. The research results showed that the substitution of 25% coconut fiber composition was able to provide the fastest average distribution of mycelium in baglog for 27.80 days, the average harvest intensity per week was 3.22 times, and the highest average fresh weight of oyster mushrooms per week was 103.01 grams per baglog.

Published:
October 20, 2024

Selection and Peer-review under the responsibility of the 5th BIS-STE 2023 Committee

Keywords

Mycelium oyster mushroom, Organic waste, Coconut fiber, Husk

Introduction

Food fulfillment is part of the human rights guaranteed in the 1945 Constitution of the Republic of Indonesia as a basic component of realizing quality human resources. The central and local governments continue to strive to succeed in the food security program through various programs. In support of food security, the Director General of

Horticulture of the Ministry of Agriculture issued a program to increase the yield and added value of horticultural products in 2020, one of which is increasing the production of vegetables and medicinal plants.

However, increased production or availability of horticultural commodities does not always guarantee the fulfillment of the consumption of horticultural products in the community or households. Suryana (2014) states that there is a wide gap between the average availability of food that is more than sufficient and the average food that is consumed by the community, which is still below the recommendation. Adequate food availability at the macro level does not necessarily improve the quality of consumption or nutritional status of the community.

White oyster mushroom (Pleurotus ostreatus) is a horticultural commodity that has a great opportunity to be developed. In the world, this commodity is ranked second after button mushrooms. However, oyster mushroom production in Indonesia is only able to meet 45% of domestic market demand (Nugraha, 2019). In fact, the need for white oyster mushrooms is not only limited to the demand for fresh mushrooms; there are still great opportunities in several business segments that are closely related to the mushroom business. For example, the mushroom seed business (inoculants), the mushroom media sales business (baglog), the processed mushroom business, the mushroom cultivation service and training business, and the mushroom agro-tourism business (Rahmat and Nurhidayat, 2011). Karawang Regency is one of the white oyster mushroom-producing areas in West Java. According to Saepudin, chairman of the Karawang Oyster Mushroom Association (2019), there are 5 oyster mushroom farmer groups, with 51 farmers spread across 6 sub-districts. The latest data shows a decrease in oyster mushroom production in Karawang from 2017–2019 by 30-45% (Karawang in Figures, 2019).

Karawang Regency is a lowland area in West Java that has potential in the agricultural sector, both in food and lowland horticulture. Rice fields cover an area of 95,287 hectares, with the main commodity being rice. 100kg of harvested dry grain (GKP) produces 25% husk or rice skin. While the plantation sector consists of production of 3,708 tons for coconut, with coconut fiber waste accounting for 45% of Gross, 60 tons for cocoa, 265 tons for coffee, and 12 tons for cloves, (Karwang in Figures, 2019). The main problem of agriculture in Karawang is the difficulty of achieving a zero-waste agriculture production system, so that agricultural waste such as rice farming waste in the form of rice husks or skins and coconut fibers from coconut plantation waste have not been utilized and tend to disturb the environment if left unattended.

The Faculty of Agriculture of UNSIKA has and is conducting research on the utilization of agricultural waste in the hope that agricultural waste can be an additional nutrient and alternative organic media material for the oyster mushroom cultivation process in Karawang. The results of Laksono (2019) showed that the utilization of agricultural waste in the form of leri water, potato skins, bean sprout extract, and old coconut water was able to become an additional alternative nutrient for white oyster mushroom growing media and was able to increase yields by 30%. Along with the popularity of oyster mushroom cultivation among the public, the need for wood sawdust as a staple material for planting media (baglog) will increase. The increasing need for wood sawdust, without being balanced with the availability of these materials, will cause wood sawdust to be difficult to obtain (Suparti et al., 2019). In this study, it is hoped that rice waste in the form of husks and coconut plantation waste in the form of coconut fibers can become alternative raw materials to substitute raw materials for mushroom growing media (Baglog).

Methods

Media composting process

Media Sterilization Process

Incubation process

Trial layout in the barn

Figure 1. Experiment process

The materials used in this experiment were white oyster mushroom F2 seedlings, wood powder, rice husk, coconut husk, rice bran, lime ($CaCO_3$), pure TSP fertilizer, distilled water, gas, disinfectant, and 70% alcohol. The experiment was conducted at the mushroom barn located in Pinayungan Village, East Telukjambe District, Karawang Regency, West Java. The experiment was conducted from June to September 2022. The research method used is an experimental method using a single-factor randomized group design (RAK), consisting of 3 replicates and 9 treatments, so that there are 27 experimental units; each experimental unit consists of 5 baglogs. The treatments consisted of (M1) 0% addition of planting media; (M2) 10% coconut fiber; (M3) 15% coconut fiber; (M4) 20% coconut fiber; (M5) 25% coconut fiber; (M6) 10% rice husk; (M7) 15% rice husk; (M8) 20% rice husk; and (M9) 25% rice husk. The application of the treatment was carried out after composting the planting media by adjusting the proportion of planting media substitution according to the treatment using PP plastic measuring 30 cm x 18 cm, and then the baglog media that was in accordance with the treatment was sterilized, inoculated, and incubated. Observations of mycelium characteristics began during incubation for 30 days, and observations of growth and yield continued after the incubation process. The process of the experiment decribed in Figure 1.

Results and Discussion

Mycelium fulfillment time

The results of the F test analysis at the 5% level showed that the addition of coconut fiber and rice husk to the oyster mushroom growing media was able to have a significantly different effect on the average time of baglog mycelium fulfillment during the incubation period (Table 1).

The results of the DMRT test showed that the provision of 25% coconut fiber in the oyster mushroom baglog growth medium was able to provide the fastest mycelium growth during the incubation phase after inoculation of oyster mushroom seeds (Figure 2). This was thought to be due to the provision of coconut fiber with the right composition being able to enrich the content of fiber, lignin, cellulose, and pectin as compounds that support the formation of hyphae, which will then form the growth of white oyster mushroom mycelium. This is in line with the opinion (Astuti et al., 2013), that coconut coir, which contains 30.00% fiber, 45.80% lignin, 43.40% cellulose, 10.25% hemicellulose, and 3.00% pectin, functions to build mycelium, as it is known that the more nutrients contained in the planting media, the better it will be for the growth of white oyster mushrooms (Pleurotus ostreatus). According to Susiana (2010), coconut fiber contains cellulose and lignin as a source of carbohydrates. The carbohydrate component is a nutrient constituent of hyphae. Mycelium hyphae threads secrete enzymes that break carbohydrate materials into simple compounds that can be used as energy to be metabolized.

Table 1. Results of the DMRT Test at 5% level mean time of mycelium fulfillment of baglog (days) during the incubation period

Code	Treatment (%)		Average Mycelium Fulfillment Time of Baglog (Day)
A	Without Addition of head fiber and rice husk (Control)	0	33.00 cd
B	Coconut fiber	10	31.90 bcd
C	Coconut fiber	15	31.10 bc
D	Coconut fiber	20	32.50 bcd
E	Coconut fiber	25	27.80 a
F	Rice husk	10	30.40 b
G	Rice husk	15	33.00 cd
H	Rice husk	20	33.20 cd
I	Rice husk	25	33.90 d
	Coefficient of Variation (%)		3.58

Notes: Mean marked with the same letter in the same column show no significant difference at 5% DMRT.

25% rice husk (Lowest)   25% coconut fiber (Highest)

Figure 2. The DMRT test results

Maximum fruit stalk length per baglog

The results of the 5% F-test analysis showed that the addition of coconut fibers and rice husks to the oyster mushroom growing media was able to have a significantly different effect on the average maximum fruit stem length per baglog (Table 2).

The DMRT test results showed (Figure 3) that the provision of 20% coconut fiber was able to provide the highest average maximum fruit stem length per baglog of 5.55 cm, not significantly different from the provision of 15% rice husk and control, but significantly different from the other treatments. This is thought to be due to the addition of the appropriate merang mushroom growing media composition of 20% and 15% coconut fiber and rice husk being able to meet the subtract needs needed in the physiological process of oyster mushroom fruit stem elongation. This is in accordance with the opinion (Fatmawati, 2017) that the provision of coconut fiber in sawdust planting media can meet the needs of sufficient nutrients to spur the growth of white oyster mushrooms, resulting in a longer stem length.

Table 2. Results of the DMRT Test at the 5% level of mean maximum fruit stem length per baglog

Code	**Treatment (%)**		**Average Maximum Fruit Stem Length per Baglog (cm)**
A	Without Addition of head fiber and rice husk (Control)	0	4.99 ab
B	Coconut fiber	10	4.05 bc
C	Coconut fiber	15	3.57 c
D	Coconut fiber	20	5.55 a
E	Coconut fiber	25	4.31 bc
F	Rice husk	10	4.03 bc
G	Rice husk	15	4.79 ab
H	Rice husk	20	4.03 bc
I	Rice husk	25	4.37 bc
	Coefficient of Variation (%)		12.11

Notes: Mean marked with the same letter in the same column show no significant difference at 5% DMRT.

15 % Coconut fiber (lowest); 20 % Coconut fiber (Highest)

Figure 3. The DMRT test result

Harvest intensity per planting period, mushroom fresh weight per baglog, mushroom dry weight per baglog

The results of the F test analysis at the 5% level show that the addition of coconut fiber and rice husks to the oyster mushroom growing media has not been able to provide a significantly different effect on the average harvest intensity per planting period, fresh weight of mushrooms per baglog, and dry weight of mushrooms per baglog (Table 3).

The results of the analysis showed that the provision of coconut fibers and rice husks as a substitute for oyster mushroom growing media was able to provide the same average harvest intensity per planting period as the treatment without the addition of head fibers and rice husks (control). This is thought to be due to environmental factors that support the growth and maturation processes of oyster mushrooms. Data from observations during the experiment shows that the average temperature when the experiment took place was around 20–22 °C and the humidity was 80–90%. The appropriate temperature and humidity will accelerate the growth and formation of mushroom fruit, which will accelerate the physiological process of oyster mushrooms and the absorption of subrats available on the growth medium, which results in an average harvest intensity with the addition of coconut fibers and rice husks being able to match the control treatment. According to Hermawan (2015), environmental factors such as temperature, light, and oxygen play a role in the growth and development of mushrooms.

The results of the analysis showed that the provision of coconut fibers and rice husks as a substitute for oyster mushroom growing media was able to provide the same average fresh weight of mushrooms per Baglog, and dry weight of mushrooms per Baglog as the treatment without the addition of head fibers and rice husks (control). It is suspected that coconut fibers and rice husks contain a lot of phosphate nutrients, sugars, organic matter, cellulose, and lignin needed in the physiological process of oyster mushrooms, especially the formation of hyphae as constituents of mycelium and mushroom body mass, so that they can match the subrat content contained in sawdust growth media (control). According to Irianto et al. (2008) dry weight is the weight resulting from the accumulation of organic compounds in cell metabolism. Fresh weight affects dry weight, the higher the fresh weight of the body, the more in line with the results of fresh weight and dry weight.

Table 3. Results of the DMRT test at 5% level mean harvest intensity per planting period, fresh weight of mushrooms per Baglog, and dry weight of mushrooms per Baglog

Code	Treatment (%)		Harvest Intensity Per Planting Period	Mushroom Fresh Weight Per Baglog	Mushroom Dry Weight Per Baglog
A	Without Addition of head fiber and rice husk (Control)	0	1.44 a	69.04 a	16.72 a
B	Coconut fiber	10	1.33 a	57.63 a	15.17 a
C	Coconut fiber	15	1.20 a	49.58 a	13.66 a
D	Coconut fiber	20	1.11 a	62.04 a	15.45 a
E	Coconut fiber	25	1.22 a	59.01 a	14.03 a
F	Rice husk	10	1.17 a	49.97 a	12.24 a
G	Rice husk	15	1.27 a	56.81 a	13.98 a
H	Rice husk	20	1.07 a	54.98 a	12.53 a
I	Rice husk	25	1.08 a	58.09 a	13.64 a
	Coefficient of Variation (%)		17.75	19.14	26.36

Notes: Mean marked with the same letter in the same column show no significant difference at 5% DMRT.

Conclusion

The provision of substitution of oyster mushroom growing media from coconut fibers and rice husks as a substitute for sawdust scarcity can have a significantly different effect on the average time of baglog mycelium fulfillment during the incubation period and the average maximum fruit stem length per baglog. The substitution of oyster mushroom growing media from coconut fiber and rice husk can match the average fresh weight and dry weight of the treatment without the addition of head fiber and rice husk (Control), with an optimized composition of 20% coconut fiber and 15% rice husk.

References

[1] Aini, F.N., Nengah, D.K., 2013. Pengaruh Penambahan Eceng Gondok (*Eicchhornia crassipes*) Terhadap Pertumbuhan Jamur Tiram Putih (*Pleurotus ostreatus*). *Jurnal Sains dan Seni Pomits*, 2 (1).

[2] Astuti, Kusuma H dan Kuswytasari ND. 2013. Efektifitas Pertumbuhan Jamur Tiram Putih (*Pleurotus ostreatus*) dengan Variasi Media Kayu Sengon (*Paraserianthes falcataria*) dan Sabut Kelapa (*Cocos nucifera*). *Jurnal Sains dan Seni Pomits* 2 (2) : 2337- 3520.

[3] Ayu, P. 2016. Bertanam Jamur Tiram. Putra Danayu Pubhliser. Jakarta. Hal. 38.

[4] Aziz, S.A, Krisantini, Winarso D. Widodo dan Aris munandar. 1992. *Studi Pemanfaatan Sekam, Serbuk Gergaji, Kulit Kayu, dan Kulit Kacang Tanah Sebagai Media Tanam dalam Wadah*. Institut Pertanian Bogor.

[5] BPS. 2019. *Karawang dalam Angka 2019*. BPS Karawang. Karawang.

[6] Departemen Pertanian [Deptan]. 2011. *Basis Data Statistik Pertanian*. http://aplikasi.deptan.go.id. Diakses tanggal 24 Maret 2019.

[7] Fatmawati. 2017. Pertumbuhan Jamur Tiram Putih (*Pleurotus ostreatus*) pada Berbagai Komposisi Media Tanam Serbuk Gergaji Kayu dan Serbuk Sabut Kelapa. *Skripsi*. Fakultas Sains dan Teknologi Univ UIN Alauddin Makasar.

[8] Gomez, K.A., dan A.A. Gomez. 2010. *Prosedur Statistik untuk Penelitian Pertanian. Terjemah Endang Sjamsudin dan Justika S. Baharsjah*. Edisi Kedua. UI Press: Jakarta.

[9] Haryadi. 2006. *Teknologi Pengolahan Beras*. Gadjah Mada University Press.

[10] Hermawan. H. 2015. Teknologi Budidaya Jamur Tiram Putih (*Pleurotus ostreatus*). Sumber: http://jambi.litbang.pertanian.go.id/ind/index.php/onovasi-teknologi/581-teknologi-budidaua-jamur-tiram-putih-pleurotus-ostreatus. Diakses tanggan 24 Maret 2019.

[11] Irianto, dkk. (2008). Pertumbuhan, Kandungan Protein, dan Sianida Jamur Kuping (*Auricularia polytricha*) pada Medium Tumbuh Serbuk Gergaji dan Ampas Tapioka dengan Penambahan Pupuk Urea. *Jurnal Bioteknologi*, 5 (2) : 43 – 50. Surakarta: Jurusan Biologi FMIPA Universitas Sebelas Maret.
[12] Laksono, R.A. Uji daya hasil jamur tiram putih (Pleurotus ostreatus) akibat aplikasi jenis nutrisi alternatif dengan pendekatan bioklimatik di kabupaten Karawang. 2019. Jurnal Kultivasi Vol.18 No.3.
[13] Meinada, I. 2013. Panen Cepat Budidaya Jamur. Padi. Bandung.
[14] Nugraha, Tatang. 2019. *Kiat Sukses Budidaya Jamur Tiram*. Yrama Widya.Jakarta.
[15] Nuryono, dkk. 2014. *Penggunaan NaOH dan Na_2CO_3 pada Pembuatan Silika Gel dari Abu Sekam Padi*. Seminar Nasional MIPA. Fakultas MIPA UNY. Yogyakarta.
[16] Rahmat, S. dan Nurhidayat, 2011. *Untung Besar dari Bisnis Jamur Tiram*. Agro Media Pustaka. Jakarta.
[17] Sipahutar, D. 2010. Teknologi Briket Sekam Padi Balai Pengkajian Teknologi Pertanian (BPTP) Riau.
[18] Stevani, S. 2011. Pengaruh Campuran Media Tanam Serbuk Sabut Kelapa dan Ampas Tahu Terhadap Diameter Tudung dan Berat Basah Jamur Tiram Putih (*Pleurotus ostreatus*). Skripsi. Surakarta: Fakultas Pertanian Universitas Sebelas Maret.
[19] Suharjo, E. 2016. Budi Daya Jamur Tiram Media Kardus. PT. AgroMedia Pustaka. Hal: 2. Jakarta
[20] Suparti dan Purnamasari, Anisa. 2016. Produksi Jamur Tiram Putih (*Pleurotus ostreatus*) pada Media Tambahan Serabut Kelapa (*Cocos nucifera*). Yogyakarta: Universitas Muhammadiyah Surakarta dalam Seminar Nasional Pendidikan dan Saintek.ISSN: 2557-533X
[21] Suryana. A. 2014. Menuju Ketahanan pangan Indonesia Berkelanjutan 2025: Tantangan dan Penanganannya. Forum Agro Ekonomi. Volume 32. No.2. Desember. Pusat Sosial Ekonomi dan Kebijakan Pertanian. Badan Litbang Pertanian. Kementan.
[22] Winarno F G. 2014. Kelapa Pohon Kehidupan. Penerbit PT Gramedia Utama. Jakarta.
[23] Yulliawati, T. 2016. Pasti Untung dari Budi Daya Jamur. PT. AgroMedia Pustaka, PP: 8 - 9. Jakarta.