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Research Article

Effect of Watering Frequency on the Growth and Yield of Oyster Mushrooms (Pleurotus ostreatus)

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ABSTRACT

Oyster mushrooms have the conditions of growing at low temperatures and high relative humidity, so when you want to cultivate it is needed an appropriate environment for the growth and development of oyster mushroom. Banjarbaru City tends to have high temperatures with a relative humidity that tends to below. This is quite different from the requirements for growing oyster mushrooms which require low temperatures with relatively high humidity. One of the easiest and cheapest methods to maintain temperature and relative humidity to remain ideal and appropriate is to water the surrounding oyster mushrooms growing media, so knowledge of the most appropriate and ideal watering frequency for growth and development of oyster mushrooms is needed. The environmental design used was a Completely Randomized Design (CRD), a single factor with 4 treatments, 5 replications, so that 20 experimental units were obtained. The treatments are p1 = once watering per day, p2 = twice watering per day, p3 = three times watering per day, p4 = four times watering per day. The result showed that the watering frequency showed significant difference to the growth time of oyster mushroom shoots and the wet weight of oyster mushrooms. The best treatment in accelerating the growth time of oyster mushroom shoots and increasing the wet weight of oyster mushrooms is four times watering frequency per day.

Keywords: Humidity; Oyster mushroom; Watering frequency.

1. Introduction

Oyster mushrooms have the conditions of growing low temperatures and high relative humidity, so when you want to cultivate it is needed an appropriate environment for the growth and development of oyster mushrooms. One area in South Kalimantan Province has the potential for the development of oyster mushroom cultivation such as the City of Banjarbaru. However, in Banjarbaru City it tends to have a higher temperature, which reaches 36.8°C with a relatively low relative humidity which reaches 44% (BPS Kal-Sel 2018). This is quite different from the conditions for growing mushrooms that require low temperatures with relatively high humidity. Certainly requires special treatment to condition the appropriate microclimate so that the growth and development of oyster mushrooms can be optimal.

Oyster mushrooms or hiratake (*Pleurotus ostreatus*) belong to the consumption mushroom group that lives on wood that has rotted. Named oyster mushrooms because it has a shape similar to oyster shells with a variety of hood surface colors namely white, gray, brown, yellow, orange or pink (Maulana 2012).

Oyster mushroom (*Pleurotus ostreatus)* is a food fungus with an oyster-like shell with a slightly concave middle part and white to beige. The surface of the oyster mushroom hood is smooth, somewhat oily when moist and the edges are bumpy. Its diameter reaches 3-20 cm. Rod-shaped spores measuring 8-11 x 3-4 µm. Mycelium is white and can grow quickly (Wiardani 2010).

Oyster mushroom is a type of saprophyte fungus that lives on softwoods and obtains food by utilizing the remnants of organic matter. Oyster mushrooms, including mushrooms that do not have chlorophyll (does not have leaf green substances) so they can

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not process food by themselves. To meet the needs of life, oyster mushrooms are very dependent on organic materials that are absorbed for growth and development. The main nutrients needed for oyster mushrooms are carbon sources that can be provided through various sources such as sawdust and various other organic wastes (Susilawati & Raharjo 2010).

Oyster mushrooms like the cultivation of other types of fungi, there are several factors regarding the condition of the media and the appropriate environmental conditions to produce optimally. Media conditions and environmental conditions include media water content, nutrients in the media, acidity, temperature, relative humidity, oxygen, carbon dioxide concentration, and light.

The most important factors during oyster mushroom cultivation are relative humidity, aeration, temperature, and contamination. Although oyster mushroom spawning grows well at 25°C, it is better to place it at a lower temperature if possible. Substrate that experiences drought greatly affects the reduction in oyster mushroom yield so spraying it with water is mandatory (Tesfaw *et al*. 2015). Soaking media in a bucket of water for 15 minutes, then treated with watering frequency at media at intervals every 12 hours, showed an increase in oyster mushroom production compared with watering intervals every 18, 24, 30 and 36 hours (Sultana *et al*. 2018).

A study was conducted to identify the effect of relative humidity on oyster mushroom production. The results showed that the oyster mushroom showed better growth in relative humidity (74% -79%) compared with the relative humidity (55% -68%) (Chitra *et al*. 2018). In addition, Uddin *et al*. (2011) also reported that oyster mushroom production is strongly influenced by environmental conditions such as temperature and relative humidity, so that when cultivating oyster mushrooms, good environmental conditions are needed for the growth and development of fungi. If environmental conditions are not suitable, then oyster mushrooms should be cultivated in controlled mushroom house conditions. When maintaining oyster mushroom growth, if the humidity is lacking, it is necessary to water or fog it (Stevani 2011). Therefore, temperature and humidity conditioning is relatively necessary in the cultivation of oyster mushrooms.

One of the easiest and cheapest methods to maintain the temperature and relative humidity when cultivating oyster mushrooms to remain ideal and appropriate is to do watering around the oyster mushroom growing media, so knowledge of the most appropriate and ideal watering frequency for mushroom growth and development is needed. The purpose of this study was to determine the effect of watering frequency on growth and yield of oyster mushrooms and to determine the best watering frequency on growth and yield of oyster mushrooms.

2. Materials and Methods

The study was conducted at " Kumbung " Oyster Mushroom Banjarbaru, Jl. Lestari 3, Kemuning, South Banjarbaru, City of Banjarbaru, South Kalimantan. The research was carried out for 4 months about 120 days from May 2019 to August 2019.

The material used in this study was baglog oyster mushrooms and well water. The making of oyster mushroom growing media uses materials such as wood dust, bran, lime, and molasses with a water content of 60%. All of the earthquake materials were mixed well and then the fermentation process was carried out. After the fermentation process, the planting medium is put into a plastic bag which is compacted and given a lid. Sterilization is carried out in a drum and after that it is cooled for 1 day, then the material is inoculated (given oyster mushroom seeds) and then incubated in a dark room. While the tools used in this study are sprayers, syringes, buckets, calipers, scales, thermometers, hygrometers, styrofoam boxes, tweezers, flashlights, pH meters, stationery, and cameras.

This research was conducted using a single completely randomized design (CRD) consisting of 4 treatments with 5 replications to obtain 20 experimental units. The treatments are as follows: p1 = once watering per day; p2 = twice watering per day; p3 = three watering per day; p4 = four watering per day. In treatment p1, spraying as much as 100 mL was carried out every day in the morning starting at 07.00. In the p2 treatment, spraying as much as 100 mL was carried out every day in the morning and evening starting at 07.00 a.m. and 05.00 p.m. In p3 treatment, spraying as much as 100 mL was carried out every day in the morning, afternoon and evening starting at 07.00 a.m., 12.00 p.m. and 05.00 p.m. In the p4 treatment, spraying as much as 100 mL was carried out every day in the morning, afternoon, evening, and evening starting at 07.00 a.m., 12.00 p.m., 05.00 p.m. and 10.00 p.m.

The parameters observed were the time grow oyster mushrooms shoots, age of oyster mushroom harvest, number of oyster mushroom hoods, oyster mushroom hood diameter and the weight of wet oyster mushrooms. Data analysis is performed after obtaining data. Data obtained from observations were tested for homogeneity with the Bartlett test.

If the data obtained is homogeneous, proceed with the Anova test (analysis of variance). If the Anova test results show a real influence ($P \leq 0.05$) on the observed variables, then it is continued with a different treatment test using the Least Significance Difference Test (LSD) at the α level of 5%.

3. Results

The results of the analysis of variance showed that the watering frequency of the oyster mushroom baglog significantly affected the growth time of oyster mushroom shoots (Figure 1). The results showed that watering frequency of up to four times per day was able to accelerate the growth of oyster mushroom shoots by an average difference of up to 10 days compared to watering once per day. So, the time of watering four times per day is better than the time of watering once, two or three times per day.

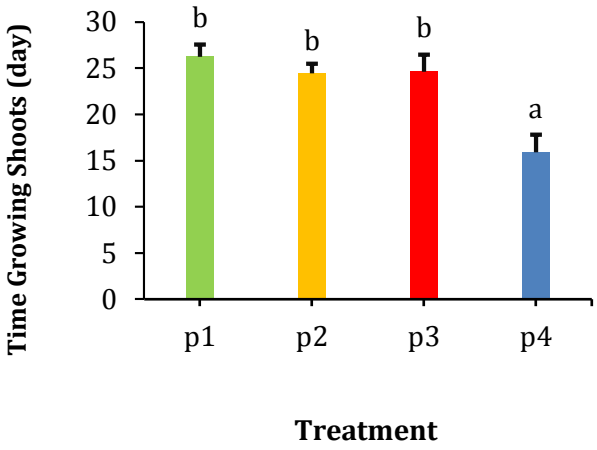

Figure 1. The difference in time of growth of oyster mushroom shoots is influenced by watering frequency (p1 = once watering per day; p2 = twice watering per day; p3 = three watering per day; p4 = four watering per day). The line above the bar is the standard error of the treatment (n = 5). The same letter above the line shows that the treatment has a different effect based on the Least Significance Difference Test (LSD) at the α level of 5%.

The results of the analysis of variance showed that the treatment of watering frequency did not give a significant difference to the harvest time, hood number, and hood diameter of oyster mushroom (Figure 2, 3, and 4). The watering frequency on the baglog of oyster mushrooms significantly affected the fresh weight of oyster mushrooms (Figure 5). The results showed that the watering frequency had a significant effect on the wet weight of the oyster mushrooms. Watering treatment four times per day was able to provide a significant difference in wet weight compared to watering once, twice and three times per day. So, the time of watering four times per day is better than the time of watering once, two or three times per day.

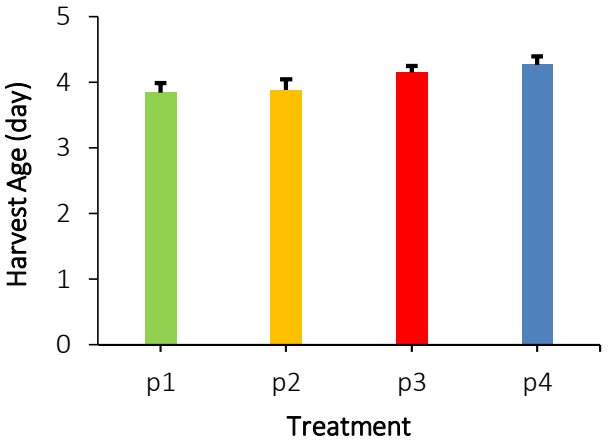

Figure 2. The difference in age of oyster mushroom harvest is influenced by the time of watering. The line above the bar is the standard error of the treatment (n = 5). (p1 = once watering per day; p2 = twice watering per day; p3 = three watering per day; p4 = four watering per day).

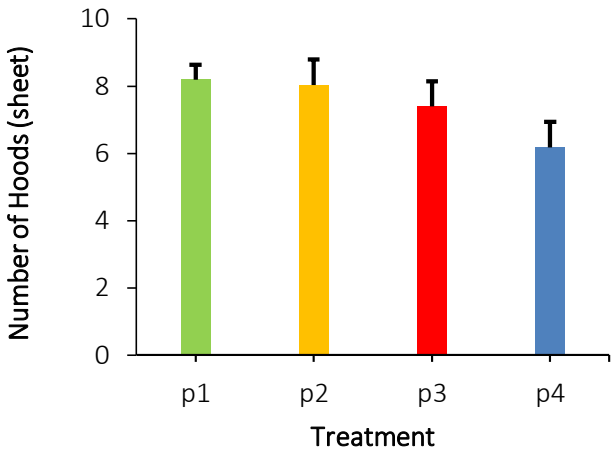

Figure 3. Difference in the number of fruit or oyster mushroom hoods that are affected by watering frequency. The line above the bar is the standard error of the treatment (n = 5). (p1 = once watering per day; p2 = twice watering per day; p3 = three watering per day; p4 = four watering per day).

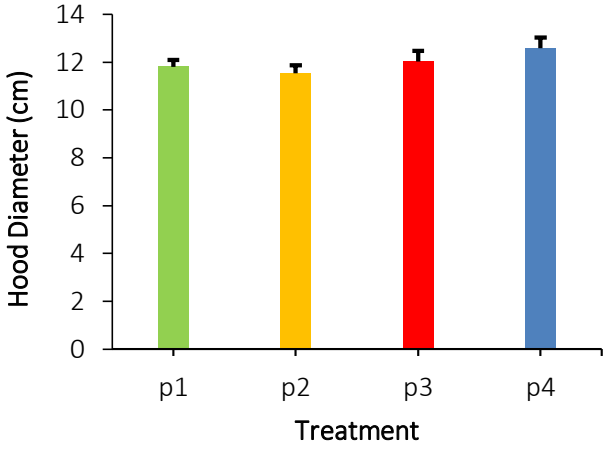

Figure 4. The difference in diameter of the oyster mushroom hood is influenced by the time of watering. The line above the bar is the standard error of the treatment (n = 5). (Note : p1 = once watering per day; p2 = twice watering per day; p3 = three watering per day; p4 = four watering per day).

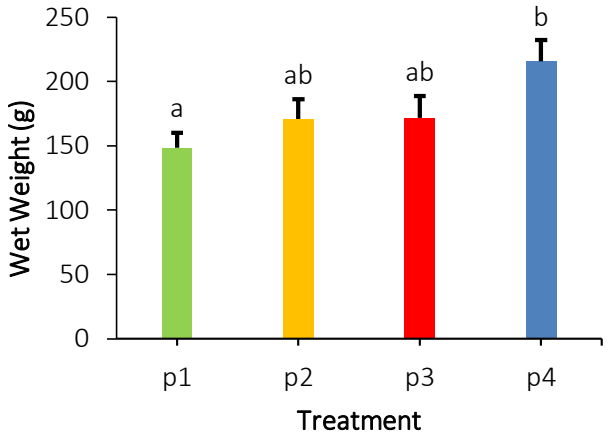

Figure 5. The difference in the wet weight of oyster mushrooms is influenced by the time of watering. The line above the bar is the standard error of the treatment (n = 5). (p1 = once watering per day; p2 = twice watering per day; p3 = three watering per day; p4 = four watering per day). The same letter above the line shows that the treatment has a different effect based on the Least Significance Difference Test (LSD) at the α level of 5%.

4. Discussion

The acceleration of shoot growth time is thought to be caused by low temperatures and relatively high humidity around the growing media of oyster mushrooms due to frequent watering frequency per day. This is in accordance with the statement of Widyastuti & Tjokrokusumo (2008), that air temperature plays an important role in the optimal growth of mushroom fruit bodies. Buah et al. (2010) also argued that oyster mushrooms require relatively high humidity (80-90%) and moderate temperatures (25-30°C) during the incubation period and require lower temperatures (18-25°C) during fruit body formation. Humidity must always be in optimal conditions so that the substrate in the baglog or planting media does not dry out. The way to keep humidity is by water.

The age of the harvest is not influenced by the time of watering, but the nutrients available in the planting media, because in this study the composition and dosage of media-making materials for all treatments are on average the same amount. This is in line with the results of research by Hasan *et al.* (2010) that the oyster mushroom harvest time showed a significant effect with a difference in harvest time of up to four days in the planting medium with the addition of rib-leaf banana middle compared to the planting media with the addition of mahogany leaves.

The watering frequency had no effect on the number of oyster mushrooms due to the composition and availability of nutrients in the uniform growing media. This is reinforced by the statement of Syawal *et al.* (2019) that the growing media with inadequate nutrition will make the fruit body become small because oyster mushrooms need nutrients in the form of carbon compounds, nitrogen, vitamins and minerals in the formation of the fruit body. The average number of oyster mushroom fruit bodies formed is also influenced by the number of primordia that grows.

The size of the hood diameter is thought to be influenced by the presence of the element nitrogen which is available in the growing media which helps in the development of the body of the mushroom fruit. Because in this study, nutrient content in all planting media is uniform, so it does not show any real differences between treatments. Cited from Ramachela & Sihlangu (2016), that the elements N and K are important elements in the development of oyster mushrooms. The high content of elements K, Mg, and Ca in the oyster mushroom growing media is known to increase the diameter of the hood and the thickness of the oyster mushroom hood.

The difference in wet weight produced by oyster mushrooms is thought to be due to the time of watering, where the four-time watering treatment is thought to be able to produce a higher relative humidity compared to other treatments. The treatment of four times watering per day also gives oyster mushrooms more opportunity to get more moisture. This is reinforced by the statement from

Setiagama (2014), that the temperature and relative humidity around the mushroom planting media greatly affect the bodyweight of the mushroom fruit. If the environmental conditions around the mushroom baglog are too dry, the mushroom fruit body will experience more evaporation and make the mushroom's body surface shrink and dry.

In the treatment of watering frequency twice per day and three times per day, there was no significant difference, only a difference of 0.6 g was heavier in the treatment time of watering three times per day compared to twice per day. That is probably because, during the daytime, water splashed around the baglog fungus quickly evaporates and has not been absorbed by oyster mushrooms, because this research was carried out into the dry season, so the temperatures during the day tend to be hot. Unlike the treatment of watering four times a day that is given watering until night, it allows oyster mushrooms to get more water vapor at night because the cold temperatures at night make the watering water given evaporate more slowly than during the day. Although watering is also carried out during the day, for the treatment of watering four times a day, the possibility of oyster mushrooms also did not have time to absorb the water vapor given through watering.

Time to sprout mushrooms faster at treatment p4 compared with other treatments, making the harvest frequency for treatment p4 more than the p1, p2, and p3, thus making the total wet weight of oyster mushrooms in treatment p4 more large compared with the treatment of p1, p2, and p3. The more harvest done, the greater the wet weight produced.

5. Conclusion

Watering frequency has a significant effect on the growth time of oyster mushroom shoots which are shorter in the treatment of four times watering frequency per day compared to once, two and three times per day. The frequency of watering also has a significant effect on the yield of oyster mushrooms on the wet weight parameter with a more frequent watering frequency, four times per day, which shows better results than the other frequencies. The best watering frequency for growth and yield of oyster mushrooms is the four times watering frequency per day in the morning, afternoon, evening and night.

6. References

BPS Kal-Sel. 2018. Provinsi Kalimantan Selatan Dalam Angka 2018. Badan Pusat Statistik Provinsi Kalimantan Selatan: Kalimantan Selatan. https://kalsel.bps.go.id/publication/2018/08/16/f646d3011e4c3dfb0a4cbd74/provinsi-kalimantan-selatan-dalam-angka-2018.html. [14 Desember 2019].

Buah JN, Van der Pujie G, Bediako EA, Abole F, Showemimo. 2010. The Growth and Yield Performance of Oyster Mushroom (*Pleurotus ostreatus*) on Different Substrates. *Biotechnology*. 9(3) : 338–342.

Chitra K, Sathyaparvathavarthini B., Mahalakshmi S, Kamali R, Sharavanan PT, Balisasikumar C, Dhanalakshmi K. 2018. Effect of Abiotic Factors on Oyster Mushroom Production (*Pleurotus* Species). *International Journal of Current Microbiology and Applied Sciences* 7(07) : 1032–1036.

Hasan MN, Rahman MS, Nigar S, Bhuiyan MZA, Ara N. 2010. Performance of Oyster Mushroom (*Pleurotus ostreatus*) on Different Pretreated Substrates. *Int. J. Sustain. Crop Prod*. 5(4) : 16–24.

Sultana R, Hossain MI, Saifullah, Amin R, Chakraborty R. 2018. Influence of Substrate pH and Watering Frequency on the Growth of Oyster Mushroom. *International Journal of Plant Biology and Research* 6(4) : 1097.

Stevani S. 2011. Pengaruh Penambahan Molase Dalam Berbagai Media Pada Jamur Tiram Puith (*Pleurotus ostreatus*). Skripsi. Universitas Sebelas Maret. Surakarta.

Maulana E. 2012. Panen Jamur Tiap Musim. (T. A. Prabawati, Ed.) .Issue 1. Lily Publisher: Yogyakarta.

Ramachela K. & Sihlangu SM. 2016. Effects of Various Hormonal Treated Plant Substrates on Development and Yield of Pleurotus ostreatus. *Cogent Food & Agriculture* 7(1) : 1–14.

Setiagama R. 2014. Pertumbuhan dan Produktivitas Jamur Tiram Putih (*Pleurotus ostreatus*) Dengan Kompisisi Media Tumbuh Serbuk Gergaji Kayu Sengon, Tandan Kosong Kelapa Sawit, dan Ampas Tahu yang Berbeda. Thesis. Muhammadiyah University. Surakarta.

Susilawati, Raharjo B. 2010. Budidaya Jamur Tiram (*Pleurotus ostreatus* var florida) yang Ramah Lingkungan. Palembang.

Syawal M, Lasmini SA, Ramli. 2019. The Effect of Bran and Corn Flour Composition on Swadust Media Materials Towards the Growth and Result of White Oyster Mushroom (Pleurotus ostreatus). *The Int. J. BioL Res* 2(1) : 156–161.

Tesfaw A, Tadesse A, Kiros G. 2015. Optimization of Oyster (*Pleurotus ostreatus*) Mushroom Cultivation Using Locally Available Substrates

and Materials in Debre Berhan, Ethiopia. *Biology and Biotechnology* 3(01) : 15–20.

Uddin MN, Yesmin S, Khan MA, Tania M, Moonmoon M, Ahmed S. 2011. Production of Oyster Mushrooms in Different Seasonal Conditions of Bangladesh. Journal Of Scientific Research. 3(1) : 161–167.

Wiardani I. 2010. Budidaya Jamur Konsumsi. (B. R. W, Ed.) .Issue 1. Lily Publisher: Yogyakarta.

Widyastuti N, Tjokrokusumo D. 2008. Aspek Lingkungan Sebagai Faktor Penentu Keberhasilan Budidaya Jamur Tiram (*Pleurotus* sp). *J. Tek. Ling*. 9(3) : 287–293.