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Growth of mycelium oyster mushroom (*Pleurotus ostreatus*) in medium rice wastewater with coconut water

Y S Rachmawati*, Z A Akbar, L Chaidir and A A Roosda

Agrotechnology Department, Faculty Science and Technology, UIN Sunan Gunung Djati Bandung, Bandung, Indonesia

*yatisetiati@uinsgd.ac.id

Abstract. The high consumption of oyster mushroom (*Pleurotus ostreatus*) is constrained by the production capacity and the provision of mushroom seed with low quality. Also, the price of starter pure brood stock is expensive, a calculated Rp400.000-Rp1.000.000 per-bottle. This research aims to determine the effect of rice wastewater with coconut water on the growth of the mycelium pure brood oyster mushroom. The research was conducted in July 2019-Februari 2020 in the integrated laboratory of the Faculty of Science and Technology UIN Sunan Gunung Djati Bandung. The method used is experimental with 9 treatment of combination of rice wastewater with coconut water concentration i.e. 100%:0%, 80%:50%, 80%:20%, 50%:80%, 50%:50%, 50%:20%, 20%:80%, 20%:50%, 0%:100%, and repeated three times. The combinations concentration of 50% rice wastewater with 50% coconut water produced the best growth of colony diameter and mycelia growth rate compared to other treatments. Therefore, the combination medium 50% rice wastewater with 50% coconut water can be used as a medium to multiply pure broodstocks of oyster mushrooms.

1. Introduction

Pure culture of oyster mushrooms is very important in the early production of oyster mushrooms. Pure culture can be done in vitro using mycelium growing media in the form of potato Dextrose Agar or can also be used as rice washing water. 100% rice waste water can increase growth and quality of pure Shiitake mushrooms [1].

Rice wash water contains carbohydrates needed for the growth of mold spores. Oyster mushrooms will grow on media that is rich in carbohydrates and other nutrients [2]. Apart from rice waste water as an energy source, additional nutrients are needed in the form of protein, fat, sugar [3]. Coconut water can be used as an additional nutrient in pure mushroom culture media. Coconut water contains amino acids, organic acids, nucleic acids, purines, sugars, vitamins and minerals [4]. Coconut water with a concentration of 100% can enhance the growth of fungal growth and can be used as an alternative media for PDA media.

The difference in media concentration from some of the studies above shows the content of the media is also different so that it affects the treatment and growth results of fungal mycelium. Concentration is very closely related to concentration, that is, the relative amount between solvent and dissolved. Solutions that contain a lot of solute are called concentrated while those that contain a small amount of solute are called runny [5]. So it can be analyzed that concentrated concentrations will affect the levels



of nutrients contained in a solution, so that it will also affect the adequacy of nutrients needed for mycelium fungus to grow.

This study aims if the combination of two natural ingredients media can reduce the use of concentration so that it can be used as an alternative medium for pure oyster mushroom culture.

2. Methods

The study was conducted in July 2019-February 2020 in the Integrated Laboratory of the Faculty of Science and Technology of UIN Sunan Gunung Djati, Bandung. The experiment was arranged in a Complete random design with three replications. The method used is experimental with 9 treatment combinations of rice wash water with coconut water i.e.:

- A = 100%: 0%,
- B = 80%: 50%,
- C = 80%: 20%,
- D = 50%: 80%,
- E = 50%: 50%,
- F = 50%: 20%,
- G = 20%: 80%,
- H = 20%: 50%,
- I = 0%: 100%,

Which is repeated three times. The parameters observed coloni diameter and mycelial growth rate. Colony diameters determined by the average of the colonies diameter (cm) on horizontal and vertical direction (using a slide caliper). The mycelial growth rate (cm/day) calculated by: which is repeated three times. The parameters observed coloni diameter and mycelial growth rate. Colony diameters determined by the average of the colonies diameter (cm) on horizontal and vertical direction (using a slide caliper). The mycelial growth rate (cm/day) calculated by:

$$v = \text{diameters at last observation day} / \text{diameter at first observation day} \times \text{day range} [1]$$

The quality of mycelium determined by visually color change of mycelium. Analysis of all the data used descriptive analysis.

3. Results and discussion

3.1. Coloni diameter and mycelial growth rate

Based on observations, the highest diameter is in the treatment of 50% rice wastewater without 50% coconut water (E) (Table 1). This treatment has carbohydrate and nutrition which is suitable for mycelial growth and development.

The difference in growth when white oyster mushroom mycelium arises due to differences in concentration in a combination of rice wastewater and coconut water. This difference causes differences in nutrition in each concentration. The difference in the concentration of rice wastewater can affect the speed of growth of fungal mycelium because there are differences in nutrition in each medium. Mycelial growth effected by carbohydrates, it could be assumed that medium containing glucose [3,6,7].

The higher the concentration of coconut water there is a decrease in diameter growth and mycelial acceleration (Table 1). This is because the higher the concentration of coconut water, the less carbohydrate content needed by the growth of oyster mushroom mycelium. Coconut water have composition of sugars, vitamins, minerals, amino acids and phytohormones [4]. Coconut water showed mycelial growth which completely colonized the media in 8.2 days of incubation [8].

In addition to nutrition, the mycelium incubation period is also influenced by the environmental conditions of the incubation site [9]. Whereas glucose, dextrose, and sucrose as carbon sources gave the good mycelium growth of oyster mushroom, and at 1~3% sucrose concentration, mycelium colony diameter of *Pleurotus ostreatus* was achieved the maximum value [10].

Based on table 1 rice wastewater and coconut water if the application with different concentrations does not meet the growth of oyster mushroom mycelium. While the balanced concentration is able to meet the energy source for the growth of oyster mushroom mycelium

Table 1. Effect of ratio rice wastewater with coconut water concentrations to mycelial growth rate of oyster mushroom.

Treatment	Coloni Diameter (cm)	Mycelial Growth Rate (cm/day)
A	4.8	0.17
B	4.6	0.18
C	x	X
D	x	X
E	6.2	0.59
F	4.0	0.40
G	3.0	0.25
H	x	X
I	4.5	0.43

4. Conclusion

The concentration of 100% rice wastewater produced the best growth of mycelium compared to other treatments. Therefore, the rice wastewater can be used as a medium to multiply pure broodstocks of oyster mushrooms.

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