Variation of Rice Husk, Corn Husk and Corn Hump Ratio as Alternative Growth Media for Pleurotus osteatus (White Oyster Mushroom)

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Abstract
It has been common to do fractionation (for example using ammonium sulphate as a precipitating agent) before doing a more sophisticated method for purification of protein. The logic Natural waste like rice husk, corn husk and corn hump are potential as alternatives substrates for Pleurotus ostreatus growth media because its nutrition. This research aimed to obtain the best variation of substrate composition for the growth of the mushroom. Parameters were fresh weight of the fruiting bodies (yield), cap's diameter and fruiting bodies morphology. Based on the result, medium consist of 0.5 kg rice husk, 0.25 kg corn husk and 0.25 kg corn hump is the only composition gave the same yield as the control (100% sawdusk) did. There was also no significant difference on cap's diameter and morphology of the fruiting bodies.

Keywords: sawdust, rice husk, corn husk, corn hump, oyster mushroom

1. Introduction
Edible mushrooms are widely consumed in Indonesia where the climate is suitable for the natural growth as well as the cultivation of certain mushrooms. White oyster mushroom (*Pleurotus ostreatus*) is one of the most commonly cultivated edible mushrooms in Indonesia (Suriawiria, 2002). The cultivation process of white oyster mushroom usually makes use of a sawdust baglog as a substrate for the mushroom growth. Nowadays, the availability of sawdust tends to be limited, hampering the oyster mushroom cultivation in general. Therefore, search efforts for alternative substrates providing sufficient nutrition for the mushroom growth have gained a big interest.
Rice husk, corn husk and corn hump are examples of agricultural solid waste obtained easily in huge amount in agricultural countries like Indonesia. They are used so far only as mix components for making fertilizer. The carbohydrate content in Rice husk, corn husk and corn hump has been reported to be high enough, making them potential as alternative growth substrates for mushroom growing on sawdust.
This work aimed to evaluate the capacity of those materials in substituting the sawdust portion in the common growth substrate.

2. Methodology
F2 spawn of white oyster mushroom → ***Substrates preparation (of various compositions) and spawn inoculation*** → ***Cultivation conditions*** → ***Fructification and Harvest****

**Growth parameters analysed :*
- *Fresh weight* of the fruiting bodies
- Cap's diameter
- Number of effective fruiting bodies
- Fruiting bodies morphology (color, size)

3. Result

3.1. *Days to complete mycelium running*

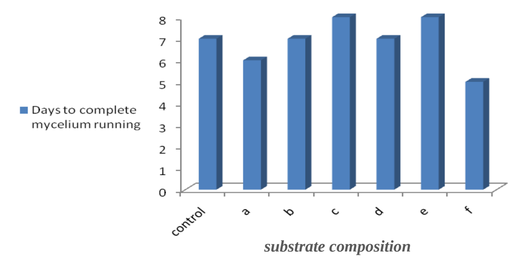

Figure 1. Time to complete the mycelium running affected by substrate composition. Control = 1kg sawdust, a = corn hump:corn husk (0.5kg:0.5kg), b = sawdust:rice husk (0.5kg:0.5kg), c = rice husk:corn hump (0.5kg:0.5kg),d = sawdust:corn hump:corn husk (0.5kg:0.25kg:0.25kg), e = sawdust:corn hump (0.5kg:0.5kg), f = rice husk:corn hump:corn husk (0.5kg:0.25kg:0.25kg).

No remarkable differences were observed in mycelial running rate on spawn packets of the different substrates used, except for composition of rice husk:corn hump:corn husk (0.5kg:0.25kg:0.25kg). It ranged from 5-6 days, while others for 7 to 8 days. Variation in the time might be due to variations in log texture, where the rice husk lowered the hardness and compactness of the logs. The result might be different if the rice husk would have been grinded before used as a substrate mix component.

3.2. *Fresh weight of harvested mushroom fruits*

Analysis of data reveals no significant effect of the substrate composition to the cap's diameter. Yet, in terms of fresh weight, it was clearly shown that the rice husk alone was not suitable for growing the mushroom, while the last composition (rice husk:corn hump:corn husk 0.5kg:0.25kg:0.25kg) performed as well as the control (sawdust) did.

Substrate composition				Average of mushroom fresh weight (g/baglog)	Average cap diameter (cm)	Color, size
Saw-dust	Rice Husk	Corn Hump	Corn Husk			
1 kg	-	-	-	235.70 28.84 [a]	6.96 0.94 [a]	white. normal size
-	-	0.5 kg	0.5 kg	123.30 54.55 [c,d]	6.46 1.50 [a]	white. normal size
-	1 kg		-	-	-	-
0.5 kg	0.5 kg	-	-	159.70 48.00 [b,c]	7.06 1.442 [a]	white. normal size
-	0.5 kg	0.5 kg	-	84.00 4.24 [c,d]	7.14 0.27 [a]	white. normal size
0.5 kg	-	0.25 kg	0.25 kg	118.50 27.64 [c,d]	6.204 0.953 [a]	white. normal size
0.5 kg	-	0.5 kg	-	92.63 29.67 [d]	6.857 1.584 [a]	white. normal size
-	0.5 kg	0.25 kg	0.25 kg	196.43 24.78 [a,b]	6.695 1.695 [a]	white. normal size

3.3. *Number and morphology of effective fruiting bodies*

Number of well-developed fruiting body was recorded and presented in Table 1. Dry and pin headed fruiting body was discarded but twisted and tiny fruiting body was included during counting. The percentage of effective fruiting body did not vary significantly in different substrates. They were rather similar in numbers, size, color and also cap's diameter.

3.4. *Yield per packet/log*

Significant variation was found in yield of white oyster mushroom grown on different substrates used. The maximum biological yield was recorded with control (1kg sawdust) and also with the composition of rice husk:corn hump:corn husk (0.5kg:0.25kg:0.25kg). The lowest biological yield was observed in composition of rice husk:corn hump (0.5kg:0.5kg). Chaudhary et al. (1985) explained the process of break-down of lignin. There is an apparent correlation between the ability to degrade lignin and the production of phenolases, which oxidize phenolic compounds to simple aromatic compounds that can be absorbed by mushroom mycelium and is used for it growth. The product of cellulolytic action in simple and soluble carbohydrates and the end products being glucose was absorbed by the fungal mycelium for growth and energy. Therefore, cellulose rich organic substrates are good for the cultivation of mushroom (Gerrits and Muller, 1965; Quimio, 1987). High cellulose content in wood results in enhanced cellulose enzyme production and increased yield of mushroom (Ramasamy and Kandaswary, 1976). The substrates with high lignin and phenolic content should decrease the activity of the enzyme, hence slow growth and low yield.

4. Conclusions
The maximum biological yield was recorded with control (1kg sawdust) and also with the composition of rice husk:corn hump:corn husk (0.5kg:0.25kg:0.25kg). Thus, that composition can be considered as an alternative growth media for white oyster mushroom.

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