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POTENTIAL OF USING SPAWN RUN AS A PLANTING MATERIAL FOR CULTIVATION OF OYSTER MUSHROOM (PLEUROTUS OSTREATUS) IN SRI LANKA

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Abstract

Oyster mushroom (Pleurotus spp.) is a commercially important, predominantly grown mushroom variety in Sri Lanka. It is widely cultivate in small scale for self-employment as a cottage industry. Successful mushroom cultivation depends on reliable spawn and a good substrate. Therefore, this experiment was carried out to find out the potential of using the grower produce spawn run as the initial planting material and to identify the suitable substrate for production of oyster mushroom for the new method. The experiment was conducted for four seasons in the mushroom unit, University Experimental Station, Dodangolla. 5 g of Department of Agriculture (DOA) oyster mushroom spawn for treatments 1 and 3, and 10 g of grower produce spawn run for treatments 2 and 4 were used as the planting material. The saw dust substrate for treatments 1 and 2 and the paddy substrate for treatments 3 and 4 were used in polypropylene bags. There was no significant difference observed among treatments on spawn run and on pin head formation. a significant difference was observed between the two substrates used, for the time taken for the first harvest and the total harvest. This study revealed that grower produce spawn run can be use as a planting material and there is no significant impact on duration of spawn run and pin head formation. In contrast the spawn run was better in paddy straw substrate compared to saw dust, which had a great impact on growth and gave the first harvest within 29-30 days. The total harvest was also significantly higher in paddy straw substrate. Since there was no significant yield difference between the DOA spawn and the grower produce spawn run treatments, the growers will be able to save the cost for planting material from the new method.

Keywords

spawn, spawn run, saw dust, paddy straw

1. Introduction

Oyster mushroom (*Pleurotus spp*.) is a commercially important, predominantly grown edible mushroom variety which widely practices in small-scale cultivation as a self-employment and a profitable agribusiness in Sri Lanka. *Pleurotus* is an efficient lignin degrading mushroom and can grow and yield well on different types of lignocellulolosic materials. Cultivation of oyster mushroom is very simple and has various advantages such as, it requires low space; low investment cost; easy to propagate; could take income in a short duration. Successful mushroom cultivation depends on three factors; reliable spawn, good substrate, conducive environment (Islam *et al*., 2009). Most of the growers in mid country buy the` reliable spawn from Department of Agriculture (DOA), Gannoruwa, Sri Lanka. Kirthisinghe and Amarasekera (2012) found that spawn run could be utilised as a planting material for the growers. Oyster mushroom growers in Sri Lanka use saw dust substrate mixture including rice bran, soya flour, or mung bean flour, $CaCO_3$ and $MgSO_4$. The information on the potential use of other locally available cost effective substrates are scarce (Rajapakse *et al*., 2007). Therefore, this experiment was carried out to find out the possibility of using the grower produce spawn run as the initial planting material and to identify the suitable cost effective substrate to reduce cost of production of oyster mushroom.

2. MATERIALS AND METHODS

The research was conducted for four seasons in the mushroom unit, University Experimental Station, Dodangolla, Sri Lanka to confirm the results obtained from Kirthisinghe and Amarasekera (2014). The primary inoculum was prepared using fresh fruiting body of the mushroom through tissue culture method and multiplied by sub-culturing on sterilized PDA medium in petri dishes, incubated at 28 ˚C of room temperature. Paddy seeds were washed by teepol and boiled for 20 minutes until 25 percent of paddy seed become split. After cooling, 5 percent $CaCO_3$ and 20 percent $CaSO_4$ powder were mixed with boiled paddy seeds. 30 g of paddy seeds were filled into a polypropylene bag and sterilized for 20 minutes in a pressure cooker. Piece of mycelium tissue was inserted into steam-sterilized paddy seeds bags under aseptic condition and incubated at 28 ˚C of room temperature for 7 days until the grains were covered with white mycelia. This grain mycelium mixture is called as ‘spawn’.

The spawn run was prepared using the following method. The substrate was prepared according to the DOA recommendation using 10 kg of saw dust, 1 kg of Rice bran, 100 g of Soya bean, 100 g of mung bean flour, 200 g of $CaCO_3$, and 20 g of $MgSO_4$ for 20 containers .Then bags were sterilized by using a barrel for 3-4 hours and kept for 4 hrs to cool. The spawns were inserted to the bags by using lighted candles to make a suitable environment for inoculation. The inoculated polypropylene bags were kept for 28 days in a dark room to complete the spawn run. After the mycelium run in the substrate and remains white and firm were called as ‘spawn run’.

5 g of spawn of oyster mushroom were used as planting material for treatments 1 and 3. Then 10 g of spawn run were used as the planting material for each in treatments 2 and 4. The experiment was laid according to Complete Randomized Design (CRD) with 10 replicates and 5 bags for each replicate. The treatments were,

T_1 - saw dust in polypropylene bags + 5 g of spawn (DOA recommendation)
T2 - saw dust in polypropylene bags + 10 g of spawn run
T3 - paddy straw in polypropylene bags + 5 g of spawn

T4 – paddy straw in polypropylene bags + 10 g of spawn run

22 cm height and 8 cm diameter of polypropylene bags were used for the experiment. Each of the polypropylene bag was filled with 500 g-of wet substrate. The substrate for polypropylene bags in treatments 1 and 2 were prepared according to the DOA recommendation using 100 kg of saw dust, 10 kg of Rice bran, 1 kg of Soya bean, 1 kg of mung bean flour, 2 kg of $CaCO_3$, and 200 g of $MgSO_4$ for 200 bags.
The substrate for polypropylene bags in treatments 3 and 4 were prepared according to the DOA recommendation using paddy 80 kg of straw, 10 kg of Rice bran, 1 kg of Soya bean, 1 kg of mung bean flour, 2 kg of $CaCO_3$, and 200 g of $MgSO_4$ for 200 bags.

All the polypropylene bags were sterilised using a barrel. The spawns for treatments 1 and 3 and spawn run for treatments 2 and 4 were inserted to the substrate autoclaved for 3-4 hours by using lighted candles to make a suitable environment for inoculation. Cotton waste, PVC rings and Rubber bands were used to seal the 200 gauges polypropylene bags. The polypropylene bags were sealed and kept for 28 days in a dark room to complete the spawn run. After completing spawn run, the bags were transferred to the cropping room and 20 ˚C temperature was maintained for fruiting body formation. Humidity of bags was accomplished by spraying of water on them twice a day. Natural air was used for mushroom during fructification. To maintain high humidity of 85 percent water was sprayed several times per day. When the pin head have grown to size of 1 cm, the humidity was lowered the 75 percent by passing fresh air through the room. Harvesting was done by twisting and pulling of the mushroom from the substrate until the mycelium remains white and firm. In total, five flushes were harvested for the study.

Days taken from inoculation to completion of spawn run, pin head formation, fruit body formation, the first harvest and the total yield were recorded. Then the biological efficiency and cost effectiveness were calculated. Data were analysed using the analysis of variance (ANOVA) procedure by SAS and mean separation was done using Duncan's Multiple Range Test (DMRT) at p= 0.05.

3. RESULTS AND DISCUSSION

There was no significant difference observed among treatments on spawn runing and pin head formation. Time taken for spawn runing, pin head formation and harvest of the above processes are given in Table 1.

Table 1 - Time taken for spawn runing, pin head formation and harvest

	T1	T2	T3	T4
Spawn run (days)	33[a]	32[a]	29[a]	30[a]
Pin head formation (days)	49[a]	48[a]	45[a]	44[a]
First flush (days)	51[a]	50[a]	47[b]	46[b]
First harvest (days)	52[a]	52[a]	48[b]	48[b]
Total yield per bag (g)	195[b]	199[b]	205[a]	200[a]
BE%[!]	39[b]	38[b]	41[a]	40[a]
CV%	10	12	11	12

Values within a row followed by a common letter are not significantly different at P=0.05, according to DMRT

Formation of Monokaryon (haploid stage) occurs soon after basidiospore (spawn) germination was observed under the microscope. The short lived monokaryon stage of the Basidiomycotina fused with a

compatible monokaryon which form Dikaryon (diploid stage) after 20-26 days in normal mushroom cultivation (Kirthisinghe *et al*., 2012). The dikaryon is the mycelium that produces the basidiocarp and basidiospore.

Celluosic substance will be degraded very easily by growing mushroom, whereas non cellulosic substances are not easily degraded. The delayed harvesting which resulted in the saw dust substrate as it one of the lignin contian substrates, it require long period for their decomposition (Pathmashini *et al*., 2008). The time taken by the mycelia to start pinning after ramification depends on the substrate used. Eventhough there was no significant difference between the two substrates used in this experiment, the substrates such as saw dust with low decomposition rate took a longer period (32-33 days) to colonize completely. The substrates with high decomposition rate took a short period (29-30 days) to colonize completely. A significant difference was observed between the two substrates used in this experiment for the time taken for the first harvest and the total harvest. This may be due to the mycelia remains vegetative for a longer period which result late pinning and take a longer period for the first harvest.

Cost effectiveness analyze for a small scale mushroom grower indicate that since there was no significant yield difference between the spawn and spawn run treatments (Table 1), the growers will be able to save Sri Lankan Rs. 1.00 from each bag (Table 2). Even though there was a significant difference in the cost of production between saw dust and paddy straw in mid country area, it can be varied with the relevant area.

Table 2. Cost of production of 100 bags with saw dust and paddy straw substrates

Treatment	Cost (Rs.)
T_1 - saw dust + spawn	490[a]
T2 - saw dust + spawn run	390[c]
T3 - paddy straw + of spawn	460[b]
T4 - paddy straw + of spawn run	360[d]

Values within the column followed by a common letter are not significantly different at P=0.05, according to DMRT

4. CONCLUSIONS

This study revealed that there was there was no significant difference among treatments on spawn run and pin head formation. It also showed that the paddy straw is a better substrate compared to saw dust, which has a great impact on growth and gives the first harvest within 29-30 days. The total harvest was also significantly higher in paddy straw substrate compared to saw dust. Therefore, the cost of production can be reduced when using spawn run with paddy straw substrate.

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References

1. Islam, M.Z., Rahman, M.H. and Hafiz, F. (2009). Cultivation of Oyster Mushroom (*Pleurotus flabellatus*) on different substrates. *International Journal of Sustainable Crop Product*. 4: 45-48.

2. Kirthisinghe, J.P. and Amarasekera, H.W.J.P. (2014) Production of oyster mushroom (*Pleurotus ostreatus*) us-

ing spawn run in different substrates. Proceedings of the Peradeniya University. International Research Sessions, Sri Lanka, Vol. 18, 4 & 5 July, 2014.

3. Kirthisinghe, J.P. and Amarasekera, H.W.J.P. (2012). Bottle cultivation for spawn production of oyster mushroom *(Pleurotus ostreatus*) using different substrates. Book of Abstracts of the Peradeniya University Research Sessions, Sri Lanka, 2012, Vol 17, p 233.

4. Kirthisinghe, J.P**.,** Niroshani, M.K.C., Amarasekera, P. (2012). Effect of nitrogen source in substrate for growth, yield and postharvest of oyster mushroom. Sri Lanka –India Conference on Agro Biotechnology for sustainable development. 12-13 March 2012 Colombo. Sri Lanka.

5. Pathmashini, L., Arulnandhy, V. and Wijeratnam R.S.W. (2008). Cultivation of oyster mushroom (*pleurotusostreatus*) on saw dust. *Ceylon Journal of Science (Biology Science)*. 37(2):177-182.

6. Rajapakse, J.C., Rubasingha, P. and Dissanayake, N.N. (2007). The potential of using cost- effective compost mixtures for oyster mushroom (*Pleurotus* spp.) cultivation in Sri Lanka. Tropical Agriculture Research and Extension. 10(1): 29-32.