HortFlora Research Spectrum, 3(1): 85-87 (March 2014) ISSN : 2250-2823

CULTIVATION OF OYSTER MUSHROOM (*Pleurotus ostreatus*) USING SPAWN RUN ON LOW COST SUBSTRATES IN SRI LANKA

J.P. Kirthisinghe and H.W.J.P. Amarasekara

Department of Crop Science,Faculty of Agriculture,, University of Peradeniya,Peradeniya Sri Lanka
**E-mail: jpkirthi@pdn.ac.lk*

ABSTRACT : *Pleurotus ostreatus* is an edible mushroom, commercially important, predominantly grown variety and widely cultivated in small scale for self-employment in Sri Lanka. Successful mushroom cultivation depends on reliable spawn and good substrate. Most of the growers in mid country buy the reliable spawn from Department of Agriculture (DOA), Peradeniya. 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 substrate for production of oyster mushroom for the new method. The experiment was conducted for two seasons in the mushroom unit, University Experimental Station, Dodangolla. 5 g of spawn of oyster mushroom for treatments 1 and 3, and 10 g of 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. No significant difference was observed among treatments on spawn runing and pin head formation. 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 study revealed that spawn and spawn run can be use as a planting material and they have no significant impact on duration of spawn runing and pin head formation. In contrast the paddy straw was a better 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 compared to saw dust. Since there was no significant yield difference between the spawn and spawn run treatments the growers will be able to save a rupee from each bag.

Keywords : *Spawn, spawn run, saw dust, paddy straw*

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.,* 1). Most of the growers in mid country buy the` reliable spawn from Department of Agriculture (DOA), Peradeniya. Kirthisinghe and Amarasekera (2) found that spawn run could be utilized 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.,* 5). 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.

Received : 28-11-2013 *Accepted : 29-01-2014*

MATERIALS AND METHODS

The research was conducted in the mushroom unit, University Experimental Station, Dodangolla. 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 per cent of paddy seed become split. After cooling, 5 per cent $CaCO_3$ and 20 per cent $CaSO_4$ 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 10 containers. Then bags were sterilized by using steam in 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 out 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)

T_2 - saw dust in polypropylene bags + 10 g of spawn run

T_3 - paddy straw in polypropylene bags + 5 g of spawn

T_4 – paddy straw in polypropylene bags + 10 g of spawn run

30 cm height and 15 cm diameter of polypropylene bags were used for the experiment. Each of the polypropylene bag was filled with one kg of wet substrate with a pH 6.7. The substrate for polypropylene bags in treatments 1 and 2 were prepared according to the DOA recommendation using 180 kg of saw dust, 20 kg of Rice bran, 2 kg of Soya bean, 2 kg of mung bean flour, 4 kg of $CaCO_3$, and 400 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 160 kg of straw, 20 kg of Rice bran, 2 kg of Soya bean, 2 kg of mung bean flour, 4 kg of $CaCO_3$, and 400 g of $MgSO_4$ for 200 bags.

All the polypropylene bags were sterilised using steam in 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 per cent water was sprayed several times per day. When the pin head have grown to size of 1 cm, the humidity was lowered the 75 per cent 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.

Spawn run length per day, 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.

RESULTS AND DISCUSSION

There was no significant difference observed in the growth rate among treatments. The highest rate (0.8 cm day^{-1}) of mycelium growth was shown in T_4 and the lowest rate 0.6 cm day^{-1}) was shown in T_1 control (T_1) treatment (Fig. 1).

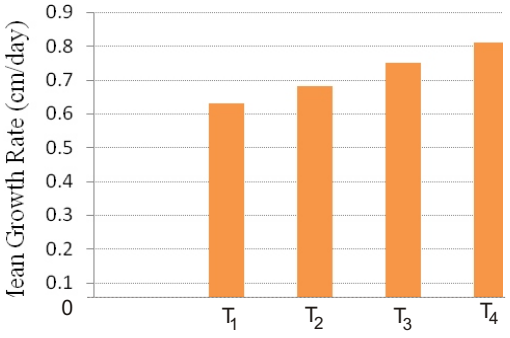

Figure 1 : Mean mycelia growth rate in four treatments.

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.

Parameter	T_1	T_2	T_3	T_4
Spawn run (d)	33^a	32^a	29^a	30^a
Pin head formation (d)	49^a	48^a	45^a	44^a
First flush (d)	51^a	50^a	47^b	46^b
First harvest (d)	52^a	52^a	48^b	48^b
Total yield per bag (g)	205^b	207^b	215^a	212^a
BE%	32^b	35^b	44^a	45^a
CV%	25	24	24	25

**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.,* 3). The dikaryon is the mycelium that produces the basidiocarp and basidiospore.

Cellulosc substances are 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 containing substrates, it require long period for their decomposition (Pathmashini *et al.,* 4). 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.

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

Treatment	Cost (SLR.)
T_1 - saw dust + 5 g spawn	490^a
T_2 - saw dust + 10 g spawn run	390^c
T_3 - paddy straw + 5 g of spawn	460^b
T_4 - paddy straw + 10 g 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*

Cost effectiveness analysis 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 Lanka Rs. 1.00 (SLR) 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.

Conclusions

This study revealed that there was no significant difference observed among treatments on spawn runing 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 in paddy straw substrate.

REFERENCES

1. Islam, M.Z., Rahman, M.H. and Hafiz, F. (2009). Cultivation of oyster mushroom (*Pleurotus flabellatus*) on different substrates. *Interna. Sustain. Crop Product,* **4**: 45-48.
2. 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.
3. Kirthisinghe, J.P., Niroshani, M.K.C. and 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.
4. Pathmashini, L., Arulnandhy, V. and Wijeratnam R.S.W. (2008). Cultivation of oyster mushroom (*Pleurotus ostreatus*) on saw dust. *Ceylon Sci. (Biol. Sci.),* **37**(2):177-182.
5. 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 Agri Res and Extn.,* **10**(1): 29-32.

Citation : Kirthisinghe J.P. and Amarasekara H.W.J.P. (2014) Cultivation of oyster mushroom (*Pleurotus ostreatus*) using spawn run on low cost substrates in SriLanka. *HortFlora Res. Spectrum,* 3(1) : 85-87.