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Matchwood (*Ailanthus exelsa*) Saw Dust as an Alternative Substrate for Oyster Mushroom (*Pleurotus florida*) Cultivation

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ABSTRACT

Oyster mushroom (*Pleurotus* spp.) accounts for 14 per cent of the total world production of edible mushroom. In Kerala, paddy straw is the most common substrate used for the production but since availability of good quality straw has become a limitation, farmers were forced to shift to new substrates. Rubber saw dust has been proved to be an alternative substrate but not commonly available. Hence an effort was made to assess the suitability of match wood (*Ailanthus exelsa)* saw dust which is commonly available in Alappuzha district as a substrate for production of oyster mushroom. For this, an On Farm Testing (OFT) was conducted in five mushroom units in Chengannur block of Alappuzha district. It could be observed that the spawn running period, days to harvest and interval between flushes were almost same in match wood saw dust medium compared to that in rubber saw dust but better compared to that of paddy straw. The yield obtained per bed was 1.07 kg compared to 1.02 kg from rubber saw dust for a crop duration of about 120d whereas the beds with paddy straw yielded 0.69 kg for a duration of 60d. The study indicated that match wood saw dust can be used as an alternative substrate for mushroom production as it is cheaper and yielded at par with rubber saw dust. The BC ratio also was found to be favourable compared to the other substrates.

Key Words: Alternative Substrate, Match wood saw dust , Oyster mushroom, Rubber.

INTRODUCTION

Mushroom cultivation is gaining importance as a promising enterprise capable of generating employment opportunities and income and most suitable technology for creating wealth out of plant residues. Moreover, this has become a means of livelihood for many families. Oyster mushroom cultivation is becoming popular throughout the world because of its abilities to grow at a wide range of temperatures and to utilize various lignocelluloses. Oyster mushroom can play an important role in managing organic wastes which have become problematic for disposal (Das and Mukherjee, 2007). *Pleurotus* species has a remarkable ability to degrade lignin, cellulose and hemicelluloses into nutritious food. Oyster mushroom is an efficient lignin degrading fungus which grows well on different lignocellulosic substrate (Ahmed *et al*, 2009).

Oyster mushroom can be cultivated in any type of lignocelluloses material like straw, sawdust, rice hull etc. It can grow on various types of lignocellulosic waste materials owing to its simple and low cost production technology, fewer environmental controls and shorter growth time. It is also less attacked by diseases and pests as compared to other edible mushrooms (Dehariya and Vyas, 2013). Out of the different types of agro residues paddy straw and rubber saw dust are most frequently used in Alappuzha district of Kerala. Because of the higher cost and non-availability of paddy straw and rubber saw dust, there is a need to explore alternate substrate for commercial cultivation of mushroom. The substrates used in each region depend on the locally available wastes. (Cohen *et al*, 2002). Kumar (2020) revealed that different substrates significantly affected the number of primordia and fruiting bodies, and

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the amount of fresh weight or yield of oyster mushroom. The highest number of primordia and fruiting bodies and the amount of fresh weight was obtained with black gram straw+ wheat straw in all flushes whereas, the lowest with maize straw alone. However high and significant performance of other substrates ensures the possibilities of utilizing the locally available agricultural wastes for *Pleurotus sajor- caju* cultivation. Cultivation of mushrooms on saw dust may be one of the solutions to transform inedible wastes into edible biomass. Hence, the present experiment was undertaken to evaluate match wood saw dust (*Ailanthus exelsa*), a locally available substrate, as a medium for the growth and yield of *Pleurotus florida.*

MATERIALS AND METHODS

The trial was conducted in seven mushroom units in Chengannur block with the following three different substrates for the cultivation of *Pleurotus florida* 1.Paddy straw 2. Matchwood (*Ailanthus exelsa*) saw dust - Fresh saw dust collected from saw mills in the locality 3. Rubber (*Hevea brasiliensis*) saw dust. The substrates were filled in a clean cotton clothbag for 24 – 48hr, moistened them thoroughly and were stalked so as to remove the excess moisture. Then it was steam sterilized for 1hr at 121^0c or chemically sterilized for 14 hr and shadow dried upto 50 percent moisture. The moisture content was tested by palm method by pressing a handful mixture. If there was no water runoff and the material stayed in that form, it indicated that the moisture content was around 50%. Mushroom beds were prepared in cylindrical polypropylene bags of size 30 x 60 cm up to 7 – 8cm layer height with the processed substrates and 10g of bed spawn was inoculated on the substrate in each layer along the circumference of the bags. The substrate was again layered to 5 cm height and spawn was inoculated along the corners of the mushroom beds with gentle pressing of the substrate in each layer for tight packing .The process were repeated until eight layers of spawn and substrates were packed and then mouth was plugged by rubber band tightly. The inoculated bags were perforated with sterilized paper pins for exhaust of gases.

During the spawn running period, humidity was maintained at 80 per cent by daily watering the walls and floors of the mushroom house. Sand was put on the floor to aid moisture conservation, room was ventilated and the netted door always kept closed. A footbath was put at the door so as to avoid possible contamination. Spawn running period (days required for the completion of growth of mycelium on substrates), days to harvest, interval between flushes, yield and duration of plucking in different treatments were recorded. Harvesting of the basidiocarps was done by hand pulling. Each bag was harvested separately and the mass of the basidiocarps was recorded in grams using a digital scale. The data were also recorded for the yield of fruiting bodies and biological efficiency in different substrates. Total yield of all fresh fruiting bodies harvested from the pickings were measured as total yield of mushroom. The biological efficiency (BE - yield of mushroom per kg substrate on dry wt. basis) was calculated using the following formula by Chang *et al* (1981).

$$BE\ (\%) = \frac{\text{Mushroom fresh weight}}{\text{Substrate dry weight}} \times 100$$

The data were statistically analyzed in Complete Randomized Design (CRD) using the WASP–I available on the website of ICAR - CCRI, Goa (https://ccari.res.in/waspnew.html).

RESULTS AND DISCUSSION

During the vegetative growth of mushroom cycle, mycelium grows through the substrate, biodegrades its components and supports the formation of fruiting bodies. Speed of spawn run denotes how easily the fungal hyphae establish in the medium for absorption of nutrients and water. The minimum number of

Table1. Effect of substrates on yield attributing parameters of *Pleurotus florida*

Substrate	Spawn running period (days)	Time taken for first harvest(days)	Interval between flushes (days)
Paddy straw	16.36	20.93	8.00
Rubber sawdust	23.29	25.64	12.57
Matchwood saw dust	19.43	23.14	8.57
CD (P<0.05)	2.19	1.77	1.25

days for spawn run (16.36 d) was observed in paddy straw which was significantly lesser compared to that in matchwood saw dust (19.43 d) and rubber saw dust (23.29 d) (Table 1).

The time taken after complete spawn run and first set of pin head formation to first harvest is given in table 1. The minimum days for first harvest (20.93 d) was recorded in paddy straw medium, which was significantly less compared to that in matchwood saw dust medium (23.14 d) and in rubber saw dust medium (25.64 d). The collective formation and development of fruiting bodies on mushroom beds often occur in a rhythmic manner within a short period of time. The time gap between the occurrences of two flushes is the interval between flushes. An interval of 8 d between flushes was observed in paddy straw medium which was on par with that in match wood saw dust medium (8.57 d) but significantly lesser compared to that in rubber saw dust (12.57 d).

The lowest cropping period of 59 d was recorded with paddy straw as the medium whereas both rubber saw dust and match wood saw dust media supported mushroom production for 126 and 120 d, respectively, (Table 2). Naturally, the yields obtained from the latter two media were significantly higher compared to that from paddy straw medium.

The highest sporophore yield was observed with match wood saw dust (1.07kg/2kg of dry substrate with 53.57% BE) which was on par to rubber sawdust (1.02 kg/2 kg of dry substrate with 51.07% BE) but significantly higher compared to 0.69 kg/0.8 kg of dry paddy straw with 85.71 BE in paddy straw. This result was supported by the findings of Hami (1990) that oyster mushrooms yielded well on saw dust of different wood species.

The economics of mushroom production using different substrate for a period of one year with a unit of 25 beds/cycle was worked out (Table 3).While with saw dusts 3 cycles were enough for an year, paddy straw medium requires 6 cycles, naturally increasing the cost of production.

Even though the net return obtained in mushroom production using paddy straw as a substrate was slightly higher (Rs.19450/) from six cycles of a unit of 25 beds, it was observed that the benefit cost ratio was higher in beds with matchwood saw dust substrate (2.43) owing to lower cost of production compared to the mushroom production using paddy straw (2.15).

Table 2. Effect of substrates on cropping period, yield and biological efficiency of *Pleurotus florida*

Substrate	Cropping period (days)	Yield (kg/bed)	Biological efficiency (%)
Paddy straw	59	0.69	85.71
Rubber sawdust	126	1.02	51.07
Matchwood saw dust	120	1.07	53.57
CD(0.05)	3.01	0.17	14.54

Table 3. Economics of mushroom cultivation for one year using different substrates.

Substrate	Number of cycles/year	Gross cost (Rs.)	Yield (kg)	Gross returns @Rs.350/kg	Net Return (Rs.)	BC ratio
Paddy straw	6	16950	104	36400	19450	2.15
Rubber sawdust	3	12000	77	26950	14950	2.25
Matchwood saw dust	3	11500	80	28000	16500	2.43

CONCLUSION

It was concluded that match wood saw dust substrate supported the growth and yield of the *Pleurotus florida*, and hence it can be used as an alternative and effective substrate for oyster mushroom production. The economics of production is also favourable comparing the other media. So match wood saw dust would be recommended as a suitable substrate for the cultivation of *Pleurotus florida*.

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