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Effect of Different Substrates on Yield of *Pleurotus ostreatus* Mushroom

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Abstract Oyster mushroom is gaining popularity in India due to its high nutritional value, medicinal value and high yield potential. An experiment was conducted to evaluate spawn running, pin head and fruiting body formation, and yield performance of oyster mushroom (*Pleurotus ostreatus*) on different agro-substrates such as paddy straw, wheat straw, banana leaves, sugarcane bagasse, sugarcane leaves, deenanath grass and maize stalks and leaves. Amongst the substrates, highest yield and biological efficiency was recorded in paddy straw followed by sugarcane leaves, wheat straw, deenanath grass, banana leaves, respectively.

Keywords *Pleurotus osteratus*, Substrates, Growth, Yield, Biological efficiency.

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Introduction

Mushrooms are reproductive structure of fleshy fungi. Oyster mushrooms (*Pleurotus* species) are important edible mushrooms which are cultivated commercially throughout the world due to their ability to grow at a wide range of temperature [1]. They are efficient lignin degraders which can grow on different agricultural wastes. They belong to the genus *Pleurotus* and class basidiomycetes and they are commonly called as oyster mushroom due to oyster like shape of their cap. Among different species of *Pleurotus, P. ostreatus* is an important edible mushroom which is grown commercially in India as well as Orissa due to its high nutritional value, medicinal value and high yield potential. In Orissa it is mainly grown during winter season at a temperature range of 20°–30°C.

Oyster mushroom are efficient lignin degraders which can grow on different agricultural wastes. Oyster mushrooms are rich sources of Vitamin C, B-complex, minerals and proteins [2]. Thus they helps in overcoming problem of malnutrition of poor peopleindeveloping countries. Apart from food value,

they are also considered as ideal food for patients suffering from heart diseases and diabetes [3]. Mushroom cultivation is an important profitable agribusiness which converts waste products into protein rich food products.

Oyster mushroom (*P. ostreatus*) can be grown on different agro-residues containing lignin, cellulose and hemicellulose as substrates like rice straw, wheat straw, sugarcane bagasse, paper, saw dust, leaves, barley straw, maize stem, banana leaf midribs [4—6]. As mushroom yield is influenced by substrates used, it is necessary to find out the best substrate for mushroom cultivation. Therefore, the present investigation was carried out to evaluate growth and yield performance of *Pleurotus ostreatus* on different agro substrates locally available.

Materials and Methods

The present experiment was carried during winter 2016 at Department of Plant Pathology, College of Agriculture, Chiplima, Sambalpur. Pure culture of *Pleurotus ostreatus* was obtained from Orissa University of Agriculture and Technology, Bhubaneswar.

Spawn was prepared as per the method described by Michael et al. [7] with slight modifications. Healthy wheat grains were soaked overnight in water and then grains were boiled, drained off excess water and mixed with calcium carbonate at the rate of 2% on dry weight basis of the grains. The grains were then filled into bottle, plugged with cotton and sterilized in autoclave at 121°C for 30 min. Grains were then inoculated with mycelium of *P. ostreatus* and incubated at 25°C for 15 days.

Different agro wastes such as paddy straw, wheat straw, banana leaves, sugarcane leaves, deenanath grass (*Pennisatum pedicellatum*) and maize stalks and leaves were collected from students' plot, College of Agriculture, Chiplima and used as cultivation substrate. The substrates were chopped into 2–3 cm pieces. Sugar cane bagasse was collected from local juice shop, Chiplima, sun dried and chopped into small pieces. The substrates were soaked in 100 liters of water for overnight. 10g of carbendazim were mixed with water. After soaking, different substrates were taken out and excess water was drained. The substrates were spread as thin layer on polythene sheet and shade dried to get 60% moisture capacity.

Table 1. Days for completion of spawn run, pin head formation and fruiting body formation of *Pleurotus ostreatus* on different substrates.

Substrates	Spawn running (days)	Pinhead formation (days)	Fruiting body formation (days)
Sugarcane bagasse	18.00	26.00	31.00
Paddy straw	22.00	31.00	35.00
Wheat straw	24.00	33.00	40.00
Deenanath grass	25.20	33.50	39.00
Banana leaves	27.50	37.00	41.00
Sugarcane leaves	25.00	33.20	38.00
Maize stalks and leaves	30.00	41.00	48.00
SEm±	0.63	0.66	0.76
CD at 1% level	2.68	2.80	3.22

To prepare the beds, the sterilized substrates were filled in polythene bag of the size of 35 × 45 cm and multi layered technique was used for spawning. One kg of substrate was used to fill up in each bag and spawn was added at the rate of 2% of wet substrate. Three replications were done for each treatment. The inoculated bags were kept in the spawn running room in dark at room temperature (20 to 28°C). When the spawn run was completed, the bags were shifted to cropping room in the thatched shed. Using a new blade polythene covers were tear off and removed fully. Water was sprayed on the bed from second day of opening using an atomizer. Total yield of mushroom fruiting body from each bed was recorded immediately after harvest. Biological efficiency was calculated by dividing average yield of mushroom per bed by dry weight of substrate.

$$\text{Biological efficiency} = \frac{\text{Fresh weight (g) of mushrooms harvested}}{\text{Dry weight (g) of substrate}} \times 100$$

Table 2. Yield, biological efficiency and benefit-cost ratio of *Pleurotus ostreatus* on different substrates.

Substrates	Yield (g/kg dry substrate)	Biological efficiency (%))	Benefit cost ratio
Sugarcane bagasse	504.00	50.40	2.67
Paddy straw	827.00	82.70	4.41
Banana leaves	586.00	58.60	3.13
Wheat straw	603.00	60.30	3.21
Sugarcane leaves	710.00	71.00	3.79
Maize stalks and leaves	270.00	27.00	1.44
Deenanath grass	596.00	59.60	3.18
SEm±	6.08		
CD at 1% level	33.64		

Benefit cost ratio: The benefit cost ratio for different substrates were computed based on present market price of mushroom and cost of different inputs in the market [8].

Results and Discussion

Spawn run, pin head formation and fruiting body formation

Data on time requirement for spawn run, pin head and fruiting body formation by *P. ostreatus* on different substrates are presented in Table 1. Time required for completion of spawn run ranged from 18 days to 30 days. Lowest time required for completion of spawn run by this mushroom fungus was recorded in sugarcane bagasse (18 days) followed by paddy straw (22 days), wheat straw (24 days), sugarcane leaves (25 days), deenanath grass (25.2 days), respectively. The mushroom fungus took 26–41 days for formation of pin head on different agro substrates. Shortest time required for pinhead formation was recorded in sugarcane bagasse (26 days). It was followed by paddy straw (31 days), wheat straw (33 days), sugarcane leaves (33.2 days). Time required for fruiting body formation by this mushroom ranged from 31 to 48 days. Our results are in agreement with findings of Shah et al. [4] who reported that *P. ostreatus* took 16.67–25 days for compete spawn run and 24–30.33 days for pinhead formation on different substrates. Sharma et al. [6] also showed that 32.40–37.80 days are required for fruiting body formation by *P. ostreatus* on different agro-substrates which are almost similar to the findings of our present study.

Mushroom yield, biological efficiency and benefit cost ratio

Seven different types of substrates were used to analyze total yield and biological efficiency of *P. ostreatus* and results are presented in Table 2. The results revealed that highest yield was obtained from paddy straw (827 g) which was significantly different from other substrates. It was followed by sugarcane leaves (710 g), wheat straw (603 g), deenanath grass (596 g), respectively. Lowest yield was obtained from maize stalks and leaves (270 g). Highest biological efficiency was recorded in paddy straw (82.7%) followed by sugarcane leaves (71.0%), wheat straw (60.3%), deenanath grass (59.6%), respectively. Lowest biological efficiency was found in maize stalks and leaves (27%). Highest yield was obtained from paddy straw which might be due to presence of all necessary nutrients in sufficient amount in paddy straw for the growth of *P. ostreatus*. Our results are in line with Sharma et al. [6] who cultivated *P. ostreatus* on different substrates and obtained highest yield and biological efficiency from paddy straw. Mondal et al. [9] also obtained highest biological yield from paddy straw among different substrates in *P. florida*. The highest benefit cost ratio was obtained from paddy straw (4.41) followed by sugarcane leaves (3.79), wheat straw (3.21). The lowest benefit cost ratio was obtained from maize stalks and leaves (1.44). Sarkar [8] showed that highest benefit cost ratio of 6.50 with wheat straw in *P. ostreatus*.

References

1. Sharma S, Yadav RKP, Pokhrel CP (2013) Growth and yield of oyster mushroom (*Pleurotus ostreatus*) on different substrates. J New Biol Rep 2 : 3—8.
2. Caglarirmak N (2007) The nutrients of exotic mushrooms (*Lentinula edodes* and *Pleurotus* species) and an estimated approach to the volatile compounds. Food

Chem 105 : 1188—1194.
3. Randive SD (2012) Cultivation and study of growth of oyster mushroom on different agricultural waste substrate and its nutrient analysis. Adv Appl Sci Res 3 : 1938—1949.
4. Shah ZA, Ashray M, Ishtiod M (2004) Comparative study on cultivation and yield performance of oyster mushroom (*Pleurotus ostreatus*) on different substrates. Pak J Nut 3 : 158—160.
5. Hasan MN, Rahman MS, Nigar S, Bhuiyan MZA, Ara N (2010) Performance of oyster mushroom (*Pleurotus ostreatus*) on different pretreated substrates. Int J Sustain Crop Prod 5 : 16—24.
6. Sharma S, Yadav RKP, Pokhrel CP (2013) Growth and yield of oyster mushroom (*Pleurotus ostreatus*) on different substrates. J New Biol Rep 2 : 3—8.
7. Michael HW, Bultosa G, Pant LM (2011) Nutritional contents of three edible oyster mushrooms grown on two substrates at Haramaya, Ethiopia and sensory properties of boiled mushroom and mushroom sauce. Int J Food Sci Tech 46 : 732—738.
8. Sarker NC (2004) Oyster mushroom (*Pleurotus ostreatus*) production technology suitable for Bangladesh and its nutritional and postharvest behavior. PhD Thesis. Bangabandhu Sheikh Mujibur Rahman Agric Univ, Gazipur, Bangladesh.
9. Mondal SR, Rehana MJ, Noman MS, Adhikary SK (2010) Comparative study on growth and yield performance of oyster mushroom (*Pleurotus florida*) on different substrates. J Bangladesh Agric Univ 8 : 213—220.