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Comparative study on effect of different substrates on the growth and yield performance of oyster mushroom-*Pleurotus florida* (Mont.) Singer

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Abstract

The research experiment was carried out to evaluate the effect of different substrates on the growth and yield of oyster mushroom (*Pleurotus florida*) to find out the best alternative substrates that support the growth of oyster mushroom, produces the maximum yield with highest biological efficiency and nutritional contents. The objective of the study was to determine the effect of different substrates on the performance of *Pleurotus florida* mushroom. The wheat straw and saw dust substrates were used to determine the growth of oyster mushrrom *pleurotus florida*. The minimum time taken for mycelium run (10 days) was in wheat straw and maximum was observed in saw dust (12 days). The maximum time from primordial stage to harvesting stage was recorded in saw dust (18 days) and minimum time from primordial stage to harvesting stage was recorded in wheat dust (16 days). Maximum yield was obtained on wheat straw (1570 gms) with highest biological efficiency (91 %) and minimum yield was observed on saw dust (570 gms). Therefore, it can be concluded that wheat straw substrates individual as well as in combination proved to be best for cultivation of *P. florida*.

Oyster mushroom, Pleurotus spp. a macro fungus with a distinctive fruiting body, is a unique biota which assembles its food by secreting degrading enzymes. The genus *Pleurotus* (oyster mushroom) is an organoleptic fast growing fungus, which decomposes the complex organic materials to generate simpler compounds for its nutrition[4]. Since centuries, mushrooms have been recognized as important food item and their usage is being increased day by day for their significant role in human health, nutritional and medicinal properties[9]. *Pleurotus* spp. are also rich in medicinal values and so it provides a wide variety of medicinal properties and they are effective against certain life threatening diseases. Major medicinal properties attributed to oyster mushrooms include anticancer, antibiotic, anti-inflammatory antiviral activities, immune- modulator effect and blood lipid lowering effects[7]. An attractive feature of oyster mushrooms is that they can utilize a large

variety of agricultural waste products and and transform the lignocelluloses biomass in to high quality food, flavour and nutritive value[1]. *Pleurotus florida* belongs to family Pleurotaceae and it is commonly called as Dhingri in India. This mushroom is an edible mushroom having excellent flavor and taste. Its productivity is maximum in a short time providing more protein per unit area than any other area. *Pleurotus florida* produces metabolites of medicinal and pharmacological interest, such antioxidant antimicrobials, immune stimulants and antitumor activities[8,10]. Among the numerous species of mushroom, oyster mushrooms (*Pleurotus florida*) are more advantages in terms of easiness in cultivation, role in biodegradation and bio-remediation, production of extracellular enzymes and neutraceuticals[12]. Mushrooms are still cultivated on small pockets on a specific substrate and yield potential is not satisfactory. In the present study *P. florida* was cultivated on wheat straw and saw dust on single and mixed bed consisting of equal amounts of these substrates in polythene bangs. The yields of mushroom and biological efficiency of the mushrooms were analysed.

The experiment was carried out during the months of August-January (2020-2021). The pure culture of *Pleurotus florida* was procured from research laboratory Omcar, Goswami Shastri Bhavan, Mahalgon, city center , Gawlior (M.P.), India. The Oyster mushroom can be grown on various substrates including paddy straw, maize stalks/cobs, vegetable plant residues, etc. In the present study two substrates viz. wheat straw and saw dust were selected for the cultivation of oyster mushrooms because these substrates are cheap and easily available. The methods proposed by Survase[15]; Vijay and Sohi[17]. Yield of mushrooms and their biological efficiency was determined by using the formula[14]. The fruit bodies were analysed for their moisture content[11].

Substrate collection :

The dirt, pest and mold free substrate (wheat straw and sawdust) was chosen. After that 200-250 litres of water were taken in a large sized container in which formalin and bavistin was added and substrate was soaked in this water for 8-10 hours after which the excess water was drained off. The substrate was taken out from the container and spread in the sunlight to evaporate excess water content so that the final moisture content is not more than 65%. The mixer rod was sterilized by flame locally made. Then, the pasteurized substrates were inoculated with 4-6% *P. florida* seed aseptically from mother spawn and they were incubated at 25°C. After substrates were filled to plastic bags, different size holes were made to evaluate effect of aeration, contamination and moisture loss. Optimum temperature for growth of mushrooms is usually 25-28°C and moisture content is 70%. Light and temperature were used to initiate the formation of pinheads after the mycelium was fully grown on the substrate i.e. after the substrate was fully turned into white colour due to mycelium mass. The growing mycelium that was placed in dark was brought to a fully illuminated region; on the other hand, the plastic bags that were put in the incubator at 25°C were placed at ambient temperature. Water is continuously sprayed on mushroom bags and after 5-6 days large size fruiting bodies were appeared. The mushrooms

Table-1. Showing Oyster mushroom yield with different substrates

S.No	Substrate	Quantity of Straw/Spawn	No. of Days of Mycellium Cover	Pin Head Initiation	Fruiting	Total Weight After IIIrd Harvesting	Colour
1	Wheat Straw	1.5kg/200gm	10 Days	14 Days	16 Days	1570 gms	White
2	Saw Dust	1.5Kg/200gm	12 Days	16 Days	18 Days	560 gms	White

were harvested before the fruiting body showed any splitting on the edges.

In the present study two substrates viz. wheat straw and saw dust were used for the cultivation of oyster to know about the yielding potential of substrate, the time of fruiting and the quality of fruit. The data is shown in table-1.

Yield of oyster mushroom in wheat straw:

In wheat straw the mycelium covered the bag steadily within 10 days and the pin head initiation appeared on the substrate within 14 days, the growth of fruiting body started usually after day 14. After which the full blossom of mushroom with good quality, full in size and white in colour appeared in 16 days. First Harvest appeared with a yield of 770 gms and IInd crop appeared with a yield of 500 gms and IIIrd harvest produced 300gm. Finally the total weight of 1570gms was obtained from wheat straw after all the three harvests.

Yield of oyster mushroom in saw dust:

In saw dust the mycelium covered the bag within 12 days and the pin head formation is also delayed than wheat straw usually appears in 16 days. First Harvest appeared in 18 days with a yield of 260gms and IInd crop appeared with a yield of 200gms and IIIrd harvest produced 100gm. Finally the total weight of 560gms was obtained from saw dust after all the three harvests. (Figure 1).

From the above results it showed that the substrate of wheat straw has good potential for the growth of mycelium compared to the saw dust, because the fruiting occurred in less time with greater yield.

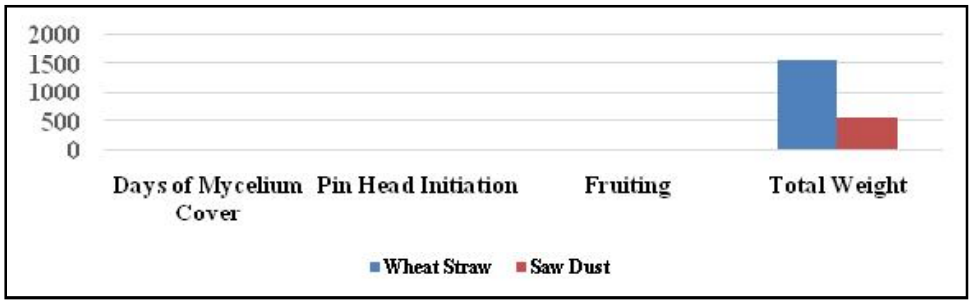

Figure 1. Showing Oyster Mushroom yield with different substrates.

Wheat straw

Saw dust

Figure 2: Showing Bag formation using different substrates

Wheat

Saw dust

Figure 3: Photographs showing different stages of mycelium run

Figure 4**:** Pin head initiation

Figure 5: Fruiting body

Figure 5: Harvesting of fruits and drying in sunlight

This is comparable with other similar studies elsewhere. Biswas and Biswas[2], reported the completion of spawn running on wheat straw waste to be 14 days, while, Lalithadevi *et al.*[4] recorded between 16-25 days on paddy straw. The difference in days for full mycelia running on different substrates might be due to variation in their chemical composition and C: N ratio as reported by Bhatti *et al*.[2]. The results recorded on spawn running on different substrates were almost similar to the findings of Shah *et al.*[13]. Tan[16] reported that the spawn running took 16-25 days after inoculation. The variation in the number of days taken or a spawn to complete colonization of a given substrate is a function of the fungal strain, growth conditions and substrate type. Unlike other mushrooms they have much diversity in their adaptation to varying agro-climatic conditions along with low substrate-specificity for a wide range of lignocellulase activity[5]. The flexible nature of this genus is mainly due to their rapid mycelial growth, high saprophytic colonizing ability and simple cultivation technology. In the present study two substrates viz. wheat straw and saw dust were used for the cultivation of oyster to know about the yielding potential of substrate, the time of fruiting and the quality of fruit.

Wheat straw and saw dust the good result as mixed substrates compared to individual substrates. Wheat straw, single and in combination supported the growth of P. florida better than saw dust and produced a significantly higher yield and biological efficiency. It is also proved to be better in terms of mycelia density, time required for mycelia sunning, pinhead formation and development of fruiting bodies. Wheat straw individually and in combination showed a highest protein content which can be substitute for expensive fish and meat which is mostly unaffordable by most as a result of poverty. Thus, the wheat straw can be a best alternative and replacement of traditional substrates.

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