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CULTIVATION OF OYSTER MUSHROOM ON PADDY STRAW SUBSTRATE

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ABSTRACT: Mushroom cultivation is one of the most profitable and eco- friendly enterprises, among all the horticultural crops in India. Oyster mushrooms (Pleurotus sp) are widely cultivated all over the world. The cultivation of oyster mushroom (*Pleurotus ostreatus*) on paddy straw without supplements was studied as a way to use the circular economy concept of turning agricultural waste into value added products. It's a subtropical edible mushroom, is suitable for cultivation in summer and rainy season. Therefore, paddy straw has the potential to be a cost-effective and efficient substrate for oyster mushroom production.

KEYWORDS: Mushroom, Oyster, *Pleurotus ostreatus*, paddy.

1.Introduction

Among all the horticultural crops grown in India, mushroom cultivation is one of the most profitable and eco-friendly. It is mostly grown indoors in cropping rooms, where changes in weather, such as drought and rain, have little effect on yield (Grimm *et al.*, 2018). It has been established that mushrooms are an important food item from ancient times. Because of their significant effects on human health, nutrition and disease and their consumption increases constantly. Mushrooms of *Pleurotus* sp. are commonly known as oyster mushrooms which occupy the second position among cultivated edible mushrooms worldwide due to their nutritional and medicinal values (Patel *et al.*, 2012).

The oyster mushroom, commonly referred as "Dhingri" in India, is a type of basidiomycetes which is classified as part of the genus Pleurotus. This lignocellulolytic fungus grows naturally on dead, decaying wood logs in temperate and tropical forests. It can also grow on the drying trunks of coniferous or deciduous trees. It can also develop on organic materials that has decomposed (Shukla *et al.*, 2011). Depending on the species, the fruit bodies of this mushroom have a characteristic shell, fan, or spatula shape with variety of colors, including white, cream, grey, yellow, pink, or light brown (Kamalakannan *et al.*, 2020). That being said, the sporophores' color varies greatly depending on the substrate's nutrients, temperature, and light intensity. The word Pleurotus comes from the Greek word "Pleuro," which meaning "formed laterally" or "lateral position of the stalk or stem" (Kashangura *et al.*, 2008).

The taste, nutritional value, and therapeutic qualities of oyster mushrooms have been well explored. It provides an essential nutritional source of iron, calcium, protein, vitamins, and carbohydrates (Majesty *et al.*, 2019). Moreover, these mushrooms derive nutrients from decomposing organic waste, deadwood, dung, straw, and manure. These mushrooms produce high-value human food when grown on lignocellulosic agricultural waste.

It is commonly known as fungus fruiting bodies and has been widely cultivated throughout the world. Therefore, it can grow over a wide range of temperatures using a variety of lignocelluloses.

Mushroom growing started in India in the nineteenth century. China is the world's leading producer of mushrooms, according to data from the Food and Agriculture Organization (FAO) of the United Nations, as reported in 2018 (Li *et a.*, 2022). As a result, they are frequently used in the bioremediation of pollutants and the enzymatic breakdown of lignocellulosic wastes.

According to Mercy *et al.*, (2011), mushrooms require primary nutrients such as cellulose, hemicellulose, and lignin as well as inorganic substances like carbon, nitrogen. Paddy or rice straw as a substrate for mushroom cultivation is produced as an agricultural by-product. Rice fields are currently disposed of by open burning, which causes major ecological problems. If oyster mushrooms can be cultivated on paddy straw, this could transform non-edible waste into a profitable and edible biomass (Zaghlou et al., 2018).

These fungi can be collected in the wild during the last the wettest part of the rainy season, where they meet and grows on deeply decaying organic matter. But not every mushroom that grows in the wild is suitable for human consumption. This biomass may also be used by mushroom producers as a low-cost substrate. However, because of its low biological competence and productivity, it is said that rice straw is not often used in oyster mushroom cultivation in China.

But, according to Anusiya et al. (2021) it also provides medical advantages for those with diabetes and cancer. Pleurotus species, in particular, are high in potassium and sodium and can be consumed by people with heart disease and high blood pressure. Furthermore, by decreasing the proportion of lignocellulosic biomass, mushroom farming techniques may enhance the quality of the straw (Van Kuijk et al., 2015). Therefore, the purpose of this study is to explore the use of paddy straw as a basal substrate in oyster mushroom cultivation.

2. Materials and methods

2.1. Preparation of mother spawn

Mother spawn is nothing but the mushroom fungus grown on a grain based medium. The sorghum grains are the best substrate for excellent growth of the fungus. Disease- free sorghum grains are used as substrate for growing the spawn materials. Boil the sorghum grains submerged in clean water for 20-30 minutes. When the grain become soft, remove and spread evenly on a cloth to drain out the grains. At 50% moisture level mix calcium carbonate (CaCO3) thoroughly with the cooked, dried grains @ 20 g / Kg to remove the excess moisture present in the cooked grains, to neutralize the pH of the grains and to avoid caking of grains after sterilization. Fill 20 gms of grain in cleaned and dried glucose bottle of 500ml capacity or polythene bags and plug the mouth of the bottle with non-absorbent cotton. Sterilize the bottles in autoclave by exposing to 121°C and 15 lbs. pressure for 2 hour. After cooling transfer the bags to laminar air flow chamber put on the UV light (Sharma et al., 2017).

2.2. Multiplication using mother spawn:

A well grown mother spawn (18-20 days old) is used for multiplication. Stir the spawn using sterilized forceps to get the individual grains with fungal growth. Transfer few grains with mycelial growth into sterilized substrate bottle under aseptic condition and plug it with cotton. Shift the inoculated bottles to spawn running room having temperature range of 25-3 0°C. Inspect the bottles regularly and discard contaminated one immediately. Within 15-20 days of inoculation mycelial growth covers entire substare and the spawn is ready for use (Sharma, V. P. *et al.*, 2014).

2.3. Substrate preparation

The paddy straw is chopped (5-10 cm) using sterilized knife after chopping straw is soaked in hot water for one hour where the temperature may be in the range of 65 to 70°C. normally soaking the substare in boiling water helps in achieving this temperature and no future heating may be necessary. It will be appropriate to check the temperature and standardize the conditions as per your location. Over

boiling or over heating may not lead to proper result. The straw is covered in a polythene sheet for 2 hours to remove excess water and the substrate is ready for use (Vieira *et al.,* 2016).

2.4. Bed preparations

The cultivation of oyster mushroom is usually carried out in transparent polythene covers. The size of the cover should be 60 x 30 cm, with a thickness of 80 gauge. Wash hands thoroughly with antiseptic lotion. Take the polythene cover and tie the bottom end with a thread and turn it inwards. Shade dry steam sterilized straw to get a uniform moisture level in all areas. Take out a well-grown bed spawn, squeeze thoroughly and divide into two halves. (Two beds are prepared from the single spawn bag) Fill the straw to a height of 3" in the bottom of polythene bag, take a handful of spawn and sprinkle over the straw layer, concentrating more on the edges. Fill the second layer of the straw to a height of 5" and spawn it as above. Repeat this process to get five straw layers with spawns. Gently press the bed and tie it tightly with a thread. Put 6 ventilation holes randomly for ventilation as well as to remove excess moisture present inside the bed (Gogoi *et al.,* 2019). Arrange the beds inside the thatched shed, (Spawn running room) following Rack system or hanging rope system. Maintain the temperature of 22-25° C and relative humidity of 85-90 % inside the shed. Observe the beds daily for contamination, if any. The contaminated beds should be removed and destroyed. Similarly, observe regularly for the infestation of insect pests *viz.*, flies, beetles, mites etc., if noticed, and the pesticide like Malathion should be sprayed inside the shed @ 1 ml per litre of water. The fully spawn run beds can be shifted to cropping room for initiation of buttons (Singh *et al.*, 2008)

2.5. Cultivation of mushroom

For the cultivation of mushrooms, bedding preparation was done. Initially, 200-250 g of the substrate was taken in a polythene bag, 1st layer of the substrate was about 5 cm. 2nd layer of spawns was scattered for about 5 cm and the above step was fallowed up to 5-6 layers. During the incubation period, the temperature and pH were maintained. An optimized temperature of about 20-25°C was maintained. Temperature and moisture were maintained by spraying the water between 21-23°C (Villaescusa *et al.*, 2003).

2.6. Harvesting

The mushrooms were harvested using an environmental chamber (temperature, ventilation, and humidity). Relative humidity and temperature were controlled at 70-80% and 24 ± 1°C, respectively (Islam *et a.*, 2016). These conditions were determined using the preliminary test carried out using different conditions. The inoculated bags were kept in the environmental chamber to develop the fruit bodies. After harvesting, the mushrooms were gently twisted, and the end parts were cut off and later weighed. Also, the substrate in the bag was weighed.

3. Result and discussion:

In this experiment, the result discuss about cultivation of Oyster mushroom on paddy straw substrate. Harvesting is carried out at different maturation stages and upon consumer preferences and market value. The cost of production was calculated in each step (Spawn preparation, bedding supplements and packing). Mushroom bedding and fruiting are shown in fig (1). The mycelium was spread all over the mushroom bedding during incubation (10-20 days) and temperature was maintained 21±1° C. similarly, the bedding of mushroom and matured mushroom are shown in fig (2). The total cost for the production of mushroom is listed in table (1).

In addition, to increase mushroom marketing, storage, and packaging are essential sources for consumption. It has been reported that development and economic mushroom consumption are gradually generating. Hence, this method of cultivation and production could be environment-friendly for farmers and consumers.

4.Conclusion

According to the result obtained in this experiment, the cultivation of Oyster mushrooms using paddy straw without supplements to convert agricultural waste into value-added products. Therefore, paddy straw has the potential to be cost-effective for mushroom producers.

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Table 1: Cost of production for Oyster mushroom cultivation

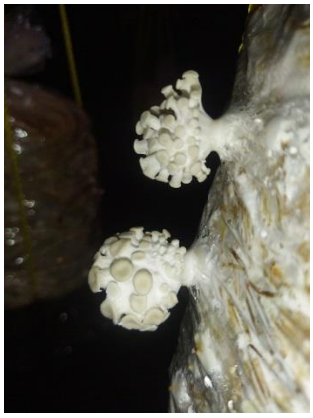
S.no	Particulars	Cost (Rs.)
1	Spawn	250
2	Paddy straw	100
3	Labour cost	-
4	Polythene cover	50
	Total	**400**

a. Bed preparation

b.Mycelial growth covering entire substrate

c. Bud formation stage

Figure 1: Mushroom bedding and Fruiting body



a. Bud maturation stage

b. Matured mushroom

Figure 2: Bedding of mushroom and matured mushroom

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