



## **Cultivation of *Pleurotus ostreatus* (Oyster Mushroom) using Different Substrates**

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**Abstract:** *The cultivation of edible oyster mushroom was done on different substrates to find out the suitable substrate that gives maximum yield in the given time period. Three different substrates viz sugarcane bagasse, Paddy straw and wheat straw were used for the comparative growth of *Pleurotus ostreatus*. The mycelial growth of oyster mushroom was faster in sugarcane bagasse (15 days) and paddy straw (16 days) as compared to wheat straw (17 days). Likewise, Pin head formation was faster in paddy straw (17 days) as compared to sugarcane bagasse (18 days) and wheat straw (25 days). Fruit body maturation was observed early in sugarcane bagasse (25 days) followed by paddy straw (27 days) and wheat straw (36 days). Highest yield in terms of fruiting bodies was observed in sugarcane bagasse. Length and thickness of stipe significantly varied in different substrates. These studies have revealed that sugarcane bagasse is found to be best substrate for oyster mushroom in terms of mycelial growth, pin head formation, maturation of fruiting body and higher numbers of fruiting bodies followed by paddy straw and wheat straw with insignificant variations in sugarcane bagasse and paddy straw.*

**Key words:** Mushroom cultivation, Organic farming, *Pleurotus ostreatus*, Agriwaste management, Oyster mushroom

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## 1. Introduction

Mushroom belong to the kingdom Fungi under the *Basidiomycota* due to unique fungal characteristics. Mushroom are being used as food and medicine from ancient time. The oyster mushrooms have three distinct parts- a fleshy shell or spatula shaped cap (*pileus*), a short or long lateral or central stalk called *stipe* and long ridges and furrows underneath the pileus called gills or *lamellae*. The gills stretch from the edge of the cap down to the stalk and bear the spores. The spores are smooth, cylindrical and germinate very easily on any kind of mycological media within 48-96 hrs. The mycelium of *Pleurotus* is pure white in colour. Basidiomycetes are characterized primarily by the fact that they produce their sexual spores termed basidiospores, on the outside of a specialized, microscopic, spores producing structure called basidium [1]. The basidiospores on of most species are blastospores and are discharged forcibly from their basidia by mean of an elaborate discharge mechanism. Basidiospores, on form after plasmogamy, karyogamy and meiosis. The last two of these processes occur in basidium and four basidiospores typically are produced on each basidium. Although haploid basidiospores

may be either uninucleate or binucleate at maturity [2]. As will be discussed later basidiospores comes in variety of size, shape and colors and may be either thin or thick walled and smooth or ornamented [3]. The basidiomycetes are an important group of fungi including harmful as well as useful species. The genus *Pleurotus* contained the so-called Oyster mushroom [4]. These fungi are among same of the most commonly encountered agaricus and are choice edible species [5]. The Oyster shell shaped caps of *Pleurotus* appear on logs or tree stumps in shelf like layers. They are either sessile lacking a stalk or have a very short lateral stalk. However, *P. ulmarius* a large white mushroom that is very good to eat has a thick almost central stalk [4]. It often grows on living elm tree or elm logs *P. ostreatus* is one of the most frequently encountered member of the genus in eastern northern America. North America where the mushroom is being explored as a high value crop by part-time and full-time farmers who have access to hard wood trees [6]. The paddy straw mushroom of India, China and Japan also is grown outdoors but as the name implies on straw rather than wood. Oyster mushroom was cultivated on different substrate like paddy straw, sugarcane bagasse and

mustered straw using cylindrical block system to find out suitable substrate [7].

Studies have shown that the highest number of primordia and fruiting bodies of Oyster mushroom was found in sterilized paddy straw. Substrate rice was the best for spawn production of Oyster mushroom. Oyster mushroom (locally known as Dhingri) is easy to grow comparatively in tropical and subtropical climate [8]. These species are characterized by the rapidity of their mycelial proliferation. There is no need of composting of substrate for Oyster mushroom production. Oyster mushrooms are easily dried to provide for a longer shelf life and export possibilities [9]. To make Oyster mushroom cultivation more profitable and popular, different types of agro-wastes, crop residues and byproducts can be used with cylindrical block system, which has already been proven economically viable rather than conventional polybag method [10]. However, a profitable mushroom cultivation on large scale also requires close attention, experience and skill; Therefore, three experiments were carried out at production of Oyster mushroom on different substrates using cylindrical block system [11].

## 1.2 Benefits of Oyster Mushroom

1. Oyster mushrooms are an excellent source of several vitamins, including niacin (providing 21% of your recommended daily intake), riboflavin (18%), and pantothenic acid (11%). You'll also get smaller amounts of folate, vitamin B6, and thiamin [12].

2. Minerals in oyster mushrooms include phosphorus, potassium, copper (providing 10% of your daily needs for each), iron, magnesium, zinc, manganese, and selenium [13].

3. Oyster mushrooms contain a number of substances thought to influence health. These substances include dietary fiber, beta-glucan, and several other polysaccharides—a class of carbohydrates found to affect immune function [14].

4. Recent studies have shown that oyster mushrooms also have various medicinal properties like lowering of Cholesterol lowering, Anti-oxidant and Anti-carcinogenic [15].

## 2. Materials & Methods

### 2.1 Materials

1. Spawn 2. Paddy Straw, Wheat Straw, Sugarcane bagasse 3. Container 4. Plastic bags

### 2.2 Methods Oyster Mushroom Cultivation

#### 2.2.1 Substrate preparation

Oyster mushroom was fully grown on numerous substrates viz., Wheat straw, Paddy

straw, sugarcane straw. Since paddy straw is well accessible and low cost, it's wide used. Paddy straw used was recent and well dried.

**Soaking:** Wheat and paddy straw were sliced into 3-5 cm items and soaked in H<sub>2</sub>O for 8-16 hours. The excess water from straw was drained off by spreading it on paper.

**Heat Treatment:** Heat treatment of substrate leads to minimizing the contamination drawback and offers higher and nearly constant yields. It is done by sterilization.



Fig. 1: SPAWN (500gm)

**Pasteurization:** Water was cooked in a very wide mouth instrument. The wet substrate was crammed in burlap baggage. The crammed bag was lordotic in quandary of 80 – 85 °C for concerning 10-15 minutes. To avoid floating, it absolutely was ironed with some

significant material or with the assistance of a picket piece. Once sterilization was made, the excess quandary was drained far from instrumentality so it is reused for alternative sets and quandary temperature was maintained at 80 - 85 °C for all sets to realize sterilization.

**Spawning:** When the change integrity substrate had cooled right down to temperature, it absolutely was prepared for filling and spawning. At this stage substrate wetness content was concerning seventieth polyethylene baggage (35x fifty cm, a hundred and fifty gauges or plastic baggage) or plastic baggage (35x fifty cm, eighty gauges) were used for its cultivation. One five hundred mil bottle spawn (200-250 g) is used for 10-12 metric weight



unit wet straw (3 bags).

Fig. 2: STRAW

Spawning is wiped out layer spawning or through spawning. In case of layer spawning, substrate was crammed in bag, ironed to a depth of 8-10 cm and broadcasted with a couple of spawn on top of it. Similarly, 3d and third layers of substrate were place and at the same time once spawning, the baggage was closed. Once spawning, change integrity straw was mixed with two spawn and crammed in baggage was gently ignored, and also the baggage was sealed for spawn running (development). Spawned baggage was stacked on racks in neat and clean place, in closed position. Temperature at 25-35 C and humidness at 70-85% was maintained by spraying water double each day on walls and floor.



Fig. 3: Squeeze Straws From

It took 15- once baggage was absolutely lined with white and pink plant structure severally.

**Cropping and harvest:** After 20-22 days, once baggage was absolutely fertilized with white plant structure, they were transferred into cropping space and also the polyethylene covers were removed. The open blocks were unbroken on racks concerning twenty cm apart with gap of 50-60 cm between 2 shelves. Mushrooms were fully grown in a very temperature vary of 20-33 °C ratio was maintained by spraying water double each day on the walls and floor of the area. a lightweight spray of water was given on blocks as shortly because the little pin heads appeared. Once pinheads were 2-3 cm massive a bit heavier watering was done on blocks and watering of blocks was stopped to permit them to grow.



Fig. 4: Spread the Straw in water Container

Mushrooms were plucked before they shed spores to take care of quality. After first flush of harvest, 0.5 to one cm outer layer of the block was scrapped. This helped to initiate 3d flush that appeared once ten in days. Once gathering they were packed in perforated (5-6 little holes) polyethylene baggage to stay them recent. It loses freshness once concerning half-dozen hours, which might be increased by keeping them in icebox. *Pleurotus* is shed dried for two days and dried product marketed in polyethylene baggage. Dried mushrooms were soaked in water for ten minutes before use. After the expansion of oyster mushrooms following organic Chemistry check were administered. The various steps in *Pleurotus ostreatus* Cultivation are shown in Fig. 1 to 4.



Fig. 5: Material Filled in Plastic Bags and Tied Tightly



Fig. 6: Growth In Wheat Straw



Fig. 7: Growth in Paddy



Fig. 8: Growth in Sugarcane

### 3. Results and Discussion

Results from mycelia running, pin head formation and the maturation of fruit bodies are illustrated as follows (Table). The mycelia growth was faster on Sugarcane bagasse and paddy straw than wheat straw in all the spawned substrates. Pin head formation occurred quickly in Sugarcane bagasse followed by Paddy straw, wheat straw in all the spawned substrates. The maturation period of fruiting bodies ranges from 25 days (Sugarcane bagasse) to 36 days (Wheat straw).

Findings have shown that the growth of oyster mushroom was faster in sugarcane bagasse and paddy straw as compared to other substrates. It was observed that 15-17 days for mycelia to run each substrate, spawn in sugarcane is appeared

in 16 days whereas in paddy straw appeared in 16 days and in wheat straw in 17 days.

Table 1: Growth of *Pleurotus ostreatus* (Oyster mushroom) on different substrates

Growth	Sugarcane Bagases	Paddy Straw	Wheat Straw
Mycelial Growth	15 Days	16 Days	17 Days
Pin Head Formation	17 Days	18 Days	25 Days
Maturation of Fruiting Bodies	25 Days	27 Days	36 Days
No. of Fruiting Bodies	32	29	23
Stripe Diameter (cm)	5.67	5.23	4.07
Stripe Length (cm)	3.80	2.89	1.99

Other substrate it is between 13-18 days. The variation comes in number of days taken for spawn to complete colonization of a given substrate is a function of the fungal strain, growth condition and substrate type. Pin head formation was observed after 17 days in sugarcane bagasse while compared with paddy straw (18 days) and wheat straw (22-25 days). It was observed that this study of that the

overall cropping period for oyster mushroom varies for each of the different substrate used. Oyster mushroom require less nitrogen and more carbon sources. Also, Sugarcane bagasse gave maximum number of primordia and fruiting bodies and fresh weight followed by paddy straw and the lowest in wheat straw, the difference in various growth parameters

was significant in terms of growth on various substrates. Other growth parameters: stipe length and stipe diameter are on higher side in sugarcane bagasse in comparison to other substrates. The variations were occurred due to the difference of bulk density and constituents of the substrates used in experiment.

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