

Effect of Different Substrate on in vitro Growth of Oyster Mushroom

¹Roshni Adiyecha and ²Janvibahen Joshi

¹Assistant Professor, Indian Institute of Teacher Education, Gandhinagar

²Student, Indian Institute of Teacher Education, Gandhinagar

Corresponding Author: Roshni Adiyecha

Date of Submission: 01-05-2024

Date of Acceptance: 10-05-2024

ABSTRACT: *Pleurotus ostreatus* (Oyster mushroom) is the second most cultivated edible mushrooms worldwide after the *Agaricus bisporus* and has more ecological and medicinal values. The present study was conducted to know the effects of different substrate on the growth and biological efficiency of Oyster mushroom. The different substrates used for this experiment are Wheat straw, Groundnut straw, Soybean straw and different sized saw dust. Different Substrates was sterilized in boiled water at 120° C for 1 hour before spawn inoculation. The experiment was conducted under controlled environment (Humidity 80-85 %) in dark room. During the growth period, different morphological characters studied are spawn germination time, Mycelium formation, Pinhead formation, Fruiting body formation time & biological efficiency of Oyster mushroom. The study found that groundnut substrate shows the rapid growth in terms of spawn germination, mycelium growth, pinhead formation and fruiting body formation. Also, the Soybean substrate shows the maximum biological efficiency and moisture content.

KEY WORDS: Oyster Mushroom, Substrates, Biological Efficiency & Moisture Content.

I. INTRODUCTION

Since centuries, mushrooms have been identified as important food item and their usage in daily life is being increased day by day for their important role in human health, nutrition and medicinal properties. Mushrooms are belonging to the genus *Pleurotus* under the class Basidiomycetes. Oyster mushroom (*Pleurotus ostreatus*) is an edible mushroom having good flavor and taste. *Pleurotus* species are popular and widely cultivated throughout the world mostly in Asia and Europe owing to their simple and low-cost production technology and higher biological efficiency (Onifade, 2019).

There are several species of *Pleurotus* identified in the world. Most of them are suitable

for cultivation. Some *Pleurotus* species are *Pleurotus ostreatus*, *Pleurotus columbinus*, *Pleurotus florida*, *Pleurotus salignus*, *Pleurotus spodoleucus*, *Pleurotus pulmonarius*; and subspecies are *Pleurotus sajor-caju*, *Pleurotus sapidus*, *Pleurotus populinus*, *Pleurotus cornucopiae*, *Pleurotus djamor*, *Pleurotus flabellatus*, *Pleurotus eryngii*, *Pleurotus cystidiosus*, *Pleurotus calytratus*, *Pleurotus dryinus*, *Pleurotus purpureo-olivaceus* and *Pleurotus tuber-regiu* (Nadir et al., 2016). However, the most important cultivated species is *Pleurotus ostreatus*, being easier to cultivate, favorable to eat, and grow economically on different kinds of organic waste raw material (Kong, 2004).

Oyster mushrooms are type of mushroom linked to various health benefits. Oyster Mushrooms are highly nutritious, they may promote immune system health, encourage healthy blood sugar control, and provide antioxidant and anti-inflammatory effects. The benefits of oyster mushroom are High Nutritional Value, Antioxidants, Anti-inflammatory, Improve Heart health, Lower Cancer's Risk, Maintain Sugar level, Boost brain health, Prevents tooth decay and Provides energy Boost Immunity.

It was discovered that several species can grow on lignocelluloses, forest by-products and agricultural wastes (Carrera, 1998). Oyster mushroom may be grown on wide range of plant waste as substrate e.g. sawdust, paddy straw, sugarcane baggage, corn stalk, corn cobs, waste cotton, leaves and pseudo stem of banana, water hyacinth, duck weed, rice straw etc. does not require costly processing method and enrichment material (Quimio, 1980; Chow, 1980; Bano et al., 1979).

The present study was conducted to know the effects of different substrate on the in vitro growth of Oyster mushroom (*Pleurotus Ostreatus*). The different substrate includes Wheat straw, Saw dust, Soybean Straw and Groundnut Straw was used. The effect of different substrate on spawn

running time, Pinhead formation and Fruiting body formation time of Oyster mushroom (*Pleurotus Ostreatus*) are studied. The present researcher aimed to study the effect of different substrate on in vitro growth of oyster mushroom.

II. MATERIALS AND METHODS

The present investigation entitled Effect of different substrate on in vitro growth of oyster mushroom. The information of methodology adopted in this experiment has been presented below:

Location and site of experiment

The present investigation was carried out at Jalvihar Society, Modasa under home conditions from February 2022 to April 2022. The elevation of Modasa city is situated at of 197 meter above mean sea level and located at 23.47° N 73.3° E.

Experimental materials

350 g Shroomness Premium Mushroom Spawn was ordered online from Flipkart. Wheat Straw, Soya been Straw and Groundnut Straw were collected from agricultural farm near Modasa. Two types of saw dust were collected from wooden mill in Modasa. Also Polythene bags, Rubber bands and temperature and humidity meter was used.

Climatic requirement

Temperature

Temperature requirement of Oyster mushroom species *Pleurotus Spp.* ranged between 20-30 ° C under normal conditions. There was always in mind to keep temperature shock during the cultivation process. The Pileus or cap colour depend on temperature and showed colour light brown to pale yellowish.

Relative humidity

During fruiting, there was need to maintain the relative humidity of 70-85% in *Pleurotus spp.* However, depending upon relative humidity and seasonal variations, water spraying was done in the cultivation setup as per requirement. As per normal standard procedure, during hot and dry weather conditions it required 2-3 spray daily. Whereas, hot and humid conditions needs one light spray were be sufficient.

Light

Generally, mushrooms do not need sunlight directly for the synthesis of food and dead organic plant material. Diffused light needed for fruit body formation. Light and air is essential for growth and development of fruiting body. Essential

lightening was provided for the growth of oyster mushroom.

Method

Preparation of the Substrate

Four types of substrate are used in this study. Wheat, Soya been Straw and groundnut straw were collected from agricultural farm. Two types of saw dust i.e., Small size and large size was collected from the wooden mill. Then, the cleaning of different straw was done.



Figure 1: Preparation of the Substrate



Figure 2: Inoculation & Incubation of bags

Sterilization

Under sterilization process, different straw was soaked in water. And then, the water was boiled for 1 hour at required temperature. Afterwards, substrate was kept for partially dry with 60% moisture.

Inoculation & Incubation of bags

The inoculation was made by mixing substrate and *Pleurotus ostreatus* spawn thoroughly

by hand. Also Cotton was added in the holes of polythene bag for aeration. The Polythene bags kept under the 20 to 30° C and relative humidity maintained around 70 - 85 %.



Figure 3: Cropping Room temperature



Figure 4: Fruiting Body & Harvesting

Fruiting Body & Harvesting

First harvests were made after 34 to 42 days from beginning of the fruiting bodies.

Biological Efficiency

Biological efficiencies of the oyster mushroom grown on the experimental substrate mixtures were determined by the following equation:

$$\frac{\text{Fresh Weight of Harvested Mushroom (g)}}{\text{Dry Weight of Used Substrate (g)}} \times 100$$

Moisture Content

It was calculated to weight of available moisture after harvesting and moisture after drying divided by weight of fresh sample in percentage.

$$\frac{\text{Weight of Fresh Sample} - \text{Weight of Dry Sample}}{\text{Weight of Fresh Sample}} \times 100$$

III. RESULTS & DISCUSSIONS

Pleurotus oyster mushroom has ability to grow on different substrate. In present study the oyster mushroom was tested on Wheat Straw, Soyabean Straw, Groundnut Straw, large Saw Dust and Small Saw Dust. The result on Spawn Germination, Mycelium Growth, Pinhead Formation, Fruiting Body Formation (1st and 2nd yield), Biological efficiency and moisture content are presented in table below.

Table 1: Result of production of oyster mushroom on different substrate

Substrate	Spawn Germination (Days)	Mycelium growth (Days)	Pinhead formation (Days)	Fruiting body Formation		Biological Efficiency (%)	Moisture Content (%)
				1st Yield (Days)	2nd Yield (Days)		
Wheat Straw	3	20	30	34	42	47.57	60.96
Soyabean Straw	3	18	25	28	34	53.42	63.96

Groundnut Straw	3	16	22	26	34	43.14	57.28
Large Saw Dust	5	25	33	37	49	36.28	55.51
Small Saw Dust	7	27	37	42	-	27.14	52.63

The present study concluded that,

- 1) **Spawn Germination Time:** The minimum days for spawn germination was recorded using groundnut substrate whereas the maximum days for spawn germination was recorded using small saw dust.
- 2) **Mycelium Growth:** The minimum days for mycelium growth was recorded using groundnut substrate whereas the maximum days for mycelium growth was recorded using small saw dust. Similar effect of mycelium growth for saw dust was noticed by Girmay et. al. (2016).
- 3) **Pinhead formation:** The minimum days for pinhead formation was recorded using groundnut substrate whereas the maximum days for pinhead formation was recorded using small saw dust. Similar effect of pinhead formation for wheat substrate was found by Girmay et. al. (2016).
- 4) **Fruiting body formation:** The minimum days for fruiting body formation was recorded using groundnut substrate whereas the maximum days for fruiting body formation was recorded using small saw dust. Girmay et. al. (2016) Reported the complete fruiting body formation of wheat substrate to be 40-41 days.



Figure 6: Mycelium Development



Figure 7: Pinhead Formation Time



Figure 5: Spawn was germinated and started to grow into thread-like mycelium



Figure 8: Fruiting Body Formation

- 5) **Biological Efficiency:** The Soyabean substrate shows the maximum biological efficiency (53.42 %). Dehariya and Vyas (2013) reported that the soybean straw showed significantly highest yield (with 93.3% B.E.) followed by wheat straw. The small saw dust shows the minimum biological efficiency (27.14 %).
- 6) **Moisture Content:** The Soyabean substrate shows the maximum moisture content (63.96 %) whereas, The small saw dust shows the minimum moisture content (52.63 %).

IV. CONCLUSION

The study was carried out to study the effect of different substrate on in vitro growth of the oyster mushroom. Also the biological efficiency and moisture content of oyster mushroom on different substrate was checked. From the present study it can be concluded that groundnut straw is the best substrate for the growth and development of the oyster mushroom (*Pleurotus ostreatus*). So, groundnut straw can be used for its higher production as compared to other substrates. The Soyabean substrate shows the highest biological efficiency and moisture content compared to others substrates. So, Soyabean substrate can be used for its higher biological efficiency and moisture content. Further studies can be done thoroughly modification of environment making suitable temperature and humidity for the better growth and development of oyster mushroom.

REFERENCES

- [1]. Onifade, E et. al. (2019). The medical benefits of Mushrooms in Public Health. Archives in Food and Nutrition, 2(2).

- [2]. Nadir HA, Ali AJ and Muhammed GA (2016) Determination of Yield and Quality of Oyster Mushroom (*Pleurotus florida*) Using Different Substrates in Halabja , Kurdistan. Plant Production 7: 787-790.
- [3]. Kong W (2004) Oyster Mushroom Cultivation (Descriptions of Commercially Important *Pleurotus* species). Mushroom Growing Handbook 1, Mushworld 54-61.
- [4]. Carrera DM (1998) Cultivation of Oyster Mushrooms. McGrawHill Yearbook of Science & technology.
- [5]. Quimio TH (2004) Oyster Mushroom Cultivation, Mushroom Growing Handbook 1, Mushworld 4-12.
- [6]. Chow LP (1980). Utilization of cotton waste substrate with temperature treatment for cultivation of oyster mushroom in Singapore. Singapore J Pri Ind 8(10): 21-27.
- [7]. Bano Z, Nagaraja N, Rajrathnam S and Pathwardhan MV (1979) Cultivation of *Pleurotus* spp. In a village model hut. Indian Fd Packer 33(6): 9-25.
- [8]. Girmay, Z et al (2016). Growth and yield performance of *Pleurotus ostreatus* (Jacq. Fr.) Kumm (oyster mushroom) on different substrates. AMB Expr 6, 87 (2016). <https://doi.org/10.1186/s13568-016-0265-1>.
- [9]. Dehariya P and Vyas D (2013). Effect of different agro-waste substrates and their combinations on the yield and biological efficiency of *Pleurotus sajor- caju*. J Pharm and Bio Sci 8: 60-6