Bulletin of Pure and Applied Sciences.
Vol.40 B (Botany), No.2.
July-December 2021: P.63-69
Original Research Article

Print version ISSN 0970 4612
Online version ISSN 2320 3196
DOI: 10.5958/2320-3196.2021.00011.2
Available online at www.bpasjournals.com

Biological Evaluation and Methods of Cultivation Practices of Selected Oyster Mushroom Using Different Substrates in Nirmala College Campus, Coimbatore, Tamilnadu

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Received on 25.06.2021
Accepted on 27.09.2021

Keywords:
Pleurotus (Oyster Mushroom), Compost, Spawn Preparation

Abstract

Mushrooms are fleshy, spore-bearing fruiting body of a kind of fungus. There is a vast variety of mushroom with various qualities; some are edible, which is a rich, low-calorie source of fiber, protein and anti-oxidants. It is done to study the cultivation methods of *Pleurotus* (Oyster mushroom) and to study the compost preparation and their utilization for cultivation of *Pleurotus* (Oyster mushroom). The spawn seeds were purchased from the seed processing laboratory and grown in in- vitro conditions for propagation. Every month by using paddy straw as substrate the spawn seeds were grown in polythene bags for the cultivation of Oyster mushrooms. Mushrooms are on the top in regard to taste, smell, proteins and medicinal qualities in food items. They have potential anti-inflammatory, hyperglycaemic and hypo cholesterolemic effects. Thus, the present study aims to focus mainly on the spawn preparation and cultivation of Oyster mushrooms using different substrates. By the project high yield was got in the month of January, about 7 Kg of mushroom from 15 bags. The present study deals with the Methods of cultivation and biological evaluation of selected oyster mushroom using different substrates and spawn preparation, in Nirmala College Campus, Coimbatore, Tamilnadu. The yield was gradually decreasing from January to June, in the month of June no yield was obtained from 2 bags. Mushroom cultivation gives proper growth and high yield only when it is maintained with optimum conditions with proper care and suitable substrate.

How to cite this article: Rosario, C.J., Arul Sheeba Rani, M. and Joseph, S. (2021). Biological Evaluation and Methods of Cultivation Practices of Selected Oyster Mushroom Using Different Substrates in Nirmala College Campus, Coimbatore, Tamilnadu**.** *Bulletin of Pure and Applied Sciences-Botany,* 40B(2), 63-69.

INTRODUCTION

The fungi represent completely unique kingdom of heterotrophic organisms which indicates significant variety of their morphology, habits, habitats and other characters. Mushroom is a kind of fungus generating a fleshy fruiting body, in which it consisting of a stalk with an umbrella cap and root like rhizoids. Edible mushrooms are the fleshy and suitable for eating fruit bodies of numerous species of macro fungi. They can appear both underground (hypogenous) or above ground (epigenous). Mushrooms are famous treasured in gredients these days due to the fact they're low in calories, carbohydrates, fat, and sodium: additionally, they're cholesterol-free. Along with that mushroom offer critical nutrients, inclusive of selenium, potassium, riboflavin, niacin, vitamin D, proteins, and fiber (Jaime Carrasco *et al.,* 2018). Mushrooms are used from the ancient period itself. Edible mushroom species were discovered in association with 13,000-year-vintage archaeological sites in Chile, (Maria Elena Valverde *et al.,* (2015). The mummy of a person who lived among 3400 and 3100 BCE in Europe became discovered with varieties of mushrooms. The Chinese cost mushrooms for intended medicinal properties in addition to for food. Ancient Romans and Greek, especially the top classes, used mushrooms for culinary purposes and additionally Roman emperors had been hired food tasters to make sure the protection of consuming mushroom. Different cultures cultivated distinctive species of mushrooms in Western cultures which became first recorded in Paris, France, around 1650 (Solomon P Wasser, 2010).

Agaricus bisporus, the quintessential "shop mushroom", was first located developing in melon crop compost. Mushrooms had been used even earlier than man understood the nature of other organisms. Mushroom cultivation began outin the historical instances for their dietary cost and flavour (Bipasha Chakravarty, 2011). Mushrooms are also called 'white vegetables' or 'boneless vegetarian meat' In mushroom cultivation too, waste products including chicken manure, horse manure, straw, gypsum and waste water (from their own composting) are used to supply a notable substrate from which the mushrooms will grow. Mushroom farming is one of the most profitable agri-business that you can begin with a low funding and less space. Mushroom cultivation in India is developing progressively as an opportunity supply of earnings for lots of people in India. Edibility can be described through standards that consist of absence of toxic results on human beings and acceptable flavour and aroma. Edible mushrooms are eating up for their nutritional and culinary value (Vijay Vardhan Pandey, 2018).

Oyster mushroom became gathered as wild specimen from the woodland of Florida and later its spread in numerous nations around the world as most cultivated oyster mushroom species. This Oyster mushroom may be very normally grown in India under seasonal growing conditions at temperature ranging between 20-28ºC. Out of the over total two hundred species of fungi being reported as suitable for eating, 20 of them are cultivated for their fit to be eaten functions in different elements of the sector. Oyster mushrooms are characterized through the rapidity of the mycelial growth and excessive saprophytic colonization activity on cellulosic substrates. They have the capacity to immediately break-down cellulose and lignin bearing substances without fermentation (Thakur, 2014). *Pleurotus florida* white oyster mushroom, is white in colouration from primordial head formation to maturity, and this mushroom additionally grows in bunches. The pileus of this mushroom is with skinny margins, clean and pileus thickness is lesser compared to *P. ostreatus* and *P. sajor-caju. Pleurotus ostreatus* is the second most cultivated suitable for eating mushroom global after *Agaricus bisporus* (Carmen Sanchez, 2010).

MATERIALS AND METHOD

Study Area (Figure 1 & 2)

The Study area was, Nirmala College Campus. The project was carried out during the month of January 2021 to May 2021 and observed the yield of mushrooms (Table – 1). Nirmala College for Women is situated in Coimbatore district of Tamil Nadu, India, which lies in between 11^0 North latitude and 76^0 East longitudes. The entire Northern and

Western part of the district borders the western Gharts with the Anaimalai and Munnar ranges. It lies at 411 M (1349) above sea level on the banks of the Noyyal River, in North-Western Tamil Nadu. The temperature recorded varies from 11.7°C to 42.6°C. The region experiences typical humid tropical climatic condition. Here receives an average annual rainfall of 3107mm. The average daily temperature is around 37°C (Selvakumar *et al*., 2017).

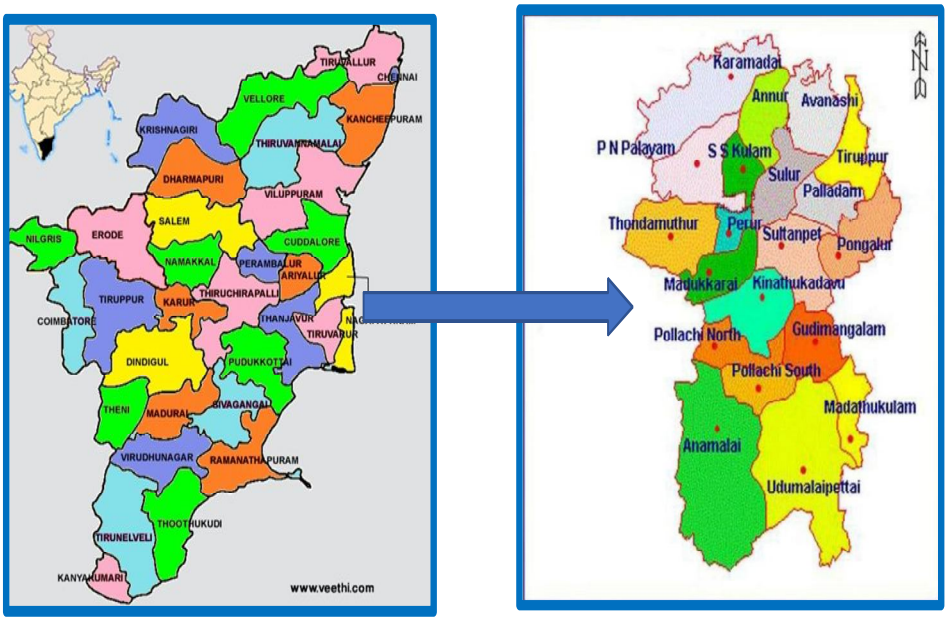

Figure 1: Study Area.

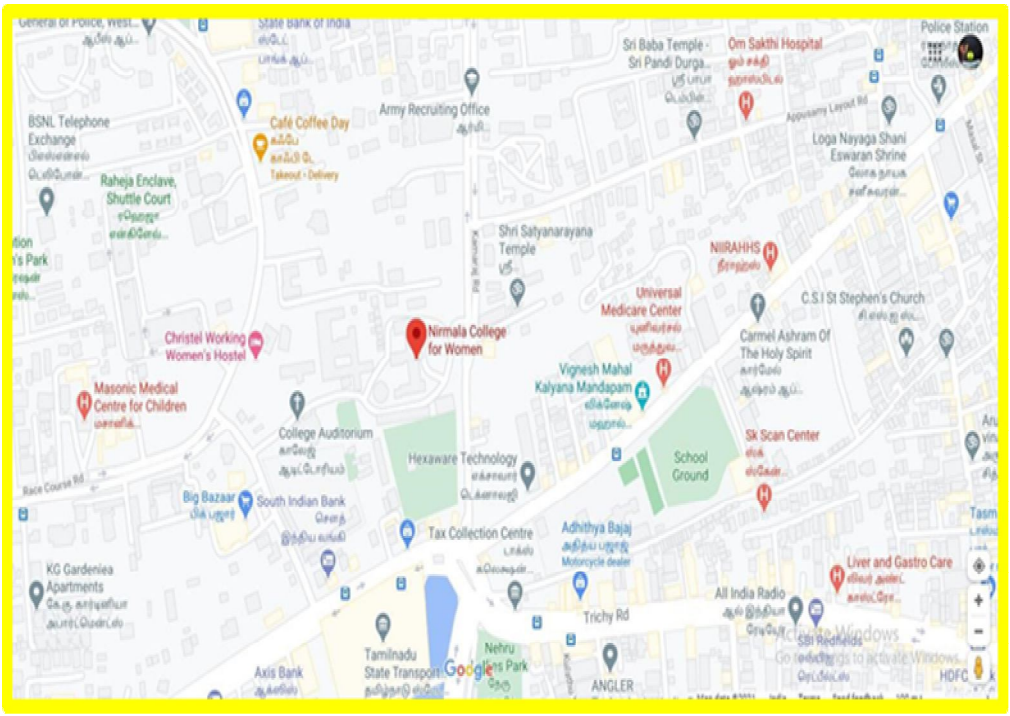

Figure 2: Location Map.

Collection of the selected Sample

Sample –*Pleurotus sajor-caju* (Figure 3)

Kingdom : Fungi
Division : Basidiomycota
Class : Agaricomycetes
Order : Polyporales
Family : Polyporaceae
Genus : *Lentinus*
Species : *L. sajor-caju*

Figure 3: Habit of *Pleurotus sajor-caju.*

Plant Description

Pleurotus sajor-caju, the oyster mushroom, is a common edible mushroom. The mushroom has a broad, fan or oyster-shaped cap spanning 5–25 cm; natural specimens range from white to grey or tan to dark-brown; the margin is enrolled when young, and is smooth and often somewhat lobed or wavy. The flesh is white, firm, and varies in thickness due to stipe arrangement. The gills of the mushroom are white to cream, and descend.

Figure 4: Early stage of mushroom cultivation

Figure 5: Later stage of mushroom cultivation

Spawn preparation:

Spawn is the seed of mushrooms, a substance inoculated with mycelium which is used to grow mushrooms. The substances may be sterilised paddy grains, wheat or maize. The spawn is usually packed in polythene cover and a packet weigh 200-250 gms.

Materials used for Cultivation

The materials used are paddy straw, Water, Machete Straw grinder, Boiling pot, Sterilizer, Temperature control device Sacks, Drums, Calcium carbonate (chalk). Cultivation Process is described in several procedures below:

Selection of raw materials (Substrates)

Paddy Straw is the base organic material for the production of oyster mushroom. It can be obtained from a variety of crops such as rice, wheat, barley, rye, sunflower, oats, buckwheat, peanuts hull etc. Straw should contain moisture levels of less than 12%, ensuring a predominantly dry material free of mould. Additives including limestone, gypsum, sugar, green hay, alfalfa, wheat and rice can be mixed into the straw to boost mushroom production.

Storage of Raw Materials

Raw materials should be stored out of the elements and kept dry to avoid mould formation and loss of materials. If it is not possible to store the raw materials in such an environment and they must be kept outside, covering them with a tarp is necessary to maintain a quality organic material.

Cutting the Raw Materials

After storing, the first step of the core processing is chopping the straw. The collected straw (or raw materials) is cut into small pieces; usually the length of the cut is 5-10 cm and is soaked in fresh water for 8-16 hours. Straw is light and less distributed organic material. Even after boiling, their density does not increase much, thus cutting is needed to tightly pack the raw materials into the plastics bag. Better the density, better the growth of mushrooms.

Preparation of the Substrate

- Once the cutting process is completed and before the "heating treatment", straw is mixed with some minerals such as lime stones, gypsum, sugar is also added during the preparation of substrates. These minerals act as sterilization as well as fertilizers.
- In addition, wheat straw, wood chips, saw dust, sugar beet pulp can also be added as substrate. But it all depends on availability and are not the strict requirements.
- These materials should be chosen carefully as they may contaminate the whole mixture.
- Fold the poly bag of 40 cm X 60 cm size length wise twice and perforate with a punch machine at a distance of about 10cm between the holes.
- The size of the holes is about 5 mm in diameter. A polythene bag should have 15-20 numbers of holes for proper ventilation.
- Tie the closed end of the polythene bag with a piece of jute thread to give a round flat bottom of the bag (Thakur, 2020).

Raw materials / Consumables Used

- Paddy straw
- Mother spawn
- Spawn for oyster mushrooms
- Calcium carbonate
- Formalin
- Polythene bags
- Packing cover
- LPG for sterilization
- Dettol, stapler,
- Pin & twine

Cultivation methods

For the cultivation of oyster mushroom polythene bag culture was adopted, as it was more convenient and simpler. Cultivation in polythene bag methods requires paddy straw, spawn, transparent polybag (40-45 cm x 60 cm), Jute ropes, bamboo poles, bucket, drum, sprayer, single hole punch machine (Block et al., 2002). .

Substrate preparation

- The good quality paddy straw was collected and chop to about 3-4 inches long
- The chopped straws were soaked in clean cold water for 6-8 hours and the excess water was drained out.
- Boil the straw in hot water for 15-20 minutes to make it free from all contaminants.
- Remove the straw from the boiled water and allow cooling by spreading on a clean floor (Abdul Rehman Niazi and Aneeq Ghafoor, 2021).

Making the Spawn Ready:

Spawn is used at the rate 3%, i.e., 30g per kg of straw. The whole packet of 200g is used in making one bag with 2 kg of straw. Break the lumps of planting spawn on a plate and divide into four equal parts of 50g each.

Spawning:

Fill the bag with a layer of 10cm straw. Make the layer compact by pressing with a palm to a height of 5-5 cm. Spawn the straw layer with 50 g of the spawn, sprinkle more amount of spawn towards the side and a little less in the centre. Likewise with a total of five layers of straw and four layers of spawn in between, fill up the polythene bag.

Spawn running:

Place the mushroom bag in a cool and dark place, safe from rodents and other insects, for spawn run.

Fruiting & cropping:

Under optimum conditions the mycelium fully colonize within 15 -20 days, the polythene bag Were tear with a sharp blade when pin head emerged from the holes. The first crop of mushroom was harvested within fifteen to twenty days after the pin head formation. Next flush after 10 days of the first flush, followed by the third flush. The yield per bag was 0.8 -1 kg per bag (Fabricio Rocha Vieira and Meire Cristina Nogueira de Andrade, 2016).

Figure 6: Harvested mushroom

Figure 7: Cultivation of *Pleurotus sajor-caju.*

RESULTS AND DISCUSSION

Thus, the present study aims to focus mainly on the spawn preparation and cultivation of Oyster mushroom using paddy straw as substrate.

Spawn preparation:
Spawn is the seed of mushrooms, a substance inoculated with mycelium which is used to grow mushrooms. The substances may be 68sterilized paddy grains, wheat or maize. The spawn is usually packed in polythene cover and a packet weigh 200-250 gms.

Oyster Mushroom:
Pleurotus sajor-caju, the oyster mushroom, is a common edible mushroom was used for inoculation in the botany laboratory for the propagation of spawn to prepare the seeds for further usage to grow mushrooms.

Cultivation of Mushroom:
Paddy straw is used as substrate for the growth of mushrooms.

Table 1. Mushroom bags prepared and yield taken during cultivation.

Month	No. of Mushroom bags prepared	Yield of mushroom in Kg
January	15	7
February	9	4
March	5	2
April	5	2
June	2	-

Benefits of Oyster mushroom:
Mushrooms contain about 90% moisture and have a low-calorie food which is highly suited to those with obesity. They contain about 2.5-3.5 % protein which is of very good quality, contains all the essential amino acids and is essentially rich in lysine. It is understood that right from the very same existence of human being, the mushroom is used as eatable item. It is known as a plant without chlorophyll and meat in vegetables and it is found in innumerable varieties, more than 2000 of varieties are included in the list of edible mushrooms. Climate is a main factor for the growth of mushrooms and easy to cultivate for urban and rural areas for their food in day today's life. Also, mainly youth and self-help women entrepreneurs can cultivate and avail this opportunity for their future. To suit to the climate of India, Button Mushrooms, Oyster Mushroom and Milky Mushrooms are produced for commercial purposes.

Mushrooms are on the top in regard to taste, smell, proteins and medicinal qualities in food items. They have potential anti-inflammatory, hyperglycemic and hypo cholesterolemic effects. The principal substances for the production of mushroom were tree stumps and timber logs. In 1995 the innovation of the cultivation of mushroom after the successful cultivation of *Agaricus bisporus* paved the manner to the cultivation of *P. ostreatus* on timber. Today, *A. bisporus* is broadly cultivated throughout the world. Finally spent mushrooms also can be used as compost, as a substrate for other mushroom forming fungi and further promotes to a

circular economy (Daniel Grimm and Han Wosten, 2018).

SUMMARY AND CONCLUSION

The present study mushrooms are considered to be healthy and highly nutritive food can be compared with vegetables and meat which needs less space for cultivation. *Pleurotus sajar-caju* potential activity was grown on paddy straw substrates. The polypropylene bag method was chosen for mushroom cultivation. Mushroom beds were prepared using paddy straw substrate. Before preparing mushroom beds all the instruments were sterilized with a dilute solution of potassium permanganate and alcohol. A polypropylene bag was tied at one end and sterilized paddy straw was filled through the open end for about 5cm. A handful of spawn from the bottle was separate toward the periphery of this layer. Holes were made over the polypropylene bag for aeration. After 15 days it was observed that the mycelium of has grown all over the paddy straw. Paddy straw was placed in a cool shady room and sprayed with water 3-4 times per day. The fruit bodies were observed to grow out of the paddy straw were harvested when attained their full growth. The harvested mushroom was weighed to estimate the yield. After harvesting the harvested mushroom fruit bodies were dried for nutritional analysis.

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