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"CULTIVATION OF OYSTER MUSHROOM- *Pleurotus ostreatus* USING FRUIT PEEL

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Abstract *:* *Pleurotus ostreatus* is the 2nd most cultivated edible mushroom worldwide after *agaricus bisporus*. It has economical, ecological and medicinal properties. Edible mushroom are able to colonize and degrade a large variety of lignocellulose substrate and other agro-industrial waste which are produced primarily through food processing industries. A large amount of agro-industrial waste is produced worldwide in various agricultural sections and food industries. The study is of great relevance with present day pandemic era, where mushroom have immunity enhancing property and they convert agro-waste into protein rich food.

Keywords**:** Mushroom, growth, harvest, cultivation, mycelium.

INTRODUCTION

Mushroom are highly nutritious and environment friendly crop that carry numerous medicinal benefits. The mushroom cultivation is a profitable agribusiness. Oyster mushroom is a edible mushroom having excellent flavor and taste. It helps class basidomycetes, subclass Hollo basidomycetidae, order agricals. Mushroom contain about 85-95% water, 3% protein, 4% carbohydrate, 0.1% fats, 1% minerals and vitamins [14]. Agricultural based industries produce the vast amount of residues every year. Various studies reported that different kinds of waste such as pomegranate peels, lemon peels, green walnut husk, pineapple peel, orange peel and watermelon peel etc. can be used as natural antimicrobials. Waste from the organic compounds although a risk to atmosphere but they represent a possible source for the making of mushroom as food stuffs and other bio-based products like bio energy and bio fertilizers. Such waste contains variability in composition like high amount of proteins, sugars and minerals. As these residues have nutritional value these are not referred as waste, so it can be considered as raw material for other product development. Environment pollution can be reduced by recycling these waste into food [5]. Oyster mushroom have a protein content of approximately 20% and are good source of all essential amino acids for human diets [9]. Mushroom consist of around 50% of carbohydrates and it is good source of vitamin B2, B3, B9 and trace elements of B12 [8]. Mushroom cultivation is highly labour intensive short duration crop and saving. Mushroom production is approximately 1.5million tons per year. The farmers should come forward to cultivate edible mushroom like *pleurotus ostreatus* (oyster mushroom) on commercial scale to fulfill the requirement of balance diet. The aim of project study was to investigate the cultivation of oyster mushroom in different substrates. The objectives of this study are

1. To study the production of oyster mushroom using different substrate (fruit waste peels of fruit).
2. Preparation of bed using fruit waste and seeds (spawn) for the mushroom production.
3. To compare the yield rate of mushroom using fruit waste.
4. To study the structure of mycelium using microscopic observation.

MATERIALS AND METHODS:

Collection of Sample:

Fruits peels of different fruit were collected. Paddy straw collected for the incorporation for mushroom grown. Seed (spam culture) is bought.

Sterilization:

Fruits peels were chopped into small pure approximately 2cm. They were shade died in sunlight for a day. So that their moisture content will be dried in sunlight for a day. So that their content will be dried. After that they are sterilized in auto chase. Paddy straw is soaked in water for an hour. After that they are chopped into small pieces and they are autoclaved and then shade dried to dry the moisture content.

Bed preparation:

Cultivation of oyster mushroom is usually carried out in the transparent polythene cover. The size of the cover should be 60*80cm with thickness of the gauge. Tie the polythene cover at the bottom and turn it inwards. Shade dry steam sterilized fruit peels and straw to get a uniform moisture level.

Take out well grown bed spawn, squeeze thoroughly and divide into 2 halws (2 beds prepared from 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. Repeat the process to get five 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.

EXTRINSIC FACTORS:

Moisture Content:

The moisture content of mushroom substrate should between the range of 65-80% [11][7]. Mycelia transport the nutrients to fruiting bodies that need adequate moisture. The moisture content in mushroom should not be low, as it leads to death of fruiting bodies. However, excess moisture during nutrient transportation would rather disturb the mushroom growth process [2].

Temperature:

Oyster mushrooms can adapt well under a wide range of temperatures (15–30 °C), and they can be cultivated under tropical climatic conditions [11][4]; Nevertheless, the optimum temperature for mycelia growth is 25 °C, , Meanwhile, for fruiting development, the optimum temperature ranges between 10 and 35 °C depending on the oyster mushroom strain [10]. A lower temperature and a dry condition will lead to the formation of mushrooms with short stalks and small cap sizes. High temperatures will allow the growth of microorganisms on the substrate [3].

Relative Humidity:

In order to obtain a high mushroom yield, the humidity of the environment for spawn running and mycelia stimulation should be in the range of 60–80 % or 80–85 %[2][1] . Additionally, some studies have reported that a high relative humidity (80–95 %) is needed for the fruiting stage of oyster mushrooms [12]. The main condition is compost and substrate should be prevented from getting dry. However, excess humidity will lead to a decrease of mushroom yield.

Harvesting:

Pleurotus ostreatus completed spawn running in 17-20 days. Pinhead formation was noted at 20-23 days. Fruiting bodies formation was noted at 23-28 days. The final cultivation stage the crop of oyster mushroom is harvested.

Culture Preparation:

Potato dextrose agar -23.5g for 100ml 0f distilled water is prepared and sterilized. They are cooled to room temperature. Then poured in petriplate each 20ml in two plates.

Mycelium of mushroom is isolated and inoculated in the media. Plates are kept in room temperature for 48-72 hours.

MICROSCOPIC OBSERVATION:

Lacto phenol Cotton Blue Staining:

Take a clean glass slide. Add a drop of lacto phenol cotton blue reagent on a clean and dry slide. Sterilize the needle and cool it. Then transfer the mycelia mat on fluid and gently press it gently so that it easily mix with the stain. Place the coverslip on the preparation (mycelium mat). Wait for about 5 minutes. Take a blotting paper remove the excess stain. Observe first under microscopic with low power intensity.

RESULT AND DISSCUSION

Substrate Weight:

Weight of fruit peels is measured and noted and also the weight of paddy straw is also measured and note.

Table: 1

Substrate	Substrate Dry Weight
Fruits peel	3.25kg
Paddy straw	2.5kg

Bed Preparation:

Using the fruit peels and paddy straw, the bed is prepared.

Spawn Running Time:

It takes 22 days for the pin head formation. After 24-30 days they start growing the fruiting bodies. [13]

Mycellial Formation:

Mycellium is formed in 12th day of bed preparation.

Pinhead Formation:

The pinhead formation is the second stage of mycellial growth during cultivation of mushroom small pinhead were formed after 17-20 days of spawn running [1] . As shown in the Figure 1 and 2.

Figure 1

Figure 2

Fruiting Bodies Formation:

This is the final stage of mushroom cultivation. The fruiting bodies appeared after one week of pinhead formation 24-30 days.

Figure 3

Figure 4

TABLE-2: MUSHROOM GROWTH TABLE

Days	Length (In Cm)
1 -12 Days	No Growth
12th Day	Mycelium Formation
17- 20 Days	Pin Head Formation
20th Day	2.8 Cm
21th – 26th Day	3.3cm – 7cm
27th Day	7.6 Cm
28th Day	Growth Stops

Culture Preparation:

Fungal plate is observed after three days the mycelium growth is observed in Potato dextrose agar (PDA) plate.

LACTOPHENOL COTTON STAINING:

Fungal spore and hyphae is observed under 40 x shown in FIGURE 5.

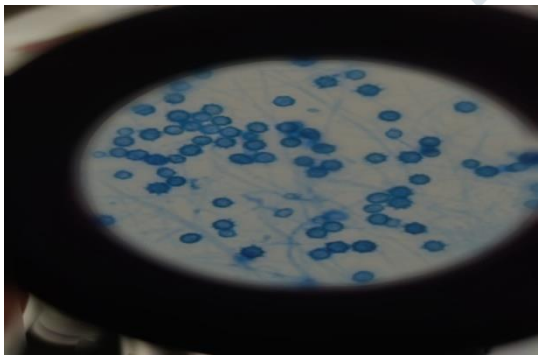

Figure 5

INVERTED MICROSCOPIC OBSERVATION:

Fungal plate is directly observed under Inverted microscope shown in FIGURE 6.

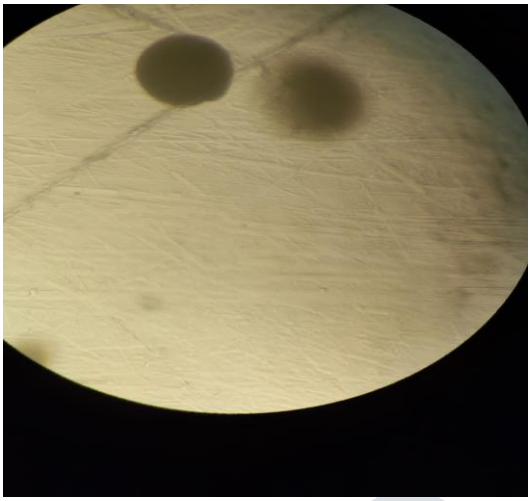

Figure 6

SUMMARY AND CONCLUSION:

The present study was done to cultivate the mushroom using different substrate rather than paddy straw. Substrate like fruit waste like peels of different fruits. It may reduce the usage of paddy straw and can be used as an alternative substrate. The fruit waste (peels) was collected from different fruit shop nearby the locality. Preparation of bed is done using the fruit waste and paddy straw incorporated with it. Their growth is checked and note regularly. The final mushroom is harvested on the 28th day and weight 210gm. After that mycelium is isolated from the mushroom and inoculated in Potato dextrose agar. The growth of mycelium is observed after three days of incubation at room temperature. The plate is observed directly under the inverted microscope. Following this lacto phenol cotton blue staining is done observe the structure of mycelium. It is observed under the light microscope under 40x, spores and hyphae are observed. Therefore the mushroom contains proteins than fruit and vegetables. Apart from protein content they also have high in certain vitamins like vitamin B, C, and D, Riboflavin, thiamine nicotinic acid. Also an excellent source of iron, potassium and folic acid.

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