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ORIGINAL PAPER



The mushroom cultivation: A holistic approach to agro waste management

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To increased production of organic waste is of great concern at different levels of population that rather polluting the environment. In this context, mushroom cultivation appears to be a safe mode of utilisation of organic wastes of agricultural, forest, house and industrial origin. The animal waste can also be useful in mushroom cultivation. The mushroom cultivation is a profitable agribusiness. Through the provision of income and improved nutrition, successful cultivation and trade in mushrooms can strengthen livelihood assets, which can not only reduce vulnerability to shocks, but enhance an individual's and a community's capacity to act upon other economic opportunities. The agro waste like wheat straw, paddy straw and saw dust can be used for substrate preparation. Further, the mushroom substrate can be used as organic manure. Mushroom cultivation is an effective method for the production of nutritional food in addition to offering a holistic approach to agro waste management by utilization of the abundant lignocellulosic waste.

Mushroom is a fungi producing a fleshy, fruiting body, especially one consisting of a sack with an umbrella cap.

It has two parts: a. cap like structure is known as PILEUS.

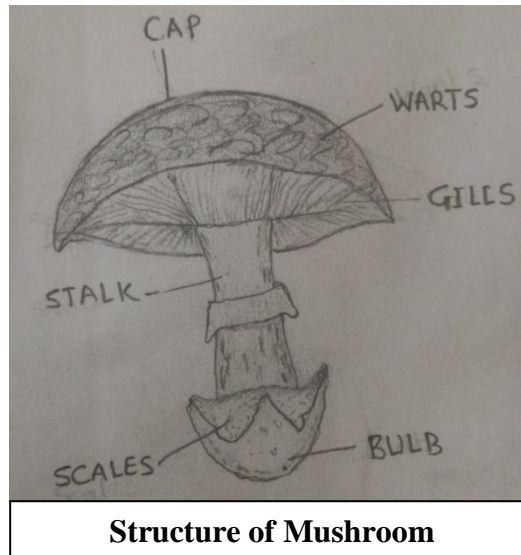
b. Attached with thread like structure MYCELIA (Mycelia absorbs nutrients from soil, it do not require sunlight for their growth).

There are different types of mushrooms:

1. Oyster Mushroom (*Pleurotus spp.*)
2. Milky Mushroom (*Calocybe indica*)
3. Paddy straw Mushroom (*Volvariclavovacea*)
4. Button Mushroom (*Agaricus bisporus*)
5. Shiitake Mushroom (*Lentinula exodes*)

EDIBLE MUSHROOM

Edible mushrooms may include many fungal species that are harvested wild or cultivated. Examples are Oyster Mushroom, Milky Mushroom, Paddy Straw Mushroom and Button Mushroom. Edibility may be defined by criteria that include mushrooms absence of poisonous effects on humans and desirable taste and aroma which are consumed by humans for their nutritional and medicinal value.



POISONOUS MUSHROOM

Poisonous mushrooms look like edible mushrooms in their morphology and life cycle, they can be disguised by following features:

- Brightly coloured fruit bodies.
- Greenish tinge on gills and yellow green spores.
- Pink coloured spores in gills.
- Unpleasant odour.
- Presence of vulva and annulus on the stalk.
- Oozing of milky or coloured latex from damaged portions.

Examples: are Amanita phalloides and Tricholomamuscarium

MORPHOLOGY OF MUSHROOM

- A mushroom consists of a stalk and a cap.
- As the mushroom develops from an underground mycelium and fused upward, it is protected by a thin membrane which eventually ruptures leaving fragments on the cap.
- Another membrane, attaching the cap, to the stalk, also ruptures allowing the cap to expand and leaving a assortment ring on the stalk.
- Radiating row of gills are found on the caps undersurface these bear the club shaped reproductive structures which forms minute spores known as asidiospores.

NUTRITIONAL VALUE OF MUSHROOM

- Mushrooms are low in calories, high in fiber and contain many important vitamins and minerals. Some also have important medicinal properties such as complex carbohydrates.
- They are an excellent source of protein.
- They contain all the amino acids needed for the body.
- The percentage of protein content is 10-30% in total body weight of mushroom.
- They have a high concentration of carbohydrates at 57% and 14% raw fiber, they regulate insulin and sugar level because they are low-glycemic sugars.
- Most mushrooms have a high protein content 20-30%.
- Helps lower cholesterol and is important for the digestive system.
- Essential for the absorption of calcium.
- Aids in helping the body absorb oxygen and create red blood cells.
- An extremely important minerals that regulates blood pressure and keeps cells functioning properly.
- Other important minerals:-Zn,Mg
- Low levels of fat, calories, sodium
- No cholesterol

Preparation of spawn: spawn is the seed of mushroom.

- I. Pure culture preparation.
- II. Preparation of mother spawn
- III. Multiplication of spawn

I. PURE CULTURE PREPARATION

There are two ways of raising pure culture and they are tissue culture and spore culture.

In tissue culture as well as grown mushroom with membrane gills is selected and from a small bit of mushroom from gill portion is taken using for cap and inoculated on PDA or MEA media slants under in-vitro condition. The mycelium cover the entire surface, in a week culture become ready for further multiplication.

In spore culture method, the fruits are collected from a well develop fruiting body by "spore mapping technique" and then the spore are inoculated to PDA or MEA and then it is kept in the incubator.

procedure

- i. Take a potato and weigh 200gm.
- ii. Pilled the potato and chop into small pieces.
- iii. Take a beaker and fill 1000ml of distilled water.
- iv. Boil the pilled potatoes for 30 minutes upto when the extract of potato comes out.
- v. Filter the substrate with muslin cloth.

- vi. Add 20gm of Agar-Agar and Dextrose.
- vii. Make the volume upto 1000ml and boil.
- viii. Put the solution in the conical flask.
- ix. Put inside the autoclave for sterilization for 121degree C for 15 minutes.
- x. After autoclaving put the solution in the petriplates and allow it for solidification.
 - i. Select the good quality wheat grains free from pest and mould.
 - ii. Boil the grains for 20-30 minutes.
 - iii. Spreading on floor for proper drying.
 - iv. Mixing of Calcium Carbonate-12g/Kg & Calcium Sulphate 3g/Kg of grain.
 - v. Then fill 250gm of grain in polypropylene bag and covering it with cotton plug.
 - vi. Sterilize the bag in autoclave for 121 degree C for15 minutes and then transfer it in laminar air flow.

II. MOTHER SPAWN MULTIPLICATION

- i. Always use well grown mother cell.
- ii. Stir the forceps with ethanol.
- iii. Transfer few grains with mycelia growth into sterilized substrate bag.
- iv. Shift the bag into the incubator.
- v. Check for contaminated bags regularly.
- vi. After 15-20 days mycelia growth will there in whole substrate.

Some precautions measures:

- i. Always keep inoculation chamber clean.
- ii. Swipe the hands with ethanol.
- iii. Switch inoculation chamber UV light for 30 minutes.
- iv. Always use fresh spawn.
- v. Bags should be properly labeled.

TYPE OF MUSHROOM CAN GROW IN DIFFERENT MEDIUM

- MILKY WHITE: It is a robust,fleshy, milky white, umbrella, which resembles button mushroom.
- OYSTER: Oyster can be grey, pale yellow or even blue with a velvety texture.
- BUTTON: The most popular mushroom, white button represents about 90% of mushroom consumed in the United State.

WHITE MILKY MUSHROOM

- White milky mushroom is a species of edible mushroom native to India.
- The sturdy all white mushrooms appear in summer after rainfall in field on road verges.

procedure of milky mushroom

- Firstly we take plastic drum and pour the 100 litre of fresh water.
- We add 10gm of Bavistin and add 120ml formalin and add 10ml insecticide.
- Now we will add 10Kg of wheat straw and dip it in solution for 10-16 hours.

- Then we will dry the wheat straw in sun.
- Then we will make raised bed and then we will mix the spawn in the bed.

bagging

- We will take polypropylene bag and fill the substrate in the bag.
- Then we will tightly tie it.
- Then we will label it and then we will make small holes in it.
- Then we will keep it in cropping room.

casing

- Casing mean causing the top surface of bag after spawn run is there casing material is 2-3 cm thick.
- Casing provides physical support and moisture.
- FYM (Farm Yard Manure)
- Garden Soil
- Vermicompost
- Coco husk
- Perlite
- Water is sprayed after Casing.

cropping

- After 10-15 days the mycelium will reach the top of casing layer.
- After 3-5 days needle shaped fruiting body appears and in a week it matures.

OYSTER MUSHROOMS

Pleurotesflorida

Pleurotesajamor (Pink mushroom)

procedure

- We take 100 liters of fresh water in a drum.
- Add 10gm of Bavistin and add 120ml of formalin and 10ml of insecticides.
- Now we will add 10Kg wheat straw and dip in the water for 10-16hrs.
- We will then dry the wheat straw.
- We will collect the straw and then we will make the raised bed.
- We will mix the spawn with the wheat straw.

bagging

- We will take polypropylene bag and then we will fill the substrate in the bag tightly.
- After filling the bag we will tightly tie the bag.
- Then we will label the bag.
- Then we will make holes in it.
- After 20 days the mycelium growth will be seen.
- We will remove the bag.
- After every one single day we will water the bag.

BUTTON MUSHROOM (*Agaricusbisporus*)

Button mushroom is the most popular mushroom variety grown and consumed.

procedure

Take 300 Kg of wheat straw needs to spread it in floor for 2 days after that add Wheat bran-15Kg+ Single Super Phosphate-3Kg+ Muriate of Potash-3Kg+ Urea-6Kg and mix well. After mixing we will mix the substrate and we will make a heap and we will water it to maintain moisture. After 6 days needs to turn the Substrate and heap can be made. Every after three days turn the substrate and heap making can be done. After seven to eight days insecticide & fungicide can be spray like Confidor-350ml, Bavistin-250gm with the help of Knapsack Sprayer.



SPAWN PREPARATION



SUBSTRATE PREPARATION



MOTHER SPAWN MULTIPLICATION



MUSHROOM CROPPING



MUSHROOM CASING