Topic: Mushroom Cultivation for Food Security and Rural Development

Sem VI General

Botany Dissertation (DSE 2)

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INTRODUCTION

Mushroom:-Mushrooms are a type of Fungus.Fungi are neither animal or plants,but feed on living or dead plants or animals and absorb their nutrients.The main body of a fungus is usually found underground.We see them when they grow above ground as mushrooms.The head of a Mushroom is called a fruiting body,and can be any shape,size or color.Fruiting bodies contain spores that produce more mushrooms.

Types of Mushrooms

- 1.Edible Mushroom
- 2.Poisonous Mushroom
- 1.Edible Mushroom: **Edible Mushrooms are the fleshy and edible fruit bodies of several species of macrofungi.They can appear either below ground or above ground where they may be picked by hand.Edibility may be defined by criteria that include absence of poisonous effects on humans and desirable taste and aroma.**
- **Example:Agaricus bisporous,Pleurotus oystreatus.**

2.Poisonous Mushroom:-

Mushroom poisoning refers to the severe and often deadly effects of various toxins that are found in certain types of Mushrooms .One type known as Amanita phalloides, appropriately called "death cap", accounts for the majority of cases .The toxins initially cause severe abdominal cramping, vomiting and watery diarrhoea and then lead to liver and kidney faliure.

Example:Amanita phalloides,Cortinarius sp.

Nutritional Value of Mushroom

Mushrooms became popular for their food value.The food values of Mushrooms are as follows:-

1.Mushrooms are the richest source of vegetable protein.

2.The Protein content varies from 1.1-4.98% in common cultivable Mushroom(much higher than pulses, vegetables are fruites.

3.All the essential amino acids including lysine(550mg/gm) are present in much higher amount than even egg.

4.A part from their protein contain mushrooms can also be high in certain vitamins like B,C, D, riboflavin, thiamine and nicotinic acid.

5.Also an excellent source of iron, potassium,and along with folic acid a component known for improving the blood and avoidance deficiencies.

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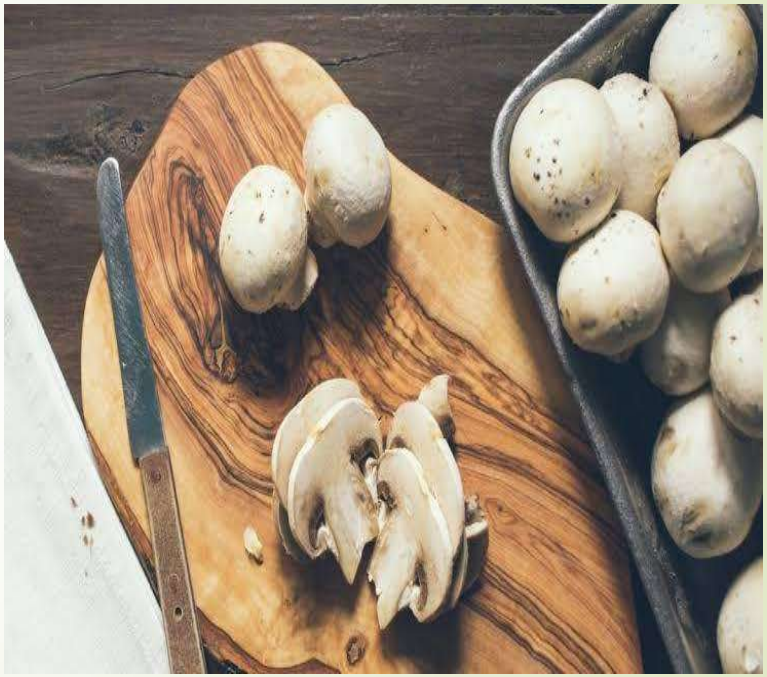
Mushrooms are recommend as a healthy food by the food and Agricultural Organization of the United Nations.

Nutritive values of Different Mushrooms(dry weight basis g/100g)

Mushroom	Carbohydrate	Fibre	Protein	Fat	Ash	Energy k cal
Agaricus bisporous	46.17	20.90	33.48	3.10	5.70	499
Pleurotus sajor-caju	63.40	48.60	19.23	2.70	6.32	412
Lentinula edodes	47.60	28.80	32.93	3.73	5.20	387
Pleurotus ostreatus	57.60	8.70	30.40	2.20	9.80	265
Vovarella volvaceae	54.80	5.50	37.50	2.60	1.10	305
Calocybe indica	64.26	3.40	17.69	4.10	7.43	391
Flammulina velutipes	73.10	3.70	17.60	1.90	7.40	378
Auricularia auricula	82.80	19.80	4.20	8.30	4.70	351



Medicinal Value of Mushroom

- 1.Aids weight Loss.
- 2.Boosts immune system.
- 3.Helps Lower Cholesterol.
- 4.Regulates Blood pressure.
- 5.Enhances iron obsorption.
- 6.Strengthens bones.
- 7.Prevents infection in diabetics.
- 8.Lowers the risk of breast and prostate cancer.
- 9.Protects hair,nails& teeth.
- 10.Regulates insulin levels in body.

Objective:-

- 1.To produce protein-rich food for family consumption.
- 2.To produce herbal , medicinal food at low cost.
- 3.To make people aware about the importance of consumption of Mushroom.
- 4.To get trained to self-employed by cultivating Mushroom at pilot or Scale.
- 5.To encourage empowerment of women and unemployed youth(especially from rural areas).
- 6.To develop marketing opportunities for indigenous mushrooms among smallholder farmers.

Cultivation of Mushrooms

- Mushroom farming has recently seen a spark in the growth due to hybridization and improved Nutritional status of Mushrooms. Mushroom farming has six major steps-

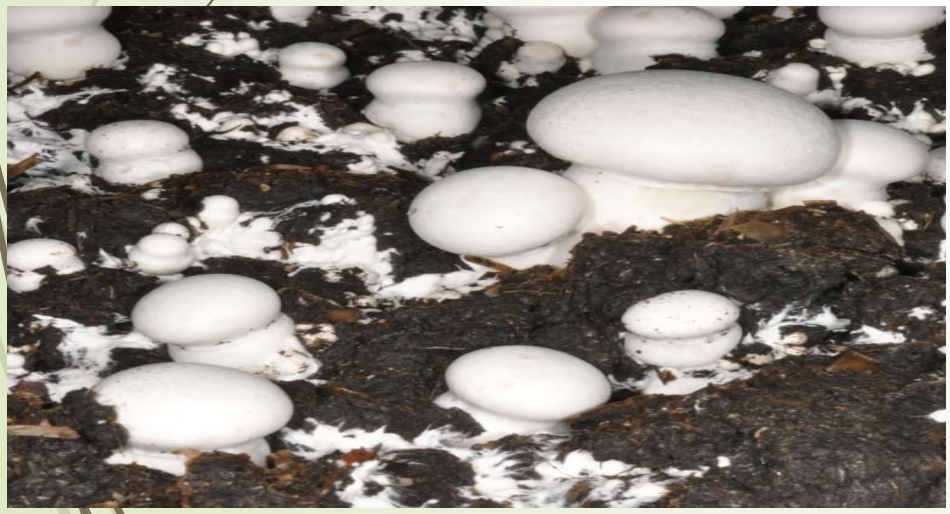
- 1.Phase-I Composting
- 2.Phase-II Composting
- 3.Spawning and Growth
- 4.Casing
- 5.Pinning
- 6.Cropping

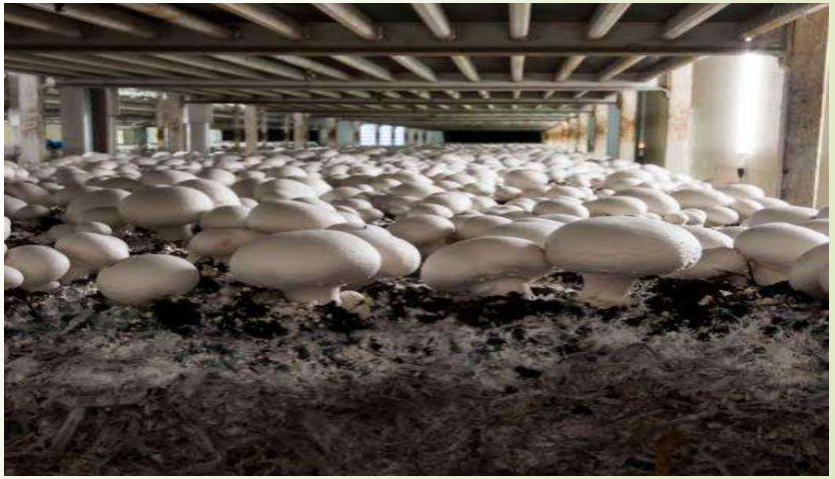
Step	Temperature	Key Points
1.Phase-I Composting (6-14 days)	40-60°c	Regulation of water and NH3 content through microbial action. Addition of fertilizer.
2.Phase-II Composting (7-18days via Composting method-2 hours for pasteurization (heat sterilization)	80-100°c	Reduction of a number potentially harmful microbes through further Composting or apply heat sterilization removal of unwanted NH3.

Step	Temperature	Key Points
3.Spawning and Growth (14-21days)	Variable anything between 18-30°c	Addition of starter culture allowing the mycelia to grow through substrate and form a colony which will depend on the substrate dimensions and composition.
4.Casing(13-20 days)	Variable temperature.	It promotes the formation of promordia or mushroom pins.It involves the addition of a top cropping or dressing to the colonized substrate.Fertilizing with nitrogen increases yield and induced pinning.

Step	Temperature	Key Points
5.Pinning(18-21 days)	Variable Temperature.	Earliest formation of recognizable mushrooms from mycelium.Adjusting temperature humidity and CO2 will also affect the number of pins and Mushroom size.
6.Cropping(Repeated over 7-10 day cycles)	The normal growth temperature.	Harvest.

Cultivation of Mushrooms





Harvesting Phase:-

1.The first flush is picked in 3-5 days and yields 15 to 20kg/m.If the Mushroom are mechanically harvest,in the form of once over harvesting ,this yields 22 to 26 kg/m2.

2.The second flush comes after about 5-7 days and yields a little less,9-11 kg/m2 for hand harvesting ,10-15 kg/m2 for mechanical harvesting.

3.The third flight at most yields 10-15%of production and is of lower quality , because diseases and pests are increasing very strongly.

Materials:-

- Agricultural wastes are the good source for the Cultivation of Mushrooms.Some of them are most commonly used such as wheat straw, Paddy Straw,rice straw,rice bran ,coffee straw,banana leaves,tea leaves, Cotton straw,Saw dust etc.
- For a profitable Mushroom growing most important feature is careful preparation of bed with nutrient substrate.The commonly use crude nutrient substrate is horse-dung manure and a Composting mixture of chopped wheat Paddy Straw and some fertilizers like superphosphate,urea and amonium sulphate etc.

Types of Mushrooms Cultivation in India

1.Volvariella volvacea(Paddy straw Mushroom)
2.Agaricus bisporus(White button Mushroom)
3.Pleurotus oyster
4.Calocybe indica(Milky Mushroom)
5.Portobello Mushroom

Types of Mushrooms Cultivation in India

Method of Cultivation for Volvariella volvacea (Paddy straw Mushroom):-

- Volvariella volvacea thrives in a temperature range of 28-36°c and relative humidity of 75-85% is required.We wet the substrate for first 2 days with sufficient trending of the cotton waste so that it absorbs sufficient water.Moisture content of 60-65% is maintained in the compost.In a modified method of Cultivation bundled substrates(rice straw,banana leaves) prepared in the same way as those used for beds ,are soaked in water ,drained ,then packed in the wooden frames.The spawned substrate in the boxes may be placed in a specially built incubation room with a high temperature (35-38°c)and high relative humidity (at least 75%)or it may be covered with plasti ac sheets and placed under shade outdoors.

Cultivation of Volvariella volvacea (Paddy Straw Mushroom)

Method of Cultivation for Agaricus bisporus (White button Mushroom):-

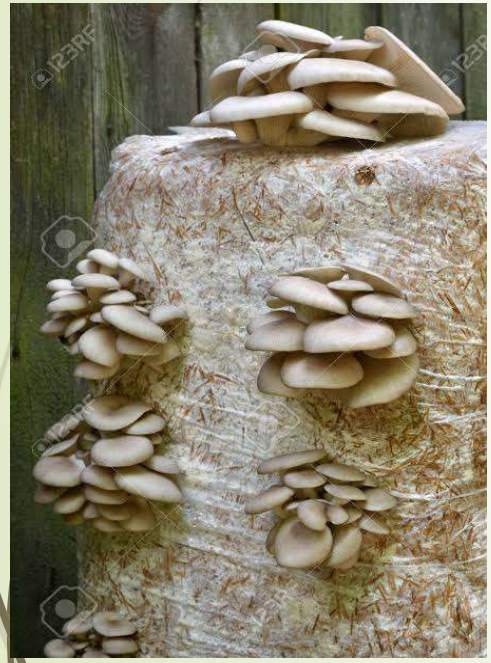
- The White button Mushroom is very popular throughout the world and is the most important Mushroom of commercial significance in India.The optimum temperature mycellial growth is 22-25°c and that for fruit body formation 14-18°c and a high percentage of relative humidity.The substrate for Cultivation is specially prepared compost.The Mushroom Cultivation rooms should have facilities for temperature control and pasteurization processes.Inside the house shelf or tray system is usually adopted for increase the area of Cultivation.

Cultivation of Agaricus bisporus (White button Mushroom)

Method of Cultivation for Pleurotus ostreatus

- Oyster Mushroom can grow at moderate temperature ranging for 20-30°c and humidity 55-70% for a period of 6-8 months in a year.It can also be cultivated in summer months by providing the extra humidity required for its growth.Humidity and temperature affect on fruiting body of oyster Mushroom.Particulary the factors affect the fruiting body shape.
- Optimal temperature and humidity for fruiting body formation of this Mushroom is known as 13-16°c and >80%high and low temperature indicates >16°c and <12°c respectively and high and low humidity indicates >80% and <60%.
- Prepare a triangular heap of 75-90cm but not more than 1 meter height.The compost will be ready after 2 days of this turning.It can be spawned as such or used after pasteurization.

Cultivation of Pleurotus ostreatus



Method of Cultivation for Calocybe indica(Milky Mushroom)

- This is the first indigenous Mushroom to be commercialized in the country.It can be grown on pasteurized or sterilized wheat or Paddy Straw.
- Optimum temperature requirement for spawn running 30-35°c.Spawn running period 24-28 days.Cropping requires an optimum temperature of 36-38°c humidity of 85-90%, diffused light and ventilization.

Cultivation of Calocybe indica (Milky Mushroom)

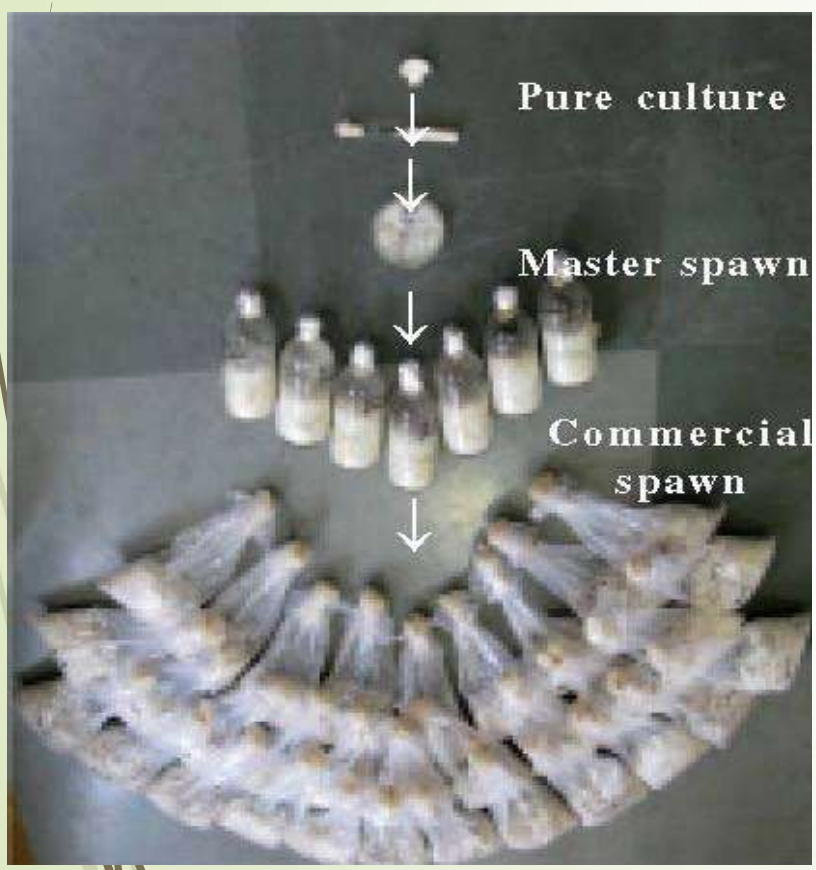
Method of Cultivation for Portobello Mushroom

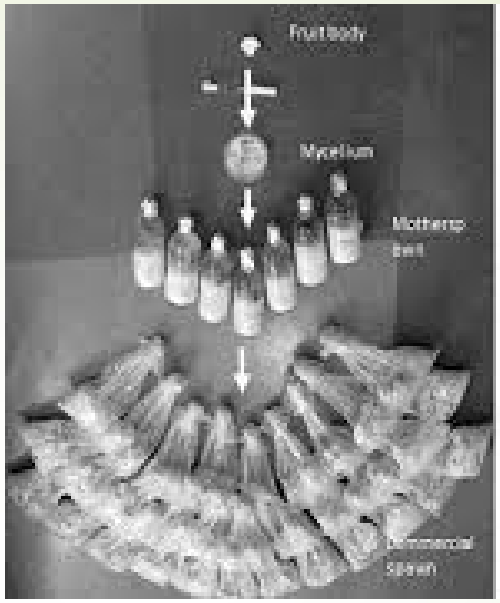
- To ensure that you're able to grow Portobello Mushrooms successfully , you'll need to maintain the proper temperature and humidity.
- For the best results ,you should keep the humidity between 65-80%.Further more ,the temperature should be between 60 and 70 .You should create a small growing area where you'll be able to maintain control over the temperature , lighting and humidity with ease.

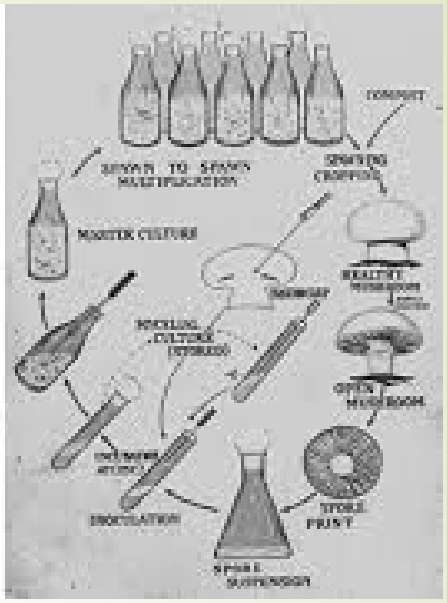
Cultivation of Protobello Mushroom

Preparation of Spawn :-

Spawn is also defined as “the mycelium of fungi, especially of Mushrooms grown to be eaten ,used for propagation”.Spawn i.e. seed required for growing Mushroom,is the vegetative mycelium from a selected mushroom cultured on a convenient medium like wheat,pearl,millet etc.In simple words spawn is grains covered with Mushroom mycelium.It essentially involves preparation of pure culture of Mushroom from tissue/spores, evaluation of selected cultures for yield, quality and other traits , maintenance of selected cultures on suitable agar medium,followed by culturing on sterilized grains and further multiplication on grains.


Pure culture
Master spawn
Commercial spawn

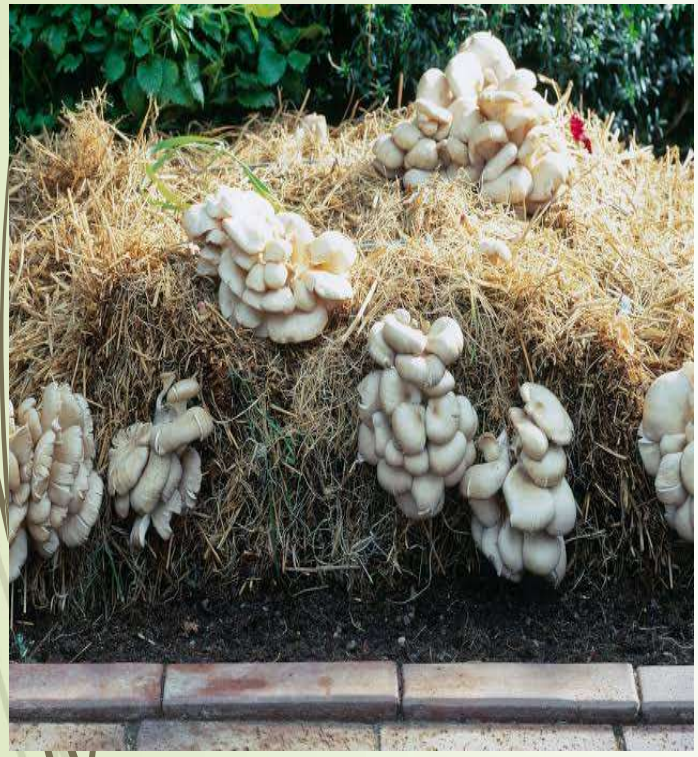

Fruitbody
Mycelium
Mother spawn
Commercial spawn



Paddy Straw Mushroom (Substrate)

- The Cultivation of Paddy Straw Mushroom can be done in a thatched house and also under the shade for tree.Fresh disease free Paddy Straw is the ideal substrate.
- Soak the straw bundles in water for 12-18hr.place the bundles over the platform with their butt end on one side.Place the a small quantity of spawn 8-12cm inside the margin at an interval of 10-15cm all along the periphery.Apply a spoonful of coarsely powdered dhal powder before placing spawn.

Mushroom Bed Preparation



Polythene Bag preparation

Result :

- The first Crop of Mushroom can usually be harvested 10 days after planting.This first growth normally supplies enough of a crop to require successive days of harvesting ,and 65-75% of the expected yield is obtained.
- The second crop also takes 2-3 days to harvest ,but the yield will be much less, supplying 25-35% balance of the total 1kg per box produced over a period of 18-22 days.
- It should be noted that box cultivated mushrooms are less likely to grow in clusters than are than are spawn planted in beds.Boxes showing contamination can be removed right after the incubation period to prevent spreading of contamination in the growing house.
- Some boxes have produced only about 350 9per cycle but a production of more than 2,000 9 through the end of second stage harvest is possible under optimum conditions.

Conclusion:-

- Mushroom Cultivation is perhaps the most important microbial technology ,after the yeast fermentation in the economic terms .
- The conclusion of this project is that Mushroom farming is very profitable business.No need of large area of land for this farming.For this farming raw materials are available everywhere.
- Nature method for doing the Mushroom farming is more beneficial than chemical method.
- Most of the farmers of Mushroom farming are satisfied.
- The marketing of Mushroom is very demadable everywhere.
- It promises to supply food with good quality protein produced from worthless wastes of varied origins.

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Thank You