

**SEM VI GENERAL  
BOTANY DISSERTATION (DSE)**

**GROW MUSHROOM, EAT MUSHROOM AND  
STAY PROTECTED**

A brief details of Mushroom cultivation  
and its benefits

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# What are mushrooms

- Mushrooms are the fruiting bodies of a fungus, just like apples are the fruiting bodies of an apple tree. A mushroom is a kind of fungus with the Latin name of *Agaricus bisporus*. Other cultivated mushrooms in the Netherlands are the oyster mushroom (*Pleurotus ostreatus*) and the shiitake (Japanese mushroom) (*Lentinula edodes*).
- In the vegetable kingdom the mushroom is ranked with the heterotrophic organisms (lower plants). In contrast to the higher, green plants, these heterotrophs are not capable of photosynthesis. Fungi are the scavengers of nature.

# Objective

Nowadays Mushroom is getting more popular substitute of meat for vegetarian and also the price and environmental impact of meat production. Mushroom can act as an alternative employment for farmers to earn some cash due to its high demand in both domestic and international markets. So we are going to know about the facts and process of growing Mushroom and how to eat this to get the benefits.

# Nutritional information of mushroom

Mushrooms contain an extra amount of vitamins B2 and B3. These vitamins take care of the metabolism and the release of energy from carbohydrates, proteins and fats. Vitamin B2 is also necessary for a healthy skin. Folic acid is necessary for growth and the production of blood. It is one of the few vitamins of which, on average, we take in too little from our food. Potassium is necessary for a healthy blood pressure and for muscle and nerve activity. Phosphorous takes care of healthy bones and teeth and of energy metabolism. Copper is necessary for your immune system, nerves and for the synthesis of body cells. All these nutritional values occur in high concentrations in mushrooms.

## Mushroom Nutrition Facts

The following nutrition information is provided by the USDA for 1 cup (70g) raw mushroom pieces or slices.

**Calories:** 15

**Fat:** 0.2g

**Sodium:** 4mg

**Carbohydrates:** 2.3g

**Fibre:** 0.7g

**Sugars:** 1.4g

**Protein:** 2.2g

# Types of mushrooms

## 8 types of Edible Mushrooms found in India

1) White Button Mushrooms 1)



2) Portobello Mushrooms



3) Shiitake Mushrooms

4) Oyster Mushrooms 3)



5) Enoki Mushrooms

6) Shimeji Mushrooms 5)



7) Porcini Mushrooms

8) Paddy Straw Mushrooms 7)

# Poisonous mushrooms

- 1) Death Cap(*Amanita phalloides*)
- 2) *Conocybe filaris*
- 3) Webcaps( *Cortinarius* species)
- 4) Autumn Skullcap(*Gallerina Marginata*)
- 5) Destroying Angels(*Amanita* Species)
- 6) *Podostroma Cornu Damae*
- 7) Deadly Dapperling(*Lepiota brunneoincarnata*)



# Identification of edible mushrooms

- Don't pick and eat any mushroom until verified with an experienced mushroom hunter, even after knowing about it.
- Mushrooms with gills are tricky. Oyster mushrooms are only ones in this group.
- Oyster mushrooms almost always grow on dead wood, such as trees, stumps, or drowned logs, wood chips.
- Morel mushrooms have a pitted and deeply ridged, honeycomb like cap, and are completely hollow when cut in half.
- Boletes do not have gills under their cap, rather a yellow or brownish spongy surface of pores.
- Lobster mushrooms have a hard red to orange exterior and a white interior, thus resembling a lobster.
- Chanterelle mushrooms are yellow to orange in colour, and have blunt ridges that fork and run down the stem rather than true gills

# General Facts about Mushrooms

- **1630:** Cultivation of white button mushroom started first in France in the open on ridges made out of horse dung manure.
- **1707:** Tournefort at Royal Academy of Science, France, mentioned about compost preparation and mushroom cultivation.
- **1731:** French method of cultivation was introduced into England by Miller.
- **1917:** Falck described the first successful cultivation of *Pleurotus ostreatus*.
- **1962:** Bano and Srivastava reported mass production on straw-based substrates and their work paved the way for large scale commercial exploitation.
- **1886:** Some of specimens of mushrooms were grown by N.W. Newton and exhibited at the annual show of Agriculture, Horticulture Society of India.
- **1921:** Bose was successful in culturing two agarics on a sterilized dung medium, details of which were published in the Indian Science Congress held at Nagpur during 1926.
- **1961:** A scheme entitled “Development of mushroom cultivation in Himachal Pradesh” was started at Solan by the H.P. State Govt. in collaboration with I.C.A.R. This was the first serious attempt on cultivation of *Agaricus bisporus* in the country.
- **China** is the highest producer of mushrooms in the world with a share of **75%**
- **India** achieves **18<sup>th</sup>** place in Mushroom production.
- **Uttar Pradesh** is the highest producer of mushroom India.



# Favorable conditions for farming

- The optimal temperature for mycelium growth of both oyster mushroom species was obtained at 28°C.
- Mycelium growth of oyster mushroom was improved by carbon sources such as glucose, molasses, and at 1~5% sucrose concentration.
- Ammonium chloride concentrations at 0.03~0.09%
- Brown rice was found to be the most favourable for mycelium growth of oyster mushroom species. In addition, sugarcane residue, acasia sawdust and corn cob were selected as favourable lignocellulosic substrate sources for mycelium growth of oyster mushrooms.
- WHITE BUTTON MUSHROOM ( *Agaricus bisporus* ) is commonly found growing in soil enriched with cow dung , horse dung or forest litters in temperate climate.
- The optimum temperature for the mycelial growth is 24°C , while it is 14-18 ° C for the formation and development of fruit body
- There are two methods of composting , Long method and short method . The distinction is based on the time taken for composting .
- .The long method needs three to four weeks , while the short method requires only 12-15 days
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# Composting

- Mushrooms grow on compost. Depending on the raw materials, compost takes 5 to 18 days to grow.
- Horse dung is a valuable medium for compost.
- Mixing the straw, livestock manure, gypsum, water to make it homogeneous.
- Opening up the straw, so that the straw absorbs water and the mushroom fungus, the mycellium, can grow in the straw.
- The compost is filled in a closed room with grating on which the compost is filled, called a tunnel.
- The compost is to be made pathogen free by pasteurizing and conditioned to convert the ammonia in it.
- Compost is mixed with spawn contained maize grains on which mycellium grows with.
- The compost is then kept for 14 to 18 days for full growth.

# Cultivation

- The compost is taken to the farm and filled with layer of 20cm with top a layer of 5 cm of casing soil. Casing soil consists of peat mixture.
- The mycellium starts growing into the casing soil from compost. This takes 4 to 7 days.
- During the growth period, irrigation is done. Thus the mycellium cannot grow to the surface of the casing soil.
- After mycellium growth, casing soil recovery takes place for 1 to 2 days. No irrigation takes place in this phase.
- A humid and warm climate is made to grow the mycellium to the surface of the casing soil.

# Cooling down stage

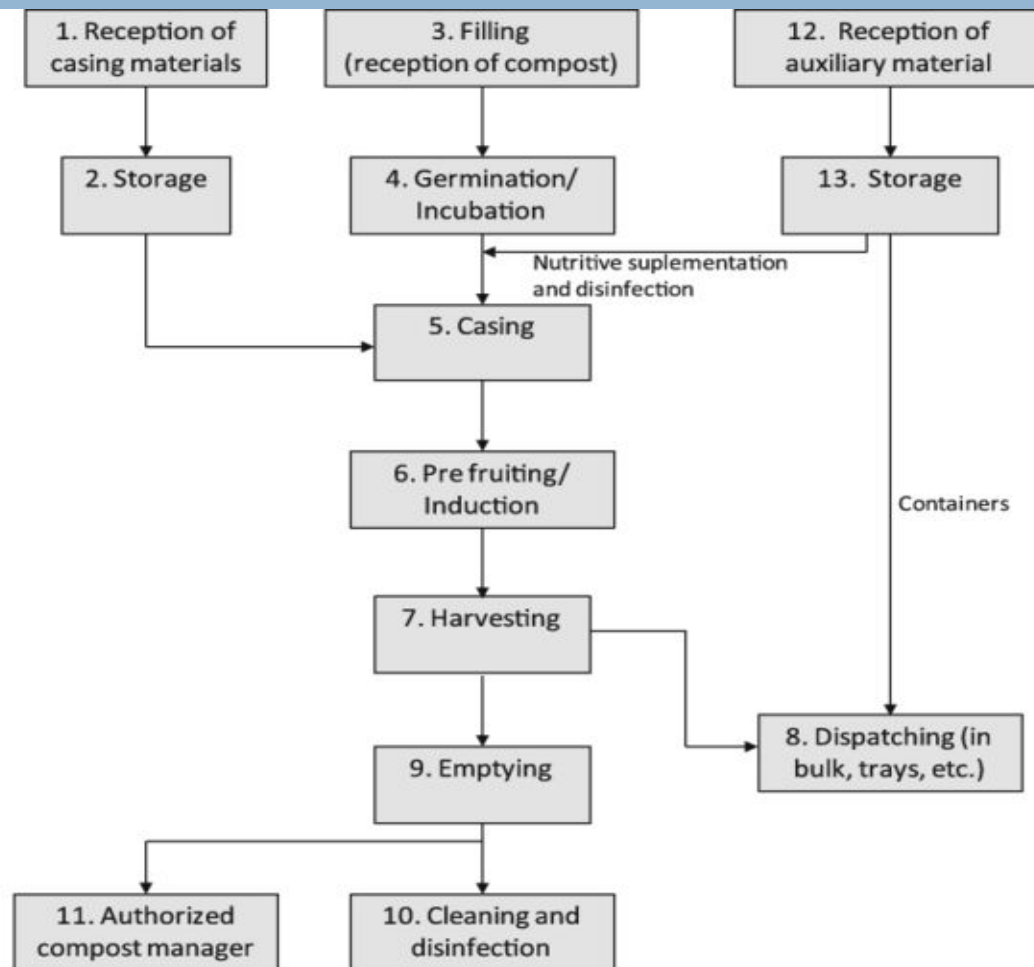
- When mycellium has grown to the surface, the grower starts cooling down.
- Because of cooler air and lower CO<sub>2</sub> the fluffy mycellium starts to contract. The mycellium has contracted 5 to 6 days after cooling down.
- It forms pins or primordia of mushroom. This period is called pin formation.
- After this relative humidity slightly lowered to grow the mushroom fully for harvesting.
- From pin to Mushroom takes 5 to 7 days.

# Harvesting

- Harvesting of mushrooms take place in flushes.
- The first flush is picked in 3 to 5 days and yields 15 to 20 kg/m<sup>2</sup>.
- The second comes after about 5 to 7 days and yield is slightly lower.
- A third lush is harvested after 6 to 8 days.
- At the end of the cultivation the spent cultivation should be heated to 8 hours to kill all diseases and pests.
- Then the compost is taken out from the room and then cleaning is done in the room.
- The new cultivation cycle is started again.

# Flow chart of Button mushroom cultivation

**Fig. 1** Flow chart of the mushroom cultivation line



# RESULTS

## Nutritional Values of Oyester Mushroom

Moisture (% of fresh weight)	82.7
Protein (% DWB)	22.2
Carbohydrate (% DWB)	22.9
Vitamins :	
i) Ascorbic acid (% DWB)	0.0123
ii) Niacin (% DWB)	0.0013
Reducing sugars (% DWB)	4.4
Crude fiber (% DWB)	9.4
Ash (% DWB)	18.4
Available K+ (% DWB)	4.4
EC (mS/cm)	2.1
pH	6.0

DWB= Dry weight biomass of mushroom. EC= Electrical conductivity

# Production and Marketing in India

- As per government data India in 2013-14 produced 17,100 metric tonnes of mushrooms
- By 2018 this increased to 4,87,000 MT (about 29 fold increase in four years)
- India only accounts for about 2% of the world's mushroom production
- Mushroom consumption in India is 30gram/person.
- By embracing and regulating mushrooms the government may have a new ally to combat malnutrition and falling farm incomes.
- Mushrooms may also help converts millions of tonnes of paddy stubble into edible mushrooms instead of noxious smog.



# EATING MUSHROOM

- ❑ Clean mushrooms before using them in recipes by brushing them with a damp paper towel to remove any dirt
- ❑ If rinse mushrooms be sure to dry them completely before use.
- ❑ Mushrooms are perfect in egg dishes, soups, savory casseroles, stir-fries, or stews
- ❑ The taste of oyster mushrooms is very mild, and some describe it as subtly woody or like seafood
- ❑ Store oyster mushrooms in a loosely closed plastic bag in the fridge, where they should stay fresh for 5 to 7 days

# Stay safe with its health benefits

- The antioxidant content in mushrooms may help prevent lung, prostate, breast, and other types of cancer, according to the National Cancer Institute
- Dietary fiber may help manage a number of health conditions, including type 2 diabetes. A cup of sliced, raw mushrooms, weighing 70 grams, provides almost 1 g of fiber.
- The fiber, potassium, and vitamin C in mushrooms may contribute to cardiovascular health.
- Women take folic acid, or folate, supplements during pregnancy to boost fetal health, but mushrooms can also provide folate. A cup of whole, raw mushrooms contains 16.3 micrograms of folate.
- Mushrooms are rich in B vitamins, such as: Riboflavin or B-2, Folate or B-9, Thiamine or B-1, Pantothenic acid or B-5, Niacin or B-3
- Vegetarians can take it as the substitute of meat for 2 to 3 days in a week.
- Mushroom is an alternate source of protein for vegetarians to meet their deficiency of protein in their regular diet.
- DARPA funded and patented along with renowned mycologist Paul Stamets various medicinal uses of mushrooms, including treatment for H1n1 virus.

# Conclusion

It is not necessary that mushrooms are always a poisonous substance and to be neglected. It has nutritional value more than most of the vegetables. That is the reason it helps to stay healthy. That's why mushroom should be cultivated and harvested with proper process and we should intake it properly to utilize its benefits for vegetarian's diet as a substitute of meat. The proper cultivation can earn money for farmers also as an employment opportunity.

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From this slide we came to about the cultivation process, health benefits and facts about edible Mushrooms and why do we need to eat.

Hope you have got the idea about Mushroom cultivation and health benefits if eating.

THANK YOU  
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