



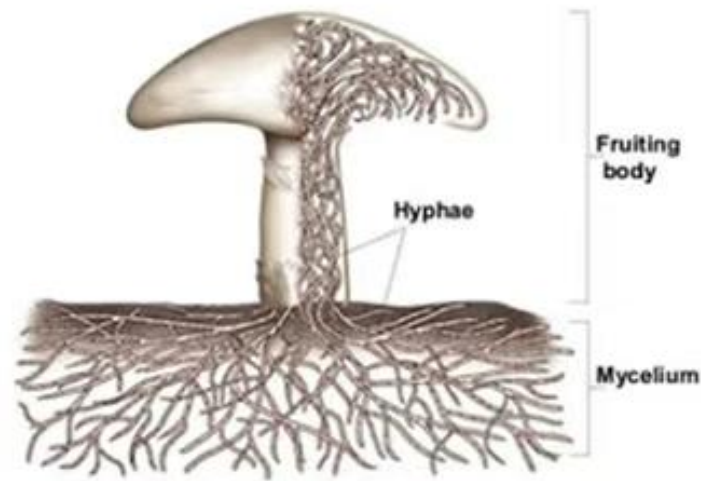
MUSHROOM CULTIVATION

B.Sc. BOTANY

Meaning of Mushrooms:

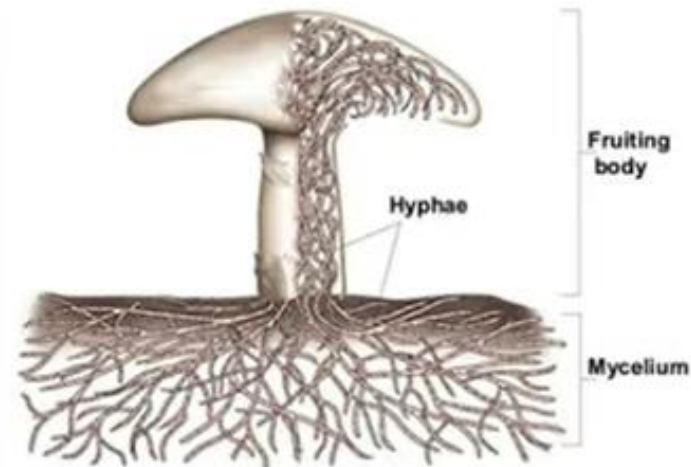
Mushrooms are the fruit bodies of edible fungi, commonly belonging to Basidiomycotina (*Agaricus campestris*, *A. brunnescens*, *Pleurotus sajor-caju*, *Volvariella volvacea* etc.) and rarely to Ascomycotina (*Morchella conica*, *M. esculenta*).

The Structure of a Mushroom



The mushrooms were used as food since long back, probably from 3000 B.C. as per ancient Indian literature. Since that time, the mushrooms are being consumed in different countries like Greece, Egypt, France etc. The Greeks and Romans described mushrooms as “food for the god”. During that period, people consumed the mushrooms after collecting them from their natural habitat.

The Structure of a Mushroom



Value of Mushrooms:

1. Nutritive Value:

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

- i. Mushrooms are the richest source of vegetable protein.
- ii. The protein content varies from 1.1-4.98% in common cultivable mushroom (much higher than pulses, vegetables and fruits).
- iii. All the essential amino acids including lysine (550 mg/gm) are present in much higher amount than even egg.
- iv. Mushrooms contain sufficient quantities of mineral elements such as Na, K, Ca, P and Fe.

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v. Mushrooms contain folic acid.

vi. Mushrooms contain vitamins like B, C, D and K.

vii. They contain little amount of fat (0.35- 0.65% dry wt.) and starch (0.02% dry wt.).

**Table 4.15 : Protein content and energy value
of mushrooms and other vegetables**

Name of the material	Protein content (% on dry weight basis)	Energy value (Kcal)
1. Mushrooms	26.9	16
2. Green peas	26.1	98
3. Green beans	21.6	35
4. Cabbage	18.4	24
5. Cauliflower	28.8	25
6. Beet root	12.9	42
7. Potato	7.6	83
8. Brinjal	15.1	24

2. Medicinal Value:

Most of the mushrooms have high medicinal value to reduce blood pressure, obesity (to be fatty), constipation, atherosclerosis (fat deposition inside blood vessel) etc. Medicinal value of some mushrooms are given in Table 4.19.

Table 4.19 : Role of some edible fungi in controlling human diseases

Name of Mushroom	Role in controlling diseases
1. <i>Agaricus brunnescens</i> (syn. <i>A. bisporus</i>)	Stimulating digestion, Curing hypertension, Hyperacidity, Obesity, Constipation and Atherosclerosis (fat deposition inside the blood vessel).
2. <i>Auricularia polytricha</i> (wood ear mushroom)	Strengthening health, helping blood circulation, using for the treatment of stomach ailments (sufferings), Piles, Atherosclerosis.
3. <i>Pleurotus ostreatus</i>	Relaxing muscle, Joint pains, Antitumorous activity.
4. <i>Pleurotus sajor-caju</i>	Reducing the rate of nephron deterioration (renal failure).
5. <i>Volvariella volvacea</i>	Reducing blood pressure.

3. Biological Value:

Biologically mushrooms are very much important. The biological value includes nutritive value, medicinal value and their efficiency in degradation of substrate.

Cultivation Procedure of Mushrooms:

It is the technique to develop the fruit bodies of edible fungi. About a dozen fungi are cultivated in 100 countries with an annual production of 2.2 million tonnes. The common four genera are *Agaricus*, *Lentinus*, *Volvariella* and *Pleurotus*.

Together, they yield a major share of the total production. Out of many, *Agaricus brunnescens* (syn. *A. bisporus*), white button yields 56%; *Lentinus edodes*, shiitake yields 14%; *Volvariella volvacea*, paddy straw yields 8% and *Pleurotus* spp., oyster 7.7%.

A. Cultivation of Agaricus Brunnescens (Syn. A. Bisporus):

The *Agaricus brunnescens* (syn. *A. bisporus*) is commonly known as white button mushroom (Fig. 4.107, 4.108). It contributes a major share in the mushroom production of the world. It is a temperate mushroom and can grow well in temperate conditions. Optimum temperature, optimum moisture, proper ventilation and good quality of spawn are very essential prerequisites for mushroom growth.



The cultivation procedure is:

1. Production of spawn,
2. Preparation of compost,
3. Filling of trays with compost,
4. Spawning i.e., inoculation of compost,
5. Watering of inoculated compost filled trays,
6. Casing,
7. Harvesting of mushrooms (fruit bodies), and
8. Storage of mushrooms.

Cultivation of Mushrooms

Mushrooms are heterotrophic as they lack chlorophyll.

Hence light is not necessary for their growth.

The three major requirements for their cultivation are:

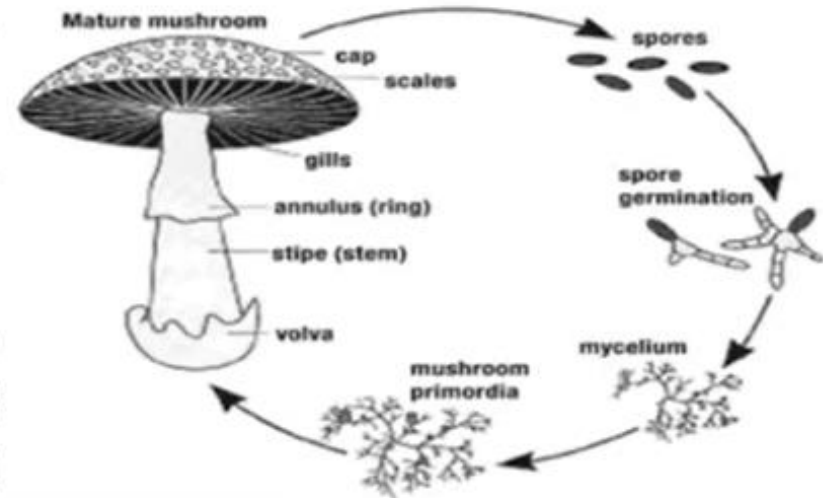
- (1) Suitable temperature**
- (2) Good compost**
- (3) Good quality spawn.**

[A] Suitable Temperature

The most suitable temperature for the growth of mushrooms is between 30° and 37°C . Temperature below 15°C and above 45°C is detrimental for the growth of the mycelium and fruiting bodies. In many parts of India, such as U.P., M.P., Punjab, Haryana, Orissa and Maharashtra, the optimum season for their cultivation is from April to September. In the plains of West Bengal, they are usually grown between March and September. In favourable conditions, the first crop of mushrooms is ready within 30–45 days and thus several crops can be taken in a growing season.

Although light has no effect on the growth of mushrooms, the shelf life of mushrooms grown in dark is relatively more.

Mushroom Lifecycle



MUSHROOM ANATOMY



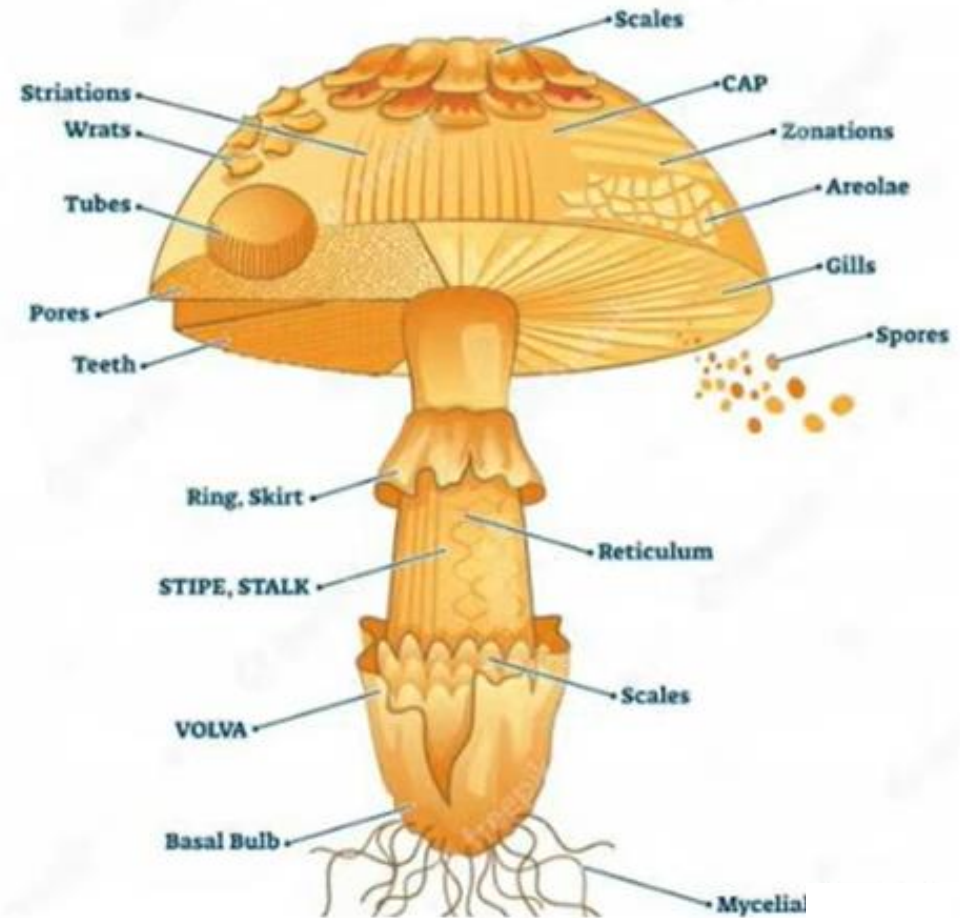
[B] Good Compost

Two types of compost — **natural** and **synthetic** are used for cultivation of mushrooms.

[I] Natural compost

The natural compost is prepared by mixing **wheat or barley straw** in **horse dung**. Normally 33 kg straw is mixed with 100 kg of dung. It should be kept in mind that dung of any other animal should not be mixed with horse dung. Stored or rain wet dung is not suitable for compost. A meter high heaps of the fresh and wet dung, obtained from the stable are made in open air. After 3-4 days, when the dung starts producing ammonia due to fermentation, it is turned and stacked again. This process is repeated 4-5 times at the intervals of 5-6 days. During this course, **gypsum** (25 kg/tonne dung) is added to the dung. Finally, 40 ml **nemagon** is sprayed on the mixture.

MUSHROOM ANATOMY



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[III] Synthetic compost

The ingredients of the synthetic compost are :

- (i) Wheat straw — 300 kg
- (ii) Wheat bran — 30 kg
- (iii) Ammonium sulphate or Urea — 4 kg
- (iv) Potash — 1.5 kg
- (v) Gypsum — 30 kg
- (vi) Calcium ammonium nitrate — 6 kg

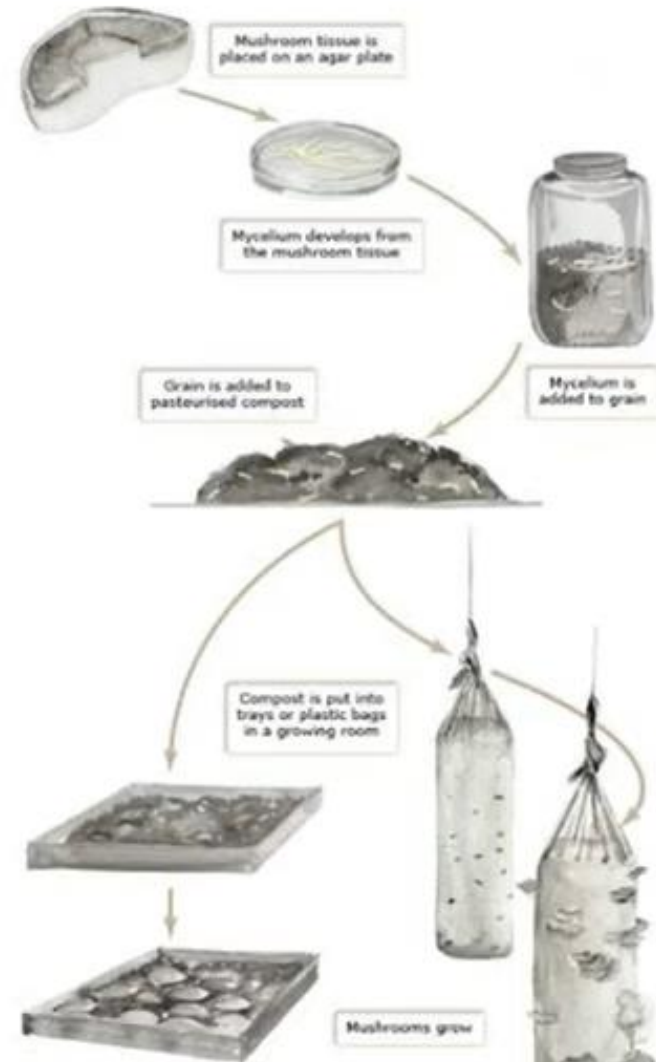
Wheat straw (cut to 8-12 cm long pieces) is spread on a clean cement concrete ground and wetted properly with water. Then it is mixed with half of the quantities of the other ingredients, except gypsum. This mixture is stacked into about a meter high heaps and the heaps are covered. After an interval of five days, these stacks are scrapped and the remaining half of the ingredients is thoroughly mixed with it and the whole mixture is piled again. This process is repeated six times. In the third and fourth turning, gypsum is added to the mixture. After the sixth turning, if there is a smell of ammonia, two or more turnings should be given until the smell of ammonia disappears. In the last turning, 10 ml malathion (dissolved in 5 litres water) is added to the mixture. In addition,

1 litre/kg of lintaff is also added to prevent insect infestation. The final mixture has sufficient quantity of moisture and can fill 20 trays of $100 \times 50 \times 15$ cm.



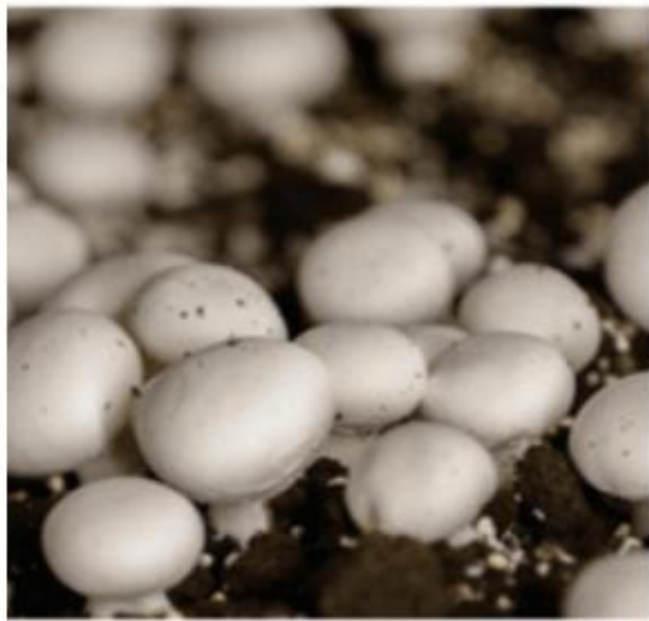
[C] Good Quality Spawn

Good quality spawn is essential for better harvest. Different substrates in which mushrooms were already grown are used as inoculum. Mostly the compost left after the harvest of mushroom crop is used as inoculum. Sometimes small pieces of mushroom stipe are used as inoculum. Inoculum of *Agaricus* is usually prepared by adding grains of wheat, rye or millets to the substrate.



Types of Mushroom Cultivation in India

DIFFERENT TYPES OF MUSHROOM CULTIVATION IN INDIA



BUTTON MUSHROOM



OYSTER MUSHROOM



**PADDY STRAW
MUSHROOMS**

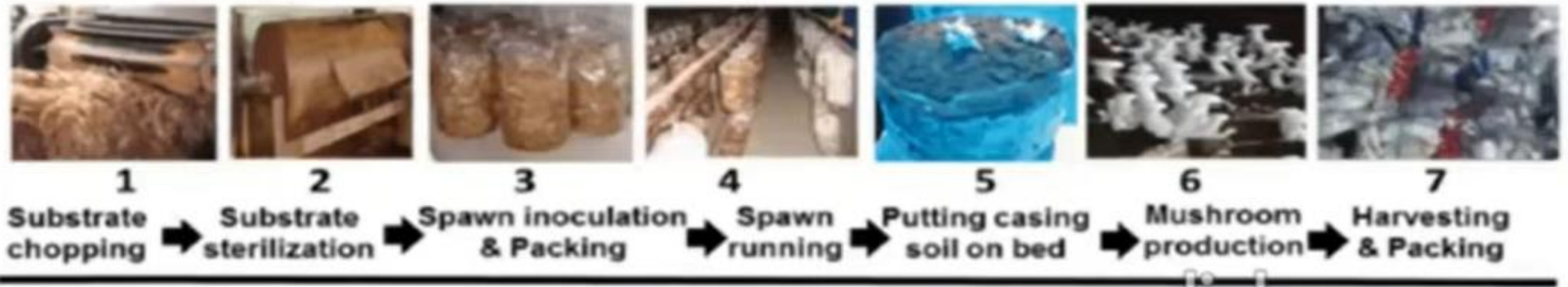
Process of Cultivation

The main process of cultivation of *Pleurotus*, sajor caju(dhingri) are as follows:

Substratum: The substrate is prepared from chopped paddy straw, crushed maize cobs, wheat straw, rye straw, dried and pulverized grasses, compost, wooden logs, etc.

Method of Cultivation: The substrate is soaked in water in a tank, it is washed with fresh water and the excess of water is allowed to drain. The substrate is filled in wooden trays of (1X0.5X0.25) metre dimensions. The trays are first filled upto 9cm and the spawn is sprinkled on the entire surface evenly. Then the substrate is again filled until the final depth of the surface is 16 to 18 cm. After spawning (compost mixed with mycelial pieces obtained from pure culture of the fungus called spawning). Trays are covered by polyethene sheets. They are sprayed with water once or twice a day. After 10 to 15 days of spraying, white cottony growth appears on the entire surface. The polythene sheets are removed and Casing is done by covering the surface with (2-2.5cm) thick uniform layer of the soil containing one part of sand, one part garden soil (sterilized), one part resin free saw dust. The cased trays are continued to be irrigated by spraying water. The first flush of mushroom appears after 10-15 days of casing. For the healthy growth of mushrooms, temperature should be maintained $25 \pm 5^{\circ}\text{C}$ and 85-90% relative humidity are essential.

Harvesting: Mushrooms are harvested when the pileus is about 8-10cm in diameter. After harvesting, the lower portion of the stalk with adhering debris is cut with the help of a clean and sharp knife. Mushrooms can be stored in refrigerator for about a week. It can be dried either in the sun or in the oven at about 55-60 °C. for 8 hours. The dry mushrooms are packed and sealed before marketing them.



THANK YOU