

All India Co-ordinated Mushroom Improvement project (AICMIP) was sanctioned by ICAR during VI plan period (1983).

An ICAR sponsored co-ordinate scheme on mushroom Research was in operation at Solan, Bangalore, Ludhina and New Delhi from 1970. This scheme was later converted in to an All India Co-ordinated Mushroom Improvement Project at NCMRT, Solan in 1983.

During the year 1974, incorporation of molasses and brewer's grain-I synthetic compost was adopted on the recommendations of Hayes (FAO, Mushroom Expert). It resulted 7Kg to 13Kg of mushroom per square meter.

UNDP (1982) was launched a mushroom development project at Solan by the State Department of Horticulture. Success in cultivation of the mushroom in H.P caught the imagination of many research workers and growers to initiate similar activity in different regions. This leads to the establishment of various research units of different centers as well as few mushroom farms in the country.

Mushroom cultivation in Kashmir Valley was introduced by Indian Institute of Horticultural Research, Bangalore during 1970. Blue mountain food products have established a big mushroom farm at the site which was earlier used by Stewart for mushroom growing. It is cultivated successfully in Down valley (UP) and in Pune. Now it was established and adapted in various districts of AP, Bihar, Haryana, HP, Jammu and Kashmir, Karnataka, Kerala, Madhya Pradesh, Maharastra, Meghalya, New Delhi, Orissa, Punjab, Rajasthan, Tamil Nadu, UP and WB.

Today mushroom cultivation has become a huge export oriented industry and large foreign exchange earning business in India. Many Universities and State govt. Departments of Agriculture and private peoples are giving training in growing mushrooms, which are mostly, exported and also used in a variety of culinary delights in hotels.

Cultivation of white button mushroom

- In India, Bose (1921) was successfully cultured two *Agaricus* mushroom on a sterilized dung media.
- In 1941, Padwick reported successful cultivation of *A. bisporus* from various countries.
- In 1961, a scheme called 'Development of Mushroom Cultivation in Himachal Pradesh' was strated at Solan by the State Govt.in collaboration with ICAR New Delhi. This was the first attempt on the cultivation of *A. bisporus* in India. The technique for its cultivation was evolved using horse dung and wheat straw synthetic compost.
- A modern spawn laboratory and air conditioned cropping rooms were designed and constructed under the guidance of E.F.K. Mental, FAD mushroom expert (1965).
- Numbers of researches were made on evaluation of different strains of mushroom and use of various agricultural wastes and organic manures and fertilizers for preparing synthetic compost.

BIOLOGY OF MUSHROOMS

Introduction

Mushrooms are a saprophytic fungus. It is commonly grows on damp wood, decomposing organic matters like humus, horse dung etc. mushrooms are cultivated commercially in various parts of India. Though different species of mushrooms are available, all showed similar vegetative and reproductive structures.

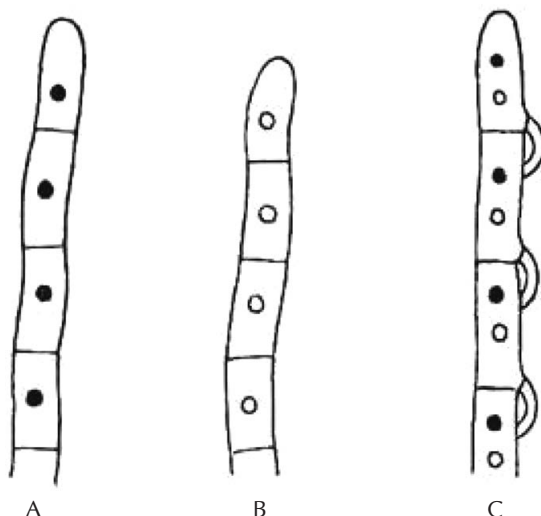


Fig. 6.1 : A and B Monokaryotic Mycellium; C-Dikaryotic Mycelium.

Vegetative Body

Vegetative body of mushroom is mycelium. It consists of septate, branched hyphae. It is developed from Spore. Spores on germination develop into monokaryotic or primary mycelium, either + or – type (**Fig 6.1A and B**). The primary mycelium is short-lived and it soon transforms into dikaryotic or secondary mycelium by the fusion of two cells of different monokaryotic mycelium (+ and -) following clamp connection (**Fig. 6.1C**).

The hyphae of the dikaryotic mycelia interlace and twist together to form thick white hyphal cord, called rhizomorph which bear the fruit bodies (Button).

Reproduction

Mushroom reproduces by means of vegetative, asexual and sexual.

1. Vegetative Reproduction: In this method, dikaryotic mycelium develops from a spawn. The mass of mycelium divides artificially and produce fruit bodies.

- (x) Paxillaceae
- (xi) Pluteaceae - *Pluteus umbrosus*, *Pluteus velutinornatus*; *Vovariella speciosa*
- (xii) Russulaceae - *Lactarius fragilis* (Candy Cap) , *Russula* sp.
- (xiii) Strophariaceae - *Hypholoma brunneum*
- (xiv) Tricholomataceae
- (xv) Polyporaceae – *Lentinus sajorcaju* (Syn. Pleurotus)
- (xvi) Marasmiaceae – *Lentinula* (Shiitake mushroom)

(b) Aphyllophorales: This group lacks the spore bearing gills (Except few). They also lack the veil. The spore bearing surface 'Hymenium' can be smooth, wrinkled, bearing teeth like structures (spine like) or a layer of tubes closely packed together.

- (i) Cantharellaceae
- (ii) Clavariaceae - *Ramariopsis pulchella*
- (iii) Ganodermataceae : *Ganoderma* sp., *Phellinus igniarius*
- (iv) Hydnaceae (Teeth fungi): *Herichium clathroides* (Icicle fungus), *Steccherinum rawakense*, *Physalaria inflata*
- (v) Shizophyllaceae: *Schizophyllum commune*
- (vi) Stereaceae (Crust fungi): *Hyphodontia sambuci*
- (vii) Dacrymycetales - Dacrymycetaceae : *Calocera fusca*, *Dacryopinax spathularia*

(c) Tremellaceae (Jelly fungi) : The fruit body is an irregular shape and usually found in the bark of dead branches. It is up to 7.5 cm broad and 2.5 to 5.0 cm high, rounded to variously lobed or brain-like in appearance. The fruit body is gelatin-like but tough when wet, and hard when dry. The surface is usually smooth, the lobes translucent, deep yellow or bright yellow-orange, fading to pale yellow, rarely unpigmented and white or colorless. The fruit bodies dry to a dark reddish or orange. The spores, viewed in mass, are whitish or pale yellow.

Auricularia lacteal, *Auricularia polytricha*, *Pseudohydnum gelatinosum*, *Tremella fuciformis*.

2. Gasteromycetes : The spores are produced inside a spore case therefore never has been exposed to external conditions. It contains six orders.

- (a) **Hymenogastrales:** The Hymenogastraceae is a family of fungi. The blue-staining members of the genus *Psilocybe* form a clade that is sister to *Galerina* in the Hymenogastraceae.
- (b) **Lycoperdales:** This group of mushroom has no cap, gills or stems. It has round shaped 'Spore Case'. The spores inside the ball are called the 'Spore Mass'. At maturity, the ball ruptures or develops an opening at the top through which the spore mass. e.g., *Lycoperdum compactum*

MUSHROOM POISONING

1. Nerve poisoning: this type of poisoning occurs 2-3 hours after eating the mushrooms. The consumption of *Amanita muscaria*, *A. pantherina* and *Inocybe patibotillardii* causes this type of poisoning. The toxic effects are due to muscarine and ibotenic acid contained in these mushroom. The fatal death rates are 10-15%.

2. The cellular poisoning: *Amanita* species and *Galerina* species are mainly responsible for this type of poison. Amanita toxin attacks body tissues and cause death. Small quantity of this mushroom (~10mg) enough to kill healthy human. This toxin is thermostable and it is not removed by boiling. This toxin inhibits the intra cellular functions such as gene expression and protein synthesis. The symptoms of this toxin causes hepatic renal failures.

3. Digestive poisoning: Mushrooms such as *Poletus satanas*, *Etmomola lividum*, *Lactarius fornosus* and *Rossula* sp. cause this type of poisoning. Toxicity is extremely variable from individual to individual mushrooms. Norcaperatic acid has been found to be the common cause of this poisoning. Symptoms such as nausea, vomiting and diarrhoea occur rapidly.

4. Muscular poisoning: the muscular disorders appear after 30-60 minutes of consumption of *Psilocybe cubensis*. The symptoms include excitement in muscular system especially in the smooth muscle fibres and the patient may feel muscle weakness and drowsiness. This type of disorder appears due to psilocybin toxin.

5. Poisoning effect of mushroom with alcohol: This type of poisoning is reported if *Coprinus atramentarius* commonly known as Ink cap is consumed with or after drinking alcohol. The symptoms occur in short time. Flushing of the face and neck with aching tightness of neck veins, a feeling of swelling parenthesis in the hand and feet followed by chest pain. Later nausea, vomiting, sweating, visual disturbances, weakness, confusion and respiratory difficulties may occur.

The following first-aid measures should be provided to the affected persons,

1. To remove the eaten part of mushroom from the system.
2. The toxin absorbed by blood should be exhausted or eliminated.
3. Pay prompt attention on the condition of patient specially collapse and generally to keep a watch on the action of heart.

Some preliminary treatments are as follows :

1. Expulsion of the fungus: if the poisonous mushrooms are consumed an attempt should be made for vomiting as soon as possible. If vomiting is possible in normal condition give a teaspoon of mustard oil in half glass of water. A pomorphin and zinc sulphate may also used under medical direction. If possible stomach should be washed out by means of a stomach tube. The next step is 1