

Scientific Study About Mushroom

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Little about Mushroom Cultivation in India

Cultivation of Mushroom has been in vogue for almost 200 years. However, commercial mushroom farming in India has started only recently. Growing mushroom under controlled condition is of recent origin. Its popularity is growing and it has become a business which is export-oriented. Today mushroom cultivation has been taken up in states like Punjab, Uttar Pradesh, Haryana, Rajasthan, etc. (during winter months) while earlier it was confined to Himachal Pradesh, J&K and hilly areas. Mushroom is an excellent source of protein, vitamins, minerals, folic acid and is a good source of iron for anemic patient.

Mushroom or toadstool is a fleshy, spore bearing fruiting body of some macro fungi which can be either epigeous or hypogeous and large enough to be seen with the naked eye and to be picked by hand (Chang and Miles 1992). The word mushroom is a general term used mainly for the fruiting body of macro fungi and represents only a short reproductive stage in their life cycle (Das, 2010). Usually, the fruiting bodies are umbrella shaped structures, which produce spores in large numbers. These spores are minute, microscopic and are dispersed through wind. When they happen to fall on suitable substrates (like dead wood, straw, manure, litter or any other cellulose material), the spores germinate and develop into mycelia. As long as the condition is favourable for the mycelial development and growth, the mycelia continue to grow, ramify and absorb food from the substrate until they develop many fruiting bodies. Mushroom belonging to the subdivision of Basidiomycotina of the class Hymenomycetes. Order: *Agaricales* and Family: *Agaricaceae*.

As estimated by different researchers, there are over 69,000 fungi species on the world. About 2000 species (31 genera) are primarily edible mushrooms. However, about 10% of some 30 species are poisonous mushrooms and relatively small, numbers are considered as lethal (Hawksworth, 2001).

Nutritional Value of Mushroom

Mushrooms contain 20– 35% of protein (dry weight), are low in lipids and contain all the nine essential amino acids (Kalac, 2009). It is also a good source of Calories 22, Total Fat 0.3 g (Saturated fat 0.1 g, Polyunsaturated fat 0.2 g, Monounsaturated fat 0 g), Cholesterol 0 mg, Sodium 5 mg, Potassium 318 mg, Total Carbohydrate 3.3 g (Dietary fiber 1 g, Sugar 2 g), Protein 3.1 g, Vitamin A 0%, Calcium 0%, Vitamin D 1%, Vitamin B-12 0%, Vitamin C 3%, Iron 2%, Vitamin B-6 5%, Magnesium 2% amount per 100 gm.

Mushrooms are a good source of B vitamins, including riboflavin, niacin, and pantothenic acid, which help to provide energy by breaking down proteins, fats and carbohydrates. B vitamins also play an important role in the nervous system.

- **Pantothenic acid** helps with the production of hormones and also plays an important role in the nervous system.
- **Riboflavin** helps maintain healthy red blood cells.
- **Niacin** promotes healthy skin and makes sure the digestive and nervous systems function properly.

Mushrooms are also a source of important **minerals**:

- **Selenium** is a mineral that works as an antioxidant to protect body cells from damage that might lead to heart disease, some cancers and other diseases of aging. It also has been found to be important for the immune system and fertility in men. Mushrooms are among the richest sources of selenium in the produce aisle and provide 8-22 mcg per serving.
- **Ergothioneine** is a naturally occurring antioxidant that also may help protect the body's cells. Mushrooms provide 2.8-4.9 mg of ergothioneine
- **Copper** helps make red blood cells, which carry oxygen throughout the body. Copper also helps keep bones and nerves healthy.
- **Potassium** is an important mineral many people do not get enough of. It aids in the maintenance of normal fluid and mineral balance, which helps control blood pressure. It also plays a role in making sure nerves and muscles, including the heart, function properly. Mushrooms have 98-376 mg of potassium per 84 gram serving, which is 3-11 percent of the Daily Value.

- **Beta-glucans**, found in numerous mushroom species, have shown marked immunity-stimulating effects, contribute to resistance against allergies and may also participate in physiological processes related to the metabolism of fats and sugars in the human body. The beta-glucans contained in oyster, shiitake and split gill mushrooms are considered to be the most effective.

Popular cultivated mushrooms

- White button or European mushroom (*Agaricus bisporus*)
- Oyster mushroom or Dhingri (*Pleurotus* spp.)
- Paddy straw and Milky mushroom
- Shiitake mushroom

Button Mushroom (*Agaricus* sp.) is the most popular mushroom variety grown and consumed the world over. These are popular strains grown during winter season in northern India (Jammu and Kashmir, H.P, Punjab, Haryana, Uttaranchal and Bihar) where temperature remains below 20°C during winter. In India, its production earlier was limited to the winter season, but with technology development, these are produced almost throughout the year in small, medium and large farms, adopting different levels of technology. The species being grown in most farms is the white button mushroom (*Agaricus bisporus*) belonging to Class Basidiomycetes and Family *Agaricaceae*.

Oyster mushroom (*Pleurotus* sp.) is much popular species that are commercially grown over a wide temperature range due to their temperate, sub-tropical and tropical nature. The flexible nature of this genus is mainly due to their rapid mycelial growth, high saprophytic colonizing ability and simple cultivation technology. Oysters are naturally found on rotten wood material.

Now there are only two varieties which are also tropical in nature viz; the **paddy straw mushroom** (*Volvariella* sp.) and the **milky mushroom** (*Calocybe* sp.). The paddy straw mushroom is popular for its taste and flavour and having very short cropping cycle. The milky mushroom as a new introduction to the edible mushroom world, no doubt India has a greater prospects to exploit its cultivation and having greatest advantage for being Indian origin.

Lentinula edodes (Berk.) Pegler is the third most important edible mushroom in the world in terms of total production. Which develop as sporophytes on tree logs and form fruit



bodies at low temperature (15-20°C). This mushroom, *Lentinula edodes* (Berk.) Pegler and *Lentinus squarrosulus* (Mont.) Singer is very popular for its nutritional and medicinal attributes (Regula and Siwulski 2007).

Other most popular cultivated mushroom species are *Agaricus bisporus*, *Agaricus bitorquis*, *Lentinula edodes*, *Pleurotus spp.*, *Auricularia spp.*, *Volvariella volvacea*, *Flammulina velutipes*, *Tremella fuciformis*, *Hypsizygus marmoreus*, *Pholiota nameko* and *Grifola frondosa*. In recent years, few new species of edible mushrooms namely, *Dictyophora indusiata*, *Stropharia rugoso-anulata*, *Agrocybe aegerita* etc. have also been successfully cultivated.

Mushroom poisoning

Mushroom poisoning also called toadstool poisoning, toxic, sometimes fatal and effect of eating poisonous mushrooms. There are some 70 to 80 species of mushrooms that are poisonous to humans; many of them contain toxic alkaloids (muscarine, agaricine, phalline). Among the mushrooms that most commonly cause poisoning are *Amanita muscaria*, *A. phalloides*, and the four white *Amanita* species called destroying angels.

Effects and treatment of mushroom poisoning:

Eating poisonous mushrooms may cause different types of reactions which can broadly be classified as follows:

1. **Gastric disorder:** The poison causes serious gastric disturbance, it chiefly acts by exciting and then paralyzing the central nervous system as by *Amanita muscaria* or poison containing irritant which cause gastric enteritis by direct action on the mucous membrane of the digestive system.e.g *Gyromitra esculenta*.
2. **Nervous disorder:** It causes degeneration of cells, especially of the nervous system and glandular parenchymatous tissues like liver as in case of *Amanita phalloides*.
3. **Muscular disorder:** There may be exciting of the muscular system, especially the smooth muscular fibre as it is there in the uterus, vessels etc.
4. **Haemolytic disorder:** There can be destruction of blood or haemolysis as in case of *Amanita rubescens*.

Treatments:



- All the collectors of wild mushrooms should be careful about mushroom poisoning and have some knowledge of the first-aid remedies in case of mushroom poisoning and then the patient should immediately be taken to a doctor.
- The patient should be made to cover his body with a blanket, lie down calmly and given the first aid treatment till the arrival of the doctor.
- **Removal of poison from the stomach:** The patient may be made to vomit by putting his fingers inside the mouth or throat or by giving warm water with one tablespoonful of mustard seeds or apomorphine. The stomach should be completely washed by means of a stomach tube. One can also give some sedatives like warm water, 4--5 tablespoonful of warm milk, two tablespoonful of olive oil beaten with the yolk of an egg etc.
- **Elimination of the toxin:** The ingested poison in the stomach can be removed by putting charcoal powder in the stomach and if it has already been absorbed in blood then subcutaneous injections of atropine or other antidotes can help in removing the effect of poisoning.

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