



Cultivating Mushroom With Better Quality And Shelf Life

Besides novel fairy rings, mushrooms are also known well for their low calorie attribute. They contain large amounts of good quality protein with all the essential amino acids, high fiber content, unsaturated fats (linoleic acid), several B vitamins, vitamin D, some even contain large amounts of vitamin C and minerals such as potassium,



phosphorus, sodium and a bit of calcium. Although there are a number of edible mushrooms like Black trumpet, Chanterelle, Enoki, Hedgehog, Maitake, Cepe, Matsutake, Morel, Shiitake, Woodear, Oyster etc but, it is the *Agaricus bisporus* which is one of the most widely used and cultivated mushroom in the world. It is commonly known as Button mushroom. It is also known by many names, including Common mushroom, Table mushroom, Cultivated mushroom, White

mushroom, Portobello mushroom, Crimini mushroom or Champignon de Paris. Button mushrooms are fairly rich in proteins, vitamins and minerals. Button mushrooms contain more protein than kidney beans. They contain an especially high amount of vitamin B and

potassium. They help in lowering both blood pressure and serum cholesterol level. They are highly perishable and need special care while handling either at cooking time or at cultivating time.

Of the various cultivated varieties of mushrooms, it is the Button mushroom (*Agaricus bisporus*) which is most suitable for cultivation in India because of favourable climatic conditions. This edible mushroom alone constitutes about 80% of the total mushroom production in the country.

Being a temperate mushroom, Button mushroom grows best during winter season throughout the plains of north India. However, it can grow throughout the year in hilly areas. The most suitable temperature for mycelial growth is 24-26°C while that for fruiting bodies formation is 16-18°C. Too low as well as too high temperature are harmful for it.

It can be grown in any available room, shed, basement, garage etc but it should be well ventilated and not stuffy. It needs special compost for its cultivation – synthetic and natural.

Synthetic compost can be prepared from wheat straw (chopped 8-20cm long, 250 kg), wheat / rice bran (20 kg), ammonium sulphate / calcium ammonium nitrate (3 kg), urea (3 kg) and gypsum (20 kg). 10 kg molasses and/or 60 kg chick manure can also be used if available (This will make compost sufficient for 15-16 trays of standard size 1m x 1/2m x 15cm). Mixing of materials and pile making is done at Day 0. The straw is uniformly spread over the composting yard in a thin layer wetted thoroughly by sprinkling water. All the ingredients except gypsum are mixed thoroughly in the wetted straw which is finally heaped into 1m high x 1m wide pile. It can be made with hands or stack mould. The straw should be firmly but not compactly compressed into the mould. It is essential to open entire pile and remake it a number of times as per the following schedule:



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| 1 st turning | – | 4 th day |
| 2 nd turning | – | 8 th day |
| 3 rd turning | – | 12 th day, add 10 kg gypsum |
| 4 th turning | – | 16 th day, add 10 kg gypsum |
| Final turning | – | 20 th day, spray 10 ml malathion in 5 litre water (any other available pesticide like DDT, BHC, Lindane can also be used). |

It is necessary to sprinkle water at each turning. To improve the quality of compost, 10 kg molasses diluted 20 times with water can be poured over the straw mixture during the first turning while 60 kg chicken manure can be added at 0-Day.

Natural compost can be prepared from horse dung which must be freshly collected and not have been exposed to rain. It admixture of dung of other straw (1/3 or more of weight with the horse dung to which kg poultry manure per ton is horse dung and straw is composting yard and over it. The manure is then high x 1m wide. After 3 days heap gets heated up and gives off ammonical repeated 3-4 times after an



should be free from animals. Chopped wheat of horse dung) is mixed 3 kg urea and/or 100-110 usually added. Mixture of uniformly spread over the sufficient water is sprinkled heaped in a pile about 1m when the manure in the (because of fermentation) smell, it is opened up and interval of 3-4 days. 25 kg

gypsum per ton is added in two installments at 3rd and 4th turning. 20 ml malathion diluted in 10 l water is sprayed into the manure at the final turning.

Composting is usually done in open on well cleaned concrete or *pucca* floor, but it has to be protected from rain by covering it with polythene sheet. It can also be done with open sides.

The compost when ready has a dark brown colour with no trace of ammonia and neither too dry nor too wet. If it is too wet, the excess water may be allowed to evaporate and if relatively dry then the water can be add up by sprinkling.

The prepared compost can now be filled in trays up to the surface level and it should be lightly compressed (Soft wooden trays,15-18 cm deep provided with pegs at the four corners can be used).



Now the grain spawn (mycelium) is scattered on the surface of the tray bed which is covered with a thin layer of compost or spawn can be mixed with compost before filling it in trays. 500 g spawn (2.5 litre bottles / polypacks) is sufficient for five trays of standard size (spawn can be procured from Mushroom Lab. College of Agriculture, Chambaghat, Solan at a nominal cost or from Division of Mycology, IARI, New Delhi). After spawning the compost surface

should be covered with old newspaper sheets wetted by sprinkling water. Water should not be directly added to the compost during spawn running. Now these trays can be stacked vertically one over the other with 1 m gap in 4-5 tiers. The room should be maintained at 25° C or near about. The humidity can build up by frequent watering the floors and walls. The room may be kept closed as no fresh air is needed during the spawn run.



After the spawn run is complete (within 12-15 days) as is evident by white mouldy growth, the surface of compost should be covered with 3 cm layer of casing soil. A suitable casing soil can be prepared by mixing equal part of well rotten cow dung (finely crushed and coarsely sieved) and garden soil. This casing material is sterilized to kill insects, nematodes, etc and can be accomplished either by steaming or by treating with formalin solution.

For 1 cubic meter of casing soil, ½ litre formalin diluted with 10 litre water is sufficient. It can be added to the casing soil spread over a plastic sheet by sprinkling. Now it should be again covered with another plastic sheet for 48 hrs.

The soil should be turned frequently for about a week to remove all traces of formalin. Still the temperature of the room is maintained for further three days, after which it must be lowered to below 18°C. At this stage lots of fresh air is required.

The first flush of the pin heads becomes visible 15-20 days after casing or about 35-40 days after spawning. Small white buttons develop 5-6 days after pin head stage. The right stage of harvest is when the cap is still tight over the short stem. In case the buttons are allowed to mature, the membrane below the cap will rupture and the cap will open up in umbrella- like shape. But such mushrooms are of inferior quality.



Mushrooms can be harvested either by holding the cap with forefingers slightly pressed against the soil or by cutting off with a sharp knife at soil level. The soil particles and mycelial threads, if clinging to the base of stalk should be chopped off.

The average yield of 3-4 kg per tray is normal. However, if compost is carefully prepared, spawn reliable and favourable temperature prevailing during the growing period, then a yield of 5-6 kg per tray can also be obtained. But due to negligence partial or complete failure may happen.

The mushrooms are best consumed fresh. Storage of mushrooms for a very short period of time within moist paper towel in a refrigerator is possible. However, under normal conditions after 24 hrs, mushrooms start losing their quality characters like intactness, whiteness, toughness etc and their long – term preservation through canning requires high capital input. But now their quality as well as shelf-life can be improved by treating them with suitable and safer agents in pre-harvest spraying and post-harvest washing procedures.

Pre-harvest spraying: Maximum whiteness can be obtained by using daily spray with 0.3% CaCl_2 instead of simple water, starting from the pinning initial stage of mushroom cropping. In addition, these mushrooms retain whiteness for a longer period.

Post-harvest washing: In post-harvest washing, mushrooms treated with 3.0% H_2O_2 + 0.0125% EDTA, get better whiteness and can be stored with same whiteness for 3-4 days.

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Note: The authors have used various references in the preparation of this article. For further details please contact them.