



Ecofriendly mushroom cultivation

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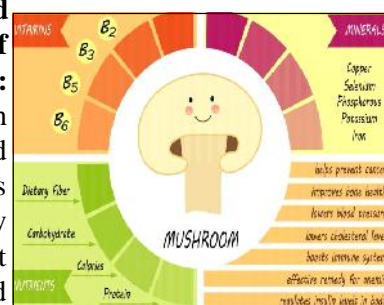
A mushroom is the reproductive structure which is produced by certain fungi, its edible part is fleshy fruiting bodies which may be collected naturally or can be cultivated under climate-controlled conditions. White button mushroom (*Agaricus bisporus*) is most commonly cultivated species. The fungal inoculums called 'spawn' (seeds of mushroom) are added to a pasteurized substrate in growing container. The fruiting bodies begin appearing about 6 weeks after spawning and continue appearing in flushes about 7-10 days apart for the next 6-8 weeks. About one dozen mushroom species are commercially grown in the world but in Haryana state mainly two species are cultivated



which are grown at commercial level.

Nutritional and medicinal value of mushroom :

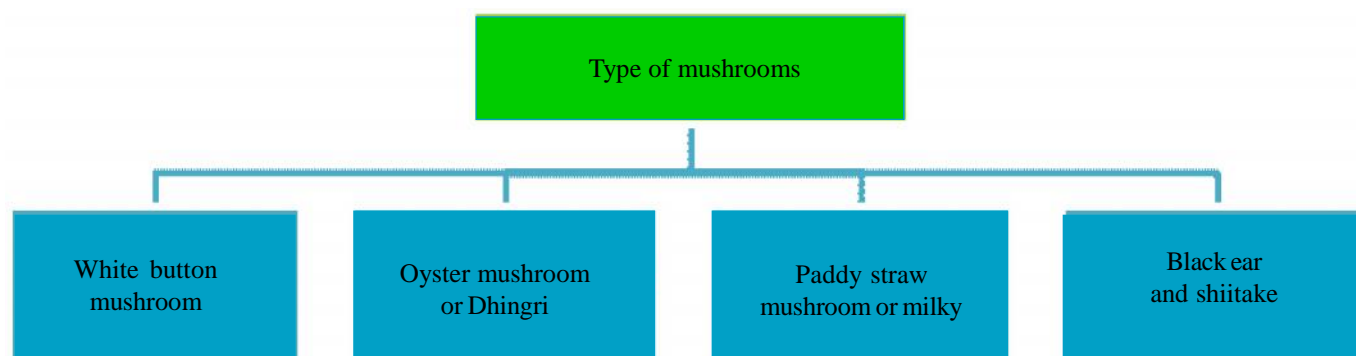
Mushrooms have been used for medicinal and source of nutrient, it is now increasingly recognized that correct diet, controls and modulates several

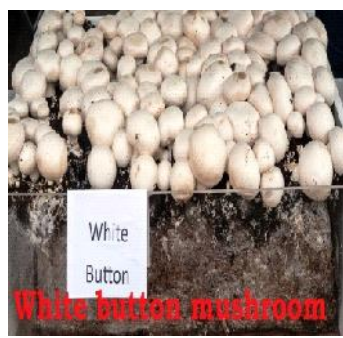


functions of human body and consequently participates in the maintenance of good health, with necessary to reduce the risk of diseases. The modern pharmacological research confirms that large parts of traditional knowledge about medicinal effects of mushrooms due to their antifungal, antibacterial, antioxidant and antiviral properties, besides being used as functional foods.

Should be know ☞

Picking wild mushrooms can be dangerous practices. Number of mushroom found in the wild look very similar to the edible varieties, but they are actually highly positions. But among the wild spp. few are very much valuable in term of medicines preparation, e.g. **Reishi Mushroom (*Ganoderma lucidum*)** this wild mushroom has very immune stimulating properties and being used in cancer, AIDS, heart disease, diabetes, blood pressure, Kidney, etc.





Steps involved in mushroom cultivation:

Temperature requirement: For spawning 20-25°C and sporophore production 14-18°C. Mostly all the mushrooms are required maximum humidity to successful and better yield, high temperature or light intensity is harmful to all mushrooms, while, due to low temperature the spawn germination and growth of the mushroom slow down.

Time of cultivation: November to February.

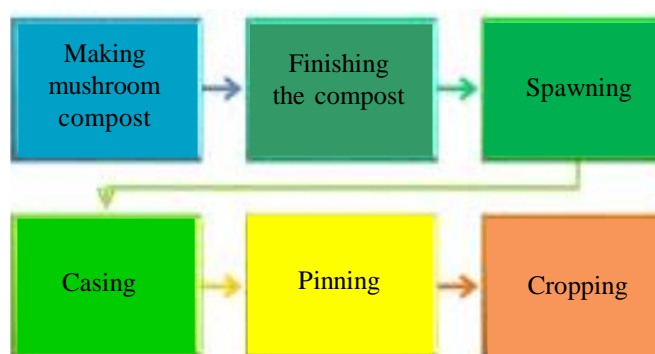
Farming technique: To farming this mushroom three basic things are required for its cultivation which are compost, spawn and casing mixture. It is necessary in fact that these three components should have high quality but to have good yield of mushroom a good quality of compost is must required. The material on which the mushroom is grown is called compost. The main base of the compost is weed or paddy straw but as per the recommendation, which has round the straw of mustard, is also suitable for making compost. There are two method of preparation of compost which are long or short method of composting. In both the methods, the compost mixture is made in open on the floor by fermentation but in short method compost are prepared in a specific room where the mixture is filled for two weeks which are called chamber or tunnel. The floor of the chamber is of sieve type and below this the air is passed through the blower that maintains the uniform temperature of the compost.

Mushroom compost formulas:

First method: Material required : Wheat bran-30 kg, Wheat straw - 300 kg, Gypsum - 30 kg, Urea -3.6 kg, Muriate of potash - 3 kg Single super phosphate-3 kg, Molasses - 5 kg, CAN - 9 kg

Second method: Material required: Chicken manure - 60 kg, Mustard straw - 300 kg, Wheat bran - 8 kg, Gypsum - 20 kg, Urea - 4 kg, Single super phosphate - 2 kg .

Preparation method of compost: A wheat straw which should be shiny and not without soaked should be spread on the concrete floor for 48 hours and wet the straw fully dully. Spread the wet straw in 1ft. layer and put 6 kg .



CAN 2.4 kg Urea, 3 kg SSP, 3 kg MOP and 15 kg, wheat bran on it and mixed thoroughly. After that make a heat of 5 ft. height, 5ft. width and suitable length. After 48 hours of heat formation temperature will start rise and reaches to 70-75°C If chicken manure is used, then wet it and mixed together. Complete quantity of chemical fertilizer may also be put on zero days.

First turning (day 6th): The outer layer of heap gets dried because of exposure to air, due to which compost do not decompose. Turning of compost is done to ensure the temperature to every part of material. It should be kept in mind during turning that no outer part of heap may go inside and inner part of heap towards outside. Spray the water on outer dry part. First turning is done on sixth day. Add 3 kg CAN 1.2 kg Urea and 15 kg, bran at the time of this turning. Make the heat as such as heap of zero days.

Second turning (day 10th): Cut 1ft. layer from all five part (four sides + top of heap) and spray some water, then expose the rest of the part remained after cutting as mentioned above and leave for cooling. It should be kept in mind during turning that outer part should be turned inside and inner part should be turned towards outside. Add 5 kg, molasses in 10 liter of water and mix it in the compost before making the heap on this turning.

Third turning (day 13th): Turn the compost on 2nd turn and spray water on outer dry part. The moisture content in the compost should be optimum. Add 30 kg, gypsum in

the compost. Compost will not be sticky and greasy with adding the gypsum. Break the heap as like as turning on the 10th day.

Fourth turning (day 16th): As third turning was done likewise repeated 4th turning if the proper moisture in the compost.

Fifth turning (day 19th): If the full turning of the heap and then make the heap again. Keep the proper moisture condition in the compost.

Sixth turning (day 22nd): Make the turning of the full heat and again make the heap.

Seventh turning (day 25th): These days' ammonia gas and moisture is examined.

Eight turning (day 28th): Compost if there is no smell of ammonia from the compost and the compost is having proper moisture condition then the compost is ready for sowing. Before sowing the spawn the heap should be opened so that the temperature of the compost cools down. In specific circumstances, if there is a smell of ammonia then every third day turning

should be done. In case of poultry manure there are great chances of remaining of ammonia. In all circumstances no ammonia gas should be left in the compost otherwise it is very harmful for the spawn germination. The optimum moisture condition can be judged by the simple method in which the small quantity of compost is taken in hand and hand full quantity of manure and apply the pressure on the finger on the compost. If the water comes out as a drop between the fingers then it shows the optimum condition in the compost in case water is coming as a stream then it shows that there is excess moisture present in the compost. In such cases compost is open and dry till it contained optimum moisture condition before spawning.

Spawning: For cultivation of mushroom the seed which is called spawn. To have good production of the mushroom it is the basic requirement that the seed should be true to the type and a good variety of high quality. In a spawn there should not be any stickiness or any smell and any foul smell.

Seed rate: The seed of the mushroom is prepared in the empty glucose bottles or in the poly propylene bags. 500 gm. Spawn is required for 100 kg prepared compost. The seed booking should be done at least one month before of the spawning.

Method of spawning: – *Spawning and spawn run:*



The following given steps are involved here-

- Good quality compost with temperature of 25°C
- Mixing of grain based spawn (@ 0.50.7% of wet compost weight) of *A.bisporus* under clean conditions (*i.e.* with clean hands and pre-sterilized area)
- Filling of spawned compost into beds (68” depth)
- Little compressing and leveling of spawned compost
- Loosely closing the mouth of polythene bags filled with spawned compost (Covering with a clean newspaper / plastic sheet if filled in trays/shelves).

– Shifting the compost filled bags in cropping rooms with a temperature of $23 \pm 1^\circ\text{C}$ (air temp.), RH of 95% and high CO₂ conc. (1.01.5% strain dependent), and keeping the bags under above conditions for 12-14 days.

– Completion of spawn run (change of dark brown compost mass in to light brown color).

Casing and case run: Casing is a 34 cm thick layer of soil applied on top of spawn run compost and is a prerequisite for fructification

in *A. bisporus*.

Casing materials: Earlier subsoil material or organic matter rich soils were used as casing in button mushroom cultivation. Presently peat is the most desirable casing material used worldwide with excellent mushroom yields and superior fruit body quality. However, peat is not available in India. The other alternative recommended materials are:

- Well decomposed farm yard manure (FYM) preferably two years old
- Well decomposed spent mushroom compost (SMC) (two years old anaerobic decomposed)
- Composted coir pith (coir industry waste) (well decomposed and water leached)
- 1:1, 2:1 and 1:2, v/v of well decomposed FYM and SMC
- 1:1, v/v of decomposed FYM or SMC with composted coir pith
- Decomposed powdered bark of some forest trees
- Paper industry waste
- Burnt rice husk is also in use along with decomposed FYM (2:1, v/v) in seasonal cultivation of button mushroom in Haryana and Punjab with reasonable success.

Quality of casing materials: Soft texture, lightweight, high water holding capacity, high porosity, deficient in available

form of C and N, Neutral pH (7.0–7.5), low conductivity (400–600 μ moh).

Casing treatment: Casing material should be treated properly before its application on the spawn run compost and the steps involved are:

- Make a heap of casing material.
- Wet it upto 50-60 per cent water holding capacity.
- Fill in trays and shift them to pasteurization chamber.
- Steam pasteurization at 60-65 °C for 68 hours.
- Auto cooling alternatively.
- Make a heap of casing material on a cemented platform.
- Wet it upto 50-60 per cent water holding capacity.
- Drench the wet casing with formalin @ 1 lit/m³ (40% formaldehyde) by mixing with shovel.
- Cover it with polythene sheet and seal the outer periphery thereafter by pouring sand/soil on outside margin.
- Keep the material for 24-48 hours in sun for fumigation effect.
- Remove the cover after 48 h and expose the material to open air and sunlight by spreading over with clean tools and permitting the formalin fumes to escape in to air for 23 days before it is used as casing (formalin treatment effect decreases at low temperature due to inadequate fumigation).

Casing application:

- Unfold the fully spawn run bag and make the top surface even by gentle pressing with hands
- Light spray of water on spawn run compost
- Application of 45 cm thick layer of casing uniformly using iron rings of 4 cm height or wooden blocks water spray in installments immediately after casing application.

Casing and environment: After casing the temperature

should be maintained for one week for 23-25 °C. After that the temperature should be come down 17-18 °C. This temperature should be maintained till the growth of the mushroom. The temperature should not be increase through the burning of smoky material. If the mushroom's room temperature comes down below 12 °C then the steam should increase the temperature. The optimum moisture condition is necessary in the mushroom house. After casing the relative humidity should be maintained about 80 per cent when there is a production of mushroom then the relative humidity should be maintained 80-90 per cent. To maintain humidity on mushroom's room sprinkle the water on the compost and gunny bags of wind app. Doors the outside dry air is very harmful for the growth of the mushroom.

Air circulation: After the spread of the mycelium of the mushroom it is necessary once or twice to give fresh air to the room. The CO₂ percentage should not exceed more than 2 per cent. But for the formation of pin hold the CO₂ per cent age should not be exceed 0.3 per cent. At the time of production of mushroom the CO₂ should not exceed 0.08- 0.1. It clearly shows that at the time of pin head formation there should be a good aeration in the compost.

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