

In House Cultivation Methods for Mushroom

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Abstract: Mushrooms are truly remarkable organisms, characterized by their unique ability to thrive without chlorophyll and leaves. They derive nutrition by secreting enzymes from their mycelia to break down complex compounds like cellulose and lignin, converting them into usable biomass. Nutritionally, mushrooms are rich in protein, fiber, and vitamins while being low in fat and calories, making them valuable as food, tonics, and even medicinal supplements. In India and other developing countries, mushroom cultivation holds significant promise due to the abundant and accessible agricultural waste materials. Technologies for cultivating mushrooms like oyster, paddy straw, and milky mushrooms have been developed, utilizing materials such as paddy straw, wheat, soybean husks, and cotton wastes. This not only provides nutritious food sources but also supports eco-friendly practices and generates employment opportunities, particularly benefiting rural women and youth. (M.P. Thakur, 2014).

Keywords: Mushroom, Types, Cultivation, Compact Preparation, Importance & Future Prospective

I. INTRODUCTION

Mushrooms are one of the most loved food not only For its exotic taste but also for the benefits with which it Comes. It can be consumed in various forms like fresh, Pickled, dried, powdered, canned etc. Its farming has Picked up a fast pace among contemporary Entrepreneurs owing to its nutritional and medicinal Benefits and low cost input with high output. Mushrooms are a fleshy fungi (Basidiomycota, Agaricomycetes) having a stem, cap and gills Underneath the cap . They can be edible, wild and Some of them can be toxic too. It contains more than 90% water and less than 1% fat, loaded with Vitamin B, Copper and selenium and low in sodium . Usually Vegetables, milk and other food products are fortified With Vitamin D by irradiation or direct addition but Mushrooms are unique in this sense because they are Naturally a rich source of Vitamin D which otherwise is Procured from animals or poultry . The reason being That it contains copious amount of plant sterol “Ergosterol”. It is a precursor of Vitamin D which when Stimulated by sunlight or artificial lightening source Converts to Vitamin D. (Kratika Sharma,2015).



TYPES OF MUSHROOM:

Mushrooms are easily cultivable in hilly regions due To abundant moisture but can also be grown in artificial Environment with proper temperature and humidity Control. Varieties must be identified thoroughly as some of them might cause food poisoning or allergy upon Consumption. Some of the major varieties consumed in India are as follows:

1. Button Mushroom

Button mushroom (*Agaricus bisporus*) belongs to Class Basidiomycetes and Family Agaricaceae and is Native to Europe and North America. It is of two types White and brown, out of which white button mushroom is commonly grown in India . According to ICAR – Directorate of Mushroom Research, this variety Contributes more than 85% to mushroom production. It is the most relished variety used in eateries and Households. (R D.Rai & T Arumuganathan, 2008)

2. Shiitake Mushroom

Shiitake Mushrooms are native to East Asia and are Highly consumed in Asian countries. They readily grow On wood of deciduous and hard wood trees such as Oak, Chestnut, and Maple etc. and require moist and Warm climate. In rare cases they may cause allergic Reaction like itching but can be eliminated by thorough Cooking. These are used in Asian cuisines and Traditional medicines. (Stuti Agarwal,2017)

3. Oyster Mushroom

Oyster Mushrooms (*Pleurotus ostreatus*) belongs to *Pleurotus* species. It is known as “Dhingri” in India and Has fan or oyster shaped cap . They grow easily on Decaying wood or straw .(O. P. Ahlawat & Satish Kumar,2008)

4. Paddy Straw Mushroom

Volvarellia volvacea belongs to division Basidiomycota. It is usually grown on Rice straw bed And is used extensively in Asian Cuisines. (Money N.P,2004)

CULTIVATION OF MUSHROOM:

The basic requirements for mushroom cultivation Are manure/compost, spawns, right temperature and Humidity. Favorable growing conditions involve 80%-90% of relative humidity, ample ventilation, a Temperature range of 20-280 C during spawn run and 12-180 C for reproductive growth. Initially for a week Temperature must be maintained at 23 ± 20 C and then It can be reduced to 16 ± 20 C for subsequent weeks. The CO₂ concentration should be 0.08-0.15 % . If The above stated conditions are maintained Appropriately the pin heads start to appear within few Days and progressively mature into button stage. Apart From these insecticides, nutritional supplements like Nitrogen, vermiculite, water are also required for a Healthy harvest. The following steps are to be followed For mushroom cultivation:

Compost Preparation:

Preparing compost for mushroom growth typically involves using a mixture of organic materials such as wheat straws, horse manure, poultry manure, rice bran, and gypsum. There are many steps involved in preparation of Compost i.e Given in Below:

- **Mixing:** Chopped wheat straws or rice bran are mixed with horse dung, and water is sprinkled to achieve the right moisture level.
- **Fermentation:** The mixture is heaped into a pile to undergo fermentation. This process generates heat and breaks down complex compounds into simpler components, which are beneficial for mushroom growth.
- **Management:** Regular turning and watering of the compost pile are crucial to maintain optimal moisture levels and prevent it from drying out. Gypsum Addition: Gypsum may be added to the compost to improve its structure, reduce compactness, and enhance aeration.

- **Maturation:** The compost undergoes maturation for about 15 to 20 days, during which it stabilizes and becomes suitable for mushroom cultivation.
- **Application:** After maturation, the compost is spread onto wooden trays or beds and inoculated with mushroom spawns. This allows the mushroom mycelium to colonize the compost.



SPAWNING:

Spawning means planting mushroom mycelium, Growing on a suitable substrate, in the Government and non government agencies prepared and Sold the mycelium. NCMRT-National center for mushroom Research and training, cham baghat, solan (HP), India one Such central government institute. Mycelium of mushroom propagated vegetatively on Sterilized cereal grain is known as “spawn”. Commercial Mushroom growers purchase spawn from any of about a Dozen spawn companies. Farmers have a choice of growing different strains, ranging from smooth white, off-white, Cream, to brown capped mushrooms. These strains vary in Flavor, texture, and growing requirements. Spawn is Introduced and thoroughly mixed into the compost with a Special machine that mixes the compost and spawn with Small tines or finger-like devices (figure below and to the Right). After spawning, the compost is maintained at Approx. 24oC, and relative humidity and CO2 Levels are kept High to minimize drying of the compost. The spawn will Begin to grow and produce a thread-like network of Mycelium throughout the compost. Complete colonization Of the compost usually requires 12-20 days, depending on The spawning rate and environmental conditions.

- Perform the spawning by spreading the spawn on tray Beds when half filled with compost and again after The tray is filled completely. During spawning, the Spawn is gently mixed with fore-fingers and pressed Uniformly each time.
- Cover the trays with newspaper sheets.
- Sprinkle water on newspaper sheets, to provide Humidity.
- Stack the inoculated trays vertically, one over the Other, depending on the height of the room.
- Continue water spraying twice a day or less Depending upon available humidity in the atmosphere Throughout the spawn running and cropping period.
- Maintain temperature of the room between 24 and 25°C For 12-15 days for running of the spawn, i.e. formation Of mycelium strands all over the tray beds.

TYPES OF SPAWN:

1. Virgin spawn: when the spores of the mushroom fungus Fall on suitable substrate and the environment is also Suitable they germinate and form a mat of mycelium. This is dug out and use as spawn.
2. Fake spawn: when the beds are fully covered with Mycelium before a crop of mushroom appears, the Compost is collected, broken, dried and use fresh to Inoculate other new beds.
3. Brick spawn: A mass consisting of horse and cow dung Manure and loam mixed with water, tapped out in a Layer two inches thick and cut in to pieces when half Dry. These pieces are then inoculated with the old Spawn by making a hole in each and after the spawn Grows through the entire piece.
4. Grain spawn: spawn grain as a base. Larger grains carry A greater reserve of food material per grain of Mushroom mycelium .

CASING:

Casing indeed involves applying a layer of sterilized soil or dressing containing cow manure onto the compost where mushroom spawn has been mixed. This promotes the growth of mycelium on the compost surface, which eventually leads to the formation of mushroom heads or pins. It's crucial to harvest the mushrooms before the caps open fully to ensure optimal quality. In India, a number of mixtures have been recommended:

- Well rotten cow dung, mixed with light soil in 3:1 ratio
- Soil and sand in the ratio 1:1
- Farm yard manure and gravel, ratio 4:1
- Farm yard manure and loam ratio 1:1
- Soil peat mixture 2:1
- Spent compost, sand and slaked lime (4:1:1) and Nematicide mixture.

Casing mainly prepare in three steps:

- Preparation of casing soil
- Sterilization of casing soil
- Casing the Beds

Preparation of casing soil:

1. Mix four parts of spent compost with one part of sand To which 5kg of slaked lime per cubic meter of Compost is added.
2. Treat the mixture with nemagon, a nematicide, by Spraying or sprinkling it at the rate of 5ml per cbm.
3. Leave the material in a pile (1.20M ×1.0M) under a Tree shade for a period of one year, turning it every 4 Months.
4. Sieve the spent compost, which turns into black soil In one year, for removal of undecomposed lumps.

Sterilization of casing soil:

Sterilize the casing material either by the chemicals (formalin, chloropicrin, methyl bromide or vapam) or by Heating or by steam from boiler through perforated pipes And temperature raised to 70-75°C and maintained for 6 Hours. The purpose of sterilization is to kill harmful Microorganisms (fungi, nematodes, and insects).

Casing the beds:

Remove the newspaper sheets from the spawned beds After 3 weeks.
Gently press the compost with 2-2.5 cm thick layer of Sterilized casing material.

HARVESTING:

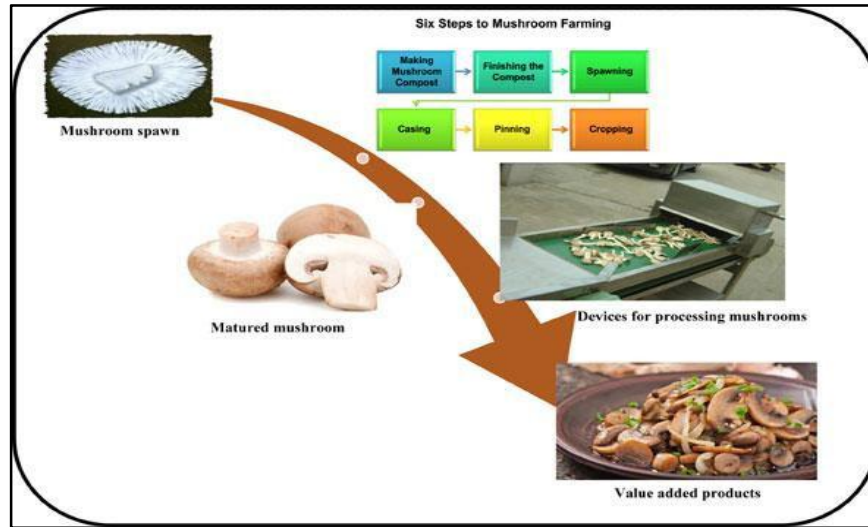


Harvest the crop everyday (in the morning and Evening depending upon the market demand) to get a good Quality of mushrooms (the cap still being tight to its stalk is The right stage to harvest the mushrooms.) Harvesting is Done by holding the cap with fore-fingers slightly pressed Against the soil and twisted out. The mycelial strands and Soil particles clinging to the base of the stalk are cut of with A knife. Specially desinged wooden box is used for Collection of mushrooms from multistoried trays, each Provided with the hooks for resting it against the side board Of the mushroom tray.(Ahlawat,2011)

PROCESSING:

Mushroom are very fragile and have a short shelf Life, unless consumed fresh. At ambient temperature they lose their freshness within a day and deteriorates Rapidly if not processed or refrigerated. They also tend To brown due to presence of compound Tyrosinase. It Converts monophenols to diphenols which in turn are Oxidized to quinones resulting in the formation of Insoluble brown pigment called Melanin .

Initial processing involves washing mushrooms to Remove adhering soil or compost and blanching them For few minutes to inactivate the enzymes. In order to Prevent discoloration they are treated with brine, salt or Citric acid prior to canning or packaging.



STORAGE:

Store the mushrooms at 4°C in a refrigerator For a few days to avoid the quality deterioration, because Mushrooms are a highly perishable commodity. The white Colour turns brown and then black in a couple of hours at High summer temperature. Soon after water oozes out and The mushrooms become unfit for cooking.

Importance of mushroom cultivation in India

1. Mushroom cultivation is labour intensive activity.
2. Mushroom harvesting is not automatic process.
3. It helps in maintaining the cycle of nature by Decomposing agro residues.
4. Good source of high quality of protein rich in vitamins And minerals. It is good for vegetarian population.
5. It provide excellent opportunity to educate rural youth And provide job.
6. Opportunity to use wastelands.
7. Rural women which are educated or uneducated easily Handle.

Future prospects :

India has tremendous potential for mushroom production, and all commercial edible and medicinal Mushrooms can be grown. There is increasing demand for quality products at competitive rates both In domestic and export markets. To be successful in both domestic and export markets, it is essential To produce quality fresh mushrooms and processed

products devoid of pesticide residues and at Competitive prices. It is also important to commercially utilize the compost left after cultivation for Making manure, vermi compost and briquettes for additional income and the total recycling of Agro-wastes. Mushrooms can make an important contribution to the livelihoods of rural and Peri-urban dwellers, through food security and income generation, and mushrooms can make a Valuable dietary addition through their protein and micronutrient contents as well as their medicinal Properties. Mushroom cultivation can represent a valuable small-scale enterprise option.

Growing mushrooms also helps to avoid some of the challenges facing collectors of wild fungi, Including species identification, obtaining access and permits for collecting, and practicing Sustainable harvesting. Cultivation is also independent of weather, and can recycle agricultural By-products as composted substrate which, in turn, can be used as organic mulch in growing other Horticultural crops, including vegetables. Mushroom cultivation is highly compatible with a variety Of other traditional agricultural and domestic activities, and can make a particularly important Contribution to the livelihoods of the disabled, of women and the landless poor who, with appropriate Training and access to inputs, can increase their independence and self-esteem through additional Income generation.(Wakchaure G C,2011)

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