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Cultivation of Oyster Mushroom (*Pleurotus ostreatus*)

(*Archana Kumawat[1], Mayank Bishnoi[1], Hansa Kumawat[2], Gayatri Kumawat[3], Mradula Bhadouria[1] and Manish Paroda[1])
[1] Research Scholar, Department of Plant Pathology, Jawaharlal Nehru Krishi Vishwa Vidhalya, College of Agriculture Jabalpur-482004, Madhya Pradesh, India
[2]Research Scholar, Department of Soil Science and Agriculture Chemistry, Rajasthan College of Agriculture, Udaipur, Rajasthan, India
[3]Research Scholar, Department of Genetics and Plant Breeding, Sri Karan Narendra Agriculture University, Jobner, Rajasthan-303329
*Corresponding Author's email: archukumawat8@gmail.com

Mushroom is kind of macro fungus having a unique fruiting body, which can be hypogenous or epigeous, large enough to be visible with the naked eye and hand-picked (Chang and Miles, 1989). Taxonomically, they belong to the class Basidiomycetes and order-Agaricales (Nair, 1982). Mushroom is fungi that have fleshy, spore-bearing reproductive structures that grow on organic substances. Because of its nutritional and therapeutic characteristics, it has been used as a human meal for a long time (Etich *et al.*, 2013).

Oyster mushrooms (*Pleurotus ostreatus*) are a popular and versatile edible mushroom that are prized for their meaty texture and delicate flavour. They are widely cultivated all over the world, both commercially and by hobbyists. Mushrooms require carbon, nitrogen and inorganic compounds as their nutritional sources and the main nutrients are carbon sources such as cellulose, hemicellulose and lignin. Oyster mushrooms require more carbon source and less nitrogen. Thus, most organic materials containing cellulose, hemicellulose, and lignin can be utilised as mushroom substrate

In India, oyster mushroom is commonly referred to as 'dhingri' and grows naturally in the temperate and tropical forests on dead and rotting wooden logs. It might also grow on decomposing organic materials. Depending on the species the fruit bodies of this mushroom are distinctly shell or spatula shaped with different shades of white, cream, grey, yellow, pink or light brown. It is one of the most suitable fungal organisms for producing protein rich food from various agro-wastes or forest wastes without composting (Anonymous, 2018).

Oyster mushroom can thrive at moderate temperature ranging from 20 to 30^{o} C and relative humidity 60-80% up to 6 to 8 months of monsoon and winter in a year. It may also be grown in the summer by providing the additional humidity essential for development. In two months, 100 kg of wheat and rice straw may produce around 600 kg of fresh oyster mushrooms (Uddin *et al.*, 2011).

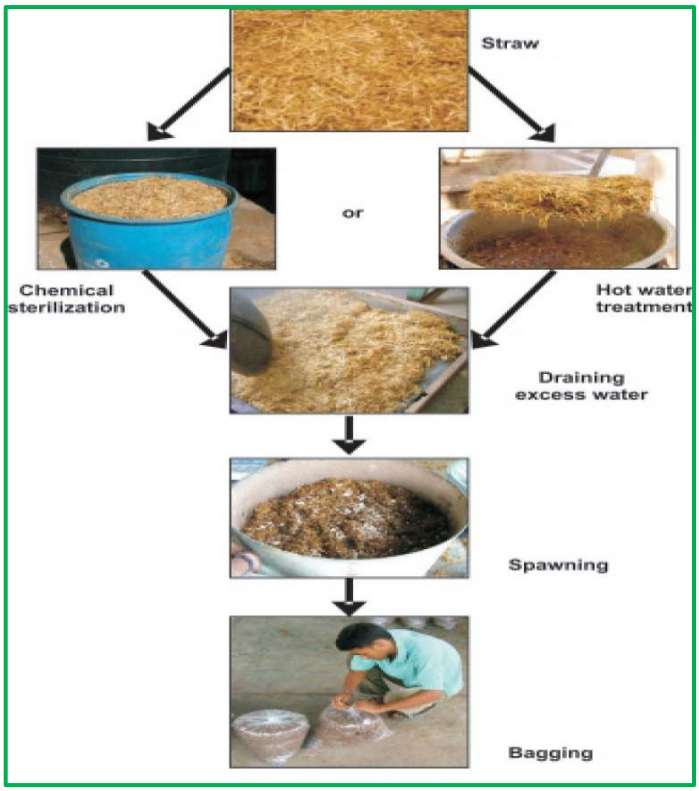
Importance of Oyster Mushroom

1. Immune system support
2. Lowering high blood pressure
3. Regulating cholesterol levels
4. Building strong bones
5. Anti-inflammatory properties

6. Anti-cancer properties
7. Protecting the heart against cardiovascular disease
8. Defend against neurodegenerative diseases

Procedure of growing oyster mushroom

1. **Substrate preparation and treatment:** The wheat or paddy straw is chopped in 3-5cm long by hand or mechanically. The chopped wheat straw (10 kg) is filled into gunny bags for 12-24 hours of soaking in 100 lit. of water, while paddy straw is treated in boiled water for 15-25 minutes. The wheat straw is also treated with boiled water. This decision is purely based on the capacity of straw to absorb and retain the moisture. In some cases, 75 ppm Bavistin and 500 ppm formaldehyde is used instead of the boiled water treatment. The hours of treatment vary according to the substrate or substrate composition.
2. **Spawn preparation:** 10kg of wheat grains are boiled for 15 minutes in 15L of water and then allowed to soak for another 15 minutes without heating. The excess water is drained off and the grains are cooled in sieves. The grains should be turned several times with a spoon for quick cooling. The cooled grains are mixed with the gypsum 2 % and 0.5% of calcium carbonate (CaCO3). The gypsum prevents the grains from sticking together and the calcium carbonate is necessary to correct the pH. The prepared grains are filled into half-liter milk bottles or polypropylene bags (150-200g per bottle or bag) and autoclaved for 2 hours at 121℃. After sterilization, the material should have a pH value of 7. The bottles are inoculated with grains or bits of agar medium colonized with mycelium, and then incubated at 22-24℃ in a dark place. The mycelium completely spreads through the grains in about 2 weeks.
3. **Substrate inoculation:** The cooled substrate is inoculated with spawn by layers at a rate of 3% on a wet basis to make the blocks. The procedure of block making is as follows.
    1. The wooden frame of 60×45cm is placed on a smooth floor.
    2. The jute ropes and poly sheet are placed on the frame.
    3. The frame is filled with approximately 5 cm of cooled pre-treated straw and compressed by the wooden lid.
    4. The spawn is sprinkled over the whole surface
    5. The same procedure is repeated five times to achieve a depth of 25-30cm.
    6. The plastic sheet is folded over the top of the frame and tied down with help of ropes previously placed below the plastic. The frame is removed from the block.
    7. Small holes of approximately 2mm in diameter are punched in the block for breathing. The blocks are later placed on the shelves in single layer for incubation.
4. **Spawn run and pin initiation:** The block temperature is maintained at 25℃ for 12-15



Procedure of bag filling

days. Once the blocks are fully colonized, they are hung, after removing the polythene, in a room where the relative humidity is maintained above 85%. The humidity is normally maintained by frequent spraying of water on the blocks and on the floor. The pins are visible 9 days after the opening of the blocks.

5. **Fruiting and picking:** A high relative humidity and proper ventilation is maintained in the growing room during pinning and fruiting body development. The mushrooms are usually picked for fresh market sales. Most of the growers take 3 flushes. Mushrooms picked in the third flush are mostly used for sun drying, where maximum dry matter is achieved.

Disease and Pest of Oyster Mushroom

A wide range of diseases and pests can cause serious problems in mushroom cultivation, and management of those diseases and pests is a key factor in successful mushroom production. The main reasons for the existence of many diseases and pests problems in mushroom cultivation can be summarized as

- Mushroom cultivation conditions such as high humidity and warm temperature are favored by many pathogens and pests.
- There is a limit on chemical use for control of diseases or pests in mushroom cultivation.
- Pathogens and pests are readily attracted inside and/or outside mushroom houses involved with continuous cultivation.
- Growing houses are not usually well equipped for environmental control.

Diseases

1. **Green mould (*Trichoderma viride*):** It is the most common disease in oyster mushroom where green coloured patches are observed on cubes.
2. **Bacterial Brown blotch disease (*Pseudomonas tolaasii*):** Bacterial brown blotch has various symptoms. The most typical symptom is a brown spot on the caps and stipes. The brown spots enlarge and coalesce with other spots, and the affected areas are sunken and covered with sticky material. At this stage a rotten fish smell is evident.

Pests

1. **Flies:** Sciarid flies, Phorid flies, Cecid flies are found to be attracted to mushroom and odour of spawn. They lay eggs on the straw or mushroom, and the larva emerging from them and damage the crop. Larva feed on the mycelium, mushroom and penetrate inside the fruiting bodies making it unfit for consumption.
2. **Mites:** These are very thin, small crawling arthropods that appear on the mushroom body. They are not damaging, but annoy the grower when present in large numbers.
3. **Slugs, Snails**: These pests chew up portion of the mushroom which may later get infected with bacteria and affect the quality of the crop.

Basic Practices for Disease and Pest Management

1. Sanitation and strict hygiene are the most important preventive methods for pest and disease control. Without them, effective disease or pest control will never be achieved. Every practice must focus on exclusion and elimination of pathogens or pests.
2. Keep doors closed and avoid any practices that expose substrates to pathogens or pests during spawning.
3. Keep mushroom flies from entering mushroom houses by installing screens on windows and doors.
4. Inspect mushroom bags or beds carefully for early detection of pests and diseases.
5. Keep mushroom bags or beds clean by removing any mushroom debris or mushroom stumps shortly after harvest.
6. Keep the floors clean. Do not dump any waste near mushroom houses, which can attract mushroom flies.

7. Disinfect or pasteurize spent substrate before removing it from mushroom houses after cultivation.
8. Clean and disinfect mushroom houses thoroughly before a new crop.
9. Clean and disinfect equipment frequently.
10. Wear clean clothes and shoes and wash hands before entering mushroom houses.

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