

Importances of Mushroom and Cultivation of Oyster Mushroom (*Pleurotus Spp.*)

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Mushrooms are basically fungi, which have a fleshy and spore-bearing fruiting body. Mushrooms have been consumed as food by human beings since ancient times. Pharaohs ate mushrooms as a delicacy, Greeks believed them to be a source of strength and Chinese regarded them as health food. Approximately more than 14000 species of mushrooms present in the world and among them nearly 3000 species are edible, about 1500 species have been known for their medicinal properties and around 1400 species were recognized as poisonous mushrooms. Today, mushrooms are consumed by people, for their flavour, texture as well as for the health benefits. Mushrooms are placed between meat and vegetables because of their nutritional content. They are also famous as medicine because they consist of a large number of bioactive molecules and properties. Hence mushrooms found their place in daily diets in many parts of the world.

Mushrooms are rich in proteins as compared to cereals, fruits and vegetables and also are rich in vitamins. In addition to proteins (3.7%), they contain carbohydrate (2.4%), fat (0.4%), minerals (0.6%) and water (91%) on a fresh weight basis. All the nine essential amino acids are present in mushrooms which are very much essential for the growth. Mushrooms are an excellent source of thiamine (Vitamin B1), riboflavin (B2), niacin, pantothenic acid, biotin, folic acid, vitamin C, D, A and K. It was noted that the vitamin contents were retained even after cooking mushrooms. Since mushrooms possess low caloric value, high protein, high fibre, high potassium and sodium ratio are usually recommended in the diets of diabetic, heart and hypertension patients. It was believed and found that consumption of seasonal wild mushroom at least once in a year increases immunity in human beings. This is because as they comprise diverse group of chemical constituents.

In India major portion of livelihood is from agriculture and variety of crops were produced in India because of diverse agro climate. At present, the changing and unstable environmental conditions made agriculture a difficult task. Apart from this availability of abundant agricultural waste and

manpower, making it more suitable for cultivation of all types of temperate, subtropical and tropical mushrooms. Any interested farmer or landless unemployed youths and other entrepreneurs can profitably cultivate mushrooms. Cultivation of mushrooms requires less, or no land as compared to other agricultural crops and is fundamentally an indoor activity. Cultivation of mushrooms will be one of the options where the agricultural wastes can be ideally utilized or otherwise these wastes may pose a problem of disposal accounts for atmospheric pollution.

Mushroom cultivation will play an important role in integrated rural development programmes by increasing income and self-employment opportunities for village youths, women folk and housewives to make them financially strong and also in pollution reduction from agricultural wastes.

Oyster Mushroom (*Pleurotus spp.*) Cultivation



Oyster mushroom (*Pleurotus spp.*) is famously known as Dhingri in India. There are nearly six Oyster mushroom species namely *P. ostreatus*, *P. florida*, *P. flabellatus*, *P. citrinopileatus*, *P. sajor-caju*, *P. djamorete* are being artificially cultivated in India and elsewhere.

The Oyster mushrooms are found in temperate, subtropical and tropical forests naturally growing on dead and decaying woods. Over the periods these Oyster species were adapted for cultivation under artificial conditions. Following are the advantages of cultivation of Oyster mushrooms.

- They can grow on wide range of agricultural waste.
- They can be cultivated in wide temperature range (20-30° C)

- Conversion rate is maximum
- Can be cultivated with low investment
- Less disease prone compared to others
- Has excellent nutritional and medicinal properties
- Good opportunity to create jobs for rural folks

Hence the cultivation of Oyster mushroom is more situated in countries like India. Following paragraph throw light on Oyster mushroom cultivation procedure.

Table 1. Nutrition content of Oyster mushroom per 100 grams

Name the contents	Amount and Unit	Name the contents	Amount and Unit
Water	89.2 g	Vitamin A, RAE	2 µg
Energy	33 kcal	Carotene, beta	29 µg
Energy	139 kJ	Vitamin A, IU	48 IU
Protein	3.31 g	Tocotrienol, alpha	0.03 mg
Total lipid (fat)	0.41 g	Vitamin D (D2 + D3), International Units	29 IU
Ash	1.01 g	Vitamin D (D2 + D3)	0.7 µg
Carbohydrate, by difference	6.09 g	Vitamin D2 (ergocalciferol)	0.7 µg
Fiber, total dietary	2.3 g	Fatty acids, total saturated	0.062 g
Total Sugars	1.11 g	Tryptophan	0.042 g
Glucose	1.11 g	Threonine	0.14 g
Calcium, Ca	3 mg	Isoleucine	0.112 g
Iron, Fe	1.33 mg	Leucine	0.168 g
Magnesium, Mg	18 mg	Lysine	0.126 g
Phosphorus, P	120 mg	Methionine	0.042 g
Potassium, K	420 mg	Cystine	0.028 g
Sodium, Na	18 mg	Phenylalanine	0.112 g
Zinc, Zn	0.77 mg	Tyrosine	0.084 g
Copper, Cu	0.244 mg	Valine	0.197 g
Manganese, Mn	0.113 mg	Arginine	0.182 g
Selenium, Se	2.6 µg	Histidine	0.07 g
Thiamin	0.125 mg	Alanine	0.239 g
Riboflavin	0.349 mg	Aspartic acid	0.295 g
Niacin	4.96 mg	Glutamic acid	0.632 g
Pantothenic acid	1.29 mg	Glycine	0.126 g
Vitamin B-6	0.11 mg	Proline	0.042 g
Folate, total	38 µg	Serine	0.126 g
Folate, food	38 µg	Betaine	12.1 mg
Folate, DFE	38 µg	Choline, total	48.7 mg

Protocol for cultivation of Oyster Mushroom

1. Take fresh dry paddy straw, chop it into small pieces of 2 to 3"
2. Rinse and soak them in clean water for about 8 to 10 hrs
3. After soaking drain out the water completely and boil paddy straw for 30 mins
4. Drain out the water completely and spread the boiled straw on a clean wire mesh to remove excess water
5. Take polythene bag of 12" x 18" or 14" x 24" size and make few holes at the bottom and other sides of the polythene bag.

6. Fill up the prepared paddy straw to about 4" thick inside the polythene bag and press it slightly
7. Spread the half handful of spawn seeds uniformly all along the periphery of the filled paddy straw
8. Repeat this procedure of filling the bag for 4 to 5 times with straw and running spawn
9. Once the bag filling and spawning is over, bag must be tied and a label has to be fixed indicating the date
10. Bags are later shifted to spawn running room where temperature of $25 \pm 2^{\circ}\text{C}$ is maintained
11. Bags are kept for 18 to 20 days during which spawn seeds would start growing and appear as a white cottony growth inside the polythene bag
12. After 20 days of incubation, cut open and remove the polythene bag
13. At this stage white cottony growth on bundle of paddy straw is seen
14. Keep the bundle in a cool, clean and ventilated room and spray water 2 to 3 times a day,
15. Needle shaped pin heads start appearing all round the paddy straw within 2-3 days of removing polythene bag
16. In another 2-3 days, these pin heads develop into regular size mushrooms
17. Mushroom can be harvested when they attain a size of 6-8 Cm
18. Harvesting can be done by twisting of the stub slightly at the base
19. Two to three harvests at an interval of 6 to 7 days can be obtained from one crop

Harvest and yield

Matured and fully opened sporocarps were harvested by placing the thumb and forefinger near the base of the fruiting body and twisted in clockwise direction to get detached from the mycelium. First harvest will be ready on 15 to 21 days. After first harvest spray the water for maintaining the moisture at 60-65% in cultivation beds. Second harvest may develop after one week. Totally three to four harvests can be taken from one bed within 35- 45 days period. An average yield of 500-700 g can be harvested from 1 kg of straw. The spent straw can be used as enriched cattle feed.

Nutritional Value of Oyster Mushrooms

Oyster mushroom is rich in nutrition content. Table 1 shows the nutrition content given by FAO (2018) per 100 grams of raw mushroom. In general mushrooms contain less amounts of calories and consists of approximately 80 to 90 percent water. At the same time, they have low sodium, carbohydrate and fat content and high fiber content. This is the reason why mushrooms are considered good for those aiming for weight loss. Mushrooms are an excellent source of potassium. It is said that there is more potassium in a mushroom than a banana. Since potassium helps to lower the blood pressure and intern reduce the risk of stroke. Hence mushrooms are recommended to the people suffering from hypertension. Mushrooms are rich in copper, a mineral that has cardio-protective properties. A single serving of mushrooms is said to provide about 20 to 40 percent of the daily needs of copper. Mushrooms are believed to be helping to fight against cancer. They are an excellent source of selenium, an antioxidant that works with vitamin E to protect cells from the damaging effects of free radicals. Many mushrooms have been found to restrain the activity of aromatase, an enzyme which is involved in estrogen production, and 5-alpha-reductase, an enzyme that converts testosterone to DHT.

Researchers have suggested that mushrooms can reduce the risk of various types of cancers. Further the white mushrooms have been found to help in diminishing cell proliferation as well as tumor size. Shiitake mushrooms comprise of Lentinan, a beta-glucan that has been associated with stimulation of the immune system and thus, is believed to be helpful in fighting against AIDS. It also helps to fight against infections and exhibits antimicrobial activity. Mushrooms being rich in fiber, protein and Vitamins, they help to maintain a healthy metabolism.

Medicinal and Economic Value of Mushrooms

Scientific and advanced research focus on wild and cultivated mushrooms that may have hypoglycemic activity, anti-cancer activity, anti-pathogenic activity, and immune system enhancing activity. Recent research findings indicated that Oyster mushroom naturally contains the cholesterol drug lovastatin. Literature suggests that mushrooms produce large amounts of vitamin D when exposed to UV light, and certain fungi may be a future source of taxol. To date, penicillin and the statin drugs lovastatin, and mevastatin, are the most famous pharmaceuticals which have been isolated from Fungi. Other pharmaceuticals derived from fungi include

ciclosporin, griseofulvin, cephalosporin, and ergometrine.

Research is currently being conducted as to how the mushroom may help to prevent breast cancer, prostate cancer, and other lifestyle diseases such as heart disease, diabetes, high cholesterol, and obesity.

In India, the use of mushrooms dates back to Vedic period nearly 4000 years and is considered to be one of the “soma rasa plant”. This preparation may probably be a preparation of mushrooms taken to gain long life and divine qualities. The Ayurvedic texts mention the use of mushrooms as medicine for increasing vigor and energy. It also mentions that the mushrooms have the potency to cure many diseases arising from the disorders of three substances (Pitha, Kapha and Vaata) in a person’s body. Ancient Chinese civilizations use mushrooms as foods and also for medications. Archaeological findings reported the use of *Ganoderma* species could date back to 6800 years ago. The use of mushrooms was cited in Shen Nong Materia Medica, a Chinese medicinal book, published approximately 2000 years ago.

For centuries, the Japanese have hailed the shiitake mushroom as an elixir of life. Romans considered mushrooms as Foods of God, whereas Greeks regarded them as strength boosters to soldiers in the war. Food Agriculture Organization (FAO) also considered mushrooms as a food for underdeveloped countries where the protein malnutrition is very common.

The global mushroom cultivation is exponentially increasing and in 2018–2019 it was reported to be 43 million tons were produced. The analysis says that it may surpass 50 million tons by the

year 2025. Most commonly cultivated mushrooms in India are from the genera *Agaricus* (70%), *Pleurotus* (17%), *Volvariella* (9%), *Calocybe* (3%), *Lentinula*, *Cordyceps*, *Ganoderma*, etc. (1%) and India ranks 18 with 201 thousand tons of mushroom production. The major mushroom-producing countries are China, the European Union, the United States, Japan, Korea, Canada, Australia, and others.

Globally Oyster mushrooms are the 3rd largest cultivated mushroom. They are cultivated in about 25 countries around the globe. China is the largest producer of Oyster mushroom with approximately 88% of the total world production. India produced around 10,000 tons of Oyster mushroom annually. This mushroom is majorly cultivated in Japan, Italy, Philippines, South Korea, Taiwan, and Thailand. In India it is cultivated in the states of Andhra Pradesh, Karnataka, Maharashtra, North-Eastern States, Orissa, Madhya Pradesh and in West Bengal. The Oyster mushroom market size has increased over recent years from 2.79 billion dollars in 2023 to 2.94 billion dollars in 2024. Cultivation and production of Oyster mushroom in India is less because the local demand is low and the export demand orders are large. To overcome this problem a linkage between producer, cooperatives and exporters is very much needed.

The increase in mushroom cultivation is because of extended interest in mushrooms as medicine and food. Use and cultivation of mushrooms are very much needed for the country like India to attain the food security in coming future. Oyster mushroom can be one of the answers because of its fast-growing nutritional features and global demand.

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