ORIGINAL ARTICLE

A Review of the Beneficial Growthing of Oyster Mushroom Cultivation for Improved Nutritional Value for Human Health on the Loyola Degree College (YSRR) Pulivendula

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ABSTRACT Oyster mushrooms are a type of edible mushrooms commonly called Pleurotus. It has been shown to have beneficial medicinal properties. As a result, they have been classified as both functional foods and medicinal mushrooms and are listed as "mushroom nutriceuticals. Oyster mushrooms (Pleurotus species) have a high potential for use as a food or extracts from fruiting bodies or mycelium in alternative therapies for atherosclerosis, including the prevention and treatment of oxidative stress, hypertension, and hypercholesterolemia. These mushrooms have bioactive components that are sufficient for the prevention and treatment of a variety of lifestyle diseases. The genus Pleurotus contains approximately 200 different species, which are commonly referred to as "oyster mushrooms." **Objective:** The study aimed to grasp a collective information on nutraceutical and processing aspects of highly perishable but nutritious oyster mushroom. **Results:** Because of its superior flavour, taste, and nutraceutical properties, Pleurotus ostreatus is the most commonly consumed species worldwide. It is a natural antioxidant source that may be beneficial to human health by preventing or reducing oxidative damage. These mushrooms are higher in proteins, dietary fibres, glucan, vitamin B-complex, vitamin C, minerals, and amino acids like methionine, cystine, and aspartic acid than other edible mushrooms. According to reports, oyster mushrooms have hypocholesterolemic, anti-bacterial, anti-diabetic, anti-oxidant, anti-arthritic, anti-carcinogenic, hepatoprotective, anti-viral properties and act as natural immunotherapy resources. **Conclusion:** Because of the occurrence of abundant nutritional ingredients and other bioactive components in P. ostreatus, they have a great scope as a potential source for the development of functional or specialty foods for value addition of deficient foods so as to alleviate the nutritional deficiency diseases from society.

Keywords: Bioactive components, nutritional, oyster mushrooms, pharmaceutical, Pleurotus, processing aspects

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INTRODUCTION

The first reliable evidence of mushrooms being consumed as food was found in China several hundred years ago. Mushrooms have long been used in traditional Chinese medicine (Abidin *et al.*, 2016). Mushrooms were reportedly first cultivated in China around 600 AD. Mushroom consumption is increasing rapidly due to its balanced nutritional composition and will provide health benefits

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because they are low in calories, sodium, fat, and cholesterol but high in fiber, vitamins, and minerals. Furthermore, oyster mushrooms have the potential to address the problem of protein malnutrition in developing and underdeveloped countries (Arini Nuran Mohd Rashidi *et al.*, 2016). Oyster mushrooms were first isolated in India, and this strain has been identified as the best strain for tropical and subtropical cultivation. In Malaysia, oyster mushrooms are commonly consumed as soup, grilled, or deep fried, and they are popular as street food (Arini Nuran Mohd Rashidi *et al.*, 2016). People now eat mushrooms for their texture, flavor, and nutritional and medicinal properties. Mushrooms are regarded as valuable resources in food production as well as a source of lead compounds in drug manufacturing. Mushrooms are classified as a healthy food because they are low in calories and fat while being high in protein and minerals. Their health benefits include immunomodulatory, hypocholesterolemic, and anti-tumor effects (Abidin *et al.*, 2016). Experimental evidence suggests that one of the most important food components that help to reduce serum cholesterol is its polyunsaturated fatty acid (PUFA) content (Hashimoto *et al.*, 1999 and 2001; Gamoh *et al.*, 1999 and 2001; Hossain *et al.*, 1999; and Chiroro, 2004). Reacerch reports revealed that 14 species of culinary-medicinal mushrooms (*Agrocybe sp., Auricularia auricular-judae, Flammulina velutipes, Ganoderma lucidum, Hericium erinaceus, Lentinula edodes, Pleurotus cystidiosus, P. eryngii, P. flabellatus, P. florida, P. sajor-caju, Schizophyllum commune, Termitomyces heimii, and Volvariella volvaceae*) have antioxidant and anti-hypertensive properties (Abidin *et al.*, 2016).

NUTRITIONAL COMPONENTS

The oyster mushroom is a popular food mushroom that is grown all over the world. It has a distinct flavour and aromatic properties, and it is high in fibre, protein, carbohydrates, vitamins, and minerals, with a lower fat content. Many studies have found oyster mushrooms to be edible and a potential source of medicinal and nutritional components. Oyster mushrooms are said to be a good source of dietary fibres and polysaccharides like glycogen, as well as other indigestible fibres like - and - glucans, chitin, cellulose, and hemicelluloses like galactans, mannans, and Xylans. Pleurotus spp. contains carbohydrates primarily in the form of glycol-proteins or polysaccharides. Polysaccharides are composed of - and - glucans, chitin, and other hemicelluloses (such as galactans and mannans). However, nutritional composition of *Pleurotus* may differ according to chemical and physical differences in the growing medium and genetic structure of species. It contains about contains thiamin 1.9-2.0, riboflavin 1.8-5.1, niacin 30-65, folate 0.3-0.7 and ascorbic acid 28-35 mg/100 g, 17-42% proteins, 37-48% carbohydrates, 0.5-5% lipids, 24-31% fibers, and 4-10% minerals on dry weight basis (Krishan Kumar *et al.*, 2018).

NUTRITIONAL FACTS OF OYSTER MUSHROOM

One cup raw, sliced oyster mushrooms (86 g) contains 28 calories, 2.9 g protein, 5.2 g carbohydrates, and 0.3 g fat. Niacin, fiber, and riboflavin are all abundant in oyster mushrooms. The USDA provides this nutrition information.

Carbs

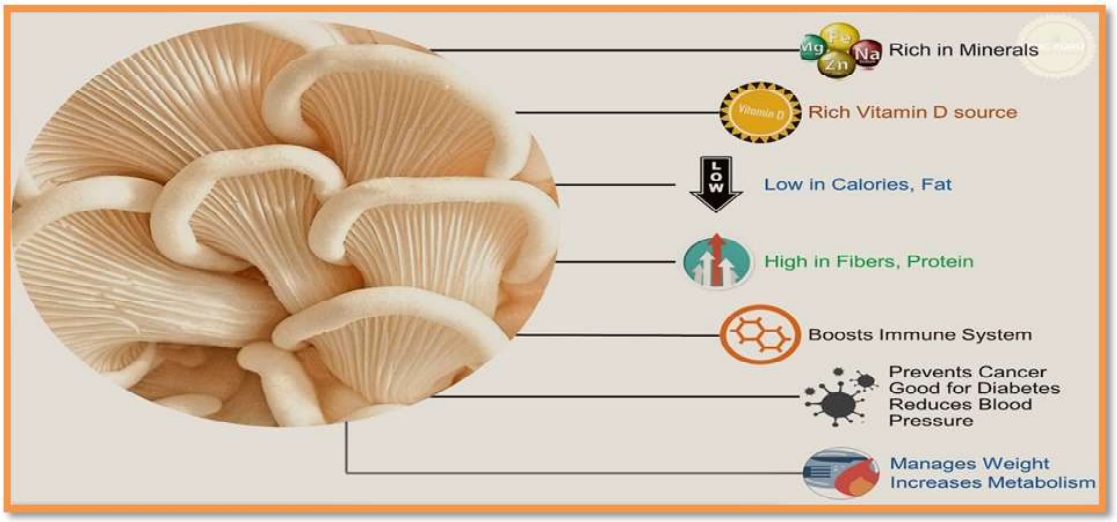
There are just 28 calories in a cup of raw, sliced oyster mushrooms. Most of the calories come from carbohydrates (5.2 g). The mushrooms are low in sugar, providing just under 1 gram of naturally occurring sugar. You'll benefit from 2 grams of fiber when you eat them. The rest of the carbohydrate in oyster mushrooms is starch.The glycemic load of a 1-cup serving is estimated to be 3, making them a low-glycemic food.

Figure 1

S. No.	Components	Availability
1.	Calories	28 g
2.	Fat	0.3 g
3.	Sodium	15.5 mg
4.	Carbohydrates	5.2 g
5.	Fiber	2 g
6.	Sugars	0.95 g
7.	Protein	2.9 g
8.	Niacin	4.27 mg

Source: ***https://www.verywellfit.com/the-benefits-of-oyster-mushrooms-89610***

Figure 2



Source: ***httpswww.youtube.comwatchv=mjAk61Jawuc***

Fats

Oyster mushrooms are nearly fat-free, providing just 0.3 grams per serving.

Protein

You'll get almost 3 grams of protein when you consume a cup of oyster mushrooms.

Vitamins and Minerals

Oyster mushrooms are an excellent source of several vitamins, including niacin (providing 21% of your recommended daily intake), riboflavin (18%), and pantothenic acid (11%). You'll also get smaller amounts of folate, vitamin B6, and thiamin. Minerals in oyster mushrooms include phosphorus, potassium, copper (10% of your daily needs for each), iron, magnesium, zinc, manganese, and selenium.

Calories

One cup of raw, sliced oyster mushrooms (86 g) provides 28 calories, 59% of which come from carbs, 32% from protein, and 10% from fat (Krishan Kumar *et al.*, 2018).

MATERIALS AND METHODS

Preparation of Substrate by Using Raw Materials

Oyster mushrooms can be grown on a wide range of substrates, including wheat straw, paddy straw, maize straw/ cobs, cotton hulls, saw dust, and others. In fact, it can grow on any type of cellulosic waste. In India, it is typically grown on wheat or paddy straw. It is more appropriate for our country. It grows well on a variety of agricultural, horticultural, and forest wastes. It does not require composing, its cultivation technique is simple, and it can be grown on a small scale in huts. It can be grown in our country's tropical regions because there are several varieties that can grow between 20 and 30 degrees Celsius. Furthermore, we have varieties that can grow in temperatures as low as 20 °C. The substrate must first be prepared. Composting of the substrate is not required for oyster mushroom cultivation. As previously stated, a variety of cellulosic waste, such as wheat straw, paddy straw, corn cobs, saw dust, cotton hulls, and so on, can be used for cultivation depending on availability. Wheat straw is the most commonly used substrate in our country, followed by paddy straw. After harvesting, we must ensure that the substrate is not exposed to rain.

Use of Straw as Such Without any Treatment

We soak straw in water overnight and use it for cultivation. To make the pH slightly basic, add 1% lime powder to the water. We soak the straw overnight, then remove it and let it air dry before spawning. It must be ensured that the straw is fresh, meaning that it has not been exposed to rain. The spawning rate is kept higher, at 4%. On a wet weight basis, we normally add about 2.5% spawn. It may be necessary to keep moisture at a lower level and to close the bags to increase carbon dioxide production. This is not, however, a recommended method, especially at the commercial level. The majority of farmers in Odisha's coastal regions keep the bags in single layer in simple huts made of coconut leaves. Due to natural high humidity, it becomes possible to cultivate this mushroom in simple huts.

We can chemically sterilize the straw by soaking it in water

containing formalin and carbendazim. Both of these also inhibit mushroom growth. As a result, it is critical that chemicals are pure and that only the recommended dose is used. For 10 kg straw, 100 liters of water are required, along with 7.5 g carbendazim (50 WP) and 125 ml formalin. Soak the straw for 18 hours in this solution, then remove and air dry for 2-4 hours, depending on the season. Farmers in South India have innovated and developed machines for drying straw. These are similar to large washing machines used to dry clothes.

Hot Water Treatment After Wetting the Straw

Overnight, we soaked the straw. Soak it in hot, boiling water after removing it. Before spawning, the straw is allowed to cool in this water for a few hours. The hot water temperature may range between 60 and 65 °C. Over-boiling does not imply better straw treatment. Rather, it will result in the straw being partially sterilized, which will attract more diseases. Second, prolonged immersion in hot water can result in anaerobic conditions that are not necessary. Many of us, however, may find it difficult to heat large amounts of water with wood, oil, or electricity. Solar energy is an alternative method.

Autoclaving

We can autoclave the straw to sterilize it. Straw is soaked, excess water is drained, and after air drying, it is placed in polypropylene bags and sterilized in the same manner as spawn bags. Autoclaving is required for the cultivation of some oyster mushroom species, such as *P. eryngii* (King Oyster). Following autoclaving, the bags are cooled and spawned under sterile conditions before being subjected to laminar flow. This method will produce better results with minimal contamination. It will be more useful where the goal is to commercially produce and sell spawn run bags or develop Ready To Fruit (RTF) packets for urban horticulture (https://nios.ac.in/media/documents/vocational/mushroom_production_(revised)(618).

CULTIVATION OF OYSTER

On a wet weight basis, we spawn the pasteurized straw at a rate of 2-3%. Each bag can hold two to five kg of wet substrate. In other words, one kilogramme of dry straw will require approximately 100 g of spawn. Spawn can be thoroughly mixed or layered inside the bag. Bags are kept inside a room or hut and can be kept on the ground or in tears as in a button mushroom, or they can be hung from the roof or rack using nylon rope. The bags have small perforations. The bags are kept at a temperature of 242 °C. When the entire bag turns white, the spawning process takes about two weeks. The spawn run does not require any light or fresh air. It is preferable to keep the rooms closed. Bags were hung on the racks. 60 Notes on Mushroom Cultivation Mushroom Production the bags require diffused light and fresh air for 3-4 hours daily to induce fruiting and produce normal fruit bodies. Large holes in the bag or the entire polythene can be removed. One kg of dry straw can yield 0.5 to 1.0 kg fresh mushrooms after 3-4 flushes. During cropping, the temperature is kept below 20°C or around 25°C (depending on the species), and the humidity is kept above 85%. Temperature requirements differ depending on the species. The colour will develop differently depending on the temperature and duration of the fruit-body on the bag. Oyster spawning, bag filling, spawn run, and fruiting RTF (Ready to Fruit) Bags If you live in a city, you may not be able to make or obtain a small quantity of spawn, as well as wet and heat straw and fill bags. As a result, it is critical that such growers be provided with ready-to-fruit bags. Ready-to-fruit bags are now available for growing mushrooms on your own, especially in urban areas. Such bags can also be used in school science projects to teach children about mushrooms. These kits are available in many countries, including India. Fruit bags are ready to use. 61 Mushroom Production Notes on Oyster Mushroom Cultivation Substrate production necessitates the use of specialized equipment. Such facilities are not available to all growers. If spawned bags are available, however, almost anyone can cultivate mushrooms. Producing ready-to-fruit bags is thus a novel occupation. However, quality control will be critical because we cannot afford bag failure, especially if someone has only purchased one or two bags. Another approach is to use satellite growers. That is, fully spawned run bags are distributed to local farmers, and the produce is collected. By this approach we will be able to get mushrooms of the same variety and thus the next important vocation of packing and marketing can be undertaken.

Health Benefits

Oyster mushrooms contain a number of substances that are thought to have health benefits. Dietary fibre, beta-glucan, and several other polysaccharides—a type of carbohydrate that affects immune function-are among these substances. There are new scientific studies on the health benefits of oyster mushrooms. The dietary fiber component of oyster mushrooms (*Pleurotus ostreatus*) may be beneficial in lowering triglyceride levels in the liver. According to research, whole foods with fiber, such as mushrooms, provide several health benefits while containing few calories, making them an excellent choice for a healthy eating pattern. Several studies have linked a higher fiber intake to better heart health. According to the authors of one study, fiber in vegetables

Figure 3: Various Activities Followed by Students in Loyola Campus-Pilivendula

1. Pady Straw

2. Chemical Sterilization

3. Drying

4. Bags Preparation

5. Straw Bags

6. Spawn Selection

7. Spawn Initiation

8. Room Tempration Maintenance

9. Growing of Oyster Mushrooms

10. Growing of Oyster Mushrooms

and other foods "makes them attractive targets for disease prevention and risk reduction of atherosclerosis and cardiovascular disease." Oyster mushrooms have been shown to improve immune function. A diet high in fiber-rich vegetables is frequently recommended by health professionals as a way to achieve and maintain a healthy weight. However, mushrooms may provide an additional benefit in terms of helping you maintain good metabolic health. At least one case of an allergic reaction to oyster mushrooms has been reported. After being exposed to the mushrooms, a mushroom worker developed chills, fever, joint pain, and skin rashes, according to the report. After a few days, the symptoms subsided (https://www.verywellfit.com/the-benefits-of-oyster-mushrooms-89610).

DISCUSSION

More practices day our botany students in tiny hamlets spread across the Loyola Campus of the Mushrooms lab have been encouraged to go for the cultivation of the highly profitable and protein-rich oyster mushroom. This would supplement students' earnings from self-employment training. The crops are only grown in the summer, from August to September. "We have been trained to grow oyster mushrooms in order to increase their yield and supplement the income of poor students," according to Dr. P. Subramanyam – Botanist Loyola Degree College campus, oyster mushroom grower of Pulivendula. Since 2018, he has been cultivating this mushroom variety. He was producing more than 60 kg of oyster mushrooms and selling them to college faculty and students for Rs. 250 to Rs. 300 per kg. So far, 50 students have been trained in the cultivation of the oyster mushroom. An official stated that they have been given its spawned bags to be incubated at room temperature. He claimed that growing it would provide direct employment for women. The oyster mushroom is one of the most suitable fungal organisms for producing protein-rich food without composting from various agro-wastes, and it also has a high medicinal value. It is high in vitamin C and B complex, with protein levels ranging from 1.6 to 2.5%. It contains the majority of the mineral salts needed by the human body, including potassium, sodium, phosphorus, iron, and calcium. It also has antibiotic properties, lowers bad cholesterol, and is suitable for diabetics. The oyster mushroom is grown on clean, dry paddy straw that has been soaked in water for about 18 hours and is mixed with a bottle of master spawn and horse gram powder. The mixture is placed in polyethylene bags and allowed to cool at room temperature. The compact mass is watered on a regular basis until the mushrooms begin to grow all over.

CONCLUSION

Oyster mushrooms are a low-calorie, fat-free, fiber-rich food high in several vitamins and minerals such as phosphorus, copper, and niacin. Analyses of the proximate composition of commonly cultivated *Pleurotus sajor-caju* reveal that they are rich in fibre with low fat and high antioxidant activity. Oyster mushroom can be considered as a functional food, which can provide health benefits.

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