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Oyster Mushroom: A Functional Food for Humans and Livestock

Prajna Mohapatra
Assistant Professor, Department of Animal Nutrition, Institute of Veterinary Science and Animal Husbandry, Siksha O Anusandhan Deemed to be University, Bhubaneswar, Odisha, India
*Corresponding Author: prajnamohapatra@soa.ac.in
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Abstract:

Mushrooms are the nutritional hub containing various nutrients and diverse bioactive compounds. Oyster mushroom, commonly known as Dhingri mushroom, is one of the most popular cultivated mushrooms globally. These mushrooms are rich in various macronutrients, micronutrients, and bioactive compounds. They are low in cholesterol and fat. Among the bioactive compounds, β-glucans, ergothioneine, phenols, flavonoids, lovastatin, terpenoids and lectins are present in it. The therapeutic properties exhibited by it, such as antioxidant, anti-inflammatory, antimicrobial, antitumour, anticancer, hypocholesterolemic and immunomodulatory activities, are due to the presence of these bioactive compounds. Oyster mushrooms and their byproducts, such as stems and spent substrate, are also used as protein-rich feed supplements in livestock animals and poultry. These mushrooms are considered a functional food for both human and livestock animals due to their rich taste and flavour, potential nutritional and therapeutic benefits.

Keywords: Mushroom, Proximate composition, Bioactive compounds, Functional food

Introduction:

Mushrooms are highly nutritious powerhouse of bioactive compounds and an excellent source of vitamin B complex, Vitamin C, vitamin D and minerals, such as potassium, phosphorus, copper, selenium, and zinc. Nutritionally, mushrooms are high in protein, low in calories and fat and enriched with all the essential amino acids (Koyyalamudi *et al.*, 2009). Apart from the high nutritional values, mushrooms also have medicinal properties. Mushrooms can also be used as an additional ingredient with different herbs as a remedy against headache, stomach pain, common cold and fever (Kettawan Aikkarach *et al.*, 2011). In addition to it, the role of mushrooms in turning waste into food in the food chain cannot be overlooked.

Oyster Mushroom:

Among different types of mushrooms, the oyster mushroom is one of the most popular cultivated species. It is commonly known as the Dhingri mushroom. This category of mushroom is the second-largest

cultivated mushroom globally. Oyster mushrooms (*Pleurotus ostreatus*) belong to the family Pleurotaceae, class Agaricomycetes and division Basidiomycota. Naturally, they are found in both temperate and tropical forests, but, like the other mushrooms, this species can also be grown on various agricultural waste and lignocellulosic materials to convert them into digestible proteins fit for animal feeding. Agricultural wastes, such as rice bran, rice straw, sawdust, corncobs, sugarcane bagasse, corn leaves and rice hulls are good substrates for the growth of this mushroom (Quimio, 1986).

Nutritional Composition:

Chang and Buswell (1996) referred to this mushroom as mushroom nutraceuticals. Oyster mushrooms are globally acknowledged for their exceptionally high nutritional and therapeutic values. These mushrooms are rich in various macronutrients, micronutrients, and bioactive compounds. They are low in cholesterol and fat.

Proximate Composition:

Fresh Pleurotus mushrooms contain approximately 85-95 % moisture (Khan, 2010), protein 2-3.4%, fat 1.2- 3.2%, carbohydrate 4.5- 5.1 %, fibre 2.5- 3.4 % and ash 1.18% (Alam *et al*., 2008; Yehia, 2012). The proteins present in Oyster mushrooms are complete as they contain all the essential amino acids, which makes them an outstanding protein source for both humans and livestock. Carbohydrates comprise dietary fibre and β-glucans, which help to promote gut health and boost the immune response. The fat of this mushroom mostly consists of unsaturated fatty. These are also rich in various minerals like potassium, phosphorus, copper, selenium, zinc and vitamins, such as B, C and D.

Bioactive Compounds:

Various bioactive compounds are present in oyster mushrooms, which are responsible for its functional food characteristics. Polysaccharides (β-glucans), ergothioneine, phenols and flavonoids, lovastatin, terpenoids and lectins are some of the important bioactive compounds.

Beneficial Effects of Pleurotus:

- **Nutritive Effects:** Oyster mushrooms are rich in protein, fibre, vitamins, minerals, and bioactive compounds. Apart from these, they contain less fat, cholesterol and sodium. The bioactive compounds are used in traditional medicine.
- **Therapeutic Effects of Pleurotus:** Oyster mushrooms contain a wide range of therapeutic properties, such as anti-inflammatory, antioxidant, antimicrobial, antiviral, antitumour, anticancer, hypocholesterolemic and immunomodulatory activities.
- **Anti-inflammatory Activity:** Due to the potential anti-inflammatory properties, these mushrooms can reduce inflammation along with other associated symptoms. The bioactive compounds such as lovastatin, pleuron compounds, rutin, cinnamic acid, *p*-coumaric acid and vitamin C present in oyster mushroom are responsible for anti-inflammatory activity (Rahimah *et al*., 2019).

- **Antioxidant Activity:** *Pleurotus ostreatus*, by virtue of its high antioxidant activity, scavenges reactive oxygen species and can mitigate oxidative stress. This quality is mainly due to the presence of phenolic compounds such as flavonoids. β-glucans present in it also contribute to scavenging free radicals and inhibit lipid peroxidation. The presence of the amino acid ergothioneine enhances the antioxidant activity.
- **Antimicrobial Activity:** Due to the presence of different myco-constituents, *Pleurotus spp.* exhibits antimicrobial activities, such as antibacterial, antifungal and antiviral activities (Bhardwaj *et al*., 2020).
- **Immunomodulatory Activity:** Oyster mushrooms possess compounds, such as lectins, *β*-glucans, polysaccharides-peptides, and polysaccharide-protein complexes, which have immune-modulatory properties.
- **Anti-cancer Activity:** Polysaccharides and triterpenoids, present in this mushroom, have anticancer properties. It can induce apoptosis and inhibit cancerous cell growth.
- **Anti-tumour Activity:** The water-soluble proteoglycans present in the mycelium possess anti-tumour and immunomodulating effects.
- **Hypocholesterolemic Activity:** *Pleurotus* mushrooms are rich in β-glucans, which regulate cholesterol levels. Fermentation of β-glucans by gut bacteria produces short-chain fatty acids, which can reduce cholesterol production.

Oyster Mushroom as Animal Feed:

In the case of livestock animals, not only oyster mushrooms but also their byproducts, such as stems and spent substrate, also act as protein-rich feed supplements. The mushroom waste is rich in nutrients and other bioactive compounds, providing beneficial effects to the animals (Antunes *et al.*, 2020). These byproducts are rich in carbohydrates, β-glucans and chitin, improving gut health and enhancing the activity of gut microflora. Thus, they can act as a natural alternative to antibiotic growth promoters in livestock animals and poultry. The stem residues can be finely chopped, dried and mixed with the basal feed to enhance palatability. They can also be fermented to get a liquid supplement which can improve the feed conversion ratio in poultry. The spent mushroom substrate, such as straw and sugarcane bagasse, can be directly used as ruminant feed.

Functional Food:

Functional foods are dietary compounds containing nutrients along with various bioactive components, bearing beneficial effects to support physiological functions, maintain human and animal health and reduce the risk of chronic diseases.

Oyster mushrooms are considered a functional food for both human and livestock animals, as it bears the exceptionally appealing taste and flavour and have potential nutritional and therapeutic benefits.

Nutritionally, they are very rich due to the presence of high-quality proteins, polysaccharides, vitamins B complex, C and D, potassium, phosphorus, selenium, zinc, essential amino acids and various bioactive compounds (Aditya *et al*., 2024). On the other hand, oyster mushrooms have antioxidant, antimicrobial, anti-inflammatory, anti-tumour, and immunomodulatory activities. They also enhance gut microbial activity and improve gut health. Hence, oyster mushrooms are considered functional food.

Conclusion:

Apart from the advantage as a great functional food for both human and livestock animals, oyster mushrooms have a great role in sustainable waste management. By virtue of their efficiency in converting organic waste into highly nutritious biomass, they can address environmental challenges as well as provide agricultural resources. Due to the presence of high-quality protein, they can be a great protein supplement for livestock animals to replace high-cost protein feeds, adding to the economics of the farmers.

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