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Review Article

Nutritional Value, Medicinal Importance, and Health-Promoting Effects of Dietary Mushroom (*Pleurotus ostreatus*)

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Pleurotus ostreatus is the second cultivated and most popular edible mushroom after *Agaricus bisporus* worldwide. As dietary supplements, nutraceuticals like *Pleurotus ostreatus* that go beyond the usual health benefits of mushrooms are becoming more popular. The objective of this study is to put together a summary of the nutrition information and link it to the possible health benefits and health-improving effects of eating oyster mushrooms. This review is based on secondary data from 102 published articles about *P. ostreatus*. All papers were examined following predetermined criteria for inclusion and exclusion, and this study contained 83 publications. The high nutritional content and beneficial health effects make *P. ostreatus* a high-quality food. It makes up for the lack of protein by switching between a diet based on wheat, rice, and maize. Nowadays, *P. ostreatus* is famous precious functional food ingredients due to the fact they may be cholesterol-free and low in calories, carbohydrates, fat, and sodium. Side by side, they offer crucial nutrients including riboflavin, selenium, potassium, niacin, proteins, and fiber.

1. Introduction

Mushrooms are macro-fungi that have spore-bearing and a fleshy fruiting body [1]. There are above 14,000 types of mushrooms present throughout the world, around 3000 species have been reported as edible [2], almost 700 are found to have medicinal importance, and approximately 1400 are identified to be toxic characteristics [3]. Among all types of mushrooms, more than 200 categories belong to oyster mushrooms [4].

Mushroom cultivation and consumption have increased day by day due to their nutritional importance and health-promoting effects. According to [5], in recent decades the use of mushrooms has interestingly increased in the pharmaceutical industry, nutraceutical, and cosmeceutical business sectors. Edible mushrooms are more highly nutritional than any fruits and vegetables and have been eaten for their texture and enjoyable flavor, and therapeutic properties for many years [6]. The study reported that there

are several oyster mushroom species i.e., *Agaricus bisporus, Pleurotus species, Lentinus edodes,* and *Volvariella species* which are the most acceptable varieties among the cultivated mushroom considering their health benefit and the biochemistry properties [6].

Pleurotus sp. are commonly referred to as "oyster mushrooms" [7]. Worldwide, *Pleurotus ostreatus* is one of the most common types of cultivated mushrooms [8], and next to the *Agaricus bisporus* mushroom it is the 2nd largest commercially produced mushroom globally, especially in Europe, Africa [9, 10], and Asian countries (especially India, South Korea, China, Taiwan, Japan, Thailand, and Vietnam) which are the main producers and consumers of *P. ostreatus* mushrooms with approximately 99% of the total volume [9]. It was first cultivated in the USA in 1900 [7, 11].

P. ostreatus cultivation has so many advantages over other edible mushrooms [8]. These are as follows: (1) grows fast under a wide range of temperatures (10°C to 30°C) and pH (6–8) [8], (2) secretes a wide range of enzymes that are capable of degrading lingo-cellulosic biomass of substrates [12], (3) has high-yield potential and high nutritional value and medicinal importance, (4) demands a few environmental control, (5) can colonize substrates in a shorter time, and (6) does not need composting of its substrate. Moreover, their fruiting bodies are not often attacked by any diseases and pests, they can be cultivated in general in simple and cheap ways, and their cultivation needs only pasteurization which is cheap and does not require a more expensive method like sterilization [8].

Nowadays, people are more concerned about their diet [13] and fitness [14]. Presently, oyster mushrooms are appreciated as food not only for their texture and flavor [3] but also for their chemical, nutritional characteristics, and medicinal properties [15] and health benefits [16]. Due to their taste, flavor, high nutritional values, and medicinal properties, nowadays *P. ostreatus* is the most popular and consumed mushroom [17] (Figure 1).

Nowadays, *P. ostreatus* are famous precious and considered functional food ingredients due to the fact they may be cholesterol-free and low in calories, carbohydrates, fat, and sodium. Side by side, they offer crucial nutrients including riboflavin, selenium, potassium, niacin, proteins, and fiber [17, 18]. Several researchers have reported [19] that mushroom consumption is increasing rapidly worldwide due to their rich source of bioactive compounds such as functional protein glucans, laccase, proteoglycan (ubiquinone-9, nebrodeolysin, and glycoprotein), proteoglycans, pleuran (β-1, 3-glucan with galactose, and mannose), pleurostrin (peptide) [10, 20], minerals (Fe, Ca, K, P, and Na), and dietary fiber [20], B complex (thiamine, riboflavin, niacin, and folic acid), vitamin C [16] and carbohydrate characterized low sugar, fat, and cholesterol [21]. Mushrooms contain 85–95% of moisture, 35–70% carbohydrates, 15–34.7% protein, 10% fat, 6–10.9% of minerals, 3–8% nucleic acids, vitamins such as niacin 60.6–73.3 mg (%), thiamine 1.4–2.2 mg (%), riboflavin 6.7–9.0 mg (%), biotin, pantothenic acid 21.1–33.3 mg (%), ascorbic acid 92–144 mg (%), and folic acid 1.2–1.4 mg/100 g in dry weight basis [6].

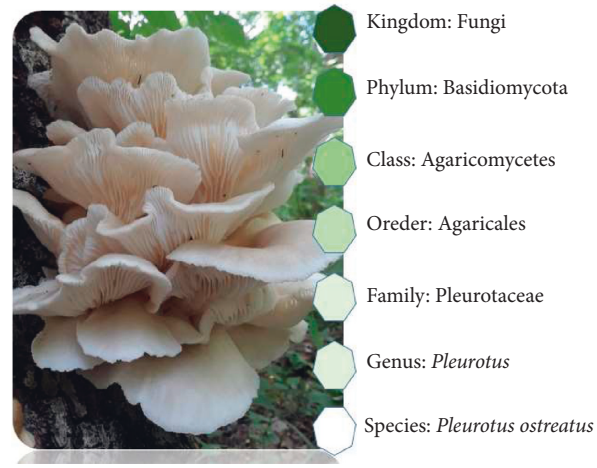

Figure 1: Taxonomic description of *Pleurotus ostreatus* mushrooms.

Therefore, the aim of this present review is to summarize the comprehensive information about the nutritional values, medicinal importance, and the health-promoting effects of dietary oyster (*P. ostreatus*) mushroom.

2. Nutritional Potentiality of *Pleurotus ostreatus*

In recent decades, edible mushrooms fulfilled the protein gap by alternating primarily based diet on cereals, i.e., wheat, rice, and maize. Moreover, mushrooms are considered a quality food due to their nutritional value and health benefits [20]. A large number of reports have been provided that the nutritional value of *P. ostreatus* mushrooms has been offered in dried fruit bodies (Table 1). According to [7], fresh *P. ostreatus* contains 85–95% moisture, the fruiting body contains approximately 100 different bioactive compounds, and phenolic compounds include phenolic acids, flavonoids, hydroxycinnamic acids, hydroxybenzoic acids, lignans, tannins, stilbenes, and oxidized polyphenols [6]. Furthermore, nutritionally, *P. ostreatus* contain high protein, fat-free, carbohydrates, high amount of vitamins B1, B2, B12, C, D, E, and K, minerals (potassium, iron, copper, zinc, and manganese), and dietary fibers [5]. Indeed, dietary *P. ostreatus* mushrooms are the second most important mushroom for food supplements worldwide [31]. Nowadays, consumers are highly interested in bioactive food that provide beneficial effects on human health-promoting and disease-reducing effect. Mushrooms can be considered as functional food which provides health benefits in addition to nutritional value [6].

According to [32], "the nutritional contents of mushrooms vary according to the composition of the substrate [32]." *Pleurotus ostreatu*s are rich in protein, fiber, lipid, ash, carbohydrate, minerals, and vitamins as shown in Table 1.

The most common nutrients of *Pleurotus ostreatus* mushrooms are discussed below.

Table 1: Nutritional value of *Pleurotus ostreatus* on a dry weight basis (%).

Protein	Carbohydrates	Lipid	Fibers	Ash	References
17–42	37–48	0.5–5	24–31	5.7	[22]
32	50.9	3.1	6.2	6.1	[23]
28.4	35.4	4.7	21.8	8.6	[11]
7.0	85.9	1.4	—	5.7	[24]
3.31	6.09	0.41	2.3	1.01	[25]
30.40	57.60	2.20	8.70	9.80	[20]
25.91	42.14	2.18	10.41	10.91	[26]
7.0	85.9	1.4	—	5.7	[27]
28.40	35.40	4.68	21.80	8.60	[28]
11–42	36–60	0.2–8	—	—	[29]
20.04	60.21	8.65	—	7.78	[13]
17–42	37–48	0.5–5	24–31	—	[30]

2.1. Carbohydrate and Crude Fiber. The carbohydrate content of mushrooms includes starches, pentoses, hexoses, disaccharides, amino sugars, sugar alcohols, and sugar acids. *P. ostreatus* mushrooms are a great source of carbohydrates and dietary fibers. The crude digestible fiber composition of the mushroom consists of partially digestible polysaccharides and chitin [20]. Carbohydrates are mainly present in *P. ostreatus* as polysaccharides and comprise various compounds like monosaccharide and their derivatives; oligosaccharides are commonly called soluble sugars [33]. They are also represented by glycogen that is present with several types of glycosidic linkages such as branched $(1 \longrightarrow 3)$, $(1 \longrightarrow 6)$-β-glucans, and linear $(1 \longrightarrow 3)$-α-glucans. Deepalakshmi and Mirunalini [17] reported in their paper that the content of dietary fiber in 100 g of edible parts ranges from 4.1 g in *P. ostreatus* mushroom.

2.2. Protein Content and Amino Acid. According to Deepalakshmi and Mirunalini [17], edible oyster mushrooms are rapidly recognized as a promising source of novel proteins. The crude protein level of dietary oyster mushrooms is usually high [33]. Reference [20] showed that the protein content of mushrooms varied from 12% to 35% depending on the species. [34] reported in their research paper that the digestibility of oyster mushroom protein is as high as 72%–83%. In 2010, Akyuz et al. represented that the content of protein in *P. ostreatus* is dependent according to its strains, and physical and chemical differences in a growing medium. The protein content ranges are from 17 g to 42 g per 100 g of dried fruit bodies, which have been documented in different research papers on *P. ostreatus* mushrooms [17]. Mushrooms are very important for vegetarian people because they contain some essential amino acids that are found in animal proteins [20]. The digestibility of *Pleurotus* mushrooms contains 7 mg of amino acids present in 100 g of the edible part of fruit bodies [17].

2.3. Lipid. The fat content of edible *Pleurotus* mushrooms is very low [17] as compared to carbohydrates and protein [34], fat fraction in mushrooms is mainly composed of unsaturated fatty acids. [17]have reported that the major monounsaturated fatty acid (F.A.) is oleic acid, and the major poly-unsaturated F.A in *P. ostreatus* linoleic acid. According to the report of [17], *P. ostreatus* contains fat content ranging from 0.2 g to 8 g per 100 g of dried fruit bodies.

2.4. Mineral. According to [34], the fruiting bodies of mushrooms contain a high level of mineral elements and the major constituents are K, P, Na, Ca, and Mg and elements like Cu, Zn, Fe, Mo, and Cd form minor constituents. *P. ostreatus* have a greater content of Cu, Fe, K, Mg, P, Zn, and Na.

2.5. Vitamins. References [17, 34] stated that mushrooms' fruit bodies are rich in vitamins, especially vit B (particularly thiamine, riboflavin, pyridoxine, pantothenic acid, nicotinic acid, nicotinamide, folic acid, and cobalamin), vit C, and vit D2. Numerous evidence indicated that P. ostreatus mushroom is rich in folacin, vitamin B1, and vitamin B3, and low in vitamin B12, vitamin C, and vitamin B2 [17, 33, 34].

3. Medicinal Importance and Health-Promoting Effects

With time, there has been an increased interest in consuming mushrooms to remedy or treat many numerous dangerous illnesses around the world [35]. *P. ostreatus* is the best example of dietary mushrooms that have great medicinal properties and pharmacological potentiality. In China since 100 A.D., mushrooms have been used as medicine [36]. Particularly in Eastern Asian countries, mushrooms have been well demonstrated traditionally for their medicinal properties [17]. From the last decades to the present, numerous studies have provided evidence for their beneficial effects on health and treatment of some illnesses. The potential health-promoting and medicinal characteristics of different bioactive ingredients found in mushrooms are concise in Figure 2. Around 6% to 10% of edible oyster mushrooms are known to have medicinal properties and have been used as important natural ingredients in the production of pharmaceutical products for their medicinal values. In addition to this, *P. ostreatus* mushrooms are most popular due to their traditional medicinal properties and also for their healing capacities. In 1960, scientists investigated the basic active principles of mushrooms that are health-promoting effects [36]. Different scientific modern pharmacological literature has confirmed that [34] the medicinal properties of mushrooms include anti-oxidant, anti-inflammatory, anti-carcinogenic, anti-microbial, anti-bacterial, anti-fungal, anti-diabetic, anti-angiogenic, immune modulatory, hepatoprotective, hypoglycemic [33], anti-viral, anti-tumor, anti-hypercholesterolemic, anti-hypertensive, protecting the liver, promoting general fitness [11], anti-asthmatic, anti-obesity, anti-atherosclerotic, and anti-ulcer, besides being used as functional foods. The medicinal and pharmacological importance of *P. ostreatus* is illustrated in Figure 2 and Table 2. The medicinal and pharmacological potentiality of *P. ostreatus* mushrooms includes the following:

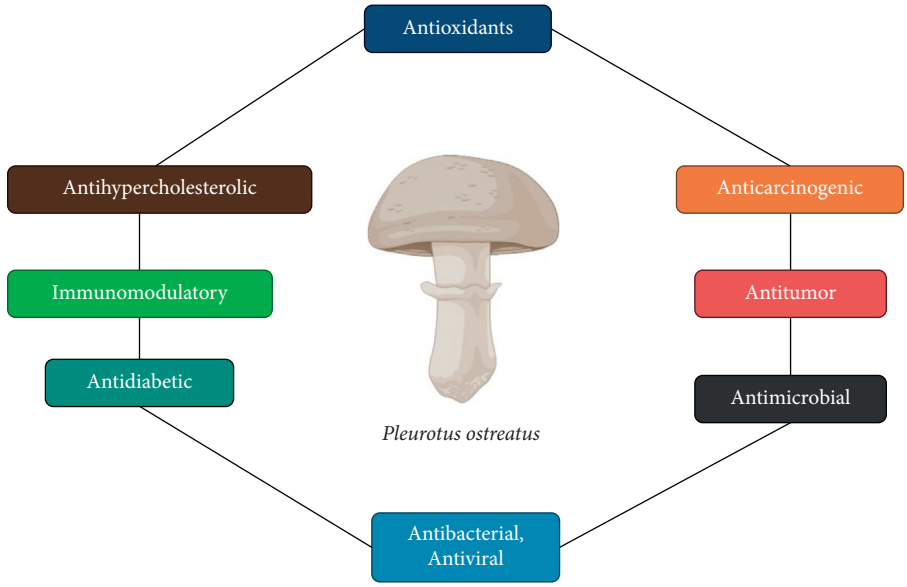

Figure 2: Medicinal properties and pharmacological potentiality of *P. ostreatus*.

Table 2: Medicinal properties and pharmacological potentiality of *P. ostreatus*.

Compounds	Medicinal functions	References
Water-soluble protein or polysaccharides, ergothioneine	Anticancer	[37]
β-D glucan (pleuran), lectin, ergothioneine	Anti-oxidant	[38]
β-D glucan (pleuran), glycopeptides, proteoglycans, ergothioneine	Anti-tumor	[38]
Ubiquitin-like protein, ergothioneine	Anti-viral	[39]
β-D glucan (pleuran)	Anti-bacterial	[40]
Unspecified bioactive, ergothioneine	Anti-diabetic	[41]
Lovastatin, ergothioneine	Anti-hypercholesterolemic	[38]

3.1. Anti-Oxidants. Several scientists have investigated that several consumable and medicinal mushrooms possessed natural anti-oxidant properties with high free-radical scavenging activity [33]. In 2011, T. Jayakumar et al. evaluated that an extract of *P. ostreatus* increased the catalase gene expression and diminished the incidence of free-radical-induced protein oxidation in matured rats, in this manner protecting the occurrence of age-related disorders. The ethanolic extract of the dietary *P. ostreatus* mushrooms is reported to have anti-oxidant activity in vitro and in vivo under its superoxide radicals and scavenging hydroxyl, inhibiting lipid peroxidation, chelating agents of ferrous ions, reducing power on ferric ions, and quenching 2,3-diazabicyclo. In yet another report, [19] also revealed that due to the presence of carbohydrate component (β-glucan), *P. ostreatus* showed superior anti-oxidant properties which seemed to be responsible for the anti-oxidant activity. Moreover, *P. ostreatus* mushrooms act as a rich source for the development of anti-oxidant in food industries as food additives.

3.2. Anti-Carcinogenic and Anti-Tumor. Several types of extract from *P. ostreatus* have been illustrated as a potential anti-carcinogenic agent. But it has not been established in medical and clinical reports of anticancer activities [17]. Reference [42] screened the anticancer properties of *P. ostreatus* against human androgen-independent prostate cancer PC-3 cells (prostate cancer cell). An aqueous polysaccharide extract from the *P. ostreatus* induces proapoptotic and antiproliferative effects on HT-29, and HCT-116 (human colon carcinogenic cells) was postulated by [17]. According to [43], the hot water extract of these mushrooms also showed suppression in the proliferation of human breast cancer cells [44] (Figure 3). According to [45], *P. ostreatus* protein extract has displayed clinical efficacy against human colorectal adenocarcinoma cell line and a human monocytic leukemia cell line, reactive oxygen species production, and mitochondrial dysfunction. In this manner, the protein extract of *P. ostreatus* could be considered a vital source of new anticancer medicine.

The anti-tumor activities of *P. ostreatus* polysaccharide fraction were first reported by Yoshioka et al. [46]. Tumor activity-restricting compounds are found in *P. ostreatus* mushrooms and have undergone clinical trials. All forms of edible mushrooms can prevent prostate and breast cancer [20]. *P. ostreatus* has been used as a nutraceutical and medicine as a treatment for carcinogenic patients. The anti-tumor effect of dietary mushrooms *P. ostreatus* mycelia derived proteoglycans which elevated mouse natural killer cell cytotoxicity and stimulated macrophages to produce nitric oxide, and which also strongly interacted with

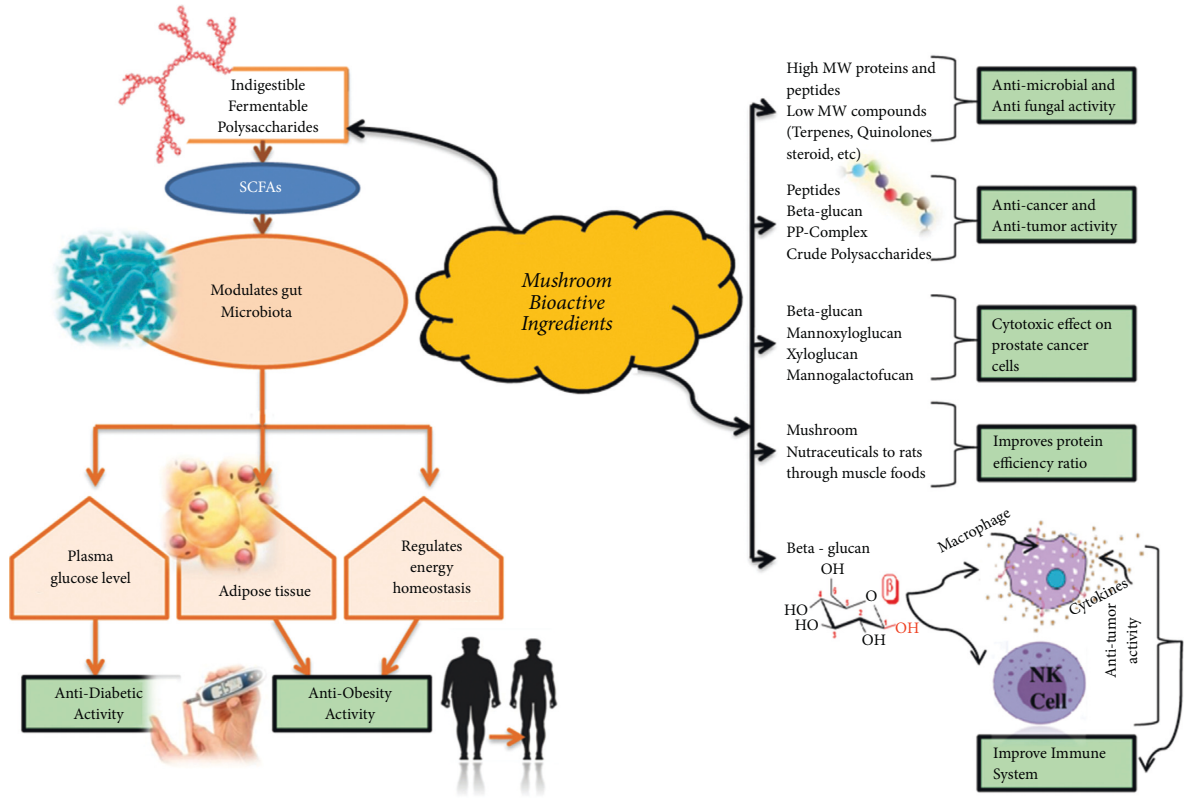

FIGURE 3: Schematic flowchart depicting the health-promoting and medicinal characteristics of mushroom bioactive ingredients (NK = cell-natural killer cell; SCFA = short-chain fatty acids; MW = molecular weight; PP-complex = protein-polysaccharide complex).

glucose or mannose-specific lectin concanavalin A (Con A) that indicates the presence of a large number of terminal sugars with glucose and mannose. [47]suggested that proteoglycans derived from the *P. ostreatus* mycelia could be used as anti-carcinogenic agents, whereas [47] postulated that a novel water-soluble glucan, i.e., heteroglucan, folded into a triple-helical conformation and exhibited enhanced immune cell activation, and anti-tumor importance in tumor-bearing mice model. Thus, the anti-tumor activities of this species are related to the production of heteroglucans [17].

The bioactive compounds, i.e., glucans, ergosterol, amino acids (arginine and glutamine), and proteoglycans, are present in *P. ostreatus* that have been related to anti-tumor activities. There is a possible mechanism of action of these substances through the inhibition of neo-vascularization induced by the tumor development in sarcoma 180 cells in vitro, the activation and clonal expansion of T cells, increase in NK (natural killer cell), and THC (T helper cells), stimulation of the synthesis of interleukins, stimulation of immunological function, extension cell survival, and increasing the greater tolerance to chemotherapy [48]. Different types of extracts from *P. ostreatus* have reported the anticancer abilities in different CCL (cancer cell lines) and experimental animals through a number of different mechanisms of action. Water-soluble extracts of *P. ostreatus* demonstrated the most significant cytotoxicity and induced apoptosis in human androgen-independent PC-3 (prostate cancer) cells [48].

3.3. Anti-Microbial. For survival in the natural environment, mushrooms need anti-bacterial and anti-fungal compounds [33]. *Pleurotus* species had an anti-bacterial spectrum against Gram-negative and Gram-positive bacteria [36]. Ethyl acetate extract of edible mushrooms *P. ostreatus* was investigated for their anti-microbial properties against *B. subtilis*, *S. aureus*, *E. coli*, *K. pneumonia*, and *Proteus Vulgaris*. *P. ostreatus* also showed an effective inhibition zone against all pathogenic strains [36]. Reference [31] showed that the anti-microbial and anti-fungal activity of oyster mushrooms depended upon the nature of the solvent, ether extract against Gram-negative bacteria, and acetone extract.

3.4. Anti-Bacterial and Anti-Viral. The anti-microbial capacity of the macro-fungus extracted with petroleum was observed to inhibit the Gram-positive and Gram-negative bacterial tested *in vitro* to suggest that *P. ostreatus* has broad-spectrum anti-bacterial properties [49]. Reference [50] observed that the phenolic and tannin constituents of dietary mushrooms *P. ostreatus* may elicit anti-bacterial properties as found in many medicinal plants with mechanisms of action characterized by cell membrane lysis, proteolytic enzymes, microbial adhesion, and inhibition of protein synthesis, whereas organic extracts methanol and chloroform of this mushrooms have been manifested as effective against Gram-positive [17] bacteria which showed to be a potential source of anti-bacterial agents. An alkaline-isolated skeletal β-D glucan from fruiting bodies of edible mushrooms *P. ostreatus* was isolated by [51].

Anti-viral activities are described not only for whole extracts of dietary oyster mushrooms but also for isolated compounds. Specific medicines are an emergency basis needed for the cure of viral diseases as they cannot be treated by common antibiotics. They may act directly by inhibiting of synthesis of viral nucleic acids, or adsorption, viral enzymes, and uptake of viruses into mammalian cells. Indirect effects of anti-viral are the result of the immune-stimulating activity of polysaccharides or other complex molecules [52]. The aim of anti-viral chemotherapy is the discovery of anti-viral activity agents that are specific for the inhibition of viral multiplication without affecting normal cell division. It is also necessary to identify and develop new anti-viral agents without adverse side effects and viral resistance [17]. Reference [53] outlined that a laccase has been purified from *P. ostreatus,* which is capable to inhibit the hepatitis C virus entry into peripheral blood cells, activity toward HIV-1 reverse transcriptase, and hepatoma HepG2 cells and its replication [54]. The medicinal properties and pharmacological potentiality of *P. ostreatus* are shown in Table 2.

3.5. Anti-Diabetic. Dietary oyster mushrooms are an ideal food for the dietetic prevention of hyperglycemia due to their low-fat content, high dietary fiber, and protein [20]. Hyperglycemia is an important characteristic of diabetes mellitus (DM). According to [41] studied, the dietary *P. ostreatus* mushrooms were orally administered to alloxan-induced diabetic rats which revealed that the combination-produced synergistic effects have shown blood glucose-lowering effects in insulin-dependent and insulin-independent diabetic conditions. Moreover, [33] showed that oral anti-diabetic drugs have been found in edible oyster mushrooms. [55]hypothesized the anti-diabetic potential of *P. ostreatus* in alloxan-induced diabetic mice, and the result of this research showed that the *P. ostreatus* delivered a significant hypoglycemic effect in diabetic mice which is capable of progressing hyperlipidemia functions. Moreover, numerous researches showed the result of the treatment with a high level of *P. ostreatus* extract could reduce the (HBGL) high blood glucose level in hyperglycemic rats.

Human participants have also been investigated for hypoglycemic effectiveness. [56]found that adding 3 grams of powdered mushroom to the diet for three months reduced diastolic and systolic blood pressure, fasting glucose level, and glycated hemoglobin (HbAc1) levels in 27 patients with diabetes and hypertension [56]. After giving 22 healthy people pulverized *P. ostreatus*, they had lower fasting glucose levels after taking a glucose solution orally. In 14 diabetic patients, a corresponding effect has been demonstrated, with an extra enhanced insulin level. There were no alterations in aminotransferase activity or creatinine levels, revealing that hepato- or renal toxicity consequences were not present [56]. *P. ostreatus* hypoglycemic contributed significantly to being a multi-faceted procedure that involves numerous pathways [56] showing that *P. ostreatus* can lower blood sugar levels by activating glucokinase, stimulating insulin burst, and inhibiting glycogen synthase kinase, all of which result in enhanced glycogen synthesis.

3.6. Immuno-Modulators. Nowadays, immuno-modulators are the most important medicinal mushroom drugs which are used particularly in Japan, Korea, China, and other East Asian countries [33]. Few studies have been carried out with oyster mushrooms for immuno-modulatory effects in India. [36] investigated that low cytotoxicity alone with immuno-modulatory activity raises the possibility which could be effective to build up immune resistance, in carcinogenic patients receiving conventional traditional treatment, chemotherapy, and decreased toxicity. [17] have also analyzed that a large number of compounds have been isolated from oyster mushrooms like lectins, polysaccharides (beta-glucans) [20], polysaccharides-peptides, and polysaccharide-protein complex that have been found to have immuno-modulatory activity and these are suggested to enhance cellular components of the immune system.

3.7. Anti-Hypercholesterolemic. In Japan in 1960s was conducted the initial research on the cholesterol-lowering effects of mushrooms. Various studies have shown that dietary fiber extracted from oyster mushrooms had a marked in vitro anti-atherosclerotic effect and patients with coronary disease showed a decreased atherogenic activity after the consumption of the mushroom that confirming its activity as a natural cholesterol-lowering agent [33]. The ethanolic extract of dietary *P. ostreatus* mushrooms or dried fruiting bodies exhibited effective evidence for the anti-hyperlipidemic properties of the diet of normal Wistar male rats and a stain with genetical hypercholesterolemia [17]. In this research, in addition, the dry oyster fungus in the diet gradually increased TAG levels whereas the ethanolic extract did not significantly change TAG levels. [7]reported the cooperative effect of oyster mushrooms on lipid profile, liver, and kidney functions in hyper-cholesterol rats. Due to the presence of a natural cholesterol-lowering agent, it has been suggested that the fruiting bodies of oyster mushrooms could be recommended for consumption in the human diet [33].

3.8. Hypolipidemic Activity. This mechanism of action of *P. ostreatus* has been investigated in both rodent and human *in vitro* experiments. In rats with Triton WR-1339-induced hypercholesterolemia, ethanol extract at a regular dose of $500\,mg{\cdot}kg^{-1}$ BW (body weight) reduced very-low-density lipoprotein (VLDL), low-density lipoprotein (LDL), lipid profile, aminotransferases, lactate dehydrogenase, and blood glucose, while increasing high-density lipoprotein (HDL) levels. In rabbits, a diet containing 10% dry mushroom and 1% cholesterol resulted in a 65% reduction in serum cholesterol levels and stopped the progression of arteriosclerosis in some animals as compared to a control group not treated with *P. ostreatus* [57]. Previous effects were obtained in rats in similar investigations [1]. In studies comparing the hypolipidemic effects of three *Pleurotus* species (*P. ostreatus*, *P. sajor-caju*, and *P. Florida*), *P. ostreatus* was found to have the greatest impact on lowering blood cholesterol and triglyceride levels, while *P. sajor-caju* was found to be more effective in lowering LDL/HDL ratios [58].

P. ostreatus had a positive influence on plasma lipids only in three subjects in eight-week research with 20 patients treated with antiretroviral medication, which causes dyslipidemia as an unfavorable pharmacological consequence [59]. Nevertheless, Slovak investigators found that six weeks of supplementation with crushed *P. ostreatus* resulted in a considerable reduction in triglyceride and cholesterol concentrations in dyslipidemic patients, with no effect on HDL [60]. A study involving 30 diabetics found that feeding mushrooms reduced glucose, triglyceride, and cholesterol levels while also lowering blood pressure [61]. They found no harmful effects on living organisms or kidneys. Multiple mechanisms are likely to be involved in the species' hypolipidemic action. Reduced lipid absorption from the gastrointestinal tract and higher feces excretion is one proposed mechanism [62]. Another approach is linked to lovastatin's suppression of HMG-CoA reductase [63]. Recent research has also revealed an effect on the expression of genes related to lipid metabolism. The transcription of Dgat1 (di-glyceride acyltransferase), which is accountable for triglyceride production, was influenced by a water extract standardized for β-glucans. A rise in the expression of genes involved in lipid transport and oxidation was detected in mice-fed *P. ostreatus* [64].

3.9. Cosmetic Activity. The fruiting bodies are high in antioxidants and anti-aging components like ergothioneine, phenolic compounds, and indole compounds like melatonin, serotonin, and selenium [65]. The selenium concentration of fresh and dried mushrooms was found to be 58.24 $mg{\cdot}kg^{-1}$ and 100.31 $mg{\cdot}kg^{-1}$, respectively. [66] found 55 fragrance compounds in mycelium, namely, 27 esters, 9 ketones, 7 thiols, 5 alcohols, 4 terpenoids, 2 phenols, and 1 aldehyde. Aroma compounds play a major role in the perfume industry and cosmetics manufacturing. In a research comprising 105 patients, 80 of whom completed the trial, a cream based on glucans and additionally containing pleuran, demonstrated a substantial favorable benefit in supportive therapy for atopic dermatitis [67–72].

4. Conclusions and Future Perspectives

Nowadays, *P. ostreatus* is one of the best sources of nutrients and medicinal resources since it contains several bioactive components that develop its large number of pharmacological effects. It contains the most common nutrients, i.e., carbohydrates, protein, amino acids, vitamins, and fatty acids. As well as, due to their high nutritional values and medicinal properties, they are considered a functional food and help to control many human ailments, including antioxidant, anti-inflammatory, anti-carcinogenic, anti-viral, anti-fungal, anti-bacterial, anti-diabetic, anti-angiogenic, immuno-modulatory, hypoglycemic, and hepatoprotective. The blessings of *P. ostreatus* mushrooms are particularly reasonable because they grew on some cheaper agricultural or woodland wastes such as wheat straw, rice straw, teff straw, paddy straw, corn cobs, cotton, waste, coffee pulp, and sugarcane bagasse.

The present review discussed the general and useful information about the nutritional and medicinal importance and pharmacological properties of the *P. ostreatus* mushroom. In addition, there are several potential characteristics, old and novel properties, provided by *P. ostreatus* with pharmacological and health benefits, which deserve further investigations and more in-depth studies wished to fully realize their potential.

Data Availability

The data used to support the findings of this study are included in the article.

Conflicts of Interest

The authors declare that they have no conflicts of interest regarding the publication of this paper.

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