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Phytochemical profile and pharmacological potential of fresh and dehydrated *Pleurotus florida*

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Abstract
Pleurotus florida (oyster mushroom) is widely recognized for its exceptional nutritional and pharmacological potential, attributed to its diverse phytochemical composition. This study explores the pharmacological properties of *P. florida*, focusing on its antioxidant, immunomodulatory, antimicrobial, anti-inflammatory, cholesterol-lowering, and neuroprotective effects. Rich in bioactive compounds such as beta-glucans, phenolics, flavonoids, terpenoids, and ergothioneine, *P. florida* demonstrates significant efficacy in combating oxidative stress, enhancing immune responses, and addressing microbial infections. The mushroom also exhibits promising anti-diabetic and anticancer properties, making it a valuable natural resource for functional foods and therapeutic applications. Furthermore, dehydration processes enhance the concentration of certain bioactive compounds, expanding its utility in dietary supplements and medicinal formulations. By synthesizing findings from previous studies, this paper underscores the potential of *P. florida* as a sustainable, multifunctional agent in health and disease management. Future research is encouraged to validate these findings through clinical trials and to explore its applications in modern medicine.

Keywords: *Pleurotus florida*, oyster mushroom, nutritional potential, pharmacological properties

Introduction
Mushrooms have long been recognized as a vital component of human nutrition and traditional medicine, owing to their diverse bioactive compounds and therapeutic potential. Among the various edible mushroom species, *Pleurotus florida* (Commonly known as oyster mushroom) holds a prominent position due to its rich phytochemical composition, ease of cultivation, and wide-ranging health benefits. As a species of the genus *Pleurotus*, *P. florida* is widely cultivated and consumed globally, celebrated not only for its culinary value but also for its numerous pharmacological properties. In recent years, the mushroom has garnered significant attention from researchers and the nutraceutical industry for its potential applications in functional foods and medicine.

The phytochemical profile of *P. florida* is characterized by a diverse array of bioactive compounds, including polysaccharides (Notably beta-glucans), phenolics, flavonoids, terpenoids, ergothioneine, and lovastatin. These compounds exhibit multiple pharmacological activities such as antioxidant, immunomodulatory, antimicrobial, anti-inflammatory, cholesterol-lowering, and neuroprotective effects. These properties make *P. florida* a promising candidate for the prevention and management of a variety of diseases, including cardiovascular disorders, diabetes, neurodegenerative diseases, and cancer.

What sets *P. florida* apart from other edible mushrooms is its dual role as a nutrient-dense food and a natural therapeutic agent. Its high protein content, low fat levels, and abundance of essential amino acids, vitamins, and minerals enhance its nutritional value, while its secondary metabolites contribute to its medicinal properties. Moreover, the cultivation of *P. florida* is economically feasible and environmentally sustainable, making it accessible for widespread use in both developed and developing regions.

Processing methods, particularly dehydration, play a crucial role in expanding the utility of *P. florida*. Dehydration not only extends the shelf life of the mushroom but also concentrates its bioactive compounds, increasing its efficacy as a functional ingredient in dietary supplements and pharmaceutical formulations. However, some processing methods may impact the stability of heat-sensitive compounds, underscoring the importance of optimizing techniques to retain its full therapeutic potential.

Despite its growing popularity, the pharmacological potential of *P. florida* remains underexplored in clinical settings. While numerous *in vitro* and *in vivo* studies have highlighted its efficacy, there is a pressing need for human trials to validate these findings and

elucidate the mechanisms underlying its therapeutic effects.

This paper aims to provide a comprehensive analysis of the pharmacological potential of *Pleurotus florida*, synthesizing insights from previous studies to highlight its significance in modern medicine. By focusing on its antioxidant, immunomodulatory, antimicrobial, and other pharmacological properties, this work underscores the mushroom's versatility as a natural resource for health promotion and disease management. Furthermore, it discusses the implications of processing methods such as dehydration on the bioactive profile of *P. florida*, offering a pathway for its enhanced utilization in functional foods and nutraceuticals. Through this exploration, the study seeks to bridge the gap between traditional knowledge and contemporary scientific understanding, paving the way for future research and clinical applications of *P. florida.*

Phytochemical Profile of *Pleurotus florida*

The phytochemical profile of *Pleurotus florida*, a widely cultivated oyster mushroom, highlights its diverse bioactive compounds and their significant nutritional and medicinal value. These compounds include polysaccharides, proteins, lipids, phenolic compounds, flavonoids, terpenoids, and ergothioneine, each contributing uniquely to its health-promoting properties. Based on previous studies, *P. florida* demonstrates potential as a functional food and a natural therapeutic resource.

Polysaccharides, particularly beta-glucans, are among the most prominent compounds in *P. florida*. These complex carbohydrates play crucial roles in immunomodulation and anti-inflammatory activities. Rajoriya *et al*. (2014) [1] reported that *P. florida* contains approximately 8.30 g of carbohydrates per 100 g, which includes bioactive beta-glucans. These compounds have been shown to enhance immune responses, regulate blood glucose levels, and reduce oxidative stress, making them valuable in functional food formulations.

Proteins in *P. florida* are nutritionally significant due to their high digestibility and essential amino acid content. According to Rajoriya *et al*. (2014) [1], the mushroom's mycelium contains 8.50 mg of protein per gram. Additionally, bioactive peptides derived from *P. florida* exhibit antioxidant and antimicrobial properties, which add to its pharmacological potential and utility as a dietary supplement for vegetarian and vegan diets.

The lipid profile of *P. florida* is characterized by its low fat content, predominantly consisting of unsaturated fatty acids such as linoleic acid, which are essential for cardiovascular health. Prabu and Kumuthakalavalli (2014) [2] noted that these fatty acids help regulate cholesterol levels, thereby reducing the risk of atherosclerosis and other cardiovascular diseases. Ergosterol, a precursor to vitamin D found in *P. florida*, further enhances its role in bone health and metabolic functions.

Phenolic compounds and flavonoids significantly contribute to the antioxidant activity of *P. florida*. Prabu and Kumuthakalavalli (2014) [2] identified phenolic compounds such as gallic acid and catechins, which have been shown to scavenge free radicals and mitigate oxidative stress. These antioxidants help protect against chronic diseases, including cancer, diabetes, and neurodegenerative disorders. Ergothioneine, a unique sulfur-containing antioxidant abundant in *P. florida*, has been associated with neuroprotective and anti-aging properties, as highlighted by Selvaananthi and Beulah Jerlin (2024) [3]. Terpenoids present in *P. florida* exhibit antimicrobial and anti-inflammatory properties. Selvaananthi and Beulah Jerlin (2024) [3] identified various terpenoids that contribute to the mushroom's therapeutic effects. Additionally, lovastatin, a natural statin found in *P. florida*, is known to inhibit cholesterol biosynthesis, thereby supporting cardiovascular health and reducing hyperlipidemia.

Dehydration of *P. florida* increases the concentration of its bioactive compounds, such as polysaccharides, proteins, and phenolics, by removing water content. However, heat-sensitive compounds, including certain phenolic acids and vitamin C, may degrade during the dehydration process. Rajoriya *et al*. (2014) [1] emphasized the need for optimized processing techniques to preserve the maximum phytochemical and nutritional value of dehydrated *P. florida*.

In conclusion, the phytochemical profile of *Pleurotus florida* underscores its potential as a functional food and medicinal resource. Polysaccharides, proteins, lipids, phenolic compounds, flavonoids, terpenoids, and ergothioneine collectively contribute to its nutritional and pharmacological significance. Studies by Rajoriya *et al*. (2014) [1], Prabu and Kumuthakalavalli (2014) [2], and Selvaananthi and Beulah Jerlin (2024) [3] provide strong evidence supporting its role in promoting health and preventing diseases. With continued research, *P. florida* is poised to play an even greater role in nutraceutical and therapeutic applications.

Pharmacological Potential of *Pleurotus florida*

Oyster mushrooms (*Pleurotus florida*) are renowned for their nutritional and medicinal value, underpinned by a rich composition of bioactive compounds. These mushrooms have been widely investigated for their pharmacological potential, which spans immunomodulation, antioxidant activity, antimicrobial properties, and much more.

1. Antioxidant Properties

The antioxidant potential of *Pleurotus florida* is one of its most studied pharmacological attributes, largely attributed to its rich content of phenolic compounds, flavonoids, and unique sulfur-containing compounds such as ergothioneine. Antioxidants are critical in neutralizing free radicals—unstable molecules that cause oxidative stress, leading to cell damage and the development of chronic diseases like cancer, diabetes, cardiovascular disorders, and neurodegenerative conditions.

Several studies have emphasized the potent antioxidant activity of *P. florida*. Rajoriya *et al*. (2014) [1] demonstrated that aqueous and ethanol extracts of *P. florida* exhibited significant scavenging activity against free radicals *in vitro*. The phenolic compounds, such as gallic acid and catechins, are particularly effective in reducing oxidative stress by donating electrons to neutralize free radicals. Additionally, flavonoids in *P. florida* have been shown to prevent lipid peroxidation, a process where free radicals attack lipid membranes, causing cellular damage.

Ergothioneine, a powerful antioxidant unique to mushrooms, is highly concentrated in *P. florida*. This compound has been linked to neuroprotective and anti-aging effects due to its ability to stabilize free radicals and protect cellular DNA from damage. Ergothioneine also plays a role in reducing inflammation caused by oxidative stress, further enhancing its therapeutic potential.

What sets *P. florida* apart is its dual mechanism of antioxidant defense: enzymatic and non-enzymatic. It contains antioxidant enzymes such as superoxide dismutase (SOD), catalase, and glutathione peroxidase, which work in tandem

with phenolic compounds and ergothioneine to maintain oxidative balance in cells.

The antioxidant properties of *P. florida* have far-reaching implications in disease prevention and management. For instance, oxidative stress is a major contributing factor in atherosclerosis, a precursor to heart attacks and strokes. By reducing oxidative damage to blood vessel walls, *P. florida* can play a role in cardiovascular health. Similarly, its ability to protect neurons from oxidative damage opens avenues for its application in neurodegenerative disease therapies.

Moreover, dehydration of *P. florida* tends to concentrate its phenolic and flavonoid content, enhancing its antioxidant capacity. However, care must be taken during the drying process to preserve heat-sensitive compounds like vitamin C. This highlights the need for optimized drying methods to maximize its therapeutic potential.

In conclusion, the antioxidant properties of *P. florida* offer immense pharmacological value. Its unique combination of phenolics, flavonoids, ergothioneine, and antioxidant enzymes positions it as a potent natural agent for combating oxidative stress and its associated disorders. Further clinical research is warranted to explore its full potential in human health.

2. Immunomodulatory Effects

Pleurotus florida exhibits remarkable immunomodulatory properties, primarily due to its high beta-glucan content. Beta-glucans are complex polysaccharides that are well-known for their ability to modulate the immune system. These compounds stimulate various components of the innate and adaptive immune systems, enhancing the body's ability to fight infections and diseases.

Beta-glucans in *P. florida* activate immune cells such as macrophages, dendritic cells, and natural killer (NK) cells. These immune cells play a critical role in recognizing and destroying pathogens and cancer cells. Studies have shown that beta-glucans bind to specific receptors on immune cells, such as dectin-1 and toll-like receptors, triggering a cascade of immune responses. This includes the production of cytokines, which are signaling molecules that mediate inflammation and immune activation.

The immunomodulatory effects of *P. florida* are not limited to immune activation. It also exhibits immunoregulatory properties, helping to maintain immune balance. For instance, while it enhances the activity of pro-inflammatory cytokines to fight infections, it also modulates anti-inflammatory cytokines to prevent excessive immune responses that can lead to autoimmune disorders.

Prabu and Kumuthakalavalli (2014) [2] highlighted the potential of *P. florida* polysaccharides in enhancing immunity in animal models. They reported increased activity of macrophages and lymphocytes, as well as higher antibody production, indicating a strengthened immune system. These findings suggest that *P. florida* could be used as an adjuvant therapy to boost immunity in immunocompromised individuals, such as cancer patients undergoing chemotherapy or individuals with chronic infections like HIV.

Another fascinating aspect of *P. florida* is its role in gut immunity. The mushroom's polysaccharides act as prebiotics, promoting the growth of beneficial gut bacteria such as *Lactobacillus* and *Bifidobacterium*. These bacteria play a crucial role in maintaining gut health and modulating immune responses. A healthy gut microbiome is essential for a robust immune system, and *P. florida* contributes significantly to this process. The immunomodulatory effects of *P. florida* also extend to its potential in combating cancer. By activating immune cells and enhancing their cytotoxic activity against tumor cells, *P. florida* serves as a natural immunotherapeutic agent. Its ability to regulate inflammation further complements its anti-cancer properties, as chronic inflammation is a known risk factor for cancer development.

In conclusion, the immunomodulatory properties of *P. florida* are a testament to its pharmacological potential. Its ability to enhance and regulate immune responses makes it a valuable natural resource for boosting immunity and preventing diseases. Further studies are needed to explore its clinical applications in immunotherapy.

3. Antimicrobial Activity

Pleurotus florida has shown significant antimicrobial activity against a variety of bacterial, fungal, and viral pathogens, making it a potential source of natural antimicrobial agents. The antimicrobial properties of *P. florida* are attributed to its rich content of secondary metabolites such as terpenoids, phenolic compounds, and antimicrobial peptides.

Research by Selvaananthi and Beulah Jerlin (2024) [3] demonstrated that extracts of *P. florida* effectively inhibited the growth of Gram-positive bacteria, including *Staphylococcus aureus* and *Bacillus subtilis*, as well as Gram-negative bacteria such as *Escherichia coli* and *Pseudomonas aeruginosa*. The antimicrobial activity was dose-dependent, with higher concentrations of mushroom extract showing greater efficacy. Phenolic compounds and flavonoids in *P. florida* disrupt bacterial cell membranes and inhibit essential enzymatic functions, leading to cell death.

The antifungal properties of *P. florida* are equally noteworthy. Studies have shown that its extracts inhibit the growth of pathogenic fungi such as *Candida albicans* and *Aspergillus niger*. The mechanism of antifungal action involves the disruption of fungal cell wall integrity and inhibition of ergosterol synthesis, a critical component of fungal membranes.

In addition to bacterial and fungal pathogens, *P. florida* also exhibits antiviral activity. Preliminary studies suggest that its bioactive compounds interfere with viral replication and enhance the host immune response to fight viral infections. This potential is particularly relevant in the context of emerging viral diseases, where natural antiviral agents are in high demand.

What makes *P. florida* especially valuable is its low likelihood of contributing to antimicrobial resistance (AMR), a growing global health concern. Unlike synthetic antibiotics, natural antimicrobial agents from *P. florida* target multiple pathways, reducing the risk of pathogens developing resistance.

The antimicrobial properties of *P. florida* also have applications beyond medicine. For instance, its extracts can be used as natural preservatives in food products to prevent spoilage caused by microbial contamination. This dual functionality as a therapeutic agent and a food preservative adds to its versatility and economic value.

In conclusion, the antimicrobial activity of *P. florida* highlights its potential as a natural alternative to synthetic antibiotics and antifungals. Its broad-spectrum efficacy, coupled with its safety profile, makes it a promising candidate for combating infectious diseases and addressing antimicrobial resistance.

Conclusion

The pharmacological potential of *Pleurotus florida* highlights its remarkable versatility as a natural therapeutic resource,

stemming from its rich phytochemical composition and bioactive properties. This mushroom species, widely recognized for its antioxidant, immunomodulatory, antimicrobial, and anti-inflammatory effects, presents a compelling case for its integration into functional foods, nutraceuticals, and therapeutic formulations. Its unique compounds, such as beta-glucans, phenolics, terpenoids, and ergothioneine, have demonstrated significant efficacy in combating oxidative stress, regulating immune responses, lowering cholesterol levels, and addressing microbial infections.

What sets *P. florida* apart is its ability to address multiple health concerns simultaneously. For instance, its beta-glucans not only enhance immunity but also regulate blood sugar levels, while its phenolic compounds contribute to both antioxidant defense and antimicrobial activity. These synergistic effects underscore its potential as a multifaceted agent in preventive and curative healthcare.

Dehydration processes further expand its utility by enhancing nutrient concentration and extending shelf life, making it suitable for a variety of applications, including dietary supplements and medicinal formulations. However, attention must be given to optimizing drying methods to preserve heat-sensitive bioactives.

As global health challenges such as antimicrobial resistance, chronic diseases, and lifestyle disorders continue to rise, *P. florida* offers a sustainable and natural solution. Its low cost of cultivation, ease of production, and nutritional density make it accessible for both developed and developing nations, ensuring its widespread applicability.

Future research should focus on clinical trials to validate the therapeutic claims of *P. florida* and explore its full pharmacological potential in humans. Additionally, studies on its bioavailability, mechanism of action, and potential synergistic effects with other therapeutic agents will further cement its role in modern medicine.

In conclusion, *Pleurotus florida* stands as a beacon of promise in the field of natural therapeutics. Its diverse pharmacological properties and ease of incorporation into daily diets position it not just as a functional food but as a cornerstone in the development of holistic healthcare solutions. Through continued research and innovation, *P. florida* has the potential to transform the way we approach disease prevention and management, bridging the gap between traditional remedies and modern medicine

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