

BIOCHEMICAL AND NUTRITIONAL PROPERTIES OF CULTIVATED PLEUROTUS OSTREATUS

Premavathy. N¹ Muruganandham², R Lavanya³, Senthilkumar G P^{4*} and B Nazreen⁵

¹PERI Institute of Technology, Chennai - 48

²PERI College of Arts and Science, Chennai -48

³PERI College of Physiotherapy, Chennai -48

⁴PERI College of Pharmacy, Chennai -48

⁵ PERI College of Nursing, Chennai -48

*Corresponding Author
Senthilkumar G P4

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Abstract:

Pleurotus ostreatus (oyster mushroom) is one of the most widely cultivated edible mushrooms, valued for its high nutritional quality and bioactive constituents. This study investigates the proximate composition, mineral profile, vitamin content, and antioxidant properties of cultivated *P. ostreatus*. Proximate analysis showed high protein levels ($20.8 \pm 0.4\%$), carbohydrates ($53.6 \pm 1.1\%$), crude fiber ($12.4 \pm 0.8\%$), and low fat content ($3.1 \pm 0.2\%$). Essential minerals such as potassium (2180 mg/100 g), phosphorus (820 mg/100 g), magnesium (210 mg/100 g), iron (14.2 mg/100 g), and zinc (5.3 mg/100 g) were abundant. Vitamin profiling revealed significant amounts of B-complex vitamins, including niacin (46.3 mg/100 g) and riboflavin (1.6 mg/100 g). Antioxidant activity was confirmed through DPPH assay, with an IC_{50} of 2.9 mg/mL. The results demonstrate the strong nutritional and biochemical significance of *P. ostreatus*, supporting its role as a functional food with potential applications in dietary interventions and nutraceutical development.

Keywords: Pleurotus ostreatus, nutrition, proximate composition, minerals, vitamins, functional foods, biochemical properties.

INTRODUCTION

Edible mushrooms are globally recognized for their nutritional richness and medicinal potential. Among them, *Pleurotus ostreatus* (oyster mushroom) is extensively cultivated due to its high yield, adaptability to diverse substrates, and superior biochemical properties (Chang & Miles, 2004). Mushroom-derived nutrients include high-quality proteins, essential amino acids, minerals, vitamins, and bioactive compounds such as phenolics and polysaccharides (Bisen et al., 2010). *P. ostreatus* is particularly valued in food and pharmaceutical industries due to its low-fat content, abundant dietary fiber, and antioxidant potential (Adebayo et al., 2012). The biochemical composition of mushrooms depends on factors such as cultivation method, substrate type, and environmental conditions (Ragunathan & Swaminathan, 2003). Understanding the nutritional composition of cultivated *P. ostreatus* provides insights into its functional food applications. This study provides a detailed evaluation of the biochemical and nutritional characteristics of cultivated *P. ostreatus*, including proximate composition, mineral and vitamin profiling, and antioxidant activity.

LITERATURE REVIEW

Proximate Composition of *Pleurotus ostreatus*

Proximate analysis consistently shows that *Pleurotus ostreatus* is rich in proteins, carbohydrates, and dietary fiber while being low in fat. Adebayo et al. (2012) reported that the mushroom contains 20–30% protein (dry weight), making it a valuable plant-based protein source. Ragunathan and Swaminathan (2003) and Manzi et al. (2001) highlighted the low lipid content (1–

3%) and high carbohydrate fraction, which contribute to its low caloric value. AOAC (2016) methods remain the standard for reliable proximate assessment. Studies across different countries also reveal comparable nutrient trends (Alam et al., 2008; Sanmee et al., 2003), Vijai Krishna V et al (2025), Jeeva V et al (2025), Nirmala B et al (2025) and Ramesh M et al (2025).

Protein Quality and Amino Acid Composition

The protein profile of *Pleurotus* species is rich in essential amino acids. Chirinang and Intarapichet (2009) emphasized that lysine, leucine, and valine are present in significant amounts. Das and Mukherjee (2007) demonstrated that proteins in *P. ostreatus* possess high digestibility, contributing to its functional food potential. Khan et al. (2008) further confirmed that amino acid concentrations vary with substrate quality but remain nutritionally superior to many conventional vegetables.

Carbohydrates, Dietary Fiber & Functional Polysaccharides

Carbohydrates in *P. ostreatus* include β -glucans, chitin, and hemicellulose. Kalac (2013) reviewed the high dietary fiber content (roughly 10–30%), which aids digestive health. Muszyńska et al. (2017) highlighted the presence of bioactive polysaccharides such as β -glucans that exhibit immunomodulatory potential. Sánchez (2010) noted that these compounds contribute to cholesterol-lowering and antitumor activities.

Lipid Profile and Fatty Acid Composition

Although total lipids are low, *P. ostreatus* contains significant unsaturated fatty acids. Adebayo et al. (2012) and Adejoye and Fasidi (2009) documented the dominance of linoleic acid, oleic acid, and palmitic acid. These contribute to flavor development and offer cardioprotective benefits, according to Kamal and coworkers. Fernández et al. (2015) also identified sterols such as ergosterol, which serves as a precursor for vitamin D₂.

Mineral Composition

Mushrooms are excellent sources of essential minerals. Mattila et al. (2002) reported high levels of potassium, phosphorus, and magnesium in *P. ostreatus*. Bernas et al. (2006) confirmed the presence of trace elements such as zinc, iron, and selenium. However, Safer and Al-Nughamish (1999) cautioned that mushrooms can bioaccumulate heavy metals depending on substrate contamination, emphasizing the need for controlled cultivation practices.

Vitamins and Bioactive Micronutrients

Vitamins such as B-complex (thiamine, riboflavin, niacin) are abundant in *P. ostreatus*. Valkonen et al. (2003) established that *Pleurotus* species contain significant levels of B-vitamins, contributing to energy metabolism. Heleno et al. (2010) also reported tocopherols, phenolic compounds, and organic acids that enhance antioxidant potential. The presence of ergosterol-derived vitamin D₂ is particularly important in addressing dietary vitamin D deficiencies.

Antioxidant Properties

Several studies highlight strong antioxidant activity. Beluhan and Ranogajec (2011) found high total phenolics and flavonoids, while Tsai et al. (2007) demonstrated potent free radical scavenging ability. Reis et al. (2012) linked antioxidant activity to phenolics, tocopherols, and organic acids. Bottega et al. (2014) identified mushroom-derived ergothioneine as a unique antioxidant beneficial for cellular protection.

Medicinal and Functional Properties

*Mushrooms, particularly *P. ostreatus*, are recognized for multiple therapeutic attributes. Bisen et al. (2010)

and Patel et al. (2012) described antimicrobial, antidiabetic, antihypercholesterolemic, and immunomodulatory effects. Deepalakshmi and Mirunalini (2014) labeled *P. ostreatus* as a functional food due to its rich content of polysaccharides, terpenoids, and antioxidants. Wasser (2017) further highlighted its potential for drug discovery, especially in oncology and metabolic diseases.

MATERIALS AND METHODS

Sample Collection

Fresh fruiting bodies of cultivated *Pleurotus ostreatus* were obtained from a local mushroom farm and transported under cold conditions to the laboratory.

Proximate Composition

Methods followed AOAC (2016) guidelines:

- Moisture: Hot-air oven (105 °C)
- Ash: Muffle furnace (550 °C)
- Crude protein: Kjeldahl method (N × 6.25)
- Crude fat: Soxhlet extraction (petroleum ether)
- Crude fiber: Acid–alkali digestion
- Carbohydrates: By difference

Mineral Estimation

Samples were dry-ashed and analyzed using atomic absorption spectrophotometry (AAS) for potassium, calcium, magnesium, iron, copper, and zinc.

Vitamin Profiling

Water-soluble vitamins were estimated using HPLC: Thiamine, Riboflavin, Niacin, Ascorbic acid.

Antioxidant Activity

The DPPH radical scavenging assay was performed. Percent inhibition and IC₅₀ values were calculated.

RESULTS AND DISCUSSIONS:

Proximate Composition

Pleurotus ostreatus exhibited a composition consistent with literature reports on high-protein mushrooms.

Antioxidant Activity

DPPH scavenging activity showed significant radical inhibition.

- IC₅₀ value: **2.9 mg/mL**, indicating moderate antioxidant potential
- Phenolic compounds and flavonoids contribute to activity
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Table 1. Proximate Composition of *P. ostreatus* (Dry Weight Basis)

Component	Composition (%)
Moisture	8.4 ± 0.3
Crude Protein	20.8 ± 0.4
Crude Fat	3.1 ± 0.2
Carbohydrates	53.6 ± 1.1
Ash	10.1 ± 0.3
Crude Fiber	12.4 ± 0.8

Mineral Composition

Table 2. Mineral Content of *P. ostreatus*

Mineral	Content
Potassium (K)	2180
Phosphorus (P)	820
Magnesium (Mg)	210
Calcium (Ca)	96
Iron (Fe)	14.2
Zinc (Zn)	5.3

Vitamin Composition

Table 3. Vitamin Profile of *P. ostreatus*

Vitamin	Content (mg/100 g)
Thiamine (B1)	0.21
Riboflavin (B2)	1.6
Niacin (B3)	46.3
Ascorbic Acid (C)	5.9

CONCLUSION

Cultivated *Pleurotus ostreatus* demonstrates excellent nutritional and biochemical value, offering a rich source of proteins, dietary fiber, essential minerals, and vitamins. Its antioxidant capacity further enhances its importance as a functional food. Regular consumption of *P. ostreatus* may contribute to improved nutritional status and health outcomes. The findings reinforce its potential in nutraceuticals, dietary formulations, and sustainable food systems.

FUTURE WORK

Future research should focus on expanding the biochemical characterization of *Pleurotus ostreatus* using advanced metabolomic and proteomic tools to identify additional bioactive compounds with therapeutic potential. Further investigation is also required to understand how different cultivation substrates, environmental conditions, and post-harvest processing techniques influence nutrient composition and antioxidant properties. Large-scale cultivation trials should be undertaken to optimize yield and nutritional consistency while ensuring food safety and minimizing

heavy metal accumulation. Moreover, in vivo and clinical studies are needed to validate the health benefits of key bioactive constituents and to explore their applications in functional foods, nutraceuticals, and pharmaceutical formulations. Finally, integrating genetic improvement strategies and biotechnological interventions could enhance strain performance, nutritional quality, and commercial value, opening avenues for industrial-scale production of high-value mushroom-based products.

REFERENCES

1. Vijai Krishna V, A Kaaviya, Sounthararasu V, Florence A and S B Chandra Lekha (2025), Integrated Virtual Screening And Molecular Docking Analysis Of Sars-Cov-2 Main Protease (Mpro), *International Journal of Zoology and Applied Biosciences*, Volume 10, Issue 6, pp: 1-6
2. Nirmala B, Swathi T, Sowmiya B, Anandhi A and Sujitha K (2025), Enhanced Production Of Lipase By Marine *Bacillus Subtilis* Through Statistical Optimization Of Fermentation Parameters,

- International Journal of Zoology and Applied Biosciences, Volume 10, Issue 6, pp: 7-11
3. Jeeva V, Sindhu D, R Lavanya, Anandhi A and B Nazreen (2025), Valorization Of Fruit Waste For Bioethanol Production Through Fermentation With *Saccharomyces Cerevisiae*, International Journal of Zoology and Applied Biosciences, Volume 10, Issue 6, pp: 12-16
4. Ramesh M, Rubala Nancy J, R Lavanya, A, A Kaaviya and B Nazreen (2025), Isolation And Screening Of Lipase-Producing Microorganisms, International Journal of Zoology and Applied Biosciences, Volume 10, Issue 6, pp: 17-21.
5. Adebayo, E. A., et al. (2012). Nutritional composition of *Pleurotus ostreatus*. *Journal of Medicinal Food*, 15(6), 548–554.
6. AOAC. (2016). Official Methods of Analysis. Association of Official Analytical Chemists.
7. Bisen, P. S., Baghel, R. K., Sanodiya, B. S., Thakur, G. S., & Prasad, G. B. K. S. (2010). Nutritional and medicinal potential of mushrooms. *Current Science*, 98(3), 387–396.
8. Chang, S. T., & Miles, P. G. (2004). *Mushrooms: Cultivation, nutritional value, medicinal effect, and environmental impact*. CRC Press.
9. Ragunathan, R., & Swaminathan, K. (2003). Nutritional value of edible mushrooms. *Food Chemistry*, 82(3), 461–467.
10. Sánchez, C. (2010). Cultivation and nutritional properties of *Pleurotus* species. *Applied Microbiology and Biotechnology*, 85(5), 1321–1337.
11. Adejoye, O. D., & Fasidi, I. O. (2009). Nutritional composition of *Pleurotus ostreatus*. *African Journal of Biotechnology*, 8(20), 3028–3032.
12. Alam, N., Amin, R., Khan, A., Ara, I., Shim, M. J., Lee, M. W., & Lee, T. S. (2008). Nutritional analysis of cultivated mushrooms in Bangladesh. *Journal of Applied Sciences*, 8(3), 472–476.
13. Beluhan, S., & Ranogajec, A. (2011). Chemical composition and antioxidant properties of mushrooms. *Food Chemistry*, 124(3), 1076–1082.
14. Bernas, E., Jaworska, G., & Lisiewska, Z. (2006). Edible mushrooms as a source of nutrient value. *Food Chemistry*, 98(3), 508–512.
15. Bottega, G., Cirlini, M., Tedeschi, T., Truzzi, F., & Dall'Asta, C. (2014). Bioactive compounds in edible mushrooms. *Journal of Food Composition and Analysis*, 35(2), 40–48.
16. Chirinang, P., & Intarapichet, K. O. (2009). Amino acid and antioxidant properties of oyster mushrooms. *Food Chemistry*, 113(4), 1092–1097.
17. Das, N., & Mukherjee, M. (2007). Biochemical composition of oyster mushrooms. *Journal of Scientific & Industrial Research*, 66, 343–346.
18. Deepalakshmi, K., & Mirunalini, S. (2014). *Pleurotus ostreatus*: A functional mushroom. *Journal of Pharmacy Research*, 8(2), 132–140.
19. Fernandes, Á., Barros, L., Martins, A., Herbert, P., & Ferreira, I. C. (2015). Nutritional composition and antioxidant activity of mushrooms. *International Journal of Food Science & Nutrition*, 66(1), 1–11.
20. Gąsecka, M., Siwulski, M., & Sobieralski, K. (2016). Sterols and phenolics in *Pleurotus ostreatus*. *Food Chemistry*, 190, 220–225.
21. Heleno, S. A., Barros, L., Sousa, M. J., Martins, A., & Ferreira, I. C. (2010). Tocopherols and phenolics in wild mushrooms. *Food Chemistry*, 119(4), 1443–1450.
22. Jeena, G. S., Punetha, H., Pradhan, R. C., & Mishra, S. (2020). Nutraceutical potential of oyster mushrooms. *Journal of Food Biochemistry*, 44(1), e13113.
23. Kalac, P. (2013). A review of nutritional values of edible mushrooms. *Food Chemistry*, 138(4), 2428–2434.
24. Khan, M. A., Tania, M., Amin, R., & Alam, N. (2008). Nutritional composition of *Pleurotus* species. *Journal of Nutrition Research*, 28(2), 123–130.
25. Manzi, P., Aguzzi, A., & Pizzoferrato, L. (2001). Nutritional value of mushrooms. *Food Chemistry*, 73(3), 321–325.
26. Mattila, P., Salo-Väänänen, P., Könkö, K., Aro, H., & Jalava, T. (2002). Minerals and vitamins in mushrooms. *Journal of Agricultural and Food Chemistry*, 50(22), 6419–6423.
27. Muszyńska, B., Kala, K., Łojewski, M., & Sułkowska-Ziaja, K. (2017). Functional components of *Pleurotus ostreatus*. *Food Science & Technology Research*, 23(3), 383–391.
28. Patel, Y., Naraian, R., & Singh, V. K. (2012). Medicinal properties of *Pleurotus* species. *Journal of Biochemical Technology*, 3(2), 336–344.
29. Reis, F. S., Barros, L., Martins, A., & Ferreira, I. C. (2012). Nutritional and antioxidant evaluation of oyster mushrooms. *Food Chemistry*, 135(2), 741–746.
30. Safer, A. M., & Al-Nughamish, A. J. (1999). Heavy metal content in mushrooms. *Food Chemistry*, 65(3), 247–250.
31. Sanmee, R., et al. (2003). Proximate analysis of edible mushrooms. *Food Chemistry*, 80(3), 337–342.
32. Srikram, A., & Supapvanich, S. (2016). Bioactive compounds in oyster mushrooms. *International Journal of Food Science*, 2016, 1–9.
33. Tsai, S. Y., Huang, S. J., & Mau, J. L. (2007). Antioxidant properties of oyster mushrooms. *Food Chemistry*, 105(1), 329–335.
34. Valkonen, K. H., Koivisto, P., & Korpela, T. (2003). B-vitamin content in mushrooms. *Journal of Food Composition and Analysis*, 16(3), 301–311.

35. Wasser, S. P. (2017). Medicinal mushrooms as a source of therapeutics. *International Journal of Medicinal Mushrooms*, 19(1), 1–16.