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Effect of preservation techniques on the phytochemical profile, antioxidant activity, and glucose adsorption capacity of oyster mushrooms (*Pleurotus ostreatus*)

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ABSTRACT

The growing demand for foods with enhanced shelf life and nutritional value has driven the rapid expansion of processed food products, often outpacing natural alternatives. This study explores the effects of oven-drying, salt-drying, and freeze-drying on *Pleurotus ostreatus* (Oyster mushrooms) cultivated on oil palm frond substrates. Key parameters analysed include moisture content (MC) and protein content (PC), total phenolic content (TPC), antioxidant activity, glucose adsorption capacity (GAC), and elemental composition. CHNS analysis confirmed the presence of carbon, hydrogen, nitrogen, and sulphur in all substrates, while MC varied slightly (82–88.54 %) with substrate composition. Protein analysis revealed that freeze-dried samples had the highest PC, while SDS-PAGE profiling showed protein bands (35–75 kDa) in all samples except salt-treated ones, which were denatured. Over 60 days, oven-dried substrates maintained relatively high PC (~4–5 mg/ml), whereas freeze-dried samples exhibited a significant decline. Salt-treated and oven-dried samples extracted with phosphate buffer consistently showed low PC. GAC increased with molar concentration, with oven-dried samples exhibiting the highest efficiency. Regarding antioxidant properties, salt-treated samples demonstrated increased free-radical scavenging activity after storage, while oven-dried and freeze-dried samples showed a decline. TPC decreased over time in all treatments, but oven-dried samples gradually increased, particularly in substrate III (87.5 %). These findings suggest that preservation methods effectively extend shelf life while maintaining bioactive compounds that may influence glucose absorption and the potential anti-diabetic properties of *P. ostreatus*. Further research should explore sensory attributes, toxicological safety, and *in vivo* molecular mechanisms.

1. Introduction

Mushrooms are macro-fungi with distinctive fruiting bodies exhibiting significant ecological and economic importance (Bazzicalupo et al., 2022; Buba et al., 2024). Oyster mushrooms known as *Pleurotus ostreatus* (Jacq.) P. Kumm (*Pleurotaceae*) is a common edible mushroom and is widely cultivated owing to their characteristic taste and high nutritional value, besides contain high fibre, protein, and essential amino acids including lysine and leucine (Zakil et al., 2022). Several phytochemicals such as myricetin, coumaric acid, ferulic acid, caryophyllene, kaempferol, limonene, farnesene, pinene, quercetin, ergosterol, and caffeic acid have been isolated from *P. ostreatus* (Fig. 1) (Araújo-Rodrigues et al., 2022; You et al., 2022). These compounds could be linked to the significant therapeutic properties such as antibacterial, antioxidant, anti-inflammatory, antidiabetic, antimicrobial, anti-aging, and anticancer exhibited by the plant. Thus, they are regarded as potential contributors to developing drugs and nutraceuticals (Odediran et al., 2020; Venturella et al., 2021). In some regions, mushrooms obtained from decaying plants such as wood are often eaten as food due to their high dietary significance (Odediran et al., 2020; Zhao et al., 2024). Furthermore, mushrooms can also be used in the synthesis or production of cosmetics, probiotics, biopesticides, biochar, flavour enhancers, and biosorbents, among others

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