

## ABSTRACT

The study was aimed at development of process technology for the extraction of ergothioneine from dried oyster mushroom (*Pleurotus ostreatus*) and its use as a food preservative. Fresh oyster mushroom ( $90.5 \pm 2\%$  mc wb) was dried in recirculatory hot-air dryer (6 kW) and microwave-convective dryer (2.45 GHz, 1.5 kW). Midilli *et al.* model fitted best to predict the drying characteristics with  $R^2$  values 0.99 for both the dryers. However, maximum retention of ergothioneine was observed for microwave-convective dryer under optimized condition of 69 °C drying temperature for duration of 59 min. The dried mushroom was ground in a grinder (3 min, 900 rpm), the free-flowing powder (200 - 250  $\mu$ m) obtained was further subjected to three different extraction techniques. Under optimized extraction condition for maximum ergothioneine and polyphenol concentration, ultrasound-assisted extraction (ethanol concentration 56% (v/v), solvent to raw material ratio 30:1 (v/w) and time 31 min) was selected over supercritical fluid (21 MPa pressure, 48 °C temperature and 133 ml co-solvent) and conventional hot-water bath extraction (temperature 47 °C, solvent to sample ratio 14:1 (v/w) and time 26 min) on the basis of percentage purity of ergothioneine as obtained by HPLC. From 1 kg of fresh oyster mushroom 92 mg ergothioneine with 90% purity was obtained. The purified ergothioneine (freeze dried: -55 °C, 4h) was characterized by employing tandem mass spectrometry (MS/MS) at m/z 230.10. The purified ergothioneine showed  $\alpha$ -amylase inhibitory,  $\alpha$ -glucosidase inhibitory and anti-cancer activity with IC<sub>50</sub> values of 12.6, 36.11 and 24.24  $\mu$ g/ml respectively; whereas, food borne pathogens *E. coli* and *E. faecalis* showed susceptibility against purified ergothioneine with a mean diameter of 18 and 17 mm respectively. Purified ergothioneine to SO<sub>2</sub> at 0/0, 70/0, 0/70 and 35/35 (w/w, mg/L) combinations were added to apple juice as preservative which lasted for 20, 50, 50 and 60 days during refrigerated storage ( $5 \pm 2$  °C) while for 10, 20, 20 and 30 days during ambient storage ( $30 \pm 2$  °C) respectively. The best preservative combination was 35/35 (w/w, mg/L) ergothioneine/SO<sub>2</sub>. Rapid, non-destructive FT-NIR spectroscopic method was developed for estimation of ergothioneine using PLS regression analysis.

**Keywords:** *Pleurotus ostreatus*, Ergothioneine, Microwave-convective drying, Supercritical fluid extraction, Ultrasound-assisted extraction, FT-NIR spectroscopy