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Effectiveness of banana leaves and coconut coir as substrates for *Pleurotus ostreatus* cultivation: A perspective of nutritional and antioxidant properties

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Pleurotus ostreatus (PO) is an edible oyster mushroom capable of degrading a wide variety of lignocellulosic substrates. Moreover, many of the *Pleurotus* species have been shown to have medicinal properties and contain bioactive compounds. Furthermore, they have high nutritional value as they are rich in fiber, proteins, carbohydrates, vitamins, and minerals. In Sri Lanka, sawdust is predominantly used as the substrate for oyster mushroom cultivation. Other substrates utilized in Sri Lanka include paddy straw, banana leaves and shredded paper. The purpose of this study was to evaluate which substrate or substrate combinations of dried banana leaves (BL) and coconut coir (CC) would produce PO mushrooms with high antioxidant activity and nutritional value. The different substrates used to grow the mushrooms were 100% BL, 100% CC, 50% BL + 50% CC, 75% BL + 25% CC and 75% CC + 25% BL. The PO spawn packets were purchased from the Mushroom Development and Training Center in Ratmalana, Sri Lanka. Polypropylene media bags were prepared by adding an appropriate weight of each substrate (BL and CC) along with white rice bran, red rice bran, chemical mix, and water. Each bag was autoclaved and inoculated under aseptic conditions. The bags were then transferred to a dark incubation room with a temperature of 25 °C. Once the spawn run had reached the bottom of each bag, the bags were cut open from the top and watered 3-4 times a day. Aqueous mushroom extracts were prepared using the mushrooms harvested from each substrate. Qualitative tests were conducted to determine the presence of bioactive compounds such as saponins, flavonoids, polyphenols, terpenoids, tannins, steroids and anthraquinones. Moreover, quantitative assays such as Lowry assay to determine the total protein content, Phenol-sulfuric acid assay to determine the total carbohydrate content, DPPH assay to evaluate the antioxidant activity, Phosphomolybdenum assay to determine the total antioxidant capacity and Folin-Ciocalteu assay to determine the total phenolic content of the mushrooms were performed. The 100% CC substrate had the highest water-holding capacity but was the least suitable substrate for mushroom growth as very little mycelial growth was observed in the media bags. All the mushroom extracts tested positive for polyphenols, saponins, terpenoids and steroids. 100% BL produced mushrooms with the highest total antioxidant capacity (1.13 mg/ml), moisture content (85.10%) and lowest IC50 value (1.25 mg/ml). Furthermore, these mushrooms had the highest number of fruiting bodies (13) and yield (18.75g). The 50% BL and 50% CC substrate produced mushrooms with the highest carbohydrate content (51.11 g/100g of sample). Based on the results it can be concluded that the 100% BL substrate is best suited to produce mushrooms with a high yield and antioxidant activity. In addition, the substrate ideal for producing mushrooms with a high nutritional value was 50% BL and 50% CC. Therefore, these substrates can be considered as suitable alternatives to the commonly used substrates by mushroom cultivators in Sri Lanka. Moreover, due to the presence of bioactive compounds identified in this study, further research can be conducted to determine the antibacterial and antifungal properties of the mushrooms grown on these substrates.

Keywords: Oyster mushrooms, Carbohydrates, Proteins, Polyphenols