ID428 | Valorization of Food By-Products Via Solid Submerged Fermentation for Sustainable Mycoprotein Production

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Background: The growing demand for sustainable protein sources has intensified interest in alternative production systems with reduced environmental impact. Mycoprotein is a promising option in this context. This study explored solid submerged fermentation (SSmF) as a bioprocess for producing mycoprotein from Pleurotus spp. using food by-products. Brewers' spent grain (BSG), banana peel (BP), peanut peel (PL), and cocoa bean shells (CBS) were selected due to their high availability and low cost.

Methods: The C/N ratios of the by-products were determined using an elemental analyzer (vario EL cube). P. ostreatus (PO), P. ostreatus black pearl (POB), and P. eryngii (PE) were cultivated under SSmF with malt extract broth (MEB), either alone or supplemented with 10% (w/v) of each by-product. Incubations were carried out in the dark at 25 °C with agitation at 200 rpm for 15 days. Fermentations were monitored by measuring sugars consumption, dried biomass yield, and protein content. In a final trial, PO was cultivated in a 3L-bioreactor using 10% BSG in MEB.

Results: The C/N ratios obtained were: BSG (10.8 ± 1.7), BP (37.9 ± 5.9), CBS (13.6 ± 1.2), PL (32.5 ± 5.6). On MEB, PO achieved the highest biomass yield (16.0 g/L) and protein content (16.5%), compared with POB (12.4 g/L; 9.9%) and PE (18.4 g/L; 8.3%). When cultivated with by-products, PO showed lower biomass yields: PL (0.66 g/L), CBS (3.46 g/L), BP (0.83 g/L), and BSG (9.80 g/L). These differences highlight the strong influence of substrate composition on fungal growth, with BSG supporting yields closest to the corresponding control (14.3 g/L).

Conclusions: The results emphasize that the intrinsic metabolic characteristics of Pleurotus spp. are determinant for the accumulation of biomass and protein. In addition, nutrient balance, particularly the C/N ratio, strongly influences substrate utilization by PO and the resulting biomass yield. Overall, SSmF demonstrates strong potential as a bioprocess for valorizing food by-products into mycoprotein.

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