Marine-Derived Basidiomycetes: Ligninolytic Enzyme Production Under Liquid-State Fermentation Supplemented With Pyrene

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Abstract:

Ligninolytic enzymes such as lignin peroxidase (LiP), manganese peroxidase (MnP) and laccase have potential applications in a large number of industrial fields and environment remediation processes, including the degradation of polycyclic aromatic hydrocarbons (PAHs). These enzymes have been extensively studied in terrestrial basidiomycetes. However, studies related to ligninolytic enzymes production and PAHs degradation by marine-derived fungi have been poorly investigated. In the present work, three ligninolytic sponge-derived basidiomycetes, *Marasmiellus* sp. CBMAI 1062, *Tinctoporellus* sp. CBMAI 1061 and *Peniophora* sp. CBMAI 1063, were used to evaluate the production of LiP, MnP and laccase in liquid-state fermentation (2% extract malt) supplemented with 2 mg/ml of pyrene for 7 days. Ligninolytic enzymes were measured in crude extract (culture supernatant obtained by centrifugation) and aqueous extract (obtained by separating the organic phase using ethyl acetate during the pyrene quantification procedure). Laccase activity was determined using guaiacol, o-dianisidine, syringaldazine and 2.2-azino-bisethylbenthiazolina (ABTS) as substrates, while LiP and MnP activity were obtained by oxidation of veratryl alcohol and phenol red, respectively. The crude extract showed higher values when compared to aqueous extract. However, the activity of laccase was higher in aqueous extract with syringaldazine as substract. The better production of LiP and MnP were obtained by *Marasmiellus* sp. CBMAI 1062 (1039.42 U/L and 11380.17 U/L, respectively) followed by *Peniophora* sp. CBMAI 1063 (109.52 U/L and 9307.42 U/L) and *Tinctoporellus* sp. CBMAI 1061 (47.79 U/L and 3268.56 U/L). Laccase was the main enzyme produced and guaiacol showed to be a good substrate: *Peniophora* sp. CBMAI 1063 (25603.13 U/L), *Tinctoporellus* sp. CBMAI 1061 (21267.77 U/L) and *Marasmiellus* sp. CBMAI 1062 (2025.77 U/L). Data derived from the present work suggested that the strategy of aqueous phase achievement could negatively affect the ligninolytic activity. Additionally, the production of ligninolytic enzymes in the presence of pyrene supports the hypothesis of PAHs degradation by sponge-derived basidiomycetes. Financial support: Fapesp and CNPq

Key words: basidiomycetes, ligninolytic enzymes, marine fungi