

Enhancement of ligninolytic enzyme activities in an *Aspergillus terreus* co-culture with macrofungi

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Abstract

Co-cultivation is a potential strategy in lignocellulolytic biodegradation with producing high activity enzymes due to synergic or stress action between two or more microorganism species. The objective of this study was to investigate the effect of different days co-culturing of two fungi on laccase and peroxidase production using cottonseed cake (CSC) as substrate. Spores of *Aspergillus terreus* ATCC20542 (1×10^7) were firstly inoculated in 50 mL of liquid medium contain basal components (yeast extract, KH_2PO_4 , $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$, $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$, $\text{Fe}(\text{NO})_3 \cdot 9\text{H}_2\text{O}$, MnCl , $\text{Na}_2\text{MoO}_4 \cdot 2\text{H}_2\text{O}$, $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$) and 7% of CSC. After 0, 1, 3 and 7 days of *A. terreus* in monoculture growth, mycellium of *Panus lecomtei* CC40 or *Fistulina hepatica* CC102 were inoculated for co-culture period. The laccase and peroxidase activities were evaluated after 0, 1, 3, and 7 days of co-culturing incubation. The highest increases of laccase ($1085.82 \pm 54.75 \text{ UI} \cdot \text{mL}^{-1}$) and peroxidase ($685.40 \pm 87.30 \text{ UI} \cdot \text{mL}^{-1}$) activities were seen in co-cultures with CC40 after 3 and 7 days, respectively; both result observed when CC40 was inoculated in CSC medium containing *A. terreus* growing for seven days in monoculture. When co-cultured *A. terreus* and CC102, laccase activity increase to $943.69 \pm 55.04 \text{ UI} \cdot \text{mL}^{-1}$ and peroxidase highest activity was only $3.59 \pm 1.55 \text{ UI} \cdot \text{mL}^{-1}$ after 3 and 1 day of co-culture, respectively; both, also, when cultured in medium contained *A. terreus* growing for seven days in monoculture. These levels of activity were significantly different from the enzyme activity when the two fungi species were growing in monoculture. *P. lecomtei* appeared to possess specific potential to be used in co-cultured production of oxidative enzymes. The production of laccase and peroxidase was not only dependent on the species of macrofungi used for co-culture but also regulated by different days of each fungi inoculation. In conclusion, interaction between *A. terreus* and *P. lecomtei* improves laccase and peroxidase activities. The inoculation time of *P. lecomtei* on *A. terreus* culture plays an important role in the laccase and peroxidase enhancement.

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