UNIVERSITI TEKNOLOGI MARA

Pleurotus ostreatus BASED BIOREMEDIATION OF POLYCYCLIC AROMATIC HYDROCARBON (PAH) ANTHRACENE

ADIBAH NUR BINTI ZAINOL ABIDIN

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ABSTRACT

Bioremediation technique has been an active field of research for the past three decades. However, the rise of PAH contamination level in the environment demands for new and more efficient bioremediation technique The study aims to explore biostimulation efforts on bioremediation of anthracene by fungi. The objective of this study are to screen potential fungus for bioremediation of anthracene, to determine bioremediation paramaters for fungal bioremediation including addition of biodegradable adsorbent agar and addition of surfactant Tween 80, as well as to elucidate bioremediation pathway prediction through anthracene degrading enzymes of manganese peroxidase and laccase in selected fungus. Methodologies included the screening of fungi towards anthracene, optimization bioremediation parameters based on anthracene concentration and initial pH of medium and optimization of biostimulation study by addition of biodegradable adsorbent agar as well as addition of surfactant Tween 80 for anthracene bioremediation. At the same time, growth of fungus and enzyme assays of manganese peroxidase (MnP) and laccase were monitored in all conditions. The result demonstrated that *Pleurotus ostreatus* was selected due to non-pathogenic character and growth performance that indicated potential in using anthracene as a carbon source. The concentration of 1 mgL^{-1} of anthracene in pH 7 condition was selected to proceed with biostimulation studies. Biostimulation with addition of two biodegradable adsorbent agar delayed bioremediation but enhanced final bioremediation performance, improved growth and increased MnP and laccase enzyme activity. In addition, biostimulation by 0.1% surfactant Tween 80 yielded similar outcome but boosted growth and enzyme activities the most. Overall, the results also revealed the sequence of activities preferred by fungus in a general bioremediation situation and in biostimulated conditions. The presence of enzymes laccase and MnP elucidated the degradation mechanisms and pathway prediction of anthracene. 9,10-anthraquinone was a major metabolite produced upon oxidative action by laccase and MnP. Subsequent and continuous fungal metabolisms provided insights on the involvement of MnP and laccase in anthracene bioremediation and the transformation of anthracene to carbon dioxide. Ultimately, this sustainable bioremediation technology adopted green chemistry where generation of hazardous substances are eliminated.

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