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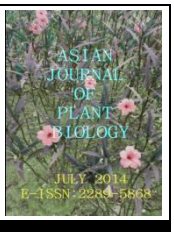

Bioremediation of Crude Oil by Different Fungal Genera

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ABSTRACT

One of the major environmental problems today is hydrocarbon contamination resulting from the activities related to the petrochemical industry. Bioremediation is the promising technology for treatment of these contaminated sites as it is cost effective and lead to complete mineralization. This research attempts to study the potential of different fungal genera in bioremediation of hydrocarbon. *Aspergillus flavus*, *Aspergillus versicolor*, *Bionectria ochroleuca*, *Penicillium chermisinum* and *Trichoderma virens* was selected for the bioremediation purpose. Screening of fungi species sensitivity towards hydrocarbons was first conducted. To enhance the growth of fungi on hydrocarbon contaminated soil, suitable bulking agent was selected prior to addition into the soil. For the period of six weeks, hydrocarbon degradation trial was conducted followed by post-treatment tests. All fungal species shows high tolerance towards hydrocarbon. Sago waste (*sago hampas*) is the most suitable bulking agent as all fungal species capable to grow on it. Significant differences were found in the ability of *Bionectria ochroleuca* to degrade hydrocarbon. *Bionectria ochroleuca* was able to degrade more than 70 % of the C12 to C28, with 100 % degradation of C12 and C28.

INTRODUCTION

Demand for petroleum as a source of energy and as primary raw material for the chemical industry has increased each year. A typical oil refinery in Malaysia which capable of producing 10 500 barrels per day will produce roughly 50 tons of sludge per [1]. Oil sludge need to handled carefully since its constituents are carcinogenic, immunotoxicants and mutagenic. Toxicity profiles of petroleum hydrocarbons to microorganisms, plants, animals and humans are well established. For example, low concentration (5-100 mg/l) of crude oil or petroleum fractions is sufficient to kill or inhibit the growth of microalgae and juvenile forms of marine animals [2]. Proficient technology in term of cost and efficiency is highly demanded in order to remove or degrade the hazardous constituents of oil sludge.

Bioremediation appear to suit the characteristics of the demanded technology. Bioremediation is a process of using microorganisms to convert hazardous pollutants into less toxic compounds. Over the past twenty years, fungal bioremediation or mycoremediation become the main desirability for all researchers who involve in bioremediation field. Due the chemical resemblance of lignin and PAHs and some other environmental pollutants, ligninolytic fungi have been regard as the most promising candidates to degrade PAHs [3]. White rot fungi produce three types of enzymes which involves in the degradation of lignin. The enzymes are lignin peroxidase (LiP), Manganese Peroxidase (MnP), and Laccase (Lac) [4,5].

The main objective of this research was to discover the full potential of fungi in bioremediation of hydrocarbon contaminated soil. To reveal fungi full potential, this research began with choosing suitable bulking agent and to determine whether fungi able to grow and penetrate into the contaminated soil with or without bulking agent. This study also reports on the results from bioremediation trial after proceed the selection of the best hydrocarbon degrading fungi on hydrocarbon contaminated soil.

MATERIALS AND METHODOLOGY

Microbial preparation

Five species of indigenous fungi, known with the potential of hydrocarbon degradation, were obtained from UNIMAS Molecular Biology Microbial Collection. The five species are *Aspergillus flavus*(UMAS-HDF8),*Aspergillus versicolor*(UMAS-HDF6),*Bionectria ochroleuca* (UMAS-BHDF7), *Penicillium chermesinum*(UMAS-HDF2), and *Trichoderma virens* (UMAS-HDF7).Fungi were grown on potato dextrose agar (PDA, Merck) plates at 28 °C for 7 days before being stored at 4 °C and were subcultured every 3 months [6].