Perhutanan dan Alam Sekitar

Distribution of Alkanes, Hopanes and Polycyclic Aromatic Hydrocarbons (PAHs) in Selected Sediments of Sarawak River and Inanam River, East Malaysia

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ABSTRACT

Rivers in Malaysia are important for fisheries, recreational activities, tourism, and maintaining biodiversity. However, the rivers are under constant threat of various pollutions. One of the major threats is persistent organic pollutants such as polycyclic aromatic hydrocarbons (PAHs). Low molecular weight PAHs results in acute toxicity while high molecular weight PAHs results in chronic toxicity and may be carcinogenic and mutagenic. Sediments samples from total of 18 stations in Sarawak River and Inanam River were analyzed for alkanes, hopanes and PAHs. Street dust, asphalt, tire rubber, fresh crankcase oil and used crankcase oil were also collected as source materials. Sediments samples and other source materials were dried with baked anhydrous sodium sulphate and soxhlet extracted for about 9 hours using distilled dichloromethane. The extracts were purified and fractioned using two-step silica gel column chromatography. The samples were analyzed with gas chromatography equipped with mass spectrometer (GC-MS). The sources of pollution in selected sediments were identified based on methylphenanthrene to phenanthrene ratio (MP/P) and other diagnostic ratios by comparing with the source materials. The ratios were calculated to distinguish petrogenic and pyrogenic sources of PAHs.

Keywords: sediments, alkanes, hopanes, polycyclic aromatic hydrocarbons, sources

Fungi as Bioremediators: An Alternative Treatment for Heavy Metal in Wastewaters and Soils

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ABSTRACT

Heavy metal (HM) contamination in soils and wastewaters is brought about by rapid urbanisation, industrialisation, technological innovations and anthropogenic activities. It is currently one of the world's major environmental problems which gives rise to health risks, ecosystem damage and may impair the human race in generations to come if left unchecked. Removal of HM from water-bearing wastewaters in major parts of the world is by physico-chemical process (ultrafiltration, electrodialysis and reverse osmosis) or the use of adsorption on activated carbon before discharging the effluents into natural water-body systems. Both systems are limited by high costs, process complexity and low removal efficiency of membrane processes. This leads to the search for an alternative method of treatment which is low-cost, non-hazardous and easily available sorbents of HM. Some fungi are able to survive and accumulate both heavy and toxic metals under conditions that are lethal for other biota, thus creating a niche for biological remediation (bioremediation). This investigation isolated such fungi based on toxicity tests on solid and in liquid media amended with heavy metals Zn, Cu, Pb and Cd. The EC_{50} and EC_{90} of the fungi were determined. Results showed isolates *Trichoderma atroviride*, *Trichoderma* sp. and *Aspergillus niger*, identified by molecular means, to consistently perform way above-average tolerance to Cu, Zn Pb and Cd up to 5000ppm per metal on agar media at 10 days incubation. The EC_{50} values for Cu(II) and Cd(II) for all 3 fungi were better than those reported for microfungi thus far. The lab studies currently focuses on the selection and formulation of an efficient, cheap and non-hazardous carrier of the selected fungi (or consortium of fungi) and use them at point of source whether in soil or at industrial point of discharge before they are released into natural water bodies.

Keywords: heavy metals, contamination, bioremediation, fungi

Vegetation Assessment of Peat Swamp Forest Using Remote Sensing (Environmental Impact if Timber Harvesting System on Peat Swamp Forest in Sarawak)

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ABSTRACT

Peat covers 1.6 million hectares (13 %) of the 12.4 million hectares land area of Sarawak and some of peat swamp forests have been logged. So, it is important to assess the impact of logging operation on peat swamp forest in this area. The study used a remote sensing technique to assess vegetation cover in a peat swamp forest areas in Sarawak as result of logging practice and land clearing activities for oil palm plantation. Vegetation Index was used to assess impact of timber harvesting system and land clearing activities on remaining peat swamp forest in two sites which were logged previously and the possible relationship of change in hydrology. The timber harvesting system was a combination of rail system for log transportation and excavator crawler for log skidding. Drainage work was probably carried out prior to logging activities which was followed up by land preparation for the establishment of the oil palm plantations. There was a general decrease in the level of greenness from 2002 to 2007. The remnant logged peat swamp forest of the area declined due to a poor state of growth as shown by the dramatically decrease in the level of greenness. The peat swamp forest types strongly related to the hydrological conditions and the associated flow of nutrients and mineral elements. The surrounding hydrology was presumed to have influence the physical and chemical characteristics of the peat.

Keywords: peat swamp forest, remote sensing, logging, land clearing, environmental impacts

Trichoderma atroviride as a Bioremediator of Cu Pollution: An *in vitro* Study

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ABSTRACT

Isolated *Trichoderma atroviride* from Cu-polluted river sediment at the Serdang Industrial Area was studied under in vitro conditions, to understand the mechanisms that allowed the fungi to thrive in the Cu-polluted freshwater ecosystem. From this study, adsorption was recognized as the main mechanism of Cu tolerance with 50 – 85% adsorption during the in vitro experiment. The uptake capacity of the isolate in liquid medium ranged from 0.8 to 11.2 mg/g in the potato dextrose broth medium with increasing Cu concentrations from 25 to 300 mg/L. It was found that 2.7–5.0% of Cu was lost due to washing. The high percentage of Cu adsorption and the high uptake capacity of Cu by *T. atroviride* suggest that it is a potential bioremediator of Cu. However, further studies are needed to confirm its practical use as a bioremediating agent for Cu under field conditions.

Keywords: *trichoderma atroviride*, bioremediator, pollution