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Mangrove Oyster (*Crassostrea belcheri)* as a Biomonitor Species for Bioavailability of Polycyclic Aromatic Hydrocarbons (PAHs) from Sediment of the West Coast of Peninsular Malaysia

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ABSTRACT

Rapid industrialization and urbanization in the west coast of Peninsular Malaysia has caused increasing pollution particularly of petroleum and petroleum by-products. Surface sediment and mangrove oyster *(Crassostrea belcheri)* were collected from five mangrove ecosystems in the west coast of Peninsular Malaysia and investigated for bioavailability of polycyclic aromatic hydrocarbons (PAHs). Sampling locations were selected from both remote areas with few or no previous records of petroleum pollution such as Pulau Merambong and polluted areas that are under international attention such as Klang mangrove ecosystem. PAH fractions were obtained through soxhlet extraction and two-step column chromatography and the fractions were injected to gas chromatography-mass spectrometry (GC-MS) for analysis. The concentrations of PAHs ranged from 151 to 4973 ng g^{-1} dw in the sediments, while from 309 to 2225 ng g^{-1} dw in the oysters. When tested for diagnostic ratios, a predominance of pyrogenic source PAHs was detected in the sediments, whereas PAHs in the oysters had mixed petrogenic and pyrogenic sources. A significant correlation ($p < 0.05$) was found between high molecular weight (HMW) PAHs in the sediments and oysters and biota accumulation factors (BAFs) of PAHs were approaching or exceeding unity indicating the ability of mangrove oyster in bioaccumulation of PAHs. Overall, this study indicates that mangrove oyster *(C. belcheri)* can be used as a biomonitor species for PAHs in an aquatic environment.

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Introduction

Rapid urbanization in 20th century was followed by serious environmental pollution, in particular petroleum pollution. Petroleum and its products are comprised of different compounds among them are polycyclic aromatic hydrocarbons (PAHs). Generally, PAHs are classified as lipophilic contaminants meaning they tend to attach to organic matter in the aquatic environment and settle as sediment. However, there are a number of natural disturbances such as storm and oceanic currents and benthic fauna activities along with anthropogenic activities such as dredging and boat propellers that can cause sediment resuspension and bioavailability to filter feeders. It was suggested that LMW PAHs with 2–3 benzene rings are more volatile, water soluble and consequently more bioavailable compared to high molecular weight (HMW) PAHs with 4 or more benzene rings that associate strongly with particles and

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