Composition and source identification of polycyclic aromatic hydrocarbons in mangrove sediments of Peninsular Malaysia : indication of anthropogenic input.

ABSTRACT

This is a comprehensive study of the composition, origin and sources of specific polycyclic aromatic hydrocarbons (PAHs) in sediments of mangrove estuary in the western part of Peninsular Malaysia. Mangrove sediments were analyzed for 17 PAHs by gas chromatography–mass spectrometry. Total PAH concentrations in the sediments ranged from 20 to 112 ng/g on a dry-weight basis. High molecular weight PAHs were abundant in the sediments. Parent PAH ratios revealed that pyrogenic input has important contribution to the sedimentary PAHs. Ratios of alkylated PAHs indicate that the sedimentary PAHs were influenced by petrogenic PAHs, which implies that petrogenic input has contribution to the sedimentary PAHs but that it is not a major factor in distribution of PAHs within the estuary. Combustion-derived PAHs show a positive and very strong correlation with total PAHs ($R^2 = 0.926$, $p < 0.05$). Total methylphenanthrenes show very weak correlation with total PAHs ($R^2 = 0.0928$, $p < 0.05$). The PAH concentrations were found to increase with distance from the upstream of the estuary to the coastal area of the Straits of Malacca. For the assessment of sediment contamination using biological thresholds, none of the individual studied PAH compounds exceeded the values of the effect range low–effect range median guideline and the threshold effects level–probable effects level guideline. This study demonstrates that the sediments of the mangrove ecosystem facing the Straits of Malacca and Sumatra are influenced by anthropogenic PAH inputs as a result of human activities such as biomass burning, vehicle emissions and boating activities.

Keyword: Mangrove sediments; PAHs composition; PAHs sources; Anthropogenic activities; Peninsular Malaysia.