

Characterization of polycyclic aromatic hydrocarbons and bioaugmentation potential of locally isolated beneficial microorganisms consortium for treatment of tar-balls

ABSTRACT

Oil spills are one of the environmental pollutions that commonly occur along coastal areas. Tar-balls are one of the products that come from the oil spill pollution. In this study, tar-ball pollution was monitored at 10 points along the coastline of Marintaman Beach in Sipitang, Sabah, Malaysia. This research determined the physical characteristics, composition, and concentration of Polycyclic Aromatic Hydrocarbons (PAHs) in tar-balls. The total number of tar-balls collected was 227 (n=227). The tar-balls were observed in various shapes and the sizes were recorded in the range of 0.1 cm to 6.9 cm. The composition and concentration of Polycyclic Aromatic Hydrocarbons (PAHs) in the outer and inner layer of tar-balls were determined. The results showed that the main Polycyclic Aromatic Hydrocarbons (PAHs) compounds were found in inner layers of the tar-balls with benzo (g,h,i) perylene (72.26 mg/kg), flourene (59.87 mg/kg), dibenzo (a,h) anthracene (44.48 mg/kg), indeno (1,2,3-c,d) pyrene (78.18 mg/kg), and benzo (e) fluoranthene (45.70 mg/kg), respectively. Further research was done with the bioaugmentation study of locally isolated beneficial microorganisms (LIBeM) consortium for treatment of tar-balls in an Aerated Static Pile (ASP) bioreactor system. The results showed that, after 84 days of treatment, this consortium, consisting of *C. tropicalis*-RETL-Cr1, *C. violaceum*-MAB-Cr1, and *P. aeruginosa*-BAS-Cr1, was able to degrade total petroleum hydrocarbon (TPH) by 84% as compared to natural attenuation (19%). The microbial population of this consortium during the biodegradation study is also discussed in this paper.