Contamination of Polynuclear Aromatic Hydrocarbons-(PNAH) in Sediments: Identification and Distribution in the River of Shatt Al-Arab-(ROSA)

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Abstract

The sediments were analyzed for total organic carbon content-(TOCC), grain size-(GS), and PNAH levels and origins. The sediments were taken from 9 stations-(ST) on ROSA. Gas chromatography-(GC) analysis showed that the PNAH level in ROSA sediments was comparatively low to medium compared to other world locations. The PNAH total levels varied from 31.86 ng/g dry weight-(DW)-(ST 9) to 88.99 ng/g DW-(ST 6). The highest PNAH levels were close to oil pollution sources at ST 2, 4, 6, and 8. The TOCC ranged from 0.32 % to 1.64 %. The data suggested that the PNAH levels in the ROSA were linked to TOCC and GS. The PNAH compounds and ratios and analysis of principal components-(AOPC) indicated that the PNAH sources in the river were biogenic-(organisms), pyrogenic-(combustion), and petrogenic-(petroleum). Ecological risk evaluation showed that PNAH did not cause any deleterious impacts on the ROSA.

***Keywords*:** Water pollution, aromatic hydrocarbons, organic carbon, Shatt Al-Arab.

Introduction

The PNAH are a widespread and stable group of pollutants in the aquatic environment. They have long transportation capacity and causes harmful environmental impacts[1]. There are many PNAH in nature but 16 compounds of them are usually studied, classified by the US-EPA as highly toxic. PNAH are generally hydrophobic and slightly soluble in water. PNAH of high-molecular-weight-(POHMW)-(≤ 4 rings) are slightly soluble in water, low evaporation and highly lipophilic than PNAH of low-molecular-weight-(POLMW)-(≥ 3 rings)[2].

Because of the hydrophobic nature of PNAH, tend to correlate with organic materials in the aquatic environment, so sediments are the ultimate PNAH stores in the water and are a good tools for monitoring PNAH[3].

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The PNAH accumulation in sediments is due to the industrial and nature releases of them[4]. PNAH industrial emissions include petrogenic and pyrogenic sources. Pyrogenic sources include fossil fuel combustion, trees and weeds burning, and volcanic eruptions, etc. Whereas, PNAH petrogenic sources are linked to the spills of oils[4]. The PNAH from petrogenic or pyrogenic sources show different behaviors and distribution. Pyrogenic PNAH are more closely associated with sediments and resistant to biodegradation than petrogenic[2].

Exposure to hydrocarbons has many health-damaging effects such as reproductive disorders, mutations in DNA, and cancer. Several guidelines for estimating PNAH damage to aquatic organisms have been documented by authors and environmental concern international organizations[1].

The employ PNAH ratios having the same molecular mass enables us to explain the PNAH formation and sources. Various criteria have been established to demonstrate the PNAH origin in aquatic sediments such as phenanthrene/anthracene-(PH/AN), fluoranthene/