First report of bioaccumulation and bioconcentration of aliphatic hydrocarbons (AHs) and persistent organic pollutants (PAHs, PCBs and PCNs) and their effects on alcyonacea and scleractinian corals and their endosymbiotic algae from the Persian Gulf, Iran: Inter and intra-species differences

ABSTRACT

The coral reefs of the Persian Gulf are the most diverse systems of life in the marine environment of the Middle East. Unfortunately, they are highly threatened by local and global stressors, particularly oil pollutants. This is the first quantitative and qualitative study aimed at assessing the concentration and sources of n-alkanes and POPs (PAHs, PCBs and PCNs) in coral tissues, symbiotic algae (zooxanthellae), reef sediments and seawaters in coral reefs of Lark and Kharg in the Persian Gulf, Iran. This work was conducted on eight species of six genera and three families of hard corals and one family of soft coral. A significant variation in the concentration of ∑30n-alkanes and POPs (∑40PAHs, ∑22PCBs and 20PCNs) was found in the decreasing order: zooxanthellae > coral tissue > skeleton > reef sediment > seawater. The bioaccumulation of these compounds was 2-times higher in ahermatypic than in hermatypic corals, among which significant variations were observed in both sites. In Kharg, Porites lutea had the highest mean concentration of ∑30n-alkanes and ∑40PAHs in soft tissue, whereas the lowest values were in Platygyra daedalea. A contrasting trend was documented for ∑22PCBs and 20PCNs, with the highest level reported in soft tissue of P. daedalea and the lowest in P. lutea at Kharg. Compositional pattern of AHs and PAHs demonstrated the predominance of LMW-PAHs and n-alkanes. In skeleton and reef sediments, tetra, penta and tri-CBs were the most abundant PCBs congeners followed by di-CB > hexa-CB > hepta-CB > octa-CB,whiletri-CB > di-CB > tetra-CB > penta-CB > hexa-CB > hepta-CB > octa-CB was observed for soft tissue, zooxanthellae and seawater. The results of RAD test indicated significantly negative correlation between total concentration of these compounds with zooxanthellae density, the chlorophyll-a and C2 in corals at both reefs. This is the first report on levels, health assessment and source apportionments of POPs in zooxanthellae and a first step in the implementation of specific coral reef management measures.

Keyword: Coral; Endosymbiotic algae; DNA barcoding; AHs; POPs; Persian Gulf