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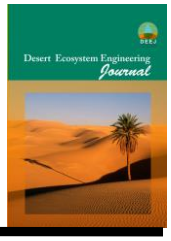

Assessment of Heavy Metal Pollution in the Mangrove Forest Ecosystem on Qeshm Island

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Extended Abstract

Introduction: The mangrove ecosystem in the coastal desert and sedimentary islands northwest of Qeshm Island off the coast of the Persian Gulf is exposed to industrial pollution, urban effluents and oil pollution. Considering the fact that pollution can affect the ecosystems, any increase in the concentration of metals such as cadmium, lead, zinc, and copper may damage coastal ecosystems. On the other hand, the role of mangrove (as a coastal ecosystem) in accumulating heavy metals can be identified by measuring its transfer coefficient. However, as the heavy metal contamination in Qeshm mangrove ecosystem has still remained unknown, this study sought to identify and evaluate heavy metal pollution in the mangrove ecosystem of the Qeshm coast and to examine the ability of contaminants to accumulate in mangrove by calculating their transfer rate.

Materials and Methods: At First, ten mangrove stations were identified using Google Earth images. Next, mangrove sediments and leaf were sampled six times in 2019, which were then were encoded in plastic bags and transferred to the laboratory. Finally, the concentrations of heavy metals including zinc, lead, copper, and cadmium were measured using an atomic absorption spectrometer. Moreover, indicators such as CF, BCF, MAI, PLI, RI, and mPELq were used to assess the pollution of mangrove ecosystem in Qeshm.

Results: According to study's results, the heavy metals' pattern was found to be Pb> Zn> Cu> Cd in the mangrove forest ecosystem's sediments and leaves. Furthermore, the maximum and minimum concentration of zinc metal in mangrove's sediments and leaves were found in stations 1 and 9, respectively. Moreover, while the maximum concentration of lead and cadmium belonged to the coastal station 1, their minimum values were found stations 8 and 5, respectively, both of which are located in the inland sediments of the mangrove ecosystem. Also, the maximum and minimum copper concentrations were identified in stations 2 and 10, respectively.

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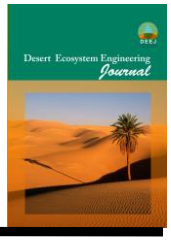

On the other hand, the investigation of Qeshm mangrove ecosystem' pollution revealed that while cadmium and zinc metals had moderate pollution coefficients, lead and copper metals possessed significant pollution coefficients. Moreover, the accumulation of heavy metals in mangroves were more than 1 in cadmium. However, the amount varied from 0.9 to 1 in zinc, lead, and copper.

In general, it could be argued that mangroves can store and accumulate heavy metals in their organs. On the other hand, the MAI index is higher in coastal areas than in sedimentary islands. In fact, while heavy metals are highly accumulated in coastal areas' mangroves, they are much less accumulated in sedimentary islands. Also, the PLI value is over 1in the whole mangrove ecosystem of the Qeshm island, indicating the island's polluted state, whose maximum and minimum values belong to the coastal areas and sedimentary islands, respectively. Furthermore, the analysis of ecological risk (RI index) suggested moderate and low ecological risks in coastal areas and sedimentary islands of the Qeshm mangrove ecosystem, respectively. Also, examining the potential hazard level's coefficient in the Qeshm Mangroveforest ecosystem (mPELq) showed that coastal areas and sedimentary islands had moderate and low pollution risks, respectively.

Conclusion: this study investigated the heavy metal contamination, its accumulation rate, and its transfer from sediments to mangrove leaves. Metal pollution with pollution indices has been studied that cadmium and zinc in the mangrove ecosystem in the coastal desert and sedimentary islands in moderate pollution and lead and copper in the pollution category are significant; However, the transfer rate from sediments to mangrove was high, indicating the ability of the plant to purge the coastal desert ecosystem from pollution. On the other hand, the Ecological and environmental risk indices and the environmental risk probability index suggested low and moderate pollution risks in the mangrove.

Generally, it could be said that according to the pollution indicators, the Qeshm island's mangrove-covered northwestern coastal desert contains higher concentrations of metals than the island's sedimentary inlands. However, due to the coarser texture of the sediments, and the extensive distribution of coastal mangrove roots, the heavy metals' transfer rate from sediments to plant organs is higher in these coastal areas than in sedimentary islands, considering the fact that soft sediments in sedimentary islands tend to absorb and accumulate heavy metals. Therefore, the coastal areas of the Qeshm island can be classified within the low pollution category. As mangrove forests possesses a high power transferring contamination from bed sediments to their leaves, they can be used as a new method for purifying the habitats of coastal desert areas, wetlands, and bays.

Keywords: Bioaccumulation, Ecological Pollution Risk, Mangrove, Sediment, Copper.