



Determination of heavy metals and microplastics in water and sediment of Rekawa lagoon with special reference to the modification of Kapuhenwala causeway

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Abstract

Microplastics (MPs) and heavy metals are ubiquitous environmental pollutants that severely damage marine, freshwater, and terrestrial ecosystems. Coastal lagoons sink accumulated pollutants from both terrestrial and marine inputs. Rekawa lagoon is one of the important coastal water bodies found in the southern coastal belt which supports many economic activities including fishing, tourism, and education in Sri Lanka. The present study was carried out to examine the heavy metals and MPs in sediments and water of Rekawa lagoon, selecting seven randomly distributed sampling sites across the lagoon. Sampling was conducted in the first and last weeks of September 2023 and then flooding disrupted the continuous sampling. Copper (Cu), cadmium (Cd) and lead (Pb) in water and sediment were analyzed using atomic absorption spectroscopy. The abundance of MPs in preserved samples was estimated microscopically after the standard digesting method followed by filtering through GF/C filter papers (5 µm pore size). The concentration of Cu was relatively higher (12.43 – 26.66 µgg⁻¹ dw) than that of Pb (6.86 – 14.60 µgg⁻¹ dw) and Cd (1.03 – 1.387 µgg⁻¹ dw) in sediment. Cu, Pb and Cd concentrations of the lagoon water were comparatively low (Cu: 0.019 – 0.054, Pb: 0.006 – 0.016, Cd: 0.006 – 0.010 mg/l) and those concentrations did not exceed the recommended level provided by World Health Organization (WHO). Compared to two decades ago, Cd, and Pb content of both sediment and lagoon water were significantly higher, and the Cu content was low. Three of the sampling sites close to the seawater inlet showed a significantly higher abundance of MPs both in water and sediment and it was significantly higher in the last week of September (p<0.05). In water and sediments, fragments were the most abundant type of MPs and their dominant color was blue. The FTIR analysis confirmed that most of the abundant MPs were polystyrene and polyethylene respectively in water and sediment. The abundance of MPs was relatively higher at the sites close to the seawater inlet whilst heavy metals concentrations were higher towards the land side. Our findings would probably benefit as baseline data when deciding criteria to manage heavy metal and MPs pollution in coastal water bodies of Sri Lanka.

Keywords

Microplastics, heavy metals, Rekawa lagoon, sediment, water