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Organic Carbon Fractions in the Weras River, Sri Lanka, under the Influence of Landfill Leachate Inputs

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Abstract

Organic Carbon (OC) is the key aquatic component that influences contaminant mobility in freshwater ecosystems, yet limited knowledge exists on the distribution of organic carbon fractions in freshwater systems impacted by municipal waste. This study quantified OC fractions in the Weras river system to evaluate the influence of landfill leachate from the Karadiyana open dumpsite with multiple discharge outlets on riverine organic carbon dynamics. Seventeen water samples were collected twice during the dry period in the same locations, with every sample triplicated from upstream reference points, the leachate discharge zone, and downstream locations using a selected sampling technique, and average values were calculated. Total Organic Carbon (TOC), Dissolved Organic Carbon (DOC), and Particulate Organic Carbon (POC) were analyzed using a TOC analyzer. The TOC, POC, and DOC showed upstream: 13.59±0.75, 2.24±0.83, and 11.35±0.57 mg/L, leachate discharge point: 121.68±63.34, 96.20±62.94, and 25.48±0.54 mg/L, and downstream: 21.11±4.27, 7.58±4.85, and 13.53±1.21 mg/L, respectively. The results showed an increased amount of OC fractions in the downstream landfill disposal point compared to the upstream reference sites. Evidenced by a high population of *Eichhornia crassipes,* reflecting the potential of DOC converted into POC through the plant biomass accumulation while releasing POC fraction through particle trapping and plant decaying. Downstream 34.89% dilution effects were observed, with TOC decreased at 2.30 km from dumpsite, though concentrations remained elevated. Flow velocities ranged from 2.25×10^{-3} to 2.74×10^{-4} ms^{-1} along the sampling locations, and the average velocity was around $2.72\times10^{-3}\pm3.21\times10^{-3}$ ms^{-1} between upstream and downstream, suggesting reduced flow conditions in the leachate-influenced zones. The study confirms the significant impact of landfill discharges on the distribution of OC in the Weras river system, considering potential OC deposition in the riverbed, even at low flow rates, thus highlighting the need for improved leachate control and remediation strategies.

Keywords: *Total organic carbon, Riverine carbon fractions, Karadiyana dumpsite, Landfill leachate, Surface water pollution*