Spatial Monitoring of Organohalogen Compounds in Surface Water and Sediments of a Rural-Urban River Basin in Tanzania

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Abstract

The presence of persistent organic pollutants in Tanzanian environment is not well monitored despite the existing pollution potential from a number of sources. In this study, we investigated for the first time, the concentration profiles of different organohalogen compounds such as organochlorine pesticide residues (OCPs), polychlorinated biphenyls (PCBs) and polybrominated diphenyl ethers (PBDEs) in environmental samples (water and sediments) from the Pangani river basin (PRB). The PRB is one of the largest drainage basins in Tanzania, with its watershed exposed to multiple input sources of trace organic contaminants. Surface water and sediments were sampled from 12 representative stations of diverse characteristics and land-use practices, in three distinct seasons, and extracted by liquid-liquid and Soxhlet extraction methods, respectively. Water samples were analyzed by GC-ECD for OCPs only, while sediment samples were analyzed for OCPs, PCBs and PBDEs by GC/MS. Seven compounds, dominated by HCH isomers (510-4460pg/L) and DDT analogs (160-1460pg/L),were detected in the water samples. These concentrations are far below the WHO guidelines for drinking water quality. A total of 42 compounds (8 OCPs, 28 PCB congeners and 6 PBDE congeners) were detected in the sediment samples. Their respective total concentration ranges were 245-10,230; 357-11,000 and 38-2175pg/g dry weight. The spatial distribution patterns and Hierarchical Cluster Analysis reflected the impact of historical agricultural usage in sugarcane plantations (OCPs), and urbanization (PCBs and PBDEs). Risk assessment using sediment quality guidelines indicated no ecotoxicological risks. The results we have found provide preliminary data on levels of the organic contaminants in Pangani river basin as a new insight on the environmental quality of the area.

Keywords

Organochlorine pesticides;

Polychlorinated biphenyls;

Polybrominated diphenyl ethers;

Water and sediment quality;

Pangani river basin;

Tanzania