

Distribution and risk assessment of heavy metals in water, sediment and fish from Akaki River Catchment and Aba Samuel Reservoir, Central Ethiopia

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Abstract

Due to fast urban expansion and increased industrial activities, large quantities of solid and liquid wastes contaminated by trace metals are released into the environment of the Addis Ababa city, primarily nearby water bodies most often untreated. Greater Akaki River (GAR) and Little Akai River (LAR), which join at Aba Samuel Reservoir 37 km South-West of Addis Ababa, are the main rivers draining the city. On the other hand, no detail and systematic study was conducted to determine the status of trace metals pollution in water, sediment and fish. 11 water, 22 sediment and 36 fish samples were taken and tested for determination of heavy metals content, distribution, pollution level, bioaccumulation, possible sources of pollutants and associated ecological risk. Total mercury (THg) and other trace metals were tested using Cold Vapor Atomic Absorption Spectrometer (CV-AAS) and an Inductively Coupled Plasma Optical Emission Spectrometer (ICP-OES) respectively. USEPA guideline values, geo-accumulation index, contamination factor, and pollution load index were used to evaluate contamination levels and eco-toxicity. Different statistical techniques were implemented to determine spatial variation, association and possible sources of trace metals. The results indicated that the mean concentration of Cr, Fe, Mn and Ni in water samples; Cd, Pb, Mn, Ni and Zn in sediment samples had exceeded their respective background values. Besides, the levels of Cr, Fe, Mn, Ni and Pb in the muscle of *Clarias gariepinus* were above the permissible limits for human consumption. Ecological risk assessment revealed the widespread pollution by Cd and Pb. These were followed by Mn, Ni and Zn. A comparison with similar studies revealed that sediments from the study area had highest average value of Pb. Generally, the study indicated that Akaki River catchment and Aba Samuel Reservoir were moderately to strongly contaminated by heavy metals and posing high ecological risks.

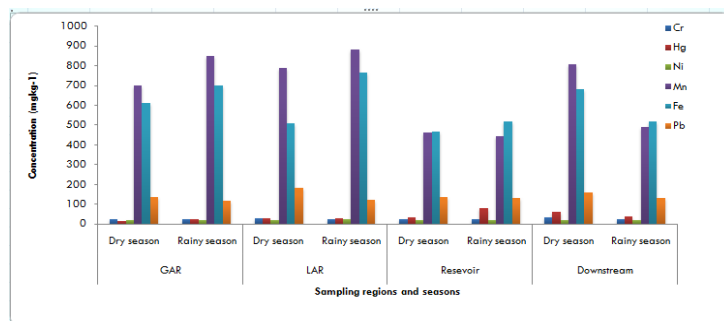


Figure 1 Mean levels of trace metals in sediment (mg/kg) collected on GAR, LAR, Aba Samuel Reservoir and downstream to the Reservoir (Cr, Hg, Ni; Mn, Fe and Pb)

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