Title: Pesticides residues accumulation in freshwater, sediments, and fish in the Guiers Lake basin: Risks for Senegal's strategic water reservoir

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Abstract

While some agricultural pesticides have been prohibited or severely restricted for use worldwide, alarming levels continue to be reported in many tropical and subtropical regions of the world. Guiers Lake is a strategic reservoir of 650.10^6 m^3 of fresh water for biodiversity and a national resource for its socio-economic function. The lake is supplied by the Senegal River (36.2 m^3/s), the drainage of non-conforming water (1.48 m^3/s), and rainfall (2.3 m^3/s). Significant amounts of pesticide residues used in agriculture could be arriving from these recharge areas. We have studied the spatiotemporal distribution of pesticide residues in water and sediments in the Guiers Lake basin using multivariate and geostatistical analysis methods. The sediments (n = 22) collected from the largest inflows to the lake showed significant levels of pollutants, with concentrations ranging from 343 µg kg-1 to 49200 µg kg-1 between 2015 and 2022. The levels of heptachlor, methyl parathion, trifluralin, cypermethrin, dimethoate, and permethrin were above the toxicity guidelines for sediment. Similarly, the levels of pesticide residues in surface water (n = 76) increased by 39 ng g-1 to 10865 ng g-1 between 1999 and 2022. The results confirmed the presence of agricultural pesticides. The herbicides and insecticides residues were the most dominant compounds in surface water and the distribution of pesticides is different indicating different sources of contamination.

The bioaccumulation was assessed by examining the residue concentrations in the muscle tissue of fish (n=8). The pesticide residues were detected in samples, with total concentrations ranging from 0.04-2.75 mg kg-1. A health risk assessment indicated a potential dietary risk associated with exposure to trifluralin, acetamiprid, malathion, and methamidophos.

The study revealed high concentrations of some pesticide residues in water, sediment, and fish that highlight potential toxicological risks in the Guiers Lake basin.

Keywords: pesticides residues, freshwater, sediment, fish, Guiers Lake basin, toxicological risks