

Heavy metals pollution risk assessment of urban soils and vegetables grown in the city of Teresina, Brazil

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Urban Agriculture (UA) contributes actively to food security cities worldwide. Urban crops can be polluted by heavy metals (HMs) emitted by several sources, therefore health risk linked to HMs contamination need to be assessed. The present study assess HMs contamination risks in the city of Teresina, Brazil, where a wide network of urban gardens exists. Both soils and vegetables (lettuce, coriander and chives) were sampled in five gardens (three within the city, one in the peri-urban fringes, and one from the nearby rural area). HMs contamination risk was assessed both for gardens' soils and for vegetables, performing respectively the Geoaccumulation Index (Igeo) and Health Risk Index (HRI). Moreover, the effect of two cropping system (traditional soil vs soilless system) on HMs pollution was investigated. Results shows that urban soils account for the most elevate total concentration of HMs, with highest contamination observed in the high-traffic urban area. The highest concentrations of Cr, Pb, Ni and Mo in plant tissues were however detected in vegetables grown in rural environment, suggesting that uptake by plants was more affected by bioavailability than total HMs concentration in soil. Only Sb has been mainly accumulated by plants grown in urban soils. Overall, the lettuce grown in the different community gardens of Teresina can be considered safe for children's consumption, according to the assessed Health Risk Index. The study demonstrates that even when HMs contamination is relevant, agronomic strategies that allow to reduce their bioavailability and the uptake by plants (i.e. the addition of organic matter to the soil, or the adoption of simplified soilless system) may be an efficient tool for guaranteeing the absence of health risks.

Keywords: Heavy metals, allotment gardens, urban agriculture, metalloids, health risk assessment.