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Perspective

Growth of Healthy Horticultural Plants in Polluted Cities

Karen Faulds*

Department of Plant Physiology, Iberoamericana University, Lomas de Santa Fe, Ciudad de México, Mexico

ABOUT THE STUDY

Inequalities and impoverishment of the world population have caused a constant acceleration of human migration to large urban areas, which has led to such megalopolises becoming home to more than 50% of the world population. This phenomenon usually results in a lack of access to green and agricultural areas, which has led to a search for alternative sources of these. One alternative source is urban agriculture (UA) (FAO 2007; SAGARPA 2020), comprising a set of practices that aim to produce food within cities, occupying their resources. UA also represents, on certain occasions, support for the family economy.

However, the increase in urbanization and industrialization caused by migration has reduced the environmental quality. Urban activities release particles into the environment that can contain considerable amounts of metals and metalloids, which may enter the trophic chain including humans, potentially negatively affecting health. The health impact derived from ingesting vegetables contaminated with metalloids depends on the concentration of the element accumulated in them. This is generally determined by the concentration of metalloids in the soil, and its specific properties, such as organic material content, pH, and the soil-plant Transfer Factor (TF) of metalloids. The TF expresses the uptake capacities of plants. It is evaluated from the ratio of the content of metalloids in the plant to that in the soil and is an important criterion for assessing global human health concerns.

The contribution of metalloids generated by long-term use of partially treated or untreated wastewater could result in accumulation of heavy metalloids in the soil. The contribution generated by irrigation could also be depressed since the irrigation system applied during growth used only potable water and rainwater. Thus, it can be considered that the translocation of metalloids to plants is only determined by the content of metalloids in the soils. Moreover, the increase in the concentration of metalloids in horticultural plants depends on their capacity to assimilate the metalloids (TF), the total concentration of metalloids in the soil, their chemical form, and other physicochemical parameters of the soil (e.g., pH and organic matter content).

Metalloids accumulation in vegetables growing in agricultural soils irrigated with wastewater or cultivated in the vicinity of industrial zones frequently exceeds the permissible values. However, the accumulation of metalloids in vegetables growing in urban areas is infrequent. The highly enriched Cd, Pb, and Hg concentrations found in the analyzed horticultural plants considered in this study may be due to the high FT values since the concentrations of these elements in the soils do not exceed the permissible values (SEMARNAT 2007). An explanation for this may be that the enriched metalloids are present in the soils in an available chemical form or that these soils possess physicochemical parameters favoring metalloids translocation.

Horticultural plants are an important source of human diets. Toxicological effects from consumption of Metalloids contaminated food by humans depend on various factors: Metalloids chemical form, dose, and exposure route. A human health hazard is closely linked to the intake of Metalloids-contaminated food crops. Excess Pb levels in the human body cause neurological and cardiovascular effects in humans, especially children. Health risk effects due to As exposure range from acute to chronic effects, including cancer, hyperkeratosis, melanosis, peripheral vascular diseases, lung diseases, and hypertension. Excessive As levels can cause skin and lung cancer.

Correspondence to: Karen Faulds, Department of Plant Physiology, Iberoamericana University, Lomas de Santa Fe, Ciudad de México, Mexico, E-mail: fauldren@ibu.edu.mx

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