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**Bioaccessibility of heavy metals and risk assessment in urban gardens of Madrid**

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Urban gardening has spread worldwide in recent years as it enhances food security and self-supply and promotes community integration. However urban soils are significantly enriched in trace elements relative to background levels. Exposure to the soil in urban gardens may therefore result in adverse health effects depending on the degree of contact during gardening, infant recreational activities and ingestion of vegetables grown in them.

In order to evaluate this potential risk, 36 composite samples were collected from the top 20 cm of the soil of 6 urban gardens in Madrid. The aqua regia (pseudototal) and glycine-extractable (bioaccessible) concentrations of Co, Cr, Cu, Ni, Pb and Zn were determined by atomic absorption spectrophotometry. Additionally, pH, texture, Fe, Ca, and Mn concentrations, and organic matter and calcium carbonate contents were determined in all urban gardens and their influence on trace element bioaccessibility was analyzed.

The results of this study show that pseudototal concentrations of trace elements in urban gardens vary significantly depending on previous soil use, addition of organic amendments and location. The concentrations of Pb, Cu and Zn clearly exceed regional background levels and that of Pb is even higher than the permissible value for agricultural soils in Madrid. The gastrointestinal bioaccessibility is highly variable: less than 10% for Cr and up to 90% for Pb, and depends strongly on the element and soil properties. Lastly, risk assessments for adult urban farmers and for children playing in urban gardens were carried out. For both scenarios the calculated risk falls below the threshold of unacceptability, but it contributes significantly to the overall risk from exposure to trace elements experienced by those receptors in urban environments.

Keywords: urban gardens, trace elements, bioaccessibility, Madrid