

Urban Agriculture in Portugal: is it safe to grow our vegetables?

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Various anthropogenic activities led to a substantial increase in pseudo-total levels of potentially toxic elements (PTEs) such as Pb, Cd, Cu, Zn, Hg and As in urban soils. Considering the expanding trend of urban agricultural practices it becomes necessary to understand both whether these contaminants are available for plant uptake and whether they pose risks to human health. Hence, it is crucial to develop tools to characterize the pathways between soil contamination, plant uptake, dietary transfer of contaminants to animals and finally consumer exposure from dietary intake of plant and animal products. Such tools are essential to determine meaningful threshold concentrations of PTEs in soils in order to deliver safe products.

The information on the impacts of urban soil contamination in Portugal is very scarce. In two of our studies [1,2] we compared the levels of As, Ba, Cd, Cr, Cu, Ni, Pb and Zn in soils and their respective contents in field-grown crops from an urban area in Portugal (Porto: around 1,400,000 inhabitants) with those from a rural area, an industrial area and three mining sites. We applied soil extraction procedures to assess the directly available pool of PTEs for plant uptake as well as a bioaccessibility extraction test that mimics the action of gastric juices in stomach for application in human health risk assessment.

These studies showed that enhanced levels of Cd, Cu, Pb and Zn of anthropogenic origin can be found in soils from the urban area and that there is a potential for dietary transfer of contaminants to grazing animals at unacceptably high concentrations at specific sites. The availability of PTEs for plant uptake decreased in the order: Cd > Zn > Cu ≈ Ba > Cr > Ni > As > Pb, with Pb being the least available contaminant. Oral bioaccessibility of Cd, Cu, Pb and Zn in urban soils was higher than in samples from rural, industrial and mining areas which

is most likely related to sources of PTEs in corresponding soils.

Hence, there is an urgent need for a contaminated soil management strategy in Portugal (Figure 1), that focus on the link between soil quality and food safety/human health protection.

REFERENCES

[1] Rodrigues S.M., Cruz N., Coelho C., Henriques B., Carvalho L., Duarte A.C., Pereira E., Römken P.F.A.M. (2013) Risk assessment for Cd, Cu, Pb and Zn in urban soils: Chemical availability as the central concept. *Environmental Pollution*. 183, 234-242

[2] Cruz N., Rodrigues S.M., Coelho C., Carvalho L., Duarte A.C., Pereira E., Römken P.F.A.M. Urban Agriculture: availability of potentially toxic elements for plant uptake. *Applied Geochemistry* (in press)

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FIGURE 1

Reference to published scientific studies on urban agriculture [1,2] in a national newspaper (Jornal i, 23 Julho 2013)

