

## 4. Phytoavailability of metals explained by physical weathering of technic materials in Technosols

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### Abstract:

In urban areas, soils are often dramatically altered by anthropogenic activity and they receive considerable pollution from industry, traffic and refuse. Urban soils developed on non traditional substrates and largely due to intensive human activity are now referenced as Technosols in the World reference base for soil resources (WRBSR) (FAO, 2006). They are defined by 20 percent or more artifacts in the upper 100 cm from the soil surface. This technic materials (e.g. plastic, paper, fabric, wood, bones, metallic elements and building materials) and particularly their coarse fraction, is usually neglected in analyses. This fraction has nevertheless an effect on the concentration of metals in the soil solution (El Khalil et al., 2008). The present work aims at predicting the effect of physical weathering of technic materials on the mobilization of heavy metals in Technosols. The objective is, in parallel, to determine the potential transfer of heavy metals from selected and pure technic materials present in urban Technosols to *Lactuca sativa* L. chosen as a model leafy vegetable. Average samples made of technic materials sorted out of the coarse fraction of 58 topsoils sampled in the city of Marrakech (Morocco) were characterised for their total and water extractable metal contents (Cd, Cu, Ni, Zn) and added to sand at a 1/4 weight ratio. A germination test and a plant growth experiment were carried out on each mixture to measure germination rate, biomass production and metal transfer to plants. Pots were fertilized with a nutrient solution without trace elements. Germination rates and biomass productions were contrasted on the different technic materials. They contributed significantly to the metal release in the solution. Physical weathering of all technic materials increased water-extractible metal concentration having an impact on plant germination, growth and metal accumulation. The highest metal concentrations in lettuce were measured after growth on metallic material (in roots and leaves) and on building material mixtures (in roots). Metals present in other technic materials (bones, wood, plastic and fabric-paper) were mainly less available. Results have shown that it is necessary to consider separately the contribution of different technic materials to the dissemination of metals present in urban soils. Risk assessment can be improved by the prediction of future metal transfer into the food chain after a progressive physical weathering of man-made materials present in Technosols.

Keywords: urban soil, Technosol, technic fraction, physical weathering, heavy metal, phytoavailability

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