

Soil Fact Sheet: Heavy Metals in Home Gardens?

Response from WV Extension Service

Heavy metal uptake is very low at pH levels best for gardening 6.0-6.5. Based on this information, metals in solution are not expected to be a problem. Contaminants from soil or air can still be a problem if the garden plants are not washed properly in clean water.

National Academy of Science Publication

Important factors affecting uptake rate include: trace element properties, soil properties, the immediate environment (especially pH) of the roots, plant crop species, and plant crop cultivar (variety or strain).

The availability of metals for uptake by plants (and thus entry into the human food chain) is limited by the extent to which these elements remain free in the soil solution. Metals can be tied up and adsorbed by soil substrate. As a result only small amounts of the metals remain free in the soil solution where they would be available for absorption by plant roots. These processes are strongly affected by soil pH.

After a metal or trace element enters the root cells of plants, transfer to other plant organs (tubers, shoots, leaves, fruits, seeds), depends on the properties of the specific metal and the type of plant.

Agency For Toxic Substances and Disease Registry

A report on potential metal absorption by food crops states that increased availability of metals to some crops means a greater potential for metals intake by humans and animals through the food chain. However, it is unlikely that metal concentrations would increase enough to result in human health effects, because it would be difficult to get a harmful dose of the metals through crops or animals.

Specific Metals

Elements like trivalent chromium, mercury, and lead are so insoluble or so strongly adsorbed to soil or plant roots that they are not transferred to edible plant parts regardless of quantities present in the soil.

Lead and mercury are so strongly bound inside the fibrous plant roots that harmful levels of these elements are not found in edible plants. However, mercury vapors can be transferred from the soil surface to plant foliage.

Copper and zinc belong to another group of elements and can be taken up by vegetative parts of the plant. However, before they reach levels in crops that could be potentially harmful to consumers, crop growth is so severely stunted that they are not harvestable.

There are exceptions to metal uptakes. For instance, livestock have been injured by forage grown on soils with excessive selenium or molybdenum.

Cadmium is absorbed by crops and can reach levels that are dangerous to humans if a high percentage of the consumer's diet is derived from crops grown on cadmium-contaminated soil over an extended time period. (Calcium, iron, and zinc play major roles in interfering with cadmium absorption in the human intestine, and when sufficiently present in the human diet, high cadmium foods will not always produce health effects.)

Commercial fertilizer application did result in increased plant tissue levels of some metals, such as cadmium, zinc, and manganese. Levels in plants, however, were well below those considered harmful.