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"Solidarity in a competing world — fair use of resources"

Pollution of Heavy Metals (Cadmium, Nickel & Lead) in some Farms of Torbat Jam, East of Khorasan Razavi Province, Iran

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Abstract

The purpose of this research was to determine cadmium (Cd), nickel (Ni) and lead (Pb) concentrations in melon (*Cucumis melo* var. inodorus), sugar beet (*Beta vulgaris*) and corn (*Zea mays*), and also in water and soils of some farms in Torbat Jam, and to examine whether the chemical fertilisers can be a source of heavy metals contamination of soil and groundwater, or not. Some samples were taken from the soil and water of each farm, both before fertiliser application and after final harvest (combined sample), as well as the most commonly used fertilisers (triple superphosphate, urea and potassium sulfate). Also during growth season, root (all crops), fruit (melon) and total shoot (corn forage) of all crops were sampled separately in each farm. The soil, plants and fertilisers samples were prepared by acid digestion and their heavy metals content, along with water samples, were measured by atomic absorption. Results showed that heavy metals concentrations in groundwater and soil were lower than adopted global standards. The only exception, among fertilisers, was Cd in triple superphosphate fertiliser, which its content was higher than California Department of Food and Agricultural Standards. The total Cd had increased to a greater extent in the soil of melon, sugar beet and corn farms in the region, in compare to Pb. The total Pb concentration in soils of corn farms showed a greater increase during season than melons and sugar beet farms. This is probably due to greater use of potassium fertiliser, which contains more Pb than other fertilisers, in corn farms. Lead had the highest transfer coefficient among all the metals studied. In general, it is likely that current farm management practices and the excessive use of chemical fertilisers will lead to more pollution and the loss of soil quality. Therefore, in addition to optimal use of fertilisers and control their quality, using other agricultural methods such as crop rotation, crop residues, green manure, organic fertilisers, and biological control could be assessed in order to mitigate the harmful effects of chemical fertiliser and to approach agricultural sustainability.

Keywords: Cadmium, corn, fertiliser, lead, melon, nickel, sugar beet

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