

Assessment of heavy metals concentration and their associated health risks in some vegetables in Isfahan

Abstract

Despite the important and numerous resources of pollution in the Esfahan city, there is a premise of soil pollution in this area that can cause the entry and accumulation of heavy metals to foods chain. The study was conducted in vegetable fields in three different regions according to the level of environmental pollutions, including "Isfahan", "Falavarjan" and "Ferydan, Golpayegan and Natanz". Soil samples and six types of vegetables in each field with three replicates in each region were selected in the summer of 2017 by the random sampling method. Selected vegetables are categorized into 3 parts, including leafy vegetables, fruity vegetables and tuber vegetables. The level of heavy metals (Pb, Cu, Co, Cd and Cr) in soil and contaminated vegetables has been measured for samples. Results showed that the highest contamination of Pb (127.37 mg/kg) and Cr (6.94 mg/kg) in field's soil of first region (Esfahan) were more than the recommended amount by the environmental protection agency of Iran. The highest ecological risk index (Er) of Cd in first and second regions soil (264.0 and 214.9, respectively) were in high risk class that cause to increase of total ecological risk index (RI) in first and second regions soil (330.8 and 272.4, respectively) which categorized in high and moderate of ecological risk class. The highest rates of transfer factor of Pb, Cu, Co, Cd, and Cr (0.01, 0.05, 0.30, 0.30, and 0.38 mg.kg⁻¹ respectively) in the first region for all types of vegetables were observed. The highest contamination of Pb in basil and tomato (0.78 and 0.75 mg/kg respectively), the highest contamination of Cu (2.69 mg/kg) in cucumber and the highest contamination of Cd (0.50 mg/kg) and Cr (1.41 mg/kg) in onion were observed. The result showed that in the first region, the highest daily intake of Pb, Cu, Co, Cd and Cr for the consumption of all the vegetables was obtained in the recipients. The highest target hazard measure for non-cancerous diseases of contaminated vegetables was 28.9 and 21.1 in "Isfahan" for children and adults, respectively. The hazard risk index for vegetable consumption was greater than one and at high hazard for both age groups and the highest of that for children and adults was 82.5 and 60.2, respectively in the first region due to potato tubers consumption. The principal component analysis showed that the contamination of heavy metals in the "Isfahan" and "Falavarjan" regions overlapped and in addition, the probability of contamination of those in urban vegetables in both regions increased the THQ of non-cancerous diseases.

Key words: Urban pollution, Heavy metals contamination, Vegetable, Crop health.



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