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Lead and Chromium contamination of irrigation water, soil and green leafy vegetables collected from different areas in and around Colombo District, Sri Lanka

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Excessive buildup of heavy metals in agricultural soils may contribute to environmental contamination, as well as increased heavy metal uptake by vegetable crops, which ultimately lead to adverse health consequences in mankind. A study was conducted to evaluate the Lead (Pb) and Chromium (Cr) concentrations in randomly collected samples of irrigation water, soils and green leafy vegetables ["Mukunuwenna" (*Alternanthera sessilis*), "Thampala" (*Amaranthus viridis*), "Nivithi" (*Basella alba*), “Kohila Leaves” (*Lasia spinosa*) and "Kankun" (*Ipomoea aquatica*)] obtained from six different locations [Wellampitiya (11 sites), Kolonnawa (5 sites), Kottawa (5 sites), Piliyandala (9 sites), Bandaragama (5 sites) and Kahathuduwa (5 sites)] in and around Colombo District, Sri Lanka using Graphite Furnace Atomic Absorption Spectrometry. The mean concentrations (mg kg^{-1}, dry weight basis) of Pb and Cr in the soils were reported as 39.7 ± 32.30 and 48.4 ± 42.90 respectively. The maximum level of Pb detected in irrigation water samples was 2.01 mg/L and Cr was not detected in any of the irrigation water samples analyzed. The mean levels (mg kg^{-1}, dry weight basis) of Cr and Pb in green leafy vegetables were reported as 3.36 ± 2.76, 2.96 ± 2.16 for Mukunuwenna, 3.58 ± 2.80, 3.14 ± 2.32 for Thampala, 3.28 ± 2.45, 3.11 ± 2.33 for Nivithi, 5.02 ± 4.09, 4.32 ± 3.47 for Kohila and 3.47 ± 2.88, 3.21 ± 2.44 for Kankun respectively. Significant differences were observed in Pb and Cr levels, between both production sites and green leafy vegetables analyzed at $P<0.05$. Maximum Pb and Cr contaminations were found in the green leafy vegetables collected from Kolonnawa area, owing to the high traffic and population density, close proximity to the Kolonnawa oil refinery and Meethotamulla garbage dumpsite and various industries, warehousing complexes, and automobile workshops operating in the area. The highest accumulations of both metals were found in Kohila leaves among the green leafy vegetables analyzed. This may be attributed to differential uptake capacity of vegetables for different heavy metals through roots and their further translocation within the plant parts. Thus, the study highlights the potential risks involved with the consumption of leafy vegetables cultivated in the contaminated areas which may adversely contribute to food quality and safety.

Keywords: Contamination, green leafy vegetables, lead, chromium

Acknowledgement: UGC Research Grant (VC/DRIC/PG/2013/SUSL/01).

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