



ASSESSMENT OF NI, CD AND CU IN SOIL, IRRIGATION WATER AND GREEN LEAFY VEGETABLES CULTIVATED IN AND AROUND COLOMBO DISTRICT, SRI LANKA

Thilini Kananke 1, Jagath Wansapala², Anil Gunaratne³

1Department of Food Science and Technology, Faculty of Applied Sciences, Sabaragamuwa University of Sri Lanka, Belihuloya, Sri Lanka

2Department of Food Science and Technology, Faculty of Applied Sciences, University of Sri Jayewardenepura, Gangodawila, Nugegoda, Sri Lanka

3Department of Livestock Production, Faculty of Agriculture, Sabaragamuwa University of Sri Lanka, Belihuloya, Sri Lanka

thilini.kananke@yahoo.com

Green Leafy Vegetables (GLV) are key component of the Sri Lankan diet. However, GLV are more prone to the bioaccumulation of toxic heavy metals when they are grown in heavy metal contaminated agro soils which may cause potential health risks for humans. The present study was conducted to evaluate the levels of trace metals (Cd, Ni and Cu) in five types of GLV ["Kankun" (*Ipomoea aquatica*), "Mukunuwenna" (*Alternanthera sessilis*), "Thampala" (*Amaranthus viridis*), "Nivithi" (*Basella alba*) and "Kohila Leaves" (*Lasia spinosa*)] collected randomly from six different cultivation areas [Wellampitiya (11 sites), Kolonnawa (5 sites), Kottawa (5 sites), Piliyandala (9 sites), Bandaragama (5 sites) and Kahathuduwa (5 sites)] located in and around Colombo District, Sri Lanka, using Atomic Absorption Spectrophotometry. Soils from GLV cultivation lands and irrigated water were also tested.

The average concentrations of heavy metals, Ni, Cd, and Cu in soils were 51.5 ± 45.5 , 1.4 ± 1.1 and 66.5 ± 59.5 mg kg⁻¹ respectively. The highest Ni contamination was detected in the irrigated water samples from Wellampitiya (2.02 mg L⁻¹) followed by Kolonnawa (1.02 mg L⁻¹) and Kahathuduwa (0.25 mg L⁻¹) areas. This has exceeded the WHO/FAO guideline (0.2 mg L⁻¹). However, Cd and Cu contents in all tested irrigated water samples were well below the detection limits (0.001 mg L⁻¹ for Cd and 0.05 mg L⁻¹ for Cu). Significant differences in heavy metal contamination were observed between cultivation areas and between types of GLV analyzed at $P < 0.05$. The mean concentrations (mg kg⁻¹, dry weight basis) of heavy metals, Ni, Cd and Cu were recorded in Mukunuwenna (6.48 ± 6.74 , 0.20 ± 0.11 , 11.85 ± 7.51), Thampala (5.95 ± 7.18 , 0.22 ± 0.11 , 9.19 ± 7.25), Nivithi (6.53 ± 7.97 , 0.20 ± 0.12 , 10.07 ± 8.75), Kohila (11.24 ± 10.36 , 0.33 ± 0.20 , 17.73 ± 10.03) and Kankun (7.90 ± 8.61 , 0.21 ± 0.12 , 14.13 ± 8.90) respectively. In contrast to Ni and Cd, mean concentrations of Cu estimated in all the five types of GLV were

below the WHO/FAO safe limit (Permissible limits: 4 mg kg⁻¹ for Ni, 0.2 mg kg⁻¹ for Cd and 40 mg kg⁻¹ for Cu). According to the results Kohila Leaves are more prone to accumulate Ni, Cd and Cu from the environment.

Among the six cultivation areas, the uppermost contaminated GLV were reported in the Kolonnawa area (21.73±10.73, 0.39±0.20, 21.97±13.59 mg kg⁻¹), followed by Wellampitiya (10.06±7.46, 0.29±0.16, 18.13±6.48 mg kg⁻¹) and Kottawa (7.15±3.61, 0.22±0.11, 13.73±7.57 mg kg⁻¹) areas for Ni, Cd and Cu respectively. Comparatively Piliyandala (2.50±1.97, 0.15±0.06, 6.77±2.84 mg kg⁻¹), Bandaragama (3.15±1.72, 0.16±0.04, 7.72±3.00 mg kg⁻¹) and Kahathuduwa (2.33±1.58, 0.16±0.04, 5.28±2.23 mg kg⁻¹) areas showed significantly low Ni, Cd and Cu concentrations in GLV. This study has demonstrated the potential risks involved in the consumption of leafy vegetables cultivated in the contaminated areas.

Keywords: *Cadmium, Contamination, Copper, Green Leafy Vegetables, Nickel*