
Assessment of Cd, Cr and Pb concentrations of soil, roots and leaves of *Centella asiatica* cultivations at Padaviya area in Anuradhapura District.

E.A.C.S. Kumari and W.M.D.N. Wijeyaratne*

Department of Zoology and Environmental Management, Faculty of Science, University of Kelaniya, Sri Lanka

Abstract

This study was conducted to assess the Cadmium (Cd), Lead (Pb) and Chromium (Cr) concentrations in *Centella asiatica* (Gotukola) harvested from chemical fertilizer applied irrigated cultivation sites in Padaviya area in Anuradhapura District during rainy and dry seasons. In the present study, Cd, Pb and Cr were selected as they are the mostly concerned heavy metals associated with the chronic kidney disease prevalent in the Padaviya area during the past decade. The area contained sandy loam soil and has been using chemical fertilizers for more than 10 years. Heavy metal concentrations in soil (Cdsoil, Crsoil, Pbsoil), roots (Cdroot, Crroot, Pbroot), and leaves (Cdleaves, Crleaves, Pbleaves) of *Centella asiatica* were analyzed using atomic absorption spectrophotometer (graphite furnace method) after acid digestion. The heavy metal concentrations during the rainy and dry seasons were compared using student t-test at 95% level of significance to assess the seasonal variation of heavy metal concentrations. MINITAB 14 software was used for statistical analysis. Only mean Cdsoil, Cdleaves and Pbroot during dry season (0.21 ± 0.05 , 0.72 ± 0.11 and 0.59 ± 0.12 mg/kg) were significantly lower than that of the rainy season (3.40 ± 0.60 , 2.61 ± 0.53 and 2.35 ± 0.46 mg/kg) among selected metals. The mean Crsoil, Crroot, Crleaves, Cdroot, and Pbleaves concentrations in dry season (23.20 ± 4.15 , 12.76 ± 3.19 , 7.34 ± 1.28 , 0.96 ± 0.10 , 1.85 ± 0.69 mg/kg) was significantly higher than that of the rainy season (22.44 ± 4.21 , 8.04 ± 0.90 , 6.09 ± 0.46 , 0.60 ± 0.13 , 1.75 ± 0.50 mg/kg). However, mean Pbsoil during the dry season (3.40 ± 0.60 mg/kg) was significantly lower than that of the rainy season (4.93 ± 0.80 mg/kg). Soil heavy metal concentrations were below the EU recommended safe limits (Pb: 300 mg/kg; Cr: 180 mg/kg; Cd: 6.4 mg/kg) during both sampling events. The mean metal concentrations of leaves exceeded the WHO/FAO safety limits for consumption of green leafy vegetables during both sampling events. (Cd: 0.2 mg/kg, Cr: 2.3 mg/kg and Pb: 0.3 mg/kg). Mean metal concentrations followed the pattern Cr>Pb>Cd in all plant parts and soil during both seasons. The mean bio-concentration factor of the heavy metals followed the order Cd > Pb > Cr during both seasons. The mean translocation factor indicated accumulation of Cr and Cd in the roots of *C. asiatica* and accumulation of Pb in the leaves of *C. asiatica*. Variations in the concentrations of the heavy metals in *C. asiatica* in this study can be ascribed to the chemical and physical characteristics of the soil of the cultivation sites due to long term fertilizer application, atmospheric deposition of heavy metals and the deposition of contaminated irrigation water.

Keywords: Bio-concentration factor, Heavy metals, Leafy vegetables, Translocation factor

*Corresponding Author: dimuthu.wijeyaratne@kln.ac.lk

Acknowledgement: This research was funded by Grant I-3-E-6048-1 by the International Foundation for Science (IFS), Sweden.