FCT - 39

Bioaccumulation of nephrotoxic metals in rice grains (*Oryza sativa*) in a CKDu hotspot in Sri Lanka via soil analysis

M. D. N. R. Dayananda*, Janitha A. Liyanage

Departmrnt of Chemistry, University of Kelaniya, Kelaniya, Sri Lanka

Accumulation of nephrotoxic metals in edible crops and associated soil is a major international concerns today which results food safety issues and adverse health risks like CKDu. Soils are considered to be an excellent media to monitor and assess chemical pollution where the application, deposition and absorption of chemicals are taken place. Therefore, this study attempts to investigate the bioaccumulation of nephrotoxic metals in soil and rice grains (*Oryza sativa*) and to interpolate the spatial distribution of selected chemical elements using Inverse Distance Weighted (IDW) and Spatial Autocorrelation tools in ArcMap 10.2.2 software in a CKDu hotspot; Girandurukotte Grama Niladhari Division (GND), Badulla, Sri Lanka via soil analysis. Dambethalawa GND in Ampara district was selected as the reference site. 30 soil samples were collected according to random stratified design including 10 paddy cultivated sites and 10 composite rice grain samples were collected from those paddy fields separately. Microwave digested soil and rice samples were analyzed by inductively coupled plasma mass spectrophotometry. The average concentrations of Cd, Pb, As, Cr, Ca and Mg in soil were 0.45±0.02, 0.20±0.02, 0.65±0.25, 0.29±0.04, 4812.00±692.00, and 15157.00±1275 mg/kg respectively. According to the lower Moran's indices given by the Spatial Autocorrelation, the selected metals were evenly distributed throughout the sampling area and Cd, Pb, Ca and Mg contents in CKDu prevailed area was significantly higher ($p<0.05$) than the reference. The higher bioaccumulation factors (from soil to rice grain) (BCF>1) indicated that rice grains tend to accumulate the nephrotoxic metals including Cd;2.35, Pb;7.48, As;2.60 and Cr;5.80. The calculated Enrichment factors (EF) which derives the degree of soil contamination by nephrotoxic metals were Cd;6.49, Pb;6.01, As;1.30 and Cr;1.48 and greater EFs (EF>1) indicates higher availability and distribution of metals in contaminated soil when compared to the reference. It can be concluded that the degree of soil contamination by nephrotoxic metals was higher in the selected CKDu hotspot than the reference. Hence, human renal dysfunctions can be related with consumption of contaminated rice with those metals.

Keywords: Enrichment factor, Soil, Nephrotoxic metals, Bioaccumulation, Rice

*Corresponding author. Departmrnt of Chemistry, University of Kelaniya, Kelaniya, Sri Lanka.
Email address: roshanid@kln.ac.lk