DISSERTATION

A STUDY OF ABSORPTION OF TOXIC ELEMENTS; Cd, As, Cr, Pb & Hg IN SELECTED RICE VARIETIES (*ORYZA SATIVA* L.) IN RELATION TO THEIR STATUS IN TWO DIFFERENT MANAGEMENT SYSTEMS.

Submitted by

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Abstract

Five traditional rice varieties (TRV) and five newly improved hybrid rice varieties (NIHRV) were cultivated according to split-plot design at Yala and Maha seasons in two regions ; Anuradhapura; which is a hot-spot for CKDu patients and Kurunegala (where no CKDu patients were recorded) where contents of these metals in water and soil together with agrochemicals used were previously estimated under conventional and organic farming conditions.

Samples were processed and microwave acid digested according to US EPA 3052 method and analyzed for the selected toxic elements ; Cd, Pb, As, Hg and Cr using atomic absorption spectrometry.[1]

Cadmium contents in rice varieties analyzed (Bg 300, 366, 352, 358, 360 , Suwandel, Madathawalu, Kurulu Thuda, Pachcha Perumal and Kalu Heeneti) were in the range of below limit of detection to 158.9 $\mu g\ kg^{-1}$ in both cultivation seasons and they did not exceed the maximum allowed limit of 200 $\mu g\ kg^{-1}$ set by Codex Alimentarious commission. Chromium contents were one tenth of the maximum allowed limit of 2000 $\mu g\ kg^{-1}$ set by Codex Alimentarious commission.[2-3] As, Hg and Pb were below the detection limits.

Among these varieties; Pachcha Perumal repeatedly showed a high tolerance to Cd absorption in both seasons in both regions. Varieties Kuruluthuda and Madathawalu showed a moderate resistance compared to other varieties. However there were no significant difference ($p > 0.05$) between the mean Cd contents with respect to farming condition, location or season of cultivation.

Metalloid As was below the detection limits in agrochemicals, soils and irrigation waters indicating that there is, no source for Arsenic to accumulate in the rice plant. Cd, Pb and Cr was present in agrochemicals below the SLSI limits of 10 $mg\ kg^{-1}$ and 250 $mg\ kg^{-1}$ respectively.[4] Cd was detected in rice straws. Use of the rice straws as organic manure has to be minimized as it can be ultimately transferred and accumulated on the rice plant.

Further, no distinct correlations were obtained with the physiochemical parameters determined in soil and irrigation water with the accumulated Cd content in rice grain. The correlations were tested using linear regression to fit data on to Freundlich model.[5]

Keywords : *Pachcha Perumal, rice, traditional, organic, Anuradhapura*