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Variations in Grain Cadmium Concentrations of Improved and Traditional Rice (*Oryza Sativa* L.) Varieties Grown under Three Nutrient Management Systems at Bathalagoda

PRIYANGA DISSANAYAKE¹, CHANDI RAJAPAKSHA², BANDARA WIJERATNA³, H.A.C.A. KUMARASINGHE⁴

¹*Sustainable Agriculture Research and Development Centre, Department of Agriculture, Sri Lanka*

²*Faculty of Agriculture, University of Peradeniya, Soil Science,*

³*Rice Research and Development Institute, Bathalagoda, Department of Agriculture,*

⁴*Rice Research and Development Institute, Sri Lanka*

Abstract

Cadmium (Cd) accumulation in rice (*Oryza sativa* L.) varies with the bioavailability of Cd in soils and characteristics of rice variety. This study assessed the Cd concentration in grains of nine rice varieties grown in low humic gley soils in Bathalagoda, Sri Lanka under three nutrient management systems, namely, added with organic manure only with all other organic inputs as organic system (OF), chemical fertiliser + compost as conventional system (CF) and without adding any external chemical or organic nutrient sources as no fertiliser system (NF). The increase in the dry matter production under CF system was about 5-fold for Suwandal and 2–3 -fold in all other varieties in comparison to those of NF. The dry matter contents of all varieties grown under OF system were lower than the respective values observed under CF system except for Bg 358 and Bg 352. All four high yielding varieties and traditional variety Madathawalu showed comparatively higher yields under CF system than under OF system.

The Cd concentration of soils varied from 0.02 to 0.04 Cd mg kg⁻¹ whereas grain Cd contents of rice varieties varied by about six-fold ranging from 0.29 to 0.186 mg kg⁻¹. None of the varieties exceed the permissible levels of grain Cd (0.4 mg Cd kg⁻¹) recommended by Codex Stan 193 (1995). Among nine varieties tested, Kaluheenati showed the least potential for Cd accumulation in grains and At 362 and Suwandal showed the highest potential with chemical fertiliser application. At 362 and Suwandal accumulated the highest amounts of Zn and P in grains with organic and chemical fertiliser inputs. There were no relationships between concentrations of Cd and Zn in grains of improved and traditional varieties. None of the varieties showed a clear trend between grain Cd concentration and P concentrations in plant dry matter except for positive trend observed for Madathawalu. The OF system effectively reduced Cd accumulation in seven varieties. Thus, chronic dietary Cd exposure to human through rice consumption could be minimised by choosing appropriate soil nutrient management strategies and rice variety.

Keywords: Cadmium, Chemical fertiliser, Organic manure, Rice grain, Rice Varieties