

## **Elevated Arsenic in Soil Affects the Trace Elements in Rice (*Oryza sativa* L.) Grains**

KS Manawasinghe<sup>1,2\*</sup>, Rohana Chandrajith<sup>3</sup> and Saman Seneweera<sup>4</sup>

<sup>1</sup>Postgraduate Institute of Science, University of Peradeniya, Peradeniya, Sri Lanka

<sup>2</sup>Horticultural Crops Research and Development Institute, Gannoruwa, Peradeniya, Sri Lanka

<sup>3</sup>Department of Geology, Faculty of Science, University of Peradeniya, Peradeniya, Sri Lanka

<sup>4</sup>Faculty of Veterinary and Agriculture Sciences, University of Melbourne, Melbourne, Australia

\*ksmanawasingha@gmail.com

Arsenic (As) contamination in soil has risen interest dramatically in recent decades. Although soils of Sri Lanka contain little amount of geogenic arsenic, agricultural practices such as fertilization, pesticide application, and irrigation are primary sources of As in the soil. Those who rely on rice as their primary source of nutrition may experience serious health consequences if rice grains are contaminated with As. A poly-tunnel experiment has been carried out to investigate the hypothesis that As contamination of soil affects the content of other micronutrients in rice grains. A two-factor factorial experiment was carried out adding 10 mg kg<sup>-1</sup> As into the soil with controls (0.60 mg kg<sup>-1</sup> As) and planting ten rice varieties. The amount of trace elements in unpolished rice grains was quantified by ICP-MS. The findings of this study showed that Zn and Fe concentrations in grains were lower in As contaminated soils, with an overall reduction of 7 and 14%, respectively. Other essential trace elements such as Mo, V, and Ni accumulations were reduced by 8, 12, and 34% under the elevated As condition, respectively while Mn contents were increased by 6%. Cu and Co contents in grains were not observed any difference between As added condition and controls. In addition, non-essential trace elements, including Al, Rb, Ba, and Sr accumulations, were reduced by 23, 34, 37, and 13% in the elevated As condition, while Li was increased by 9%. However, the soil As level only had a significant impact on Ni, Rb, and Ba accumulations ( $p < 0.05$ ). These findings suggest that As have a major role in other nutrient uptake and partitioning into the grain.

**Keywords:** *Elevated Arsenic in Soil, Micronutrients and Non-essential Elements in Rice Grains*