Partitioning of Essential and Toxic Elements Between Rice (*Oryza Sativa* L.) Grains and Husks

Sammani Manawasinghe[1*], Rohana Chandrajith[2]

[1]Department of Agrarian Development, Colombo 07, Sri Lanka
[2]Department of Geology, Faculty of Science, University of Peradeniya, Peradeniya, Sri Lanka
**ksmanawasingha@gmail.com*

Rice is the prime source of essential trace elements for consumers as it is a staple food in many countries. However, deficiencies of some trace elements are common among rice-consuming populations. In addition, rice plants have a high potential of accumulating toxic trace elements compared to other cereals, leading to health issues. Such toxic elements can also be taken into the human body by indirect pathways, such as rice husks commonly used as animal feed. This study investigated the partitioning of nutrients and trace elements between rice grain and husk in six traditional and three improved varieties available in Sri Lanka. Acid-digested rice grains and husks were analyzed using an inductively coupled plasma mass spectrometer (ICP-MS). Major elements such as K, Ca, and Na accumulation in rice husks were higher than in grains by 3.4, 2.7, and 7.7 folds, respectively. At the same time, Mg showed comparatively similar values between husks and grains. Essential minor elements such as Zn, Cu, and Mo were evenly distributed between rice grains and husks, while Fe and Mn accumulation was about 4 and 15 folds higher in husks, respectively. These findings suggested that rice husk is likely a sink for essential element accumulation. Toxic trace elements such as Cr and Al showed five folds higher accumulation in rice husks than grains, while Rb and Sr accumulations were 2.5 and 13 folds higher in husks. Accumulation of Mg, Zn, Mn and Al in husk showed significant differences among rice varieties ($p<0.05$), but there is no significant difference between traditional and improved varieties These findings suggested that rice husks potentially play a significant role in protecting rice grains from bio-accumulation of toxic heavy metals. On the other hand, it may cause essential trace elements deficiency in rice grains.

Keywords: Essential nutrients, Toxic elements, Genetically diverse rice cultivars, Protective cover in rice