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Diverse mechanism on cadmium uptake among rice varieties

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Abstract

In last study, Genome-Wide Association Studies (GWAS) was conducted for cadmium content of 295 rice varieties including 137 rice core set and 157 Korea breeding varieties collected from Kongju National University. The results showed that 9 varieties had SNP allele and amino acid substitution in exon of chromosome 1. This study was aim to understanding mechanism of cadmium uptake to confirm correlation of cadmium and other mineral nutrients (Cu, Mn, Fe) among 9 rice varieties. Nine varieties were planted on polluted soil of mine in Korea and cadmium content in root, stem, leaf and it's brown rice was analyzed by ICP-MS (Inductively Coupled Plasma Mass spectrometer, Agilent 7700E, US). Results of this study showed that mechanism for cadmium uptake and accumulation was diversity among varieties. Chin-nong and Ho-nong contained higher levels of cadmium in root, but contained relatively lower levels cadmium in brown rice than other varieties. Cheong-nam, Nam-pyeong, Gan-cheok, Suan absorbed high levels of cadmium through root and then accumulated high cadmium to brown rice. Meanwhile, Yeong-deok and Su-kwang absorbed lower cadmium in root, but high cadmium was accumulated in brown rice. Correlations between cadmium and other mineral nutrients (Cu, Mn, Fe) were analyzed by using SPSS statistics 20. The contents of iron in leaf had minus correlation ($p < 0.05$) with cooper and cadmium in root, cadmium in brown rice. Therefore understanding of cadmium uptake mechanism among varieties will be used to basic data for further breeding and phytoremediation.

Keywords: Genome-Wide Association Studies (GWAS), cadmium, rice varieties, mineral nutrients

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