

Transfer and bioaccumulation of selenium in soil-rice system, China

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Selenium (Se) is of great importance for human and animals. Both of Se deficiency and excess in the environment pose a serious threat to human and animals. Therefore, identifying the effects of soil organic carbon (SOC), Fe oxides and Mn on Se transfer and bioaccumulation is highly significant. In this study, Se concentrations in soil and grain were analyzed by X Ray Fluorescence (XRF) and Inductively Coupled Plasma Mass Spectrometry (ICP-MS), respectively. Additionally, to investigate transfer and bioaccumulation abilities, transfer coefficients (TCs) from soil to rice root and bioaccumulation factors (BAFs) from soil to rice grain were determined.

The results showed that Se concentrations in soil and grain arranged from 0.327 to 0.870 mg·kg⁻¹ with a median of 0.540 mg·kg⁻¹ and from 0.014 to 0.259 mg·kg⁻¹ with a median of 0.056 mg·kg⁻¹, respectively. According to the standards of Se-rich (soil: 0.4 mg·kg⁻¹; rice grain: 0.04 mg·kg⁻¹), the portion of Se-rich soil and grain samples reached up to 80% and 73.33%, respectively. Therefore, there were Se-rich soil and grain in this study area. TCs and BAFs of Se were 0.03 ~ 0.298 with a median of 0.129 and 0.135 ~ 0.704 with a median of 0.285, both of which indicated relatively weak transfer and bioaccumulation capacities in soil-rice system. SOC, Fe oxides and Mn were significantly negative correlations with TCs and BAFs of Se. SOC, Fe oxides and Mn lowered the bio-availability of Se owing mainly to their adsorption in soil. Generally, Se-rich grain grown on soil with relatively low concentrations of SOC, Fe oxides and Mn in this study.