The bioavailability of cadmium and influencing factors of farmland soil in karst areas of Guangxi, China

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High cadmium (Cd) concentrations in surface soils of karst areas in Guangxi have been widely reported. However, the bioavailability of Cd and their influencing factors in these soils remains unknown. In present study, the concentrations of Cd in surface soils (0-20cm) and rice seeds (n = 68) were assessed by atomic absorption fluorescence spectrometry, and the chemical forms of Cd in soil were assessed by sequential extraction. The results indicated that the concentrations of Cd in soil ranges from 0.47-5.15mg·kg^{-1} (average = 1.91mg·kg^{-1}), is higher than background value (average = 0.23mg·kg^{-1}) of Chinese surface soil. Cd was found to be mostly present in the residual form (average = 58.11%).Mean concentrations of Cd in rice seeds is 0.07mg·kg^{-1}, and 8.8% of rice samples exceeded the relevant maximum levels for pollutants according to the Chinese national standards for food safety. The mean value of bioconcentration factor (BCF, BCF = C_{rice} / C_{soil}) is less than 0.1, suggesting that the capacity of Cd transfer from soil to rice is low in the study. The significant positive correlation was found between the contents of Fe/Mn oxides and total concentrations of Cd in soil. In addition, a lot of Fe-Mn concretions and nodules in soil were found in the study area. Fe-Mn concretions and nodules can sequester metals by adsorption, and had a potentially beneficial effect on metals availability [1]. The above evidences show that Fe-Mn concretions and nodules may be one of the important factors causing low bioavailability of Cd in soil.

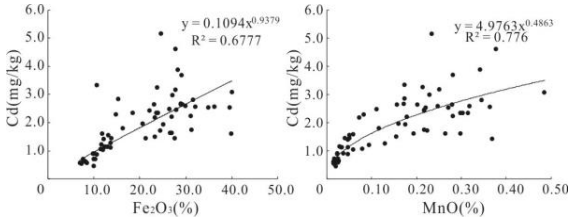

Figure 1: Relationships between the concentrations of Fe/Mn oxides and Cd in soil

[1] Gasparatos, D., 2012. Fe–Mn Concretions and Nodules to Sequester Heavy Metals in Soils, Environmental Chemistry for a Sustainable World. Environmental Chemistry for a Sustainable World, pp. 443-474.