

The study on chromium transportation and isotope fractionation in soil-maize system

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The uptake and transport of soil Chromium (Cr) by crops are directly related to food security and human health, while the mechanism of Cr transfer in the soil-plant system is not well understood. This study determined the pore water Cr concentration, Cr isotopic composition and physiochemical properties of soil, pore water and maize organs, to investigate Cr transportation and Cr isotope fractionation in the soil-maize system. The results showed that Cr supply had effects on soil pore water DOC content, Eh value, and root exudate content. The Cr content of maize organs under lower Cr supply was significantly lower than that under higher Cr supply. The degree of Cr isotope fractionation in soil-pore water was not significantly correlated with the physiochemical properties. There were significant differences in the degree of Cr isotope fractionation in the soil-maize system under different Cr supply conditions. The degree of Cr stable isotope fractionation in the maize system under lower Cr supply was small, while it was significant large under higher Cr supply ($\Delta^{53}\text{Cr}_{\text{underground} - \text{aboveground}} = -0.900 \text{ ‰}$) under high Cr supply conditions. As the growth cycle of maize increased, the Cr isotopic composition and the degree of fractionation in various parts of maize produced corresponding changes. The possible mechanisms of Cr isotope fractionation was preliminarily explored in the study, which is helpful for better understanding Cr biogeochemical cycling.