

## **Zinc isotope fractionation in soil-corn systems under microbial controls**

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Zinc (Zn) is an important micronutrient to all organisms, but can become toxic at elevated concentrations. Zinc isotopes can be used to trace the uptake, transport and absorption of Zn in plants, and to understand the biogeochemical cycling of Zn. In this study, we did a growth experiment with corn on a normal Swiss agricultural soils. Beside the untreated normal soil (NS), some of the soil was sterilized one week before corn was sown and was called Sterilized Soil (SS) and some of the soil was sterilized but reconditioned with microbial extract from the initial soil (Reconditioned Soil, RS). Each ten replicates of the three treatment were incubated with corn plants and three replicates were incubated without plants. Soil, pore water and different parts of corn were sampled and analyzed to study 1) the effect of the corn plant and 2) the effect of a disturbed microorbiome on Zn concentrations and isotope fractionation of soil-corn system. The results of the soil pore water show that the presence of corn increases the fractionation of Zn isotope (month 5  $D_{66}Zn_{no\ plant-plant}$ ), that the fractionation increase with time (no plant pots  $D_{66}Zn_{month0-month5}$ ) and that the microbial disturbance tend to decrease the overall level of fractionation. The latter effect was only quite small but consistent in all treatments. Over time and with the presence of corn and microbial disturbance the Zn concentrations in the porewater increase strongly. The corn plants were overall isotopically lighter than the pore water. In the plant heavy Zn isotopes were enriched in corn roots and light Zn isotope was enriched in aboveground parts. Under different microbial disturbance, there was no significant difference in the degree of Zn isotope fractionation in the soil-corn system, the small variations can probably be attributed to the difference in Zn concentrations in the plant and the pore water. These results demonstrate the influence of soil equilibration (effect over time), plant growth and microbial disturbance on Zn isotopes and concentrations in soil pore water and the fractionation in corn plants.