Plants that Mine Heavy Metals from Contaminated Soil

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Metal hyperaccumulating plants like \textit{Alyssum murale} can accumulate high levels of heavy metals in aboveground biomass, thus providing a “green” remediation method for metal-contaminated sites (phytoremediation) and a “green” technology for mining metals of economic value from naturally-enriched soils (phytoremediation), but the mechanisms of metal tolerance remain poorly understood.

By applying a suite of hard X-ray microprobe techniques such as X-ray fluorescence imaging (XRF) and X-ray absorption spectroscopy (XAS), the team discovered that \textit{A. murale} lacks a cellular-level tolerance mechanism for (hyper)accumulated cobalt, and tolerance is achieved by expelling cobalt in the transpiration fluids which results in precipitation of cobalt-rich mineral phases on leaf tips and margins. XAS measurements revealed that cobalt is sequestered on the leaf surface as hydrous cobalt silicates and carbonates.

These measurements are important to help understand the mechanisms of metal tolerance and homeostasis in plants which could be useful for improving phytoremediation/phytomining technologies as well as improving the nutritional content of plants.


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