New Phytologist

Publication history

Published article online:
02 Jul 2007
Issue online:
06 Aug 2007

Received: *31 January 2007*
Accepted: *23 April 2007*

New Phytologist

Volume 175 Issue 4 Page 641-654, September 2007

To cite this article: R. Tappero, E. Peltier, M. Gräfe, K. Heidel, M. Ginder-Vogel, K. J. T. Livi, M. L. Rivers, M. A. Marcus, R. L. Chaney, D. L. Sparks (2007) Hyperaccumulator *Alyssum murale* relies on a different metal storage mechanism for cobalt than for nickel New Phytologist 175 (4), 641–654. doi:10.1111/j.1469-8137.2007.02134.x

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Abstract

Hyperaccumulator *Alyssum murale* relies on a different metal storage mechanism for cobalt than for nickel

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Key words: *Alyssum murale*, cobalt (Co), computed-microtomography (CMT), hyperaccumulation, nickel (Ni), synchrotron X-ray microfluorescence (SXRF), tolerance.

New Phytologist (2007) **175**: 641–654

doi: 10.1111/j.1469-8137.2007.02134.x

Summary

- The nickel (Ni) hyperaccumulator *Alyssum murale* has been

developed as a commercial crop for phytoremediation/phytomining Ni from metal-enriched soils. Here, metal co-tolerance, accumulation and localization were investigated for *A. murale* exposed to metal co-contaminants.

- *A. murale* was irrigated with Ni-enriched nutrient solutions containing basal or elevated concentrations of cobalt (Co) or zinc (Zn). Metal localization and elemental associations were investigated *in situ* with synchrotron X-ray microfluorescence (SXRF) and computed-microtomography (CMT).
- *A. murale* hyperaccumulated Ni and Co (> 1000 μg g^{-1} dry weight) from mixed-metal systems. Zinc was not hyperaccumulated. Elevated Co or Zn concentrations did not alter Ni accumulation or localization. SXRF images showed uniform Ni distribution in leaves and preferential localization of Co near leaf tips/margins. CMT images revealed that leaf epidermal tissue was enriched with Ni but devoid of Co, that Co was localized in the apoplasm of leaf ground tissue and that Co was sequestered on leaf surfaces near the tips/margins.
- Cobalt-rich mineral precipitate(s) form on leaves of Co-treated *A. murale*. Specialized biochemical processes linked with Ni (hyper)tolerance in *A. murale* do not confer (hyper)tolerance to Co. *A. murale* relies on a different metal storage mechanism for Co (exocellular sequestration) than for Ni (vacuolar sequestration).

10.1111/j.1469-8137.2007.02128.x