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Characterization of soil properties impact and tolerance strategies in *Arabidopsis halleri* – a typical species of metal-contaminated sites of southern Poland.

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In the region of Olkusz, southern Poland, the Pb-Zn dolomite ore has been exploited since the 9th century. The smelter emissions and dumping of mining waste have caused alarming ecosystem contamination, with a dramatic increase of heavy metal concentration such as Zn, Pb or Cd in soils surrounding the industrial sites. Among the wild plant species reclaiming those contaminated areas, some metallicolous (M) populations from the pseudometallophyte *Arabidopsis halleri* have shown promising Cd and Zn hyperaccumulation capacities. Non-metallicolous (NM) populations can be found in the Tatra mountains, a UNESCO biosphere reserve situated just 100 km south of Olkusz. In previous studies, the metal-accumulation rates of hypertolerant M versus less-tolerant NM populations were shown to reach a plateau after several weeks of exposure to soil artificially contaminated with Zn, suggesting metal-adaptation mechanisms. However, the intra-population variation suggested that other environmental constraints, such as soil conditions, co-determined the accumulation rate of contaminants.
Within the framework of a European project about genomic and phenotypic aspects of metal adaptation in *A. halleri* (http://info.botany.pl/ariadna/), the main objective of this study has been to improve the mechanistic understanding regarding two driving factors of metal accumulation, namely 1) the soil properties at Olkusz versus Tatra sites and 2) the allocation strategy of metal contaminants within foliage. Taking advantage of the spatial and genetic closeness of M and NM populations in southern Poland, first horizons, corresponding to rhizospheric soil, and second horizons of 30cm soil profiles, as well as the directly overlaying plant material have been collected in contaminated and uncontaminated sites in the Olkusz region and at the northern foothills of the Tatra during the summer of 2017. The Lab analyses have included the 1) chemical composition (Zn, Cd, Pb, Fe, Ca, P, N, Corg; both plant and soil samples), 2) determination of pH, water holding capacity, grain size distribution, and cationic exchange capacity (soil samples), and 3) bio-availability of metals (Zn, Pb, Cd, Fe; soil samples). The latter measurements have been performed by means of diffusion gradient in thin film device (DGT), an emerging method for element bioavailability. The expected link between the foliage ionome and the soil properties will be tested during cross-statistical analyses. In 2018, the responses to Zn-contamination in 40 genotypes of M versus NM populations will be compared in the framework of a pot experiment under controlled conditions. The differences in Zn-allocation strategies within the foliage tissues will be analyzed by means of Zn-specific histochemical staining and confocal laser scanning microscopy. As part of their tolerance mechanisms, a better-controlled allocation of contaminants to safe sites, limiting their accumulation within sensitive assimilative tissues, is expected in M versus NM genotypes.

Improved mechanistic understanding in *A. halleri* of the mediation by soil properties of hyperaccumulation capacities and tolerance strategies within foliage should provide complementary insights with a view to further evaluating the phytoremediation potential of this interesting metal-adapted species.

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