Geophysical Research Abstracts
Vol. 18, EGU2016-4138, 2016
EGU General Assembly 2016

On the metal tolerance and resilience capacity of Helichrysum italicum G. Don growing on mine soils

Laura Maleci (1), Corrado Tani (2), Claudio Bini (3), and Mohammad Wahsha (4)

(1) Department of Biology, University of Florence, Via P.A. Micheli, 3, 50121 Firenze, Italy, (2) Department of Biology, University of Florence, Via P.A. Micheli, 3, 50121 Firenze, Italy, (3) Department of Environmental Sciences, Informatics and Statistics, Ca'Foscari University of Venice, Dorsoduro 2137, 30123 Venice, Italy, (4) Marine Science Station, The University of Jordan, Aqaba branch. P.O. Box: 195, 77110 Aqaba, Jordan

Abstract

Heavy metal accumulation produces significant physiological and biochemical responses in vascular plants. Plants growing on abandoned mine sites are of particular interest, since they are genetically tolerant to high metal concentrations. In this work we examined the effects of heavy metals (HM) on the morphology of *Helichrysum italicum* growing on mine soils, with the following objectives:

- to determine the fate of HM within the soil-plant system;
- to highlight morphological modifications at anatomical and cytological level;
- to ascertain the plant tolerance to heavy metals, and their resilience capacity.

Wild specimens of *Helichrysum italicum*, with their soil clod, were gathered from sites with different contamination levels by heavy metals (Cd, Cu, Fe, Pb, Zn) in the abandoned Niccioleta mine (Tuscany, Italy). Plants were brought to the botanical laboratory of the University of Florence, and appeared macroscopically not affected by toxic signals (e.g. reduced growth, leaf necrosis) induced by soil HM concentration. Leaves and roots taken at the same growing season were observed by light microscopy (LM) and transmission electron microscopy (TEM).

Light microscopy observations show a clear difference in the cell organization of not-contaminated and contaminated samples. In particular, the secreting trichomes, which are responsible for the characteristic flavour of the plant, present a different morphology in the polluted specimens with respect to the not-polluted ones. Indeed, the latter present the typical trichomes of the Asteraceae family, with two lines of cells bearing the secretion accumulated on the apical cuticular space. Trichomes of the polluted plants, instead, present a completely different morphology, with a stalk of 3-4 cells and a large secreting apical cell (i.e. they are capitate hairs).

Samples from contaminated sites, moreover, present a palisade parenchyma less organized, and a reduction of leaf thickness proportional to HM concentration. The poor structural organisations, and the reduced foliar thickness of the contaminated plants, are related to soil contamination.

A gradual restoration of cell organization suggests that somewhat resilience occurred in plants. Moreover, the presence of stress-tolerant mycorrhizal fungi could contribute to reduce metal toxicity. The resilience capacity suggests that *Helichrysum italicum* could be a useful species in remediation projects.

Keywords: Heavy metals Mine soils Plant morphology *Helichrysum italicum* Ultrastructure