

PROJECT TITLE

Phenotyping of red-leafed species to reveal the role of anthocyanins in resistance to metalloids and metal toxicity

CONSORTIUM

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SUMMARY OF THE REPORT

Biore(d)mediation represents the first example of a phenotyping project specifically applied to test the possibility that red genotypes can be proficiently exploited for applicative purposes, i.e. phytoremediation. In this respect, it goes beyond a classical descriptive approach aimed at the selection of interesting plant traits based on phenomics. The approach proposed in Phytore(d)mediation surely benefits from the power of automated phenotyping, in particular, the unique opportunity to measure multiple physiological and morphological plant features in a short time and following their dynamism during the plant development under metal(loid) stress. In addition, the host institution provided the unique opportunity to collect key physiological parameters related to photosynthesis, which is essential to corroborate the phenomic results with other data obtained with well-established methods, such as analysis of OJIP fluorescence transients by Handy PEA device, chlorophyll fluorescence imaging by Maxi-imaging Pam, optical properties of leaves by Multiplex. Overall, the whole dataset will doubtless prove whether anthocyanin presence is a positive trait in plants suffering for metal(loid) stress

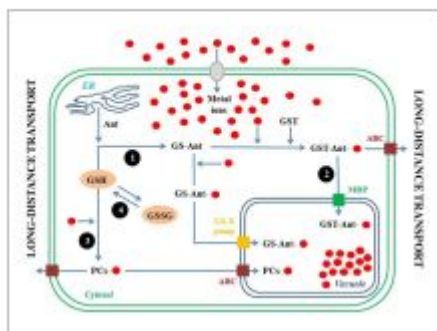


Figure 1. Mechanisms by which anthocyanins (Ant) facilitate metal/metalloid complexation and storage, long distance-transport, and increased metal(loid) tolerance. Glutathione (GS)-conjugated Ant [GS-Ant] can bind directly with metal/metalloid ions passing through the cytosol before delivery into the vacuole (1); Ant can bind directly with glutathione S-transferase [GST-Ant] (together with glutathione ?) and also with a metal(loid) ion. GST-Ant can be sequestered into the vacuole by multidrug resistance-associated proteins (MRP) and/or exported by ATP binding cassette transporters (ABC), allowing their long-distance transport (2). Metal(loid) sequestration by Ant reduces the stoichiometric requirement of GS for metal complexation, allowing the enhancement of other glutathione-based defences against metal toxicity such as phytochelatins (PCs) (3) or allowing GS to act directly as an antioxidant or a substrate for cytosolic GS peroxidases against metal(loid)-induced H₂O₂ or other reactive oxygen species (4).

and will clearly elucidate the possibility to use some species which are rich in

these colourful flavonoids for the purpose of phytoremediation of metal and metalloid contaminated soils.