Reduction of Cadmium Concentration in the Leaves of Arabidopsis thaliana Mutants Containing Over-Expressed AVP1 - A Genetic Model for Developing Edible Crops in Contaminated Areas

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Due to heavy metal pollution in soil around the world, many countries are not able to maximize their farmland usage. While removing the toxic metals is possible, current methods are not viable on a large scale for various reasons. Mechanical separation removes the topsoil and reduces soil fertility, bio-remediation yields results over excessively long periods of time, and neither of these options are cost-effective. Therefore, my alternative solution is to genetically modify Arabidopsis thaliana to uptake less cadmium in the seeds of the plant by overexpressing AVP1 (a gene responsible for cadmium accumulation) using the UBQ promoter (a promoter that enhances gene expression in specifically the roots of the plant). By enhancing the expression of AVP1 in this region, the plants will collect significantly more cadmium in this region while reducing the cadmium accumulation in other regions of the plant. After conducting an ICP-OES on plants I previously modified to contain over-expressed AVP1 grown in hydroponics media containing cadmium, it was revealed that these plants accumulated significantly less cadmium in the leaves of the plants than standard Columbia Arabidopsis thaliana. All six varieties of plants I modified were shown to possess this trait, with the UBAV2, OUBAV1, and OUBAV2 varieties all showing statistical significance in cadmium reduction for the shoots of the plants. This indicates both that my hypothesis was accepted and that the change in cadmium concentration in these plants can be attributed to the over-expression of AVP1.

Awards Won: