Reducing Lead Contamination Through Hydroponically-Grown Mycorrhizal Plants

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Lead is one of the most common heavy metal pollutants, causing an estimated 1 million deaths each year worldwide. Current methods to purify lead-contaminated water can cost thousands of dollars and generally require existing infrastructure, making them difficult to implement in lower-income areas without proper plumbing systems. Mycorrhizal hydroponics plants may present an affordable and sustainable solution to purifying lead-contaminated water, while improving overall health of semiaquatic ecosystems. My project investigated the applicability and effectiveness of cultivating mycorrhizae in deep water culture (DWC) static hydroponic systems. Basil plants were cultivated in DWC systems, with arbuscular mycorrhizal fungi (AMF) added to half of the systems. A new procedure of clearing and staining roots, which did not require the use of either trypan blue or an autoclave, was determined experimentally. Once mycorrhizae successfully colonized, trace amounts of lead were added to the hydroponics solution and an ICP-MS machine was used to analyze samples. A prediction was formulated on the kinetics and effectiveness of lead uptake in mycorrhizal and non-mycorrhizal plants. Relative health of plants was measured through total plant biomass, root length, and signs of root rot, and a t-test was conducted to prove statistical significance. Results revealed that mycorrhizal-inoculated plants had both healthier and better growth than non-inoculated plants, with longer roots by an average of 2.11 inches and a greater fresh weight biomass by an average of 3.67 grams. Thus, plants can be successfully colonized with mycorrhizae in DWC hydroponics, promoting plant growth and health while presenting applications as an affordable and large-scale lead purification system.

Awards Won:
Third Award of $1,000