Implementation of Salvinia sp. and Eichhornia sp. for the Phytoremediation, Rhizofiltration, and Recycling of Heavy Metals from Contaminated Aquatic Environments

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Bangladesh has a serious problem: 20 million in the country drink water well above the arsenic contamination standard. Phytoremediation can be effective in removing heavy metals from water, especially in countries where other forms of filtration are too expensive. For a week, Salvinia and Eichhornia were kept in water contaminated with arsenic, copper, and iron up to eight times the regulated EPA maximum metal concentration for drinking water. The concentrations of metals in the plants were calculated using Neutron Activation Analysis at a nearby institution's nuclear reactor. Salvinia increased its intracellular copper concentrations by over 800% and decreased concentrations in the water to almost EPA's 1.3 ppm maximum. Salvinia was not able to absorb arsenic, but Eichhornia increased its intracellular arsenic concentrations by over 3800% ppm and decreased concentrations in the water by 40%. Two-sample t-tests were created to statistically analyze each of the six experiments. For instance, when Eichhornia was exposed to arsenic, there was a significant difference between the 0 ppm group and both .05 ppm [t=4.98, p=.0076] and .08 ppm [t=5.55, p=.0051]. A 3D design was modeled to represent a future implementation of the plants' potential to remediate metal contamination. For extraction purposes, wet digestion was explored to break open plant cells containing copper, and electroplating was theorized to be able to collect the absorbed metal. In the future, these phytoremediators could form a process that not only purifies our drinking water, but also replenishes our diminishing metal supply.