Examining the Phytoremediation Potential of Pontederia cordata for Cobalt, Lithium, and Lead

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Increasing concentrations of metals in groundwater and waterways that are leached from coal ash ponds threaten aquatic life and drinking water quality. Phytoremediation poses a potential solution as it is the process by which plants absorb hazardous contaminants from their environment. Floating treatment wetlands (FTWs), are platforms of aquatic plants used to improve water quality through plant and microbial remediation. This study examined: 1.) the retention of lithium, cobalt, and lead by Pontederia cordata under hydroponic conditions. 2.) P.cordata's ability to reduce dissolved metal concentrations in a mixed-metal scaled FTW system. It was hypothesized that 1.) plants in metal-contaminated solutions would retain higher metal concentrations than plants in distilled water (Control). 2.) FTWs containing P. cordata would reduce metal concentrations relative to abiotic systems. For 45 days plants were grown either: 1.) hydroponically in 40 µg/L metal solutions or 2.) in FTWs constructed using 8 plants in a wooden growing matrix in 15L of mixed-metal solution. Metal ion concentrations in water and plant tissues were quantified using inductively coupled plasma mass spectrometry. Major findings included: 1.) plants exposed to lead displayed bioconcentration factors >1,000 and plants exposed to cobalt and lithium displayed a bioconcentration factor of >200. A two way ANOVA confirmed statistical significance within the data. 2.) FTWs containing P.cordata reduced cobalt, lead, and lithium concentrations to approximately 5 µg/L, 20 µg/L, and 13 µg/L respectively. Future research includes testing different pollutants, biomagnification risk, and creating transgenic plants.

Awards Won:
Third Award of $1,200