Decontamination of Heavy Metals Through Phytoremediation by Native Hawaiian Plants

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Through increasing usage of toxic substances in anthropogenic activities, contamination in the natural environment has become a major problem. To combat this increasing threat, native Hawaiian plants Scaevola taccada (naupaka), Chenopodium oahuense (aweoweo) and Sesuvium portulacastrum (akulikuli) were tested in their ability to hyperaccumulate iron, zinc, lead and copper. It was hypothesized that S. portulacastrum and S. taccada would show significant potential for phytoremediation. 75 kgs of soil was collected from the Makakilo Quarry and separated into 3 bins. Initial analysis showed 18,000 ppm of iron but low concentrations of zinc, lead and copper. To manually contaminate the soil, a total of 142.82 grams of copper chloride ($CuCl_2$), 185.29 grams of zinc sulfate monohydrate ($ZnSO_4H_2O$) and 107.90 grams of lead nitrate ($PbNO_3$) was added to the soils to bring the contamination levels to 900 ppm for each targeted metal. Finally, 2 month old S. taccada, C. oahuense and S. portulacastrum were individually transplanted into the 3 bins for the phytoremediation process to begin. Plant leaves were tested in 7 day intervals up to the 28th day, where shoots and roots were also tested, for heavy metal concentration analysis at the ADSC Lab with an ICP-OES machine. S. portulacastrum showed the most hyperaccumulation for zinc, lead and iron while S. taccada showed the most potential in hyperaccumulating copper. The results from this experiment indicates that the usage of native Hawaiian plants may be an effective method of remediating heavy metal contaminated soils.