



**CALIFORNIA STATE SCIENCE FAIR  
2013 PROJECT SUMMARY**

<b>Name(s)</b> Amanda G. Arst	<b>Project Number</b> <b>S1901</b>
<b>Project Title</b> <b>Phytoextraction of Zinc and Sodium from Contaminated Soil Using Hyperaccumulator Plants Corn, Broccoli and Kale (Year 2)</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The objective of this experiment was to determine whether corn (<i>Zea mays</i>), kale (<i>Brassica oleracea</i> L.) and broccoli (<i>Brassica oleracea</i> var. <i>italica</i>) could be used as hyperaccumulator plants. If so, which plant will be the most effective in extracting elements from the soil?</p> <p><b>Methods/Materials</b> Corn, kale, and broccoli plants were planted into containers (9 total). First group I did not add sodium selenite (<math>\text{SeNa}_2\text{O}_3</math>) or Zinc (Zn), the second group I added 50 Mg of Zn and the third group I added 50 Mg of <math>\text{SeNa}_2\text{O}_3</math> - weight of sodium was 50mg- weight of selenite was 250mcg. These were observed and recorded for 60 days and were later analyzed. The soil content of nitrogen (N), phosphorous (P), potash (K), and pH balance levels were tested. I conducted a plant tissue analysis on the sap of the plant of the Zn plants. I conducted a Na sodium test analysis with the plants that had <math>\text{SeNa}_2\text{O}_3</math> in it. I measured and observed the stems and leaves. I observed the roots of all plants.</p> <p><b>Results</b> The Kale plant treated with Zn measured marginal accumulation, the corn plant with Zn measured low accumulation and the Broccoli with Zn measured high marginal accumulation. The control plant with no Zn had adequate zinc. The Sodium in the control plants was 0.7mg, 0.8mg and 0.9mg. The kale plant with <math>\text{SeNa}_2\text{O}_3</math> accumulated 1.5mg of sodium, the broccoli plant accumulated 1.3mg of sodium and the corn plant accumulated 1.0mg of sodium. The soil with no plants was 6.0 acidic. The pH balance test of the control plants ranged from 6.5 (slight acidic) to 7.0 (neutral). The <math>\text{SeNa}_2\text{O}_3</math> plants pH test ranged from 6.5 (slight acidic) to 7.0 (neutral) and the Zn 6.5 (slight acidic) to 7.0 (neutral). The N, P and K tests ranged from depleted to surplus.</p> <p><b>Conclusions/Discussion</b> The results indicated that extraction of Zinc and Sodium from the soil using hyperaccumulator plants is possible. The broccoli plants were the most effective because it was healthier and they accumulated the most Zinc and Sodium solutions. Although the <math>\text{SeNa}_2\text{O}_3</math> kale plant accumulated the most sodium it was not as healthy as the broccoli plant. The results supported my first hypothesis that these 3 plants could be used as hyperaccumulator plants. My second hypothesis that the corn plant will be the most effective has to be rejected since the corn plant died early and it accumulated the least amount of the zinc and sodium</p>	
<b>Summary Statement</b> Whether corn ( <i>Zea mays</i> ), kale ( <i>Brassica oleracea</i> L.) and broccoli ( <i>Brassica oleracea</i> var. <i>italica</i> ) could be used as hyperaccumulator plants if so, which plant will be the most effective in extracting elements from the soil.	
<b>Help Received</b> My mother took photos and checked over my work. My father guided me with safety requirements.	