



**CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY**

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Project Title
Phytoremediation: Clean Up of Contaminated Soil Containing Selenium Using the Hyperaccumlator Plant, Brassica juncea

Abstract

Objectives/Goals
The goal of my experiment is to measure the efficiency, absorption rate, of phytoremediation of sodium selenite for two different concentrations using the plant, Brassica juncea.

Methods/Materials
I purchased 9 grown Brassica juncea plants that were 3 weeks old from a local nursery. I separated them into 3 groups of 3 plants. In the first group I added 10 mg of sodium selenite. This group is Treatment 1 group which has a 0.0035% concentration of sodium selenite by weight. In the second group I added 50 mg of sodium Selenite. This group is Treatment 2 group which has a 0.017% concentration of sodium selenite by weight. In the third group, my control group, I did not add sodium selenite. At the end of the first week, I snipped the 5 leaves from each sample: A1, B1, and C1 and placed these leaves in separate Ziploc bags to be dried. At the end of the second week, I removed the 5 leaves from each sample A2 and B2. At the end of the third week, I removed the 5 leaves from each sample A3 and B3. The leaves collected were sent to EXOVA labs to be analyzed by EXOVA labs using an Inductively Coupled Plasma Mass Spectrometry (ICP-MS machine.) I recorded observations and daily photographs.

Results
The results show how height was stunted (for Treatment 1 there was an average 2 cm decrease in Treatment 1 and 2.5 cm in Treatment 2.). In Treatment 1, A1 showed 166 parts per million of sodium selenite absorbed, A2 showed 109ppm, and A3 showed 147ppm. B1 showed 540 parts per million, B2 showed 488ppm, and B3 showed 376ppm. The control group had extremely low traces of innate amounts of sodium selenite equaling 2.7 parts per million. The efficiency rates for Treatment 1 were: 46%, 30%, and 41%. The efficiency rates for Treatment 2 were: 30%, 27%, and 21%.

Conclusions/Discussion
My results show that when more sodium selenite was placed in the soil the plant absorbed more of the toxin, which supports my hypothesis. The process at the molecular level supports my data. The bacterial endophytes degrade the toxin taken in resulting in more of the toxin being absorbed by the plant. My results show that the most sodium selenite was absorbed in the first week of the experiment as compared to the second and third week for Treatment 2 unlike what I thought would happen. The average 32% efficiency rate of phytoremediation is successful. Therefore, my hypothesis was partially supported by my experiment.

Summary Statement
Efficiency of Brassica juncea of the phytoremediation process for sodium selenite averages 38% efficiency when placed in a soil with 10 mg of sodium selenite and a 26% efficiency with 50 mg of sodium selenite.

Help Received
Mother bought the display board and helped complete it; Father helped safely handle sodium selenite; EXOVA Labs agreed to perform plant tissue analysis for my samples; Dr. Howe was a great mentor who helped considerably along the way