



CALIFORNIA STATE SCIENCE FAIR 2014 PROJECT SUMMARY

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Project Title The Phytoremediation of Zinc by Lemna minor	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Heavy metal pollution is an imperative problem worldwide. Two of the most problematic heavy metal pollutants are cadmium and mercury. If Lemna minor is proven to be a phytoremediator of mercury and cadmium, it can be used to eliminate pollution in a cheap and effective manner. Due to the known toxicity of mercury and cadmium, zinc was used in this study, as it is in the same periodic group and exhibits similar chemical behavior.</p> <p>Methods/Materials Lemna minor is cultured in tanks of water containing various concentrations of zinc sulfate. Leaf parameters, such as total surface area covered and average change in fronds were calculated using a count tool on Photoshop and imageJ program. Also, a significance test was used to determine how significant the difference in surface area was from before and after one week. Finally, after one week of growing Lemna minor, the fronds were removed, dried, and sent to an independent laboratory for ICP-AES analysis of zinc bioaccumulation.</p> <p>Results The data from the laboratory showed that the entire sample of 10 ppm contained 4209 ppm of zinc. For 20 ppm, it was 10412 ppm. For 30 ppm, it was 21316 ppm. For 40 ppm, it was 30960 ppm. For the control, it was 841 ppm. Next, the statistical analysis found that the p-value of the paired-t test of the total surface area for each trial was .0035, less than the significance level, .05, showing that there is significant evidence that the true mean difference of surface area was negative; therefore, zinc had a negative impact on Lemna minor.</p> <p>Conclusions/Discussion The ICP-AES analysis of dried leaf matter shows that the Lemna minor bioaccumulates more zinc as concentration of zinc sulfate increases. Also, the statistical analysis displayed a negative trend in Lemna minor growth as zinc sulfate concentration increased, showing an inverse relationship between Lemna minor growth and bioaccumulation of zinc. Lemna minor does possess the ability to uptake zinc because it is a hypo-accumulator, a plant that can absorb metals and concentrate them in their tissues. Based on these promising results with zinc, Lemna minor may be able to remove mercury from contaminated water, and become a future eradicator of mercury pollution.</p>	
Summary Statement If Lemna minor can bioaccumulate zinc from concentrations of zinc sulfate, then it can potentially help eradicate mercury pollution.	
Help Received Worked at Schmahl Science Workshop, an independent education institute	