CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
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Project Number
31111

Project Title
Phytoremediation with Aquatic Plants: A Study on Ecological Cleanup of Heavy Metals from Water with Duckweed

Abstract

Objectives/Goals
Heavy metal contamination is a major issue in the world, especially in developing countries that lack resources for sophisticated water purification systems. This experiment investigated the potential of duckweed species Lemna Minor in removing the heavy metal copper from water. The purpose of this project was to present an inexpensive, simple, yet efficient solution to cleaning up heavy metal contamination around the world, which could save many lives. It was predicted that duckweed would remove at least 50% of copper from water regardless of concentration.

Methods/Materials
There were three testing sessions, each testing four solutions with copper concentrations of 0, 3, 6, and 10 parts per million (ppm). 1 gram of duckweed was added to each solution and a CHEMets copper testing kit was used to analyze the concentration of copper at 0, 6, 12, and 24 hours. A lighting system was constructed for testing.

Results
Only duckweed in the 3 ppm solution satisfied the prediction by removing 50% of the copper in the solution over 24 hours. Duckweed removed 50, 42, and 27% of copper for the 3, 6, and 10 ppm solutions after 24 hours. Duckweed in the 10 ppm solution removed the highest amount of copper (0.405 mg), while duckweed in the 3 ppm solution removed the highest percentage of copper (50%).

Conclusions/Discussion
Copper reduction rates far above 50% were observed in solutions of 6 ppm and above in the first twelve hours. However, by the end of the testing session copper levels in the water rose drastically. This was concluded to be due to the short retention time that duckweed for high concentrations of copper. Moreover, it was observed that in concentrations above 6 ppm, duckweed colonies tended to stagnate and die. As a result, it is concluded duckweed (Lemna Minor) is an excellent hyperaccumulator of copper, and works best at concentrations not exceeding 3 ppm.

Summary Statement
Investigating the use of duckweed in removing heavy metal pollutants from water.

Help Received
Professor Elizabeth Pilon-Smits of Colorado State University gave advice, parents paid for materials and supervised the experiment