CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

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Project Number

S2108

Project Title

Effect of Metal Pollutants on Algal Growth under Oceanic Conditions Measured by the Resulting Chlorophyll Concentration

Abstract

Objectives/Goals

Oceanic metallic pollutants make it important to examine the effect on marine life. This project focuses on an essential building block in the aquatic food chain, algae, and explores effects of metal cations on marine algal growth and chlorophyll production.

Methods/Materials

The pollutants tested: chloride compounds of potassium, copper, zinc, cesium, and aluminum. 6 triplicates were created: 1 control with water and 5 with equal concentrations of the cations with algae. Potassium and zinc were hypothesized to be favorable because of their known presence and benefits in various lifeforms. Using spectrophotometry, transmittance readings were taken daily to measure growth. To measure chlorophyll, the triplicates were crushed and dissolved in acetone, and chlorophyll density was measured with a spectrophotometer.

Further zinc chloride tests were conducted at varied, smaller concentrations. The original molarity was diluted by 1/10s to create 9 new quadruplicates. Growth and chlorophyll production were evaluated with a spectrophotometer.

Results

Experiment 1: growth-wise, on average, copper chloride excelled (1.44%). However, aluminum chloride was lacking (1.12%). The test tube producing most chlorophyll was zinc chloride (94.60%). The solution with the least chlorophyll was cesium chloride (98.80%).

Experiment 2: growth-wise, on average, molarity 1 excelled (14.95%). Molarity 8 was the concentration at which the most chlorophyll was produced and had lowest transmittance reading of 52.00%

Conclusions/Discussion

Discrepancies where chlorophyll production differs from optical density imply that although the algae is multiplying, it#s unable to properly conduct photosynthesis and produce chlorophyll.

The heavy ratio of cations to algae were unfavorable towards growth and chlorophyll production. Control in experiment 1 excelled more than the polluted trials due to intracellular toxicity hindering growth/chlorophyll production. Although the zinc chloride trials indicate that heavy concentrations of zinc chloride don't allow for steady growth compared to the control, a small amount of the metal (molarity B) can benefit chlorophyll production. The investigations suggest high concentrations of heavy metals are detrimental to algae, but microconcentrations of these metals are essential for algal growth.

Summary Statement

This investigations measures the effects various metal pollutants have on the photosynthetic growth of marine chlorella algae under replicated oceanic conditions based on the resulting concentration of chlorophyll.

Help Received

Advise was given by our science teacher; Equipment from the science department were taken advantage of.