CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)

Daniel D. Wright

Project Number

S2021

Project Title

Suppressing Harmful Algal Blooms through the Use of Calcium Chloride

Abstract

Objectives/Goals

My project investigates whether calcium chloride (CaCl(2)) works as an effective agent for suppressing harmful algal blooms (HABs).

Methods/Materials

In Phase I, I practiced growing Chlorella vulgaris in beakers and measuring chlorophyll concentration with a spectrophotometer. In Phase II, I added different amounts of fertilizer to the beakers to see if it promoted algal growth. In Phase III, I added different amounts of CaCl(2) to algae that had already bloomed with fertilizer to see if this addition suppressed algal growth. In all three phases I measured temperature, pH, phosphate concentration (when applicable), and chlorophyll concentration. I took daily digital photographs of the beakers to record the color and gross appearance of the algal suspensions.

Results

Phase I was a test phase conducted to refine my procedure. Phase II showed that fertilizer does increase algal growth. By the seventh day, the control beaker had not produced readable concentration data, but the beakers with added fertilizer had chlorophyll concentrations of 5.6 and 7.3 mg/L^-1. Phase III spectrophotometer readings seemed to indicate algal growth increased with the addition of CaCl(2). Four days after adding the treatment, the readings were 9.4 (control), 8 (fertilizer only), 6.5 (fertilizer + 0.5 g CaCl(2)), 19.0 (fertilizer + 1 g CaCl(2)), 28.1 (fertilizer + 2 g CaCl(2)), and 39.7 (fertilizer + 3 g CaCl(2)) mg/L^-1. Digital photographs, however, show that there was actually less algal growth in the treated beakers than in the control.

Conclusions/Discussion

Fertilizer can be to blame for provoking HABs: the addition of fertilizer to the algal batches significantly increased algal growth versus the controls (Phases II and III). However, data from the algal suppression phase (Phase III) were problematic. Precipitate, clearly visible in both the beakers and centrifuged samples, interfered with the chlorophyll measuring process. The spectrophotometer could not distinguish concentration of algae from concentration of precipitate, resulting in high absorbance readings that seemed to indicate significant algal growth. This contradicted the evidence of the digital photographs. Measuring algal growth with a coulter counter or a hemocytometer might have avoided the precipitate problem.

Summary Statement

I investigated whether calcium chloride works as an effective means of suppressing harmful algal blooms.

Help Received

Dr. Thomas Schuerlein consulted on chemistry of CaCl(2); Dr. Douglas Wright consulted on procedure. Mr. Jim Olwell helped run chi square on data; Dr. Julianne Wright proofread paper.