CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
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Project Number
S1704

Project Title
Cloud Ships: Destruction of the Ocean Rainforest: How Do Different Light Intensities Affect Phytoplankton?

Abstract

Objectives/Goals
A proposal to mitigate global warming calls for cooling the earth by placing manmade clouds over our oceans, reflecting a portion of the light from the sun into space. Because phytoplankton are the foundation of the ocean's foodchain and the rainforest of the ocean, the purpose of this experiment is to determine whether phytoplankton are affected by a decrease in light.

Methods/Materials
The experiment was conducted over 4 days and utilized four bottles as culturing vessels: one as a control and 3 bottles shielded by screens which absorbed 40%, 80%, and 90% of light respectively. After innoculating the phytoplankton aquacultures into the bottles, the phytoplankton cultured for 2 days. To assess the growth of the phytoplankton, their biomass was measured each day by taking samples from each bottle. The biomass was measured by pouring the 25 ml samples through a glass fiber filter. A vacuum flask was used to remove water from the filter and then the filters were dried. The change in filter's mass was used to determine the biomass.

Results
Phytoplankton exposed to lower light levels showed a decrease in their overall biomass growth rate. The control had the highest overall biomass growth rate and the 90% absorbent screen had the lowest overall biomass growth rate.

Conclusions/Discussion
The experiment demonstrates phytoplankton grown with decreased light levels produces less biomass. Therefore, manmade cloud cover used to reduce global warming's effects by reflecting sunlight into space could affect phytoplankton's ability to convert carbon dioxide by means of photosynthesis, mitigating the cloud ship's benefits and potentially destablizing local ecosystems. I plan to assess in further experiments whether additonal nutrients and a larger habit resulting from nutrient upwellings can offset diminshed growth due to decreased light.

Summary Statement
Phytoplankton's ability to absorb carbon dioxide could be adversely affected by the use of manmade cloud cover to counteract global warming.

Help Received
Contacted a number of experts during the research phase of my project: Tracy Riggins, Dr. Mike Cohen, Keith Redfield, Elizabeth Falecjyzk, and Stephen Salter, PhD. Elizabeth Falecjyzk provided the laboratory equipment for sterilization and measuring. Parents provided financial and logistical support.