CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)

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Project Number

33634

Project Title

Algae Counts: Algal Growth Rate Response to Light Frequency and Day Period

Abstract

Objectives/Goals

Here we explore the effects of both different wavelengths of light and shorter day-periods on algal growth. We selected three different day/night periods (3, 6 and 12 hours of light then dark for the same period) and three different colors of light (red 660nM, yellow 590nM and green 570nM using L.E.D. light sources of equal brightness). Our experiment used a locally collected wild algal sample. Our initial hypothesis is that red light and earth-standard day/night periods (twelve hours) will produce the most algae cells after a two-week period.

Methods/Materials

Each of our 3 day-period sets was composed of 3 containers illuminated by our different light frequencies. To conduct our experiment we designed, built and programmed an "Arduino Nano" microcontroller to turn on and off lighting for our
sets of algae containers and also used three light intensity sensors to record changes in the light transmitted through each of the three 12-hour containers (to determine "growth" rates from "cloudiness" changes of the algae solutions). All 9 containers started with the same amount of algae (from a well mixed wild-collected sample)and after being exposed to their light and day/night period five samples from each experimental container and one control (naturally lit container) was counted under a microscope to determine differences in final algae densities. From this we determined which day-period and light frequency treatments produced the most algal growth. Prior to the experiment we tested the ability of our sensors and logging system to record differences in light transmission ("cloudiness") through our algal solutions. During the two-week experiment hourly relative algal-density ("cloudiness") was recorded for each color of light in our 12-hour day-period set.

Results

We determined that 12 hour day-night periods and yellow light frequencies showed the highest algal growth rates. Unfortunately our wild-caught sample did not experience high enough growth to show differences in our hourly transmission data.

Conclusions/Discussion

Results of this study suggest that if algal physiology (photosynthesis and respiration) may be tied directly to earth#s day-period but not the light frequency we expected. Alternate hypothesis for our result, use of additional light frequencies, and responses of extensively studied "lab" species of algae need to be further explored.

Summary Statement

Our experiment explores algal growth rate response to different light frequencies and day periods.

Help Received

Krista's dad in Honolulu helped with microcontroller programming and construction via skype and phone.