



CALIFORNIA SCIENCE & ENGINEERING FAIR 2018 PROJECT SUMMARY

Name(s) Yeji Cho	Project Number 38617
Project Title The Effect of Carbon Sources on pH Fluctuations Caused by Nannochloropsis oculata	
Abstract Objectives/Goals Biofuel producers have begun to use carbon sources as a method of stimulating continuous growth of algae through a combination of heterotrophic and photoautotrophic growth. This continuous growth of algae has the potential to stabilize the pH of water in which microalgae is grown. By stabilizing and raising pH, microalgae can be implemented as a means of ameliorating the effects of ocean acidification. This project explored the effect of carbon sources (glucose, fructose, and glycerol) on the pH fluctuations caused by growth of marine microalgae Nannochloropsis oculata. Methods/Materials Four flasks were established with a 2:1 ratio of water and microalgal cultures. Each flask received micronutrients at the beginning of trials, and received light in a 12-hour cycle. Carbon sources were added at concentrations of 0.1 g/L, and pH probes were used to monitor flasks throughout the 7-day trials. Hemocytometer counts were used to measure algal concentrations every three days. Results Glycerol tended to have the highest pH at the end of trial periods, and also had the greatest growth. On average, glycerol surpassed the next highest pH by 0.212 and did not fluctuate in pH after the first three days. The control, glucose, and fructose flasks fluctuated based on light/dark cycles, rising to around 8.7 at night, but falling by about 0.2 during daytime. Conclusions/Discussion The addition of glycerol resulted in stabilization and increase of pH. Throughout this experiment, glycerol was able to prevent fluctuations in pH based on light/dark cycles. The flask treated with glycerol also generally had the most efficient growth of microalgae, as seen in the high concentrations of Nannochloropsis oculata. The positive correlation between microalgae concentration and pH presents new insight into the potential of the biofuel industry as both a cleaner source of fuel and as a means of alleviating the negative effects of ocean acidification in marine environments.	
Summary Statement This project evaluated different carbon sources for their ability to increase and stabilize pH while optimizing growth of marine microalgae, Nannochloropsis oculata.	
Help Received I designed and performed the experiment myself. I received guidance from the staff at Cabrillo Marine Aquarium, and used their facilities and equipment.	