



CALIFORNIA SCIENCE & ENGINEERING FAIR 2018 PROJECT SUMMARY

Name(s) Lekha Pillarisetti	Project Number 38487
Project Title Assessment of Effects of Nutrient Runoff Levels and Temperature on Accelerated Algal Growth and Eutrophication	
Objectives/Goals Abstract Algal blooms cause major environmental damage. The bloom zones have increased rapidly in recent years. Total number of dead zones in the world went from 4 in 1910 to 400 in 2008 (last 100 in 20 years). They now cover 95,000 sq. miles of the water in world. Each of these zones is increasing in area - Gulf of Mexico dead zone, largest in the world, increased from 5000 sq. miles to 8000 sq. miles in 2 years and soon predicted to be 10,000 sq. miles. While factors that contribute to these blooms are known, cause of the accelerated growth is not fully known. My objective is to evaluate relative impact of different factors on algal growth to identify the factor(s) that are contributing to this accelerated algal growth. Methods/Materials 4 different water bodies (lake and marine) were sampled for surface water using phytoplankton net. Samples were subject to different nutrient runoff levels simulated using 15.5% Nitrogen solution of $H_4CaN_2O_3$ and 52% Phosphorous solution of KH_2PO_4 in a simulated environment. The samples were also subjected to different temperatures (20 & 22 deg C). Some samples were then treated with Alum to evaluate reduction in effect of nutrient runoffs. Algal growth was measured in all 144 samples using Colony Forming Unit (CFU) count, Surface Area and Biomass using optical density. A 1000x microscope was used to measure the algal cell sizes. Results Algal growth increased by 36%-107% at different runoffs and 44% with just temperature increase (2 deg C warmer). However, when there is both runoff and temperature increase the algal growth (as measured in CFU count) accelerated to 241% and 302% increase. This trend was seen in measures like surface area and biomass and also in water from all locations. When Alum was added to the water, the increase in growth was 120% and at higher Alum it was actually lower by 39%. Conclusions/Discussion Nutrient runoffs and temperature increase algal growth. But combined effect of these two factors is the key factor in the accelerated growth. Temperature change acts as a powerful stimulant and increases the nutrient effect on algae and phytoplankton growth by 3x. Reducing warming effect alone can greatly reduce algal growth even with runoffs. Also reversing the effect of nutrient runoff is possible through treatments. However, this study does not evaluate the impact of the additives on the marine life. This needs to be studied and evaluated in a follow up study.	
Summary Statement In a water body with nutrient runoffs, I showed that a temperature increase of 2 deg C acts as a catalyst that increases algal growth by 3 times.	
Help Received Ms.Amulya, Principal Microbiologist and Ms.Basu, biology teacher gave professional guidance on incubation techniques. Mr.Pillarisetti, parent, gave overall guidance and drove me to all locations. I did the sampling, experiments and analysis by myself.	