The Impact of Different Organic Fertilizers in the Proliferation of Blue Green Algae (*Gloeocapsa*)

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ABSTRACT

In the past decade, an increasing number of lakes and ponds in Vermont have reported spontaneous occurrences of cyanobacteria (*blue-green algae*) blooms. Many of the nutrients that end up in the lake are derived from the agricultural activity. The objective of this research project is to find the ideal organic fertilizer that can minimize the growth of these cyanobacteria. Commonly the fertilizers that end up in Lake Champlain as a product of runoff waters contain sufficient amount of NPK, therefore the growth of the cyanobacteria will be significant. Diverse analysis such as chlorophyll extraction, NPK and spectrophotometry were performed to quantify algal growth. There was not enough evidence to support our work hypothesis; this implies that there was no significance comparing the growth of the distinct treatments to the control. Statistically speaking there were no significant differences between the group averages as determined by ANOVA (P= 0.1352). The conditions (in vitro) and external factors require more research to be developed.

OBJECTIVE

In the past decade, an increasing number of lakes and ponds in Vermont have reported spontaneous occurrences of cyanobacteria (*blue-green algae*) blooms. Cyanobacteria are common in Lake Champlain, however these occurrences are becoming more frequent than before. Many of the nutrients that end up in the lake are derived from the agricultural activity. The objective of this research project is to find the ideal organic fertilizer that can minimize the growth of these cyanobacteria.

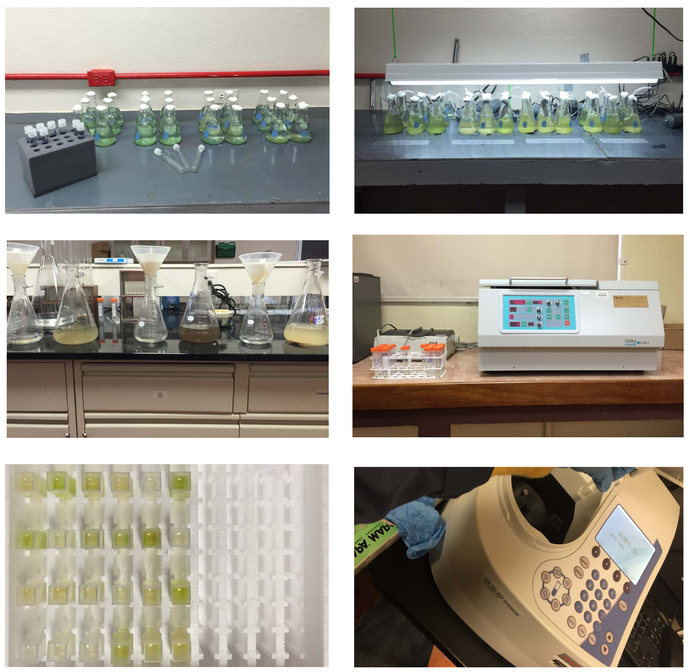
INTRODUCTION

- Lake Champlain has a wide variety of purposes; for example it serves as a source of potable water.
- Unfortunately, the water has suffered an overpopulation of cyanobacteria that caused the death of flora and fauna.
- A strong link has been found between the level of phosphorous and the amount of dangerous cyanobacteria.
- These blooms have harmful effects such as the ability to can block the sunlight needed for other living organisms to survive; they absorb all the oxygen and nutrients in the waters.
- The formation of blooms is dependent on the level of nutrients such as phosphorous, nitrogen and potassium.
- Studies have documented that these nutrients come from a non-point source such as runoffs from agricultural lands after decades of over-fertilization.

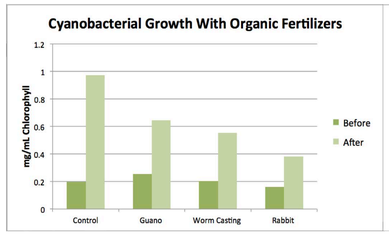
METHOD

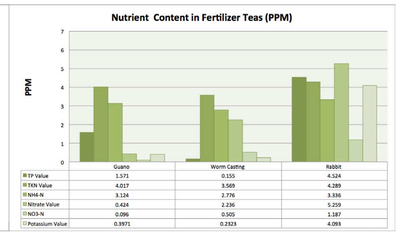
- The culture medium was prepared by enriching deionized water with macronutrients and trace elements based on the modified Allen's Blue-Green Algae Medium.
- The cyanobacteria were placed in twenty-four Erlenmeyer flasks (250 mL) undergoing the following conditions: temperatures of 22ºC, 12 continuous hours of white fluorescent illumination, and constant oxygenation with the use of air pumps.
- After 15 days, a 5 mL aliquot of each flask were centrifuged to separate cyanobacteria from water.
- Before treatment application, the cyanobacteria were treated with 5 mL of methanol for chlorophyll extraction. After centrifugation, chlorophyll was determined by a colorimetric method using a UV-Vis spectrophotometer at 665nm wavelength.
- Fertilizer treatments (Guano, Worm Casting and Rabbit Manure) were prepared using 0.6 g of each fertilizer in 1 L of deionized water. Later, the solution was filtered to remove any excess material. A 10 mL aliquot from each of these solutions were added to their respective group. These solutions were analyzed for NPK.
- After 15 days, a 5 mL aliquot of each flask was centrifuged. The cyanobacteria were treated with methanol and analyzed for chlorophyll concentration.

PHOTOS



RESULTS





	Guano	Worm Casting	Rabbit
TP Value	1.571	0.155	4.524
TKN Value	4.017	3.569	4.289
NH4-N	3.124	2.776	3.336
Nitrate Value	0.424	2.236	1.259
NO3-N	0.096	0.505	1.187
Potassium Value	0.3971	0.2323	4.093

Once the data was obtained and analyzed the results were illustrated in a bar graph to show the growth of the cyanobacteria. After 15 days, the growth was analyzed and subsequently, after 15 more days, a second growth analysis was made from the provision of treatment teas. It was observed that the range of growth was extremely small in comparison to each other. To confirm the credibility, the data underwent an ANOVA test to to compare the variances between the groups. This showed that there was no statistically significant difference because the P Value was greater than 0.1352. It can be observed that the organic fertilizer of rabbit manure contained more nutrients in the solution compared to the other treatments; however, it did not have a significant impact on the growth of cyanobacteria.

CONCLUSION

There was not enough evidence to support the work hyphothesis. This implies that there was no significance comparing the growth of the distinct treatments to the control. Statistically speaking there was no significant difference between group averages as determined by ANOVA (P= 0.1352). The measurement of the nutrients (TP, TKN, NH4-N, Nitrate, NO3-N and Potassium Values) indicated that rabbit manure contained more nutrients than other fertilizers; however, they did not show significant growth either. The conditions (in vitro) and external factors require more research to be developed.

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