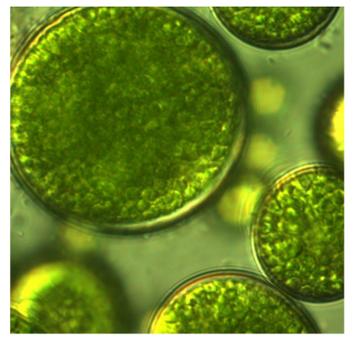


# Combating Harmful Algal Blooms by Promoting Diatom Growth Via Silica-Solubilizing Bacteria



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## I. Introduction

Harmful Algal Blooms have become a serious problem for water bodies worldwide. One potential method of inhibiting the growth of the blooms is through competition for resources. Diatoms are present in nearly every body of water and compete for similar resources as harmful algae <sup>1</sup>. However, diatoms do not typically limit algae due to scarcity of soluble silicon, which is needed for the glass shell (frustule) and division of diatoms <sup>2</sup>. Silicon is abundant, but rare in a soluble form, monosilicic acid. One natural source of monosilicic acid is created by silica-solubilizing bacteria associated with roots of plants with siliceous stalks. It has previously been found near the roots of rice and sugar cane plants <sup>3</sup>. We hypothesize that these bacteria can be grown in large quantity in a controlled environment, and the monosilicic acid they produce can be dispensed into a body of water, greatly enhancing diatom growth. Diatoms will then be able to naturally outcompete the harmful algae, reducing their abundance.



Diatom frustules composed of biologically-formed glass (silicon dioxide). Mixed species.

## II. Methods

- Water from Mantua reservoir was collected and placed in an empty aquarium under grow lights to provide a source of algae for controlled experimentation.
- Media preparation was done according to specifications in <sup>4</sup>, but some modifications were made according to cost and availability of ingredients.
- Commercial silica-solubilizing bacteria (*Bacillus mycoides*) was obtained and put into a solution containing beef broth, distilled water, and diatomaceous earth as a proof of concept.
- Several samples of water containing algae were placed in test tubes to observe the lifespan of the algae in a smaller container.
- Expert in the field of identifying algae and diatom types were contacted to give insight for our own identification.

## III. Results

The majority of work currently performed has been directed to adequate preparation for future experiments. Experts in the field have been able to offer insights into correct handling and identification of algae and diatoms as well as their quantities. Prior issues of obtaining silica-solubilizing bacteria were remedied with obtaining a commercial source. New roadblocks were identified with keeping algae alive in test tubes for small scale testing. The algae would quickly die on their own, rendering experimentation with the bacteria inconclusive. The new roadblocks offer more opportunities for problem solving and creative thinking.

## IV. Conclusions and Future Work

Proof of concept was the goal of current work with the hurdle of obtaining silica-solubilizing bacteria one of the major goals. When this hurdle was overcome, another unforeseen hurdle was encountered with keeping algae alive in test tube or smaller containers. Initially the water from Mantua reservoir required a recurring nitrogen source for the algae to thrive. A fish was introduced into the tank and the algae responded positively. When water from the tank was collected in test tubes in preparation for further experiments, the algae quickly died. This causes the issue of not being able to adequately test if the diatoms are able to outcompete the algae. Moving forward, finding a reliable method to keep the algae alive in small containers or moving to larger containers will be necessary to assure accurate conclusions can be made when diatoms are encouraged to grow and compete for resources. Both alternatives introduce their own challenges that will need to be overcome.

## V. SOURCES

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