

# The Effects of Atrazine on Primary Productivity of Phytoplankton



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## Introduction

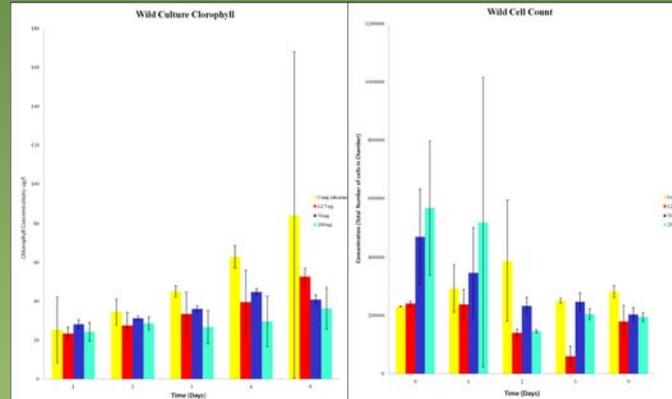
Atrazine is one of the most frequently used herbicides in the United States. Atrazine is water soluble and can transfer from soils into surface waters during rainfall events. Atrazine inhibits photosynthesis by blocking electron transport during the Hill reaction of photosystem II in target plant species and it is believed to act similarly in phytoplankton. The long water residence time in estuaries along with high atrazine loading rates may result in a prolonged exposure of phytoplankton communities to the herbicide. The primary objective of this study was to determine the effects of atrazine on primary productivity of cultured phytoplankton as well as wild phytoplankton sampled from the Charleston harbor.

## Methods

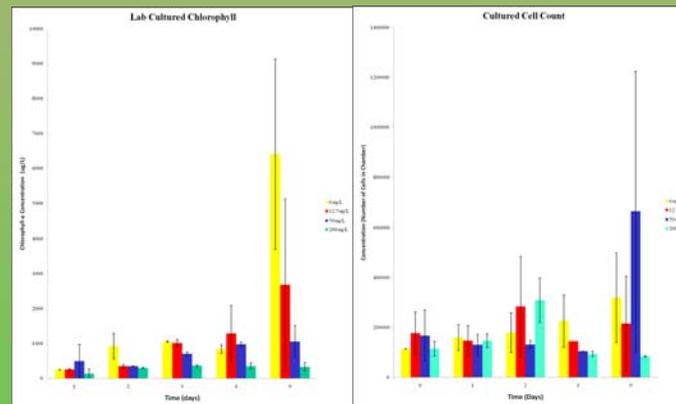
- 500 mL of wild phytoplankton were sampled from the Charleston harbor
- Phytoplankton were immediately placed in an incubator and maintained under ideal conditions.
- Phytoplankton were divided so that the samples could be exposed to various concentrations of atrazine for various lengths of time.
- Cell counts and chlorophyll concentrations were measured to determine the variability in primary productivity.
- The same process was repeated with lab grown phytoplankton.

Table 1. Samples of phytoplankton with various concentrations of atrazine with different times of exposure

Sample (phytoplankton)	Concentration (atrazine)	Time (exposure to atrazine in days)
(2) 50 mL	0	1,2,3,4, and 9
(2) 50 mL	12.5	1,2,3,4, and 9
(2) 50 mL	50	1,2,3,4, and 9
(2) 50 mL	200	1,2,3,4, and 9



- Wild phytoplankton showed an increase in chlorophyll production positively correlated with time.
- Phytoplankton exposed to 50µg/L of atrazine slightly decreased chlorophyll production at day 9.
- Chlorophyll production of phytoplankton exposed to 200 µg/L of atrazine showed little variation during the 9 day period.
- Cell counts of phytoplankton exposed to 200 µg/L decreased as time of exposure increased as well as those exposed to 50 µg/L of atrazine
- A majority of the cell count data for wild phytoplankton does not correlate to the measured chlorophyll concentrations.



- Cultured phytoplankton showed an increase in chlorophyll production as time of exposure increased .
- Chlorophyll concentrations did not steadily increase for phytoplankton exposed to 50µg/L of atrazine as well as phytoplankton that were not exposed to atrazine.
- Chlorophyll concentrations of phytoplankton exposed to 200 µg/L showed little variation after the first day of exposure.
- There was a significant increase in the number of cells counted for phytoplankton exposed to 200 µg/L on day 9.
- Although the rest of the samples show little variation cell count data stayed the same throughout the 9 day period.
- The cell count data shows no correlation to chlorophyll concentrations measured for cultured phytoplankton.

## Discussion

Atrazine, when present at concentrations greater than 200 µg/L could cause detrimental affects to the primary productivity of phytoplankton. In this study concentrations of atrazine used were not high enough to see substantial affects on the variables tested. The short length of exposure time may also contribute to the results we obtained. The number of trials would also have to be greater in order to produce significant results. Replications of the experiment would also decrease the standard deviation and as a result allow for more reliable results. If primary productivity is negatively impacted by atrazine, we would expect to see a decrease in chlorophyll concentrations as well as cell counts. However the data collected during this study provides no evidence of such an impact.

### References

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