Effects of Atrazine and Irgarol on Phytoplankton Growth

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Introduction

It is known that the world's water is contaminated by pollutants. However, questions remain regarding specific chemicals' effects on biological processes. We investigated the effects of two specific compounds, used on a daily basis.

Chemicals

1. ATRAZINE
   - -Herbicide
   - -Controls growth of weeds and fungi
   - -Used for agriculture, such as corn
   - -Found in runoff
2. IRGAROL
   - -Anti-fouling agent
   - -Controls underwater growth
   - -Used for improved vessel movement
   - -Found in the paint of boat hulls

These chemicals are often found together in aquatic environments subject to runoff and boating.

Phytoplankton

- The base of the aquatic food pyramid.
  - See Figure 1.
- When growth is inhibited, the entire aquatic biota suffers.

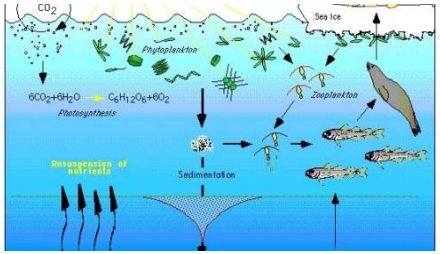


Fig. 1: Basic Aquatic Food Web

Objectives

We aimed to test atrazine and Irgarol concentrations found within the normal environmental range. The purpose of this experiment was to observe how the individual chemicals had an effect compared to the combination treatment (atrazine + Irgarol).

QUESTION

Will the combination treatment of Irgarol and atrazine have an increased detrimental effect on phytoplankton growth?

Methods

- Obtained phytoplankton of genus *Amphidinium* in exponential growth phase.
- Labeled 3 bottles (Fig. 2) each as:
  - **Control** (30 µL of 90% acetone)
  - **Atrazine** (25 µg/L)
  - **Irgarol** (0.20 µg/L)
  - **Combination** (see above)

Fig. 2: Bottle

- Separated phytoplankton into 12, 500 mL bottles
- Measured baseline cell levels using a hemacytometer (Fig. 3 & Fig. 4)

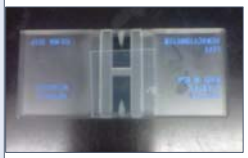


Fig. 3: Hemacytometer slide

Fig 4: Cell counting

- Measured baseline Chlorophyll *a* with a fluorometer (Fig. 5)

Fig. 5: Fluorometer

- Added chemicals to each bottle
- Stored bottles in uniform, refrigerated environment
- Took cell count and Chlorophyll *a* measurements twice a week, resulting in 5 measurements
  - Tuesdays and Fridays

Results and Figures

Figure 6: Average number of phytoplankton cells per day

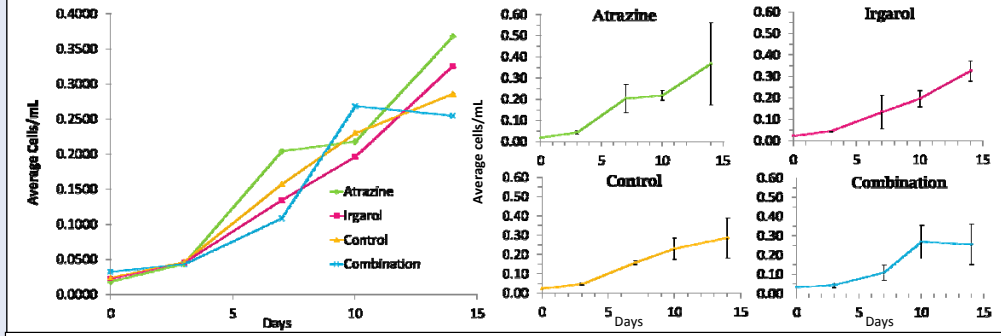
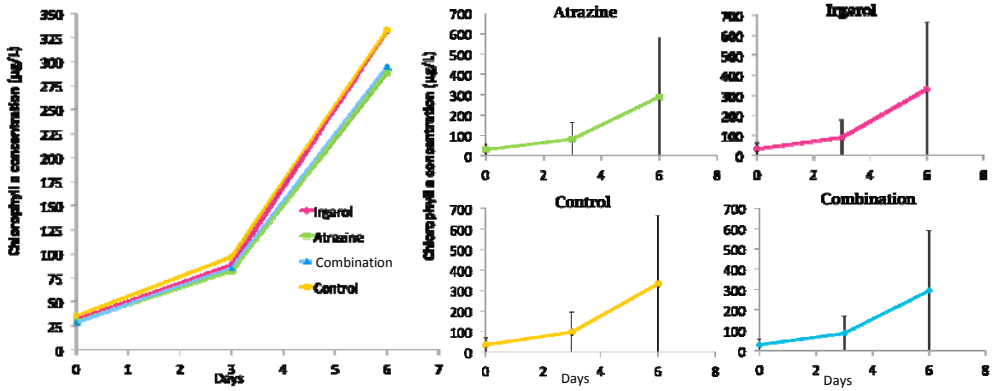


Figure 7: Average Chlorophyll *a* Concentration



Conclusions

Cell counting

There was no significant difference found between any of the treatment groups and the control.

Plausible explanation of results:

- The stock concentration were too old to be effective
- The concentration of chemicals used in each treatment was too low.
- Cell counting is more susceptible to error than measuring Chlorophyll *a* concentrations
- The timeframe of the experiment was not adequate.

Chlorophyll *a*

These results suggest that Atrazine impedes chlorophyll production more than Irgarol. Although there was no statistically significant difference, the chemically treated phytoplankton did have less chlorophyll *a* than the control group.

Concentrations were selected based on the expectation that they would yield similar results. However, the concentrations chosen did show some variation. This could be explained by the fact that the chemical potency of Atrazine and Irgarol are not equivalent.

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