



Testing the Efficacy of Algaecides for Starry Stonewort Control

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Background

- Starry stonewort is an invasive alga which has been found in 13 Minnesota lakes since 2015.
- With control efforts underway, there is a need for basic information about the efficacy of different algaecides and herbicides.
- For my Masters, I will be testing the efficacy of various algaecides and herbicides on starry stonewort.
- My preliminary results indicate that this experimental approach is sensitive to differences in algaecide concentrations.

Objectives

- Determine an effective algaecide/herbicide concentration exposure range for both starry stonewort and its bulbils.
- Determine exposure time required to observe algaecide impact.
- Evaluate whether starry stonewort and its bulbils are able to recover following treatment.
- Test whether algaecides can reach bulbils below sediment.

Methods

- I will evaluate the effectiveness of 3 copper-based algaecides and 2 herbicides at various concentrations (Table 1).
- For starry stonewort I will be measuring algaecide impact through small-scale, highly controlled, replicated lab trials.
- Fourteen days after initial treatment I will measure short term injury via chlorophyll content and biomass analysis.
- I will also measure recovery time by leaving a subset of each group intact.
- For bulbils I will follow a similar approach but I will measure impact via germination success.

Figures and Tables

Chemical	Active ingredient	Label Suggested Rate	Concentrations to be tested
Komeen Liquid	Copper Ethylenediamine Complex	0.5 – 1.0 ppm	0.125 ppm
			0.25 ppm
			0.5 ppm
			0.75 ppm
			1.0 ppm
Captain XTR	Copper Ethanolamine Complex	0.4 – 1.0 ppm	0.125 ppm
			0.25 ppm
			0.5 ppm
			0.75 ppm
			1.0 ppm
Cutrine-Plus Liquid	Copper Ethanolamine Complex	0.2 – 1.0 ppm	0.125 ppm
			0.25 ppm
			0.5 ppm
			0.75 ppm
			1.0 ppm
Clipper	Flumioxazin	100 – 400 ppb (parts per billion)	50 ppb
			150 ppb
			250 ppb
			325 ppb
			400 ppb
Hydrothol 191	Mono(N,N-dimethylalkylamine) salt of endothall	0.5 – 3.0 ppm	0.01 ppm
			0.05 ppm
			0.5 ppm
			0.5 ppm
			1.0 ppm
			3.0 ppm

Table 1 (left). Algaecides and herbicides to be studied with their active ingredient and suggested concentration rate. The last column shows the concentrations I will be testing for each chemical.

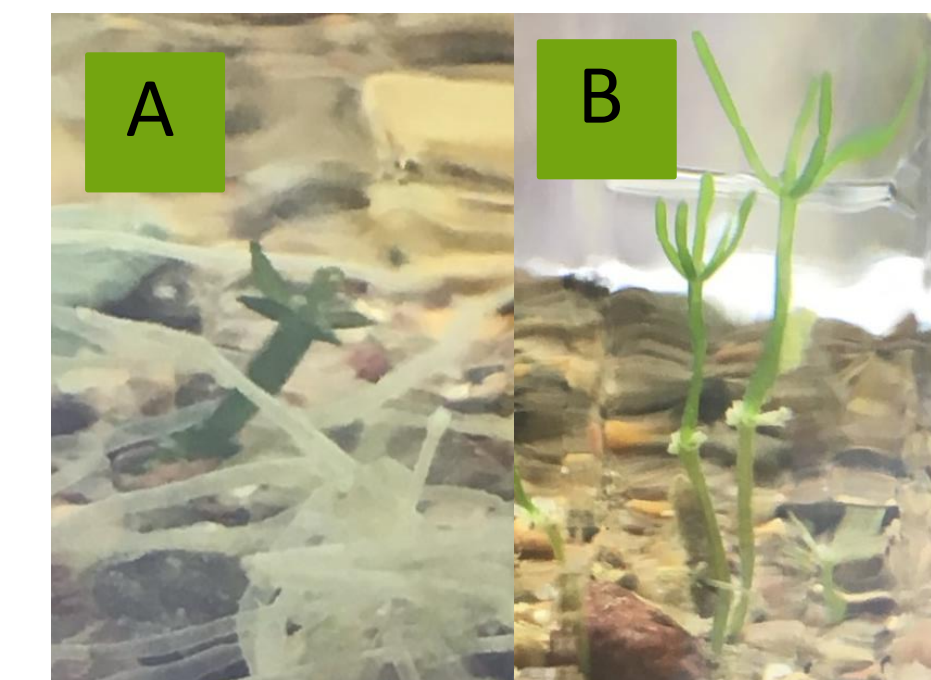
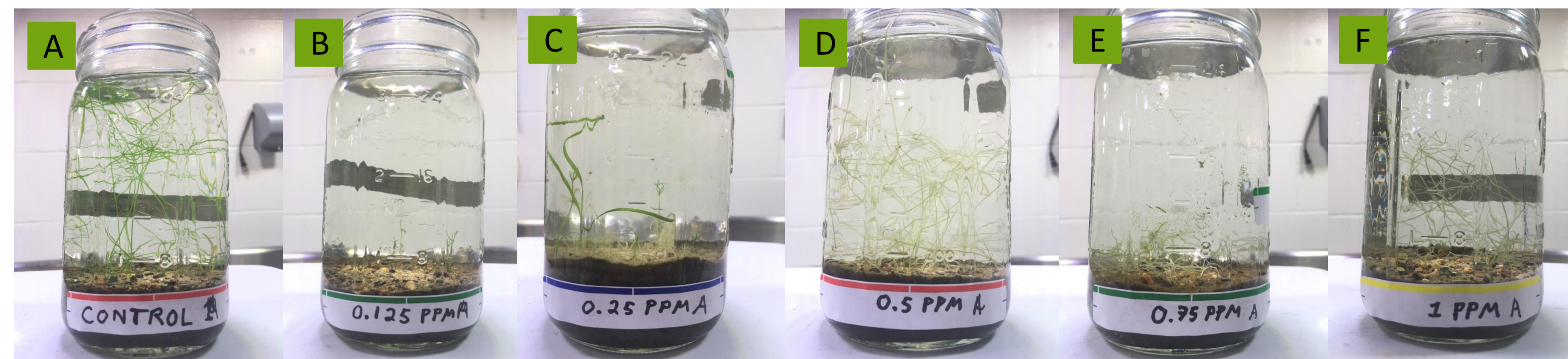


Figure 2 (above). Starry stonewort recovering 14 days after initial Cutrine-Plus treatment. **A.)** New SSW sprout appearing from the sediment along old collapsed SSW. **B.)** New SSW growing from stressed SSW.

Figure 1 (below). Starry stonewort 14 days after initial Cutrine-Plus Liquid treatment. **A.)** Control, no change. **B.)** 0.125 ppm, SSW completely disintegrated and new SSW is growing back. **C.)** 0.25 ppm, SSW mostly disintegrated and new SSW growing back. **D.)** 0.5 ppm, SSW is stressed and no new SSW is growing back. **E.)** 0.75 ppm, partial collapse of stressed SSW and no new SSW is growing back. **F.)** 1.0 ppm, SSW is stressed and no new SSW is growing back.



Results

- For starry stonewort, there was wide range of algaecide impact in the concentrations tested (Figure 1).
 - The biomass ranged from completely collapsed (Figure 1B) to stressed (Figure 1F).
 - However, collapsed starry stonewort had already started to grow back by day 14 (Figure 1 B & C; Figure 2), while the stressed ones did not have any new growth (Figure 1 D-F).
- For bulbils, they all sprouted in the control and 0.125 ppm treatment group while they all failed to sprout in the 0.25 ppm and higher concentrations.

Discussion

- The tested herbicide concentration range is effective at capturing various levels of impact for Cutrine-Plus.
- Fourteen days is an effective time point to measure herbicide impact on starry stonewort and bulbils when using Cutrine-Plus.
- Starry stonewort in medium to high concentrations was still recovering after 41 days.
 - Further observation needed to determine if treated starry stonewort can fully recover.
- In this preliminary study we only measured impact qualitatively. In future experiments we will also measure quantitatively through chlorophyll content and biomass analysis.
- Only bulbils in the control and 0.125 ppm treatment groups sprouted in the 41 days of observation suggesting that Cutrine-Plus is effective at killing bulbils at 0.25 ppm concentration and above.
- However, bulbils are often buried within the sediment so future testing will include sediment covered bulbils to test whether lake sediment acts as a shield against algaecide/herbicide.
- We only tested Cutrine-Plus Liquid in this preliminary study, future experiments will include other herbicides from Table 1.

Acknowledgements

- I would like to thank my advisor Daniel Larkin for his guidance and my fellow lab members, Carli Wagner, Mike Verhoeven, Wesley Glisson, and Ranjan Muthukrishnan for acquiring bulbils for my experiments.
- I would also like to thank West Bishop from SePro for sharing his knowledge on herbicide treatments and the Minnesota DNR for sharing their suggestions on herbicides to be studied.