DUCKWEED DIALOGUES • Exploring the nutrient uptake and • fertilizing capabilities of duckweed

Izabella Kornak – Theodore Muth

Cornell University, 144 East Ave., Ithaca, NY 14853

Department of Biology, City University of New York, Brooklyn College, NY 11210

BACKGROUND

Duckweeds are a family of aquatic plants that rapidly grow on the surfaces of still or slow moving bodies of water. They thrive on nutrient dense lakes and ponds, which amplifies their potential to remove pollutants from water systems.

Additionally, duckweed has a high protein content, which makes it attractive as a feedstock in fish and cattle farming. Various Asian cultures also utilize duckweed as a food source. Future uses point to duckweed as biofuel.

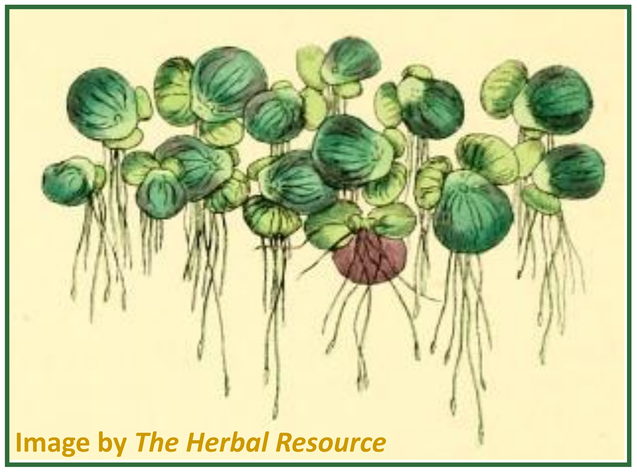


Image by *The Herbal Resource*

PURPOSE

The purpose of our experiments was to test the phytoremediation capabilities of sterile duckweed and duckweed with an environmentally recruited microbiome on polluted urban waters. The effects of regular harvesting and re-seeding were also observed. Knowledge on nutrient uptake levels may lead to the application of duckweed as a natural, inexpensive solution to polluted, or eutrophic, waters.

Furthermore, this study tested duckweed as an agricultural fertilizer, due to its potential for accumulating essential plant growth nutrients from polluted waters, such as phosphorus and nitrogen.

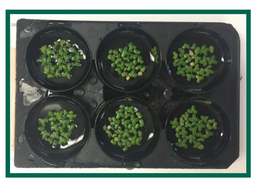
PHYTOREMEDIATION EXPERIMENT

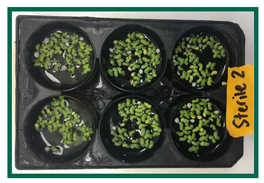
OBJECTIVES

- Observe the differences in nutrient uptake between sterile duckweed and duckweed colonized with a natural microbiome
- Investigate if regular harvesting and reseeding exhibits higher yields of nutrient uptake
- Determine effects of pond water on nutrient level changes

METHODS

- Five 6-well culture plates were set up with 10 mL of Prospect Park lake water. Two were seeded with sterile duckweed, two seeded with Prospect Park duckweed, and one remained as a control with no duckweed.
- After five days, water samples were collected. Culture plate replicates were harvested and reseeded with sterile, or lake duckweed.
- After ten days, water samples were collected
- Samples are awaiting nutrient analyzation by an Automated Discrete Nutrient Analyzer





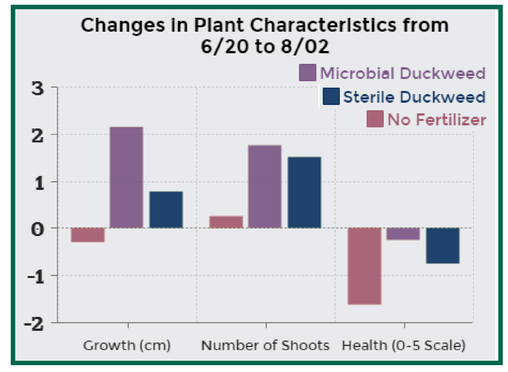
FERTILIZER EXPERIMENT

OBJECTIVES

- Determine the fertilizing capabilities of sterile duckweed, and harvested duckweed to a non fertilized system of tomato plants.

METHODS

- Twelve tomato plants were replanted in a 1:1 sand to soil mixture.
- Changes in plant measurements and characteristics were recorded
- Four plants were given dried sterile duckweed, and four were fertilized with dried lake duckweed
- Every other week, photos were taken.
- Plant height, shoot number, and health rate were recorded, by noting color and signs of wilting.



CONCLUSIONS

Duckweed, in both its sterile form and with a microbiome attached, is a viable source for fertilizer applications in agricultural settings. Plants fertilized with duckweed had higher growth rates, and exhibited more healthy characteristics throughout the six-week experiment compared to the plants which had not been fertilized. Additionally, the plants fertilized with lake duckweed started flowering four weeks into the experiment, while the other two sets did not flower at all. They also had the highest growth rates, and exhibited the healthiest characteristics by the end of the trial. The results of the phytoremediation experiment are yet to be analyzed. However, significant decreases in algae levels were observed in well plates seeded with both types of duckweed as compared to the well plates with pure lake water, proving its effectiveness at accumulating nutrients such as phosphorus and nitrogen, which are essential for algal growth.

ACKNOWLEDGEMENTS We are thankful for the funding and organization provided by the National Science Foundation through Research Experiences for Undergraduates.