

Abstract

Microalgae have the potential for sustainable biofuels, fish feed, and natural dyes. This study explores the differences in chlorophyll-a and chlorophyll-b concentrations between microalgae cultivated indoors in a controlled bioreactor and those grown outdoors in turf systems and aquaculture ponds at Delaware State University.

Introduction

Chlorophyll concentration indicates the nutritional value, pigment strength, and health of microalgae.

- Outdoor microalgae grown in DSU aquaculture ponds are influenced by various environmental factors, such as weather, animals, microorganisms.
- Indoor microalgae is cultivated in bioreactors experience controlled conditions.

Objectives

- Comparing chlorophyll content between outdoor- and bioreactor-grown microalgae.
- How natural environmental stressors (e.g., weather, animals, and sunlight variability) influence algal pigment strength.

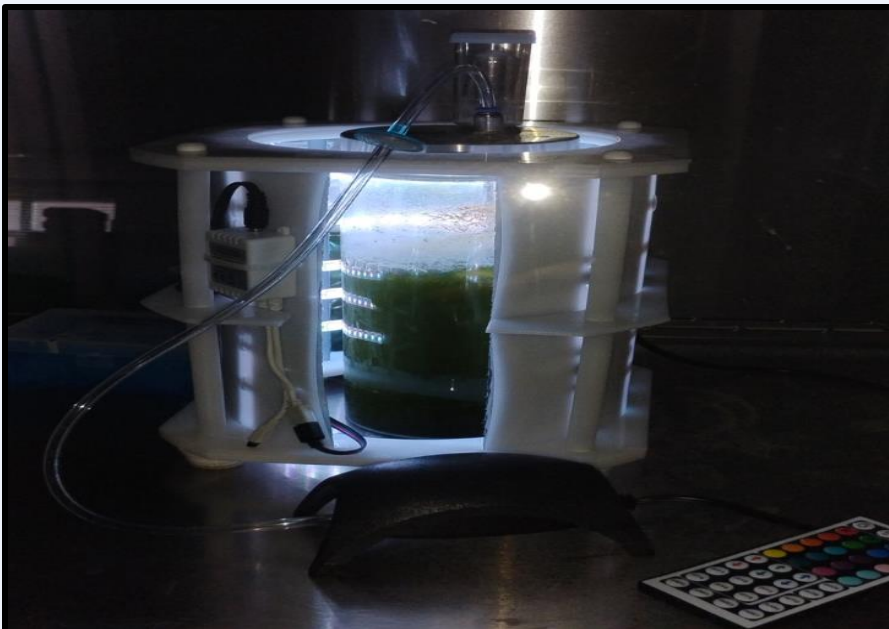
Outdoor bloom pond



Outdoor raft system pond



Indoor bioreactor



Materials and Methods

36 Samples of algae are collected from three sources: the bioreactor, the turf system, and a pond with blooms.

- Bioreactor algae is centrifuged for 10 minutes at 4,000 rpm to separate the solids.
- Once the solids are settled on the bottom, excess water is extracted.

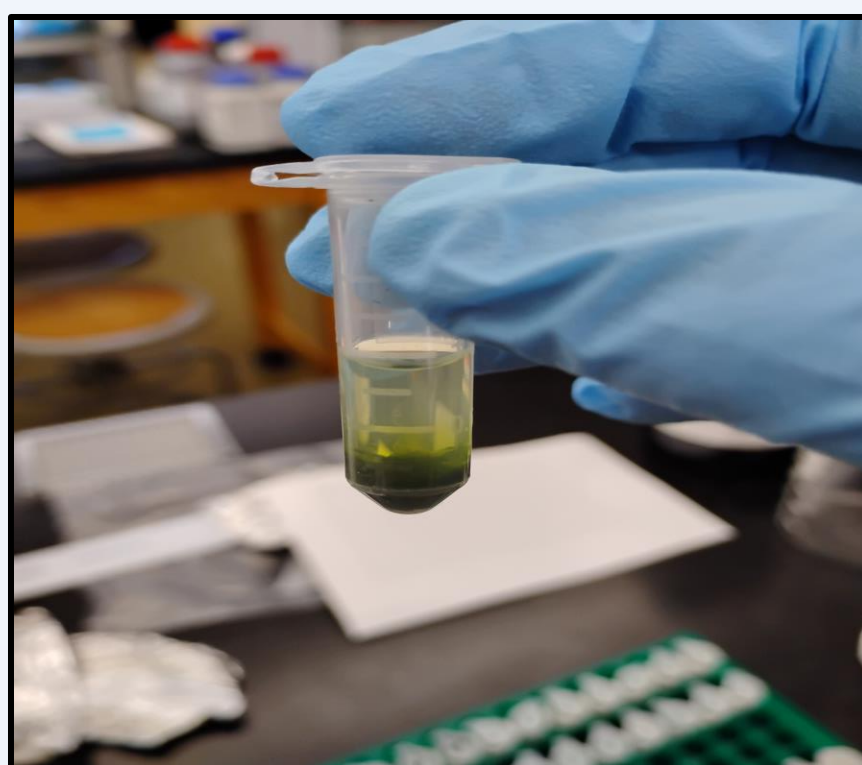
Turf systems and pond samples do not require these steps and are already in a more solid state.

- All samples get dehydrated at 75 °C for 48 hours and are crushed into a fine powder

Crushing the dehydrated samples



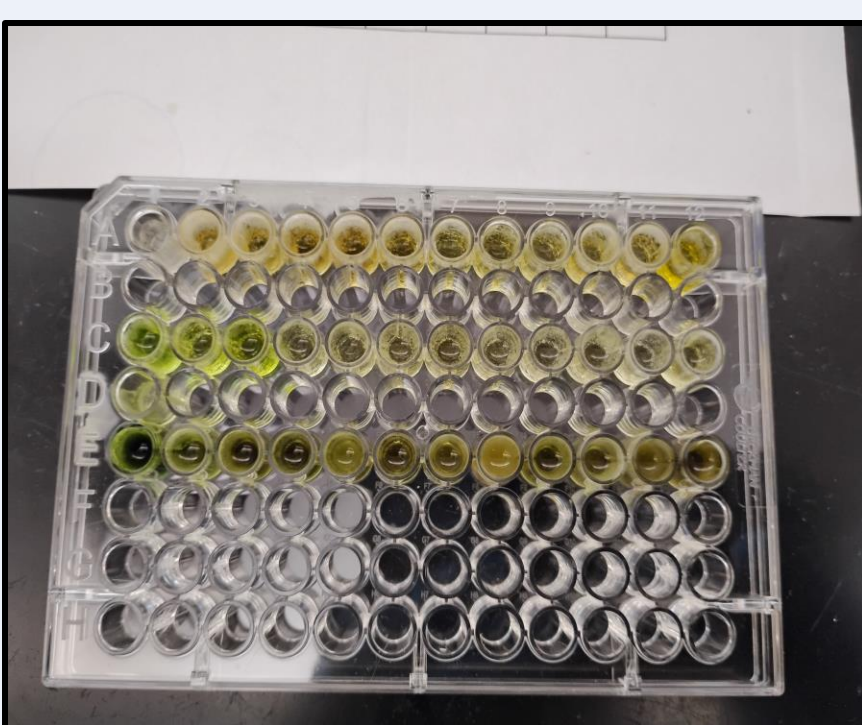
The powder is then added to a microtube with 1 ml of acetone



A Sonicator is then used to homogenize the mixture.



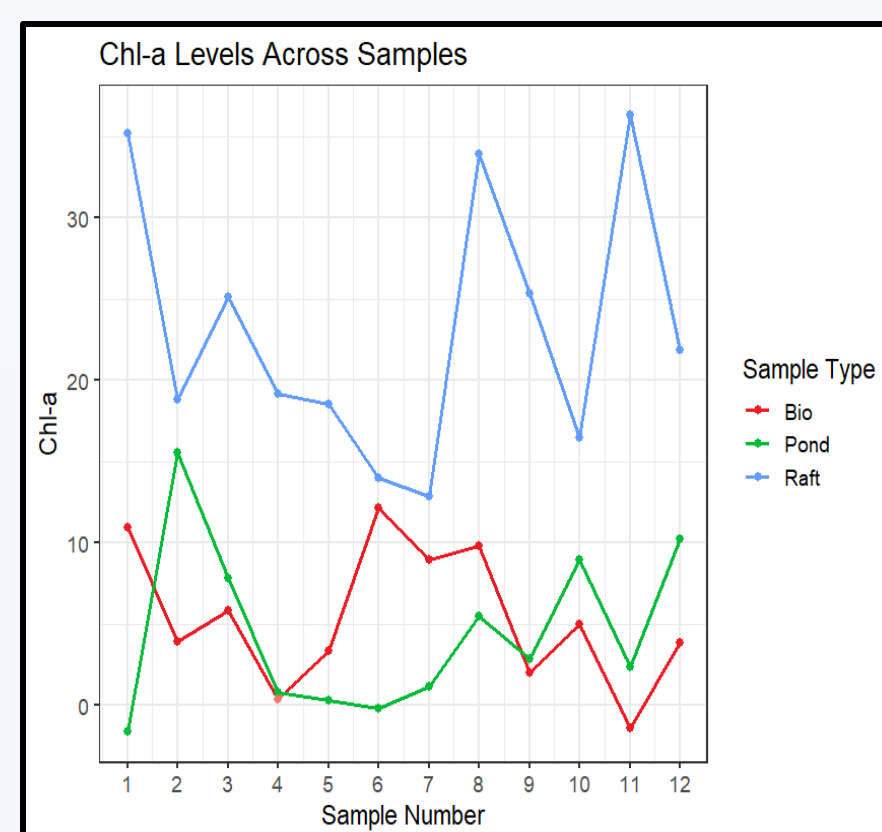
The samples are then pipetted into a microplate, then inserted into a plate reader to analyze its wavelengths.



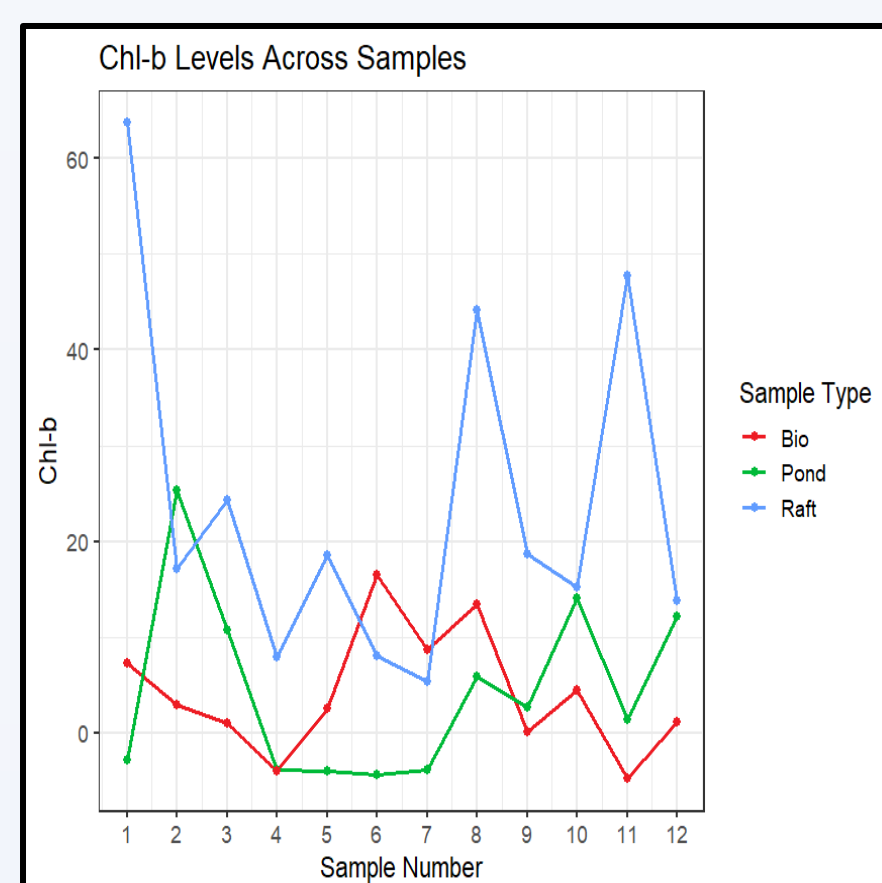
Results

Raw data from the microplate reading was used to calculate values for Chl-a, Chl-b, and Total chlorophyll.

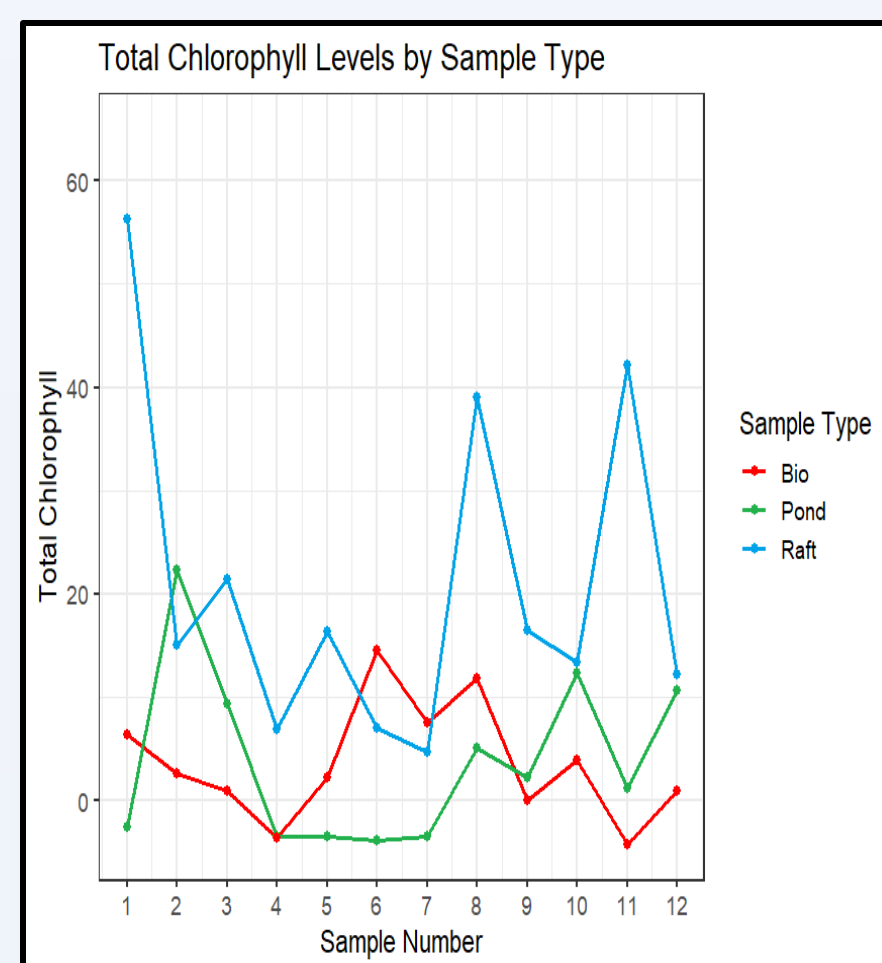
Chl-a graph



Chl-b graph



Combined chl-a and chl-b graph



Conclusions

- Raft algae had richer and darker green hues when diluted with the acetone.
- This could be due to natural sunlight also playing a large role in the strength of chlorophyll retention.
- While there is more unpredictability in outdoor cultivation and less consistency in chlorophyll hues. The biomass productivity and sustainability make it a great alternative for biofuel and aquaculture feed purposes.

Recommendations

- Multiple harvests of the outdoor algae throughout the summer and fall
- Species-specific differences in pigment concentration could also be another thing to look into, as the bioreactor is more of a monoculture versus the more diverse pond.

References

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- Yu Yu Nwe Oo , Myat Chaw Su , Kay Thi Kyaw (2017) Extraction And Determination Of Chlorophyll Content From Microalgae. *International Journal of Advanced Research and Publications* Volume 1 Issue 5, November 2017 <https://www.ijarp.org/published-research-papers/nov2017/Extraction-And-Determination-Of-Chlorophyll-Content-From-Microalgae.pdf>

Acknowledgements + Contact

This work was in part funded by a National Science Foundation REU Grant #2244195 and USDA NIFA Undergraduate Research Internship Program is funded by USDA NIFA Capacity Building Grant Program with Award#2023-38821-40369 awarded to Dr. Dayan Perera of University of Arkansas Pine Bluff, Dr. Andrew Ray of Kentucky State University and Dr. Gulnihal Ozbay of Delaware State University

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