Assessing the Influence of Glucose on Lipid Accumulation in Microalgae

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Introduction

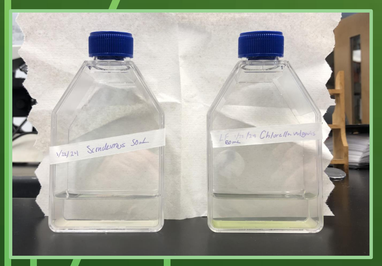
In the 1820s, humanity was introduced to the first generation of biofuels [3]. Hundreds of years later biofuels would evolve to what they are today. With increasing demands of energy and decreasing amounts of fossil fuels available, the need for biofuels also increases.

Biofuels are defined as fuel that is converted from a renewable source. There are different types of biofuels, including solids, liquids, and gases. Biofuels are converted from biomass, which is organic matter that is made of lipids, proteins, and carbohydrates [2]. It was hypothesized that by giving microalgae glucose, more lipids would accumulate, and make the microalgae a better biofuel resource. To measure the lipid accumulations of microalgae, the Blight and Dyer Method was used to quantify the lipid accumulation [1]. The two different strains that were used were *Chlorella vulgaris* and *Scenedesmus quadratica*.

Experimental Design

	Control	A	B	C	D
Algae Culture (mL)	10	10	10	10	10
Culture Media (mL)	40	40	40	40	40
Glucose (g)	0.0	0.1	0.5	0.8	1.0

Table 1: *Chlorella vulgaris* and *Scenedesmus quadratica* algae culture components



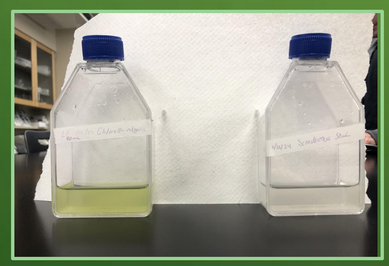


Figure 1: Original algae cultures after two weeks of growth in T50 flasks. *Scenedesmus quadratica* (left) and *Chlorella vulgaris* (right)

Acknowledgments: I wish to extend a proper thanks to Professor Karel for providing the chemicals needed for the lipid extraction.

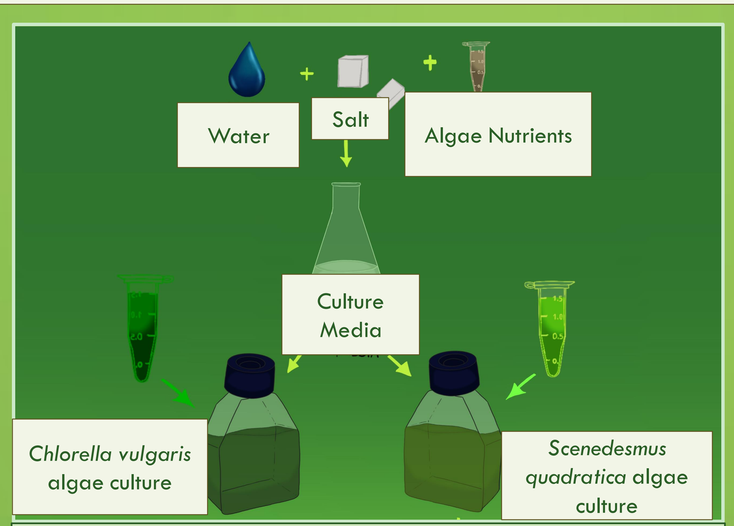


Figure 2: Flow chart of experimental design

Results

Figure 2: Strain *Chlorella vulgaris* algae cultures growing eight weeks of growth (Control – D left to right)

Figure 3: Strain *Scenedesmus quadratica* algae cultures after eight weeks of growth (Control – D left to right)

References:
[1] Breil, C., Abert Vian, M., Zemb, T., Kunz, W., & Chemat, F. (2017). "Bligh and Dyer" and Folch Methods for Solid-Liquid-Liquid Extraction of Lipids from Microorganisms. Comprehension of Solvatation Mechanisms and towards Substitution with Alternative Solvents. International journal of molecular sciences, 18(4), 708. https://doi.org/10.3390/ijms18040708
[2] Farm-Energy. (2019, April 3). Algae for biofuel production – farm energy. Farm-Energy; National Institute for Food and Agriculture. https://farm-energy.extension.org/algae-for-biofuel-production/#:~:text=Some%20algal%20species%20can%20produce
[3] Golomb , W. (2022, June 8). *History of Biofuels*. The Energy Geek. https://nhenergygeek.org/blog-post/history-of-biofuels/

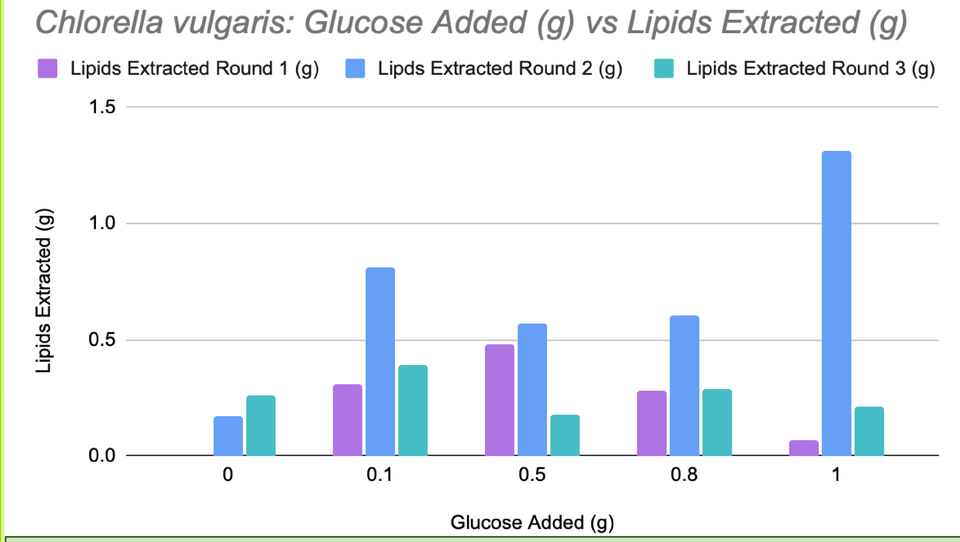


Figure 4: Total mass in extraction rounds 1, 2, and 3 after eight weeks of growth for strain *Chlorella vulgaris* after eight weeks.

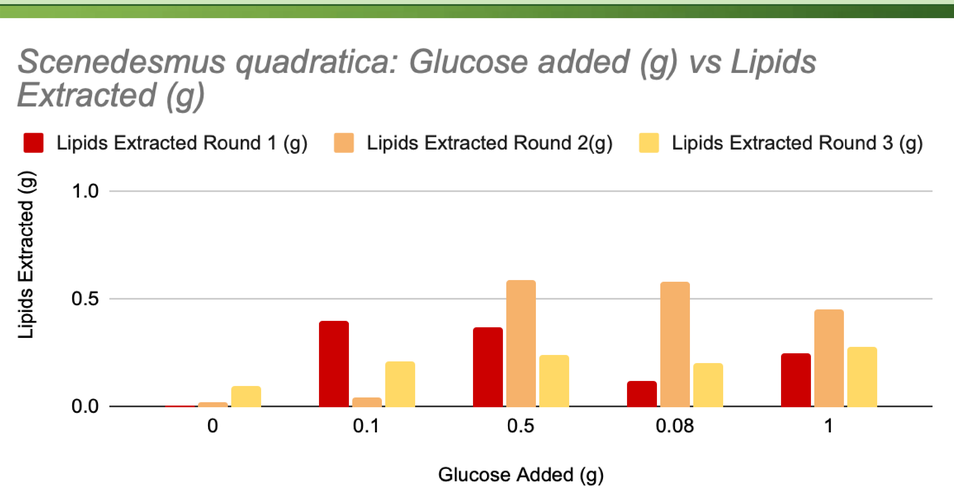


Figure 5: Total mass in extraction rounds 1, 2, and 3 after eight week sof growth for strain *Scenedesmus quadratica*.

Conclusion

Strain *Chlorella vulgaris* has optimal growth when 0.1 g of glucose are added and strain *Scenedesmus quadratica* has optimal growth when 0.5 g of glucose are added. This data can be used to better understand how to better influence the production of lipids in microalgae to meet increasing biofuel demands. The more reliable biofuels can become, compared to nonrenewable fossil fuels, the less worried humanity will have to be about running out of resources for energy. By using fewer fossil fuels as main sources of energy, there would also be less greenhouse gases being released into the atmosphere. This solution not only is better in the long run for humanity, but for the planet.