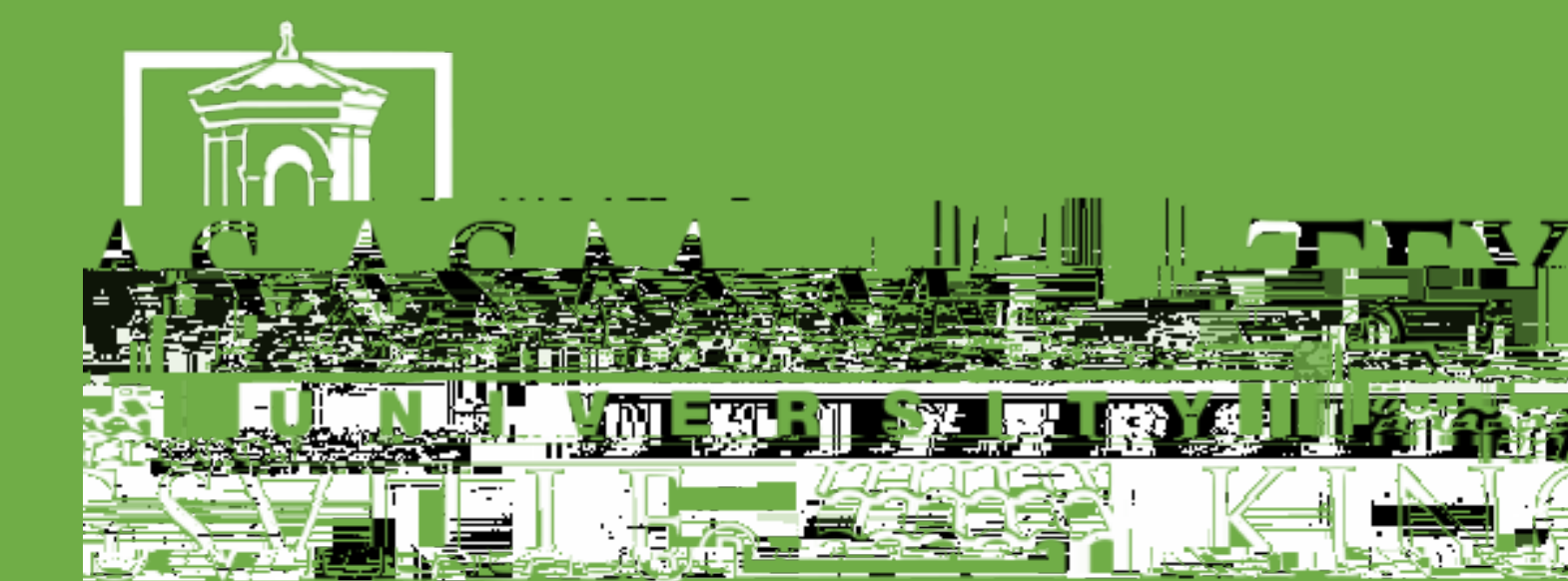


The Effects of Nitrate and Phosphate Starvation on *Dunaliella salina* and *Scenedesmus obliquus* Biomass Composition

Daniel Jones and Dr. Matthew Alexander

Wayne H. King Department of Chemical Engineering and Natural Gas Engineering



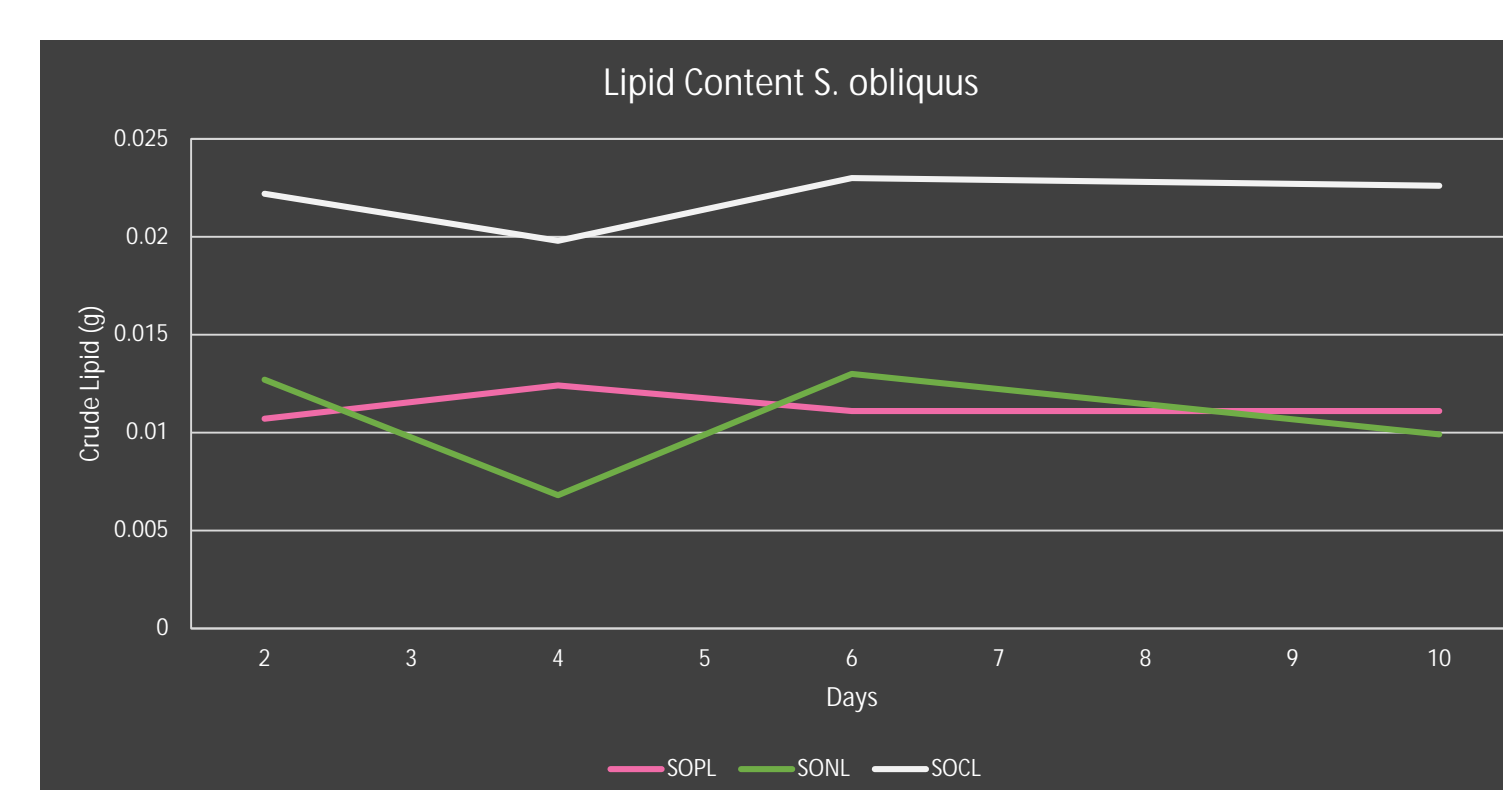
S PROGRAM — McNAIR SCHOLAR

ABSTRACT

As traditional fuels begin to run out, alternative fuels become a necessity. Renewable biofuels are especially appealing due to their compatibility with current infrastructure. The purpose of this study was to analyze two microalgal species, *Dunaliella salina*, and *Scenedesmus obliquus* th

RESULTS

- Despite increasing O.D. readings, no increase in crude lipid (g) was observed.
- Nutrient deprivation was not associated with any crude lipid (g) increase.
 - SOCL appeared to produce more crude lipid than SONL and SOPL
- Scenedesmus obliquus* O.D. readings grew faster under nutrient scarce conditions.
- Dunaliella salina* O.D. readings matched the literature expectation



CONCLUSIONS

- Nutrient deprivation was not shown to positively impact crude lipid production in microalgae
- Industrial settings are unlikely to be able to utilize nutrient deprivation to a positive effect

REFERENCES

[1] S. Shafiee, E. Topal, "When will fossil fuel reserves be diminished". Brisbane, Australia, ScienceDirect, Energy Policy, Volume 37, Issue 1, Pages 181-189, 2009. Accessed: June 20, 2023. [Online]. Available: <https://www.sciencedirect.com/science/article/pii/S0301421508004126>

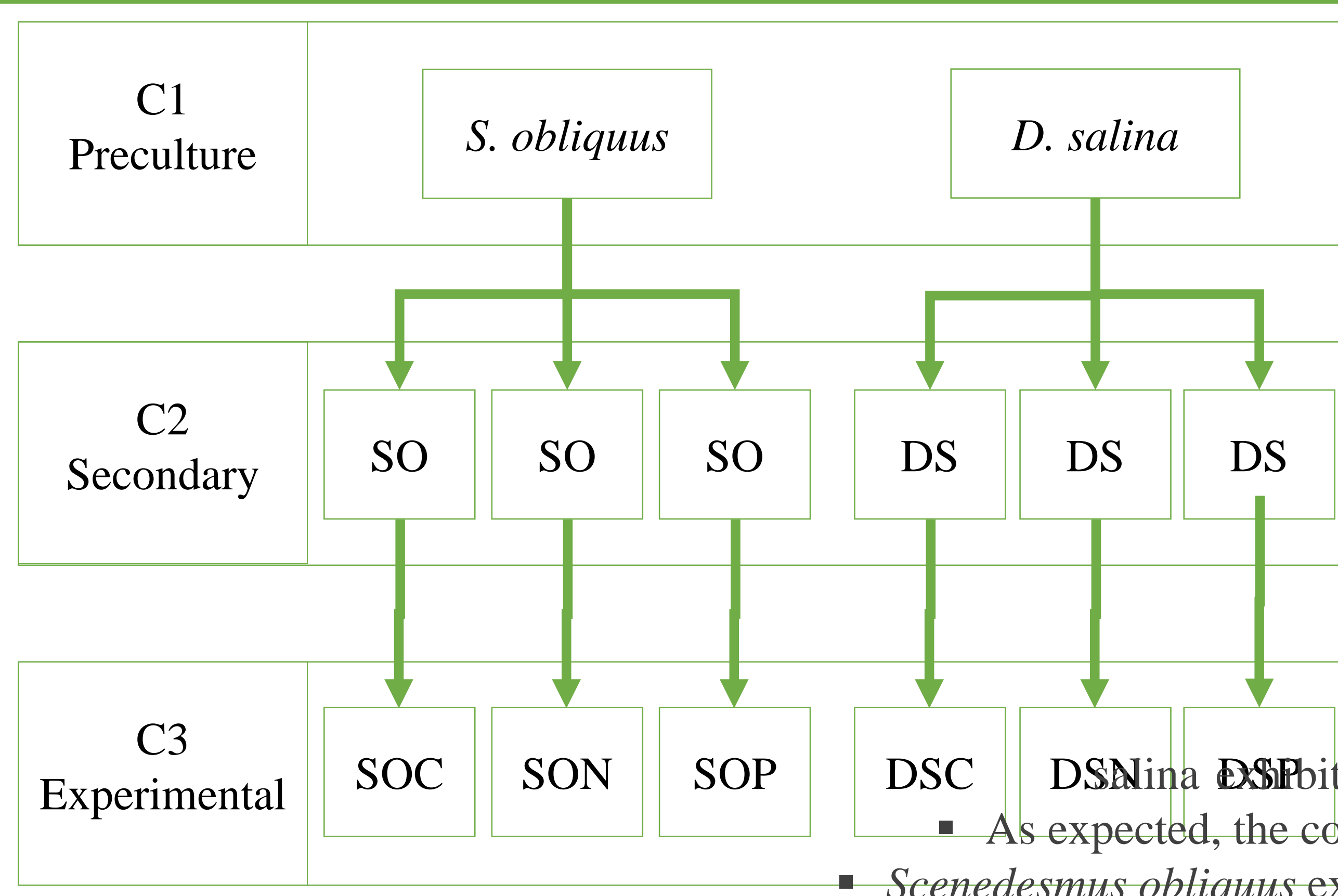
[2] *Biodiesel Handling and Use Guide*, 5th ed., U.S Department of Energy, Golden, CO, USA, 2016

[3] K. Moriarty, J. Yanowitz. *E15 and Infrastructure*. -2.87ccessed: Ao 241063.4 (l)5.6 (2)0.5 (2)0.6 (0)0.71.547-2.870.6 (7)6.9 (c)12.6

BN

- Compounding rate studies predict depletion of oil reserves by 2044
- Biofuels are renewable and low blends are already compatible with current infrastructure
- Third generation biofuels minimize drawbacks
 - Less land use
 - Less threat to local food supply
- Lipid content acts as a feedstock for biodiesel
 - Up to B20 is compatible
 - Yield increased through nutrient deprivation
- Carbohydrate content acts as a feedstock for bioethanol
 - Up to B15 is compatible
 - Yield increased through nutrient deprivation

METHODS



- Dunaliella salina* exhibited mostly normal behavior in terms of growth rates
 - As expected, the control outpaced the nutrient deprived growth rate
- Scenedesmus obliquus* exhibited strange behavior in response to experimental conditions

ACKNOWLEDGEMENTS

Dr. Matthew Alexander – Texas A&M University-Kingsville
 McNair Staff – Texas A&M University-Kingsville

[18] Khoirah, D. Vo, P. Kumar, P. Show, "Techniques of lipid extraction from microalgae for biofuel production: a review". Malaysia, Springer, Environmental Chemistry Letters, Vol 19, Pages 231-251, 2021. Accessed: June 13, 2023. [Online]. Available: <https://link.springer.com/article/10.1007/s10311-020-01088-5#citeas>

[19] C. Cheng, T. Du, H. Pi, S. Jang, Y. Lin, H. Lee. "Comparative study of lipid extraction from microalgae by organic solvent and supercritical CO₂". Hsinchu, Taiwan, ScienceDirect, Bioresource Technology, Volume 102, Issue 21, Pages 10151-10153, 2011. Accessed: June 16, 2023. [Online]. Available: <https://www.sciencedirect.com/science/article/pii/S0960852411011709#tblfn1>

[20] H. Benson, "Bacterial Population Counts", in *Microbiological Applications*, 5th ed. Dubuque, Iowa, U.S.: Wm C Brown Co. Pub, 1990, pp. 87-92.

[21] K. Zhong, Q. Want, "Optimization of ultrasonic extraction of polysaccharides from dried longan pulp using response surface methodology". Beijing, China, ScienceDirect, Carbohydrate Polymers, Volume 80, Pages 19-25, 2010. Accessed: Jul. 13, 2023. [Online]. Available: <https://www.sciencedirect.com/science/article/pii/S0144861709006249>