

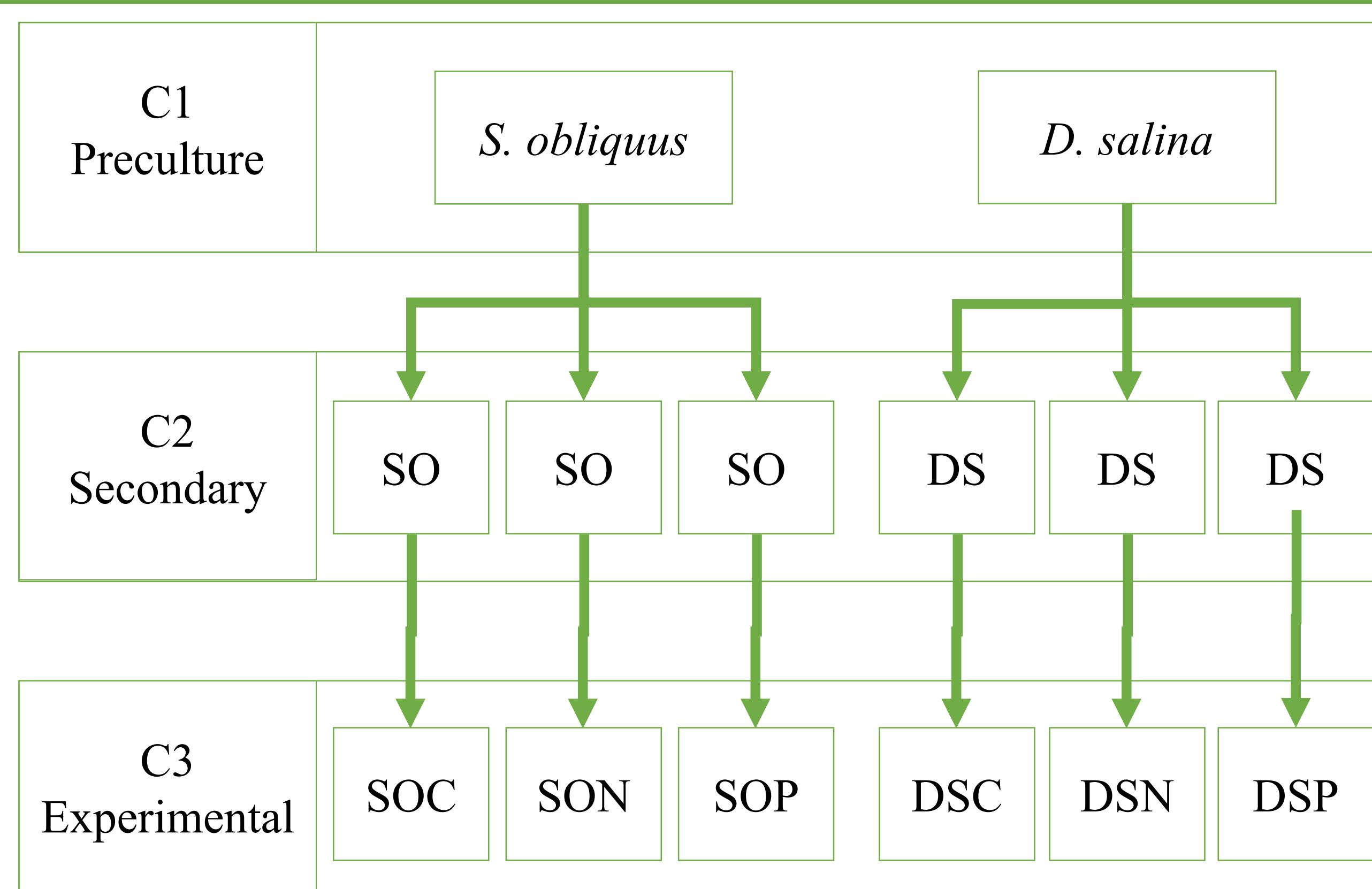
ABSTRACT

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* that appear highly promising for use as a biofuel feedstock. A quantitative approach was utilized to analyze fluctuations in useful biomass production that occur under nutrient scarce conditions relative to cultivator recommended growth conditions. Each species was subject to nutrient deprivation. Specifically, each species was separately deprived of nitrate and phosphate. The crude lipid and carbohydrate was measured and compared to growth rates to determine useful biomass productivity. It was found that lipid g/mL would stagnate despite increasing algae population. The research suggests that industry may not be able to effectively utilize nutrient starvation as a method of increasing lipid feedstock efficiency. Crude carbohydrate analysis is pending.

INTRODUCTION

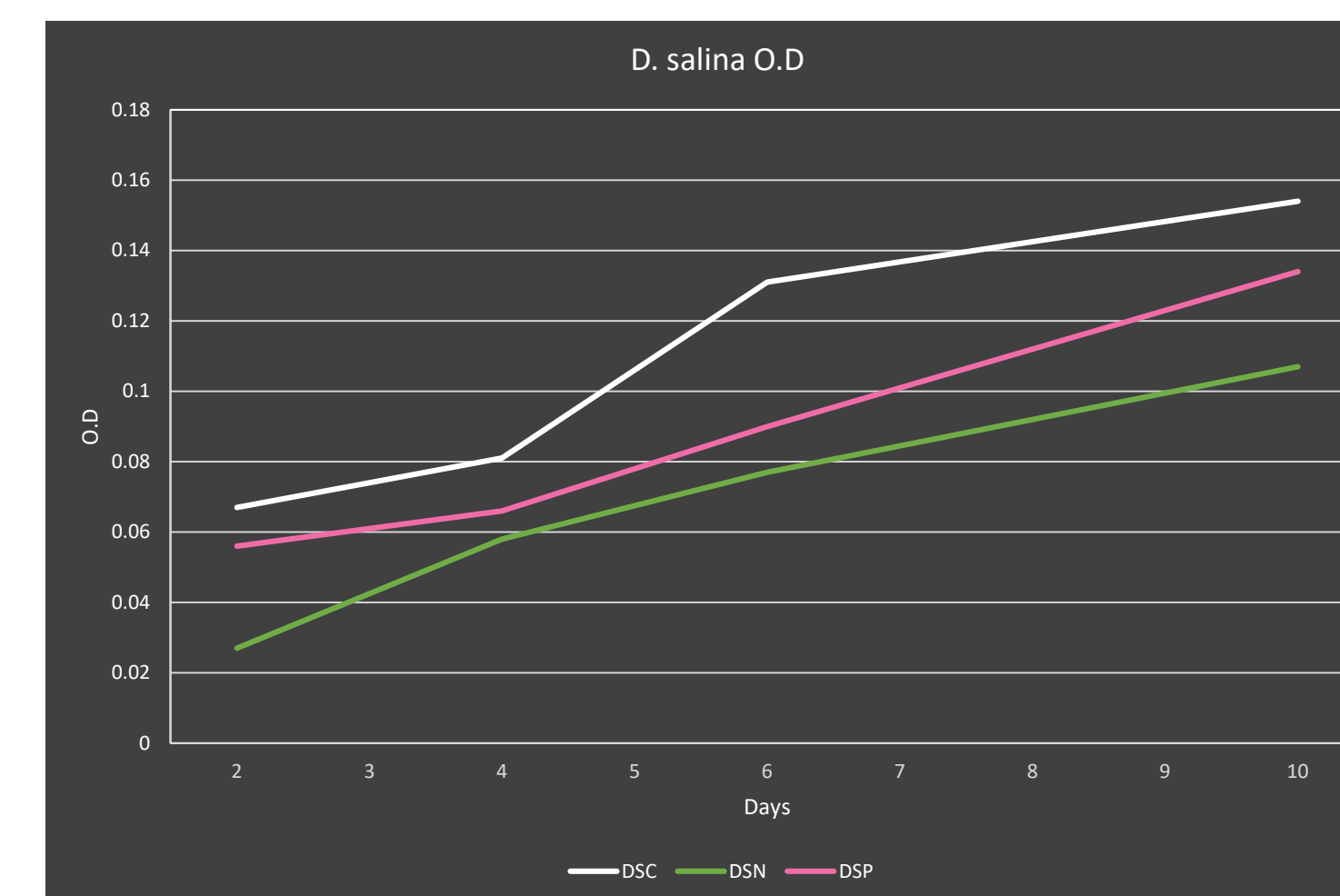
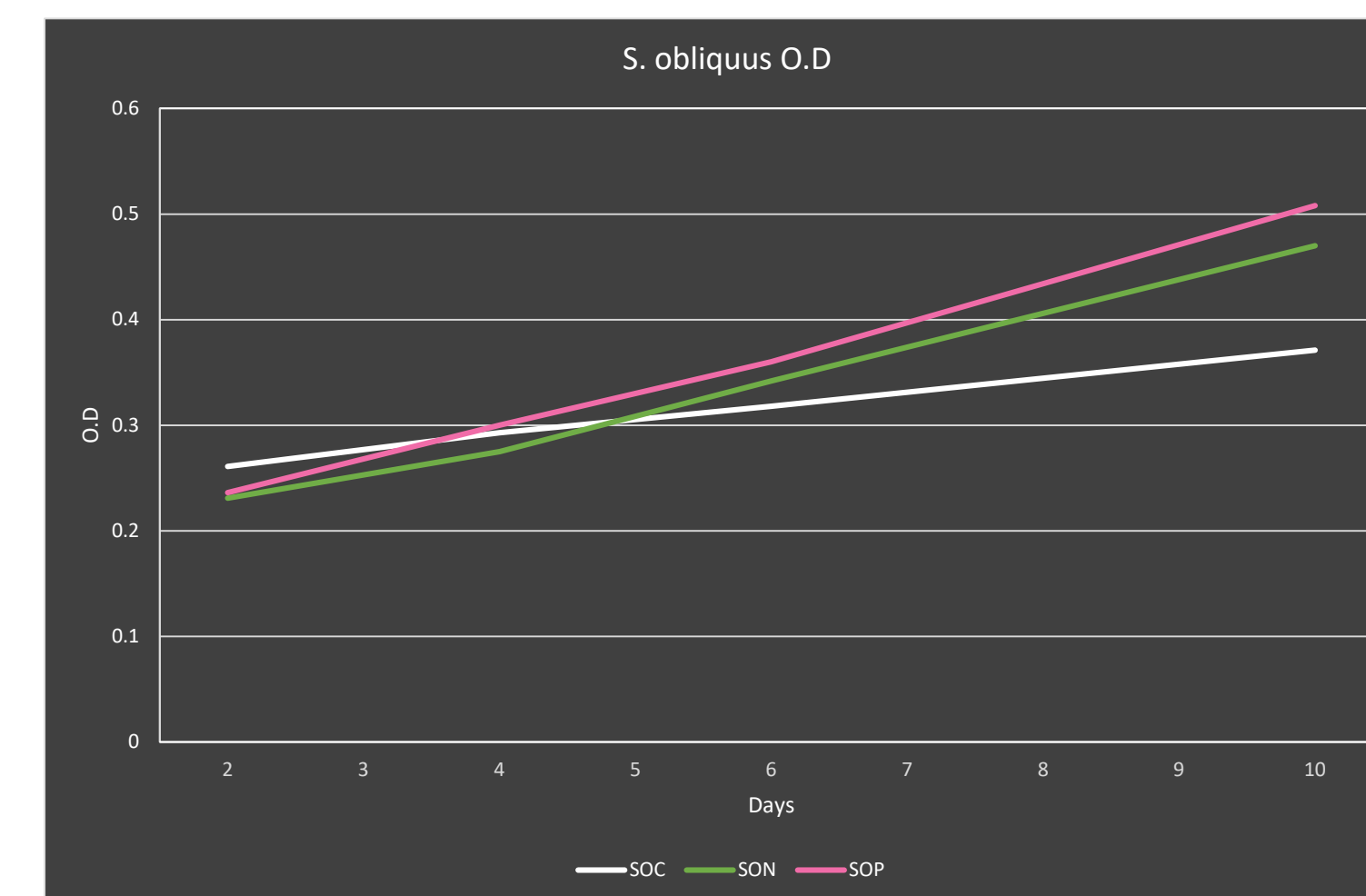
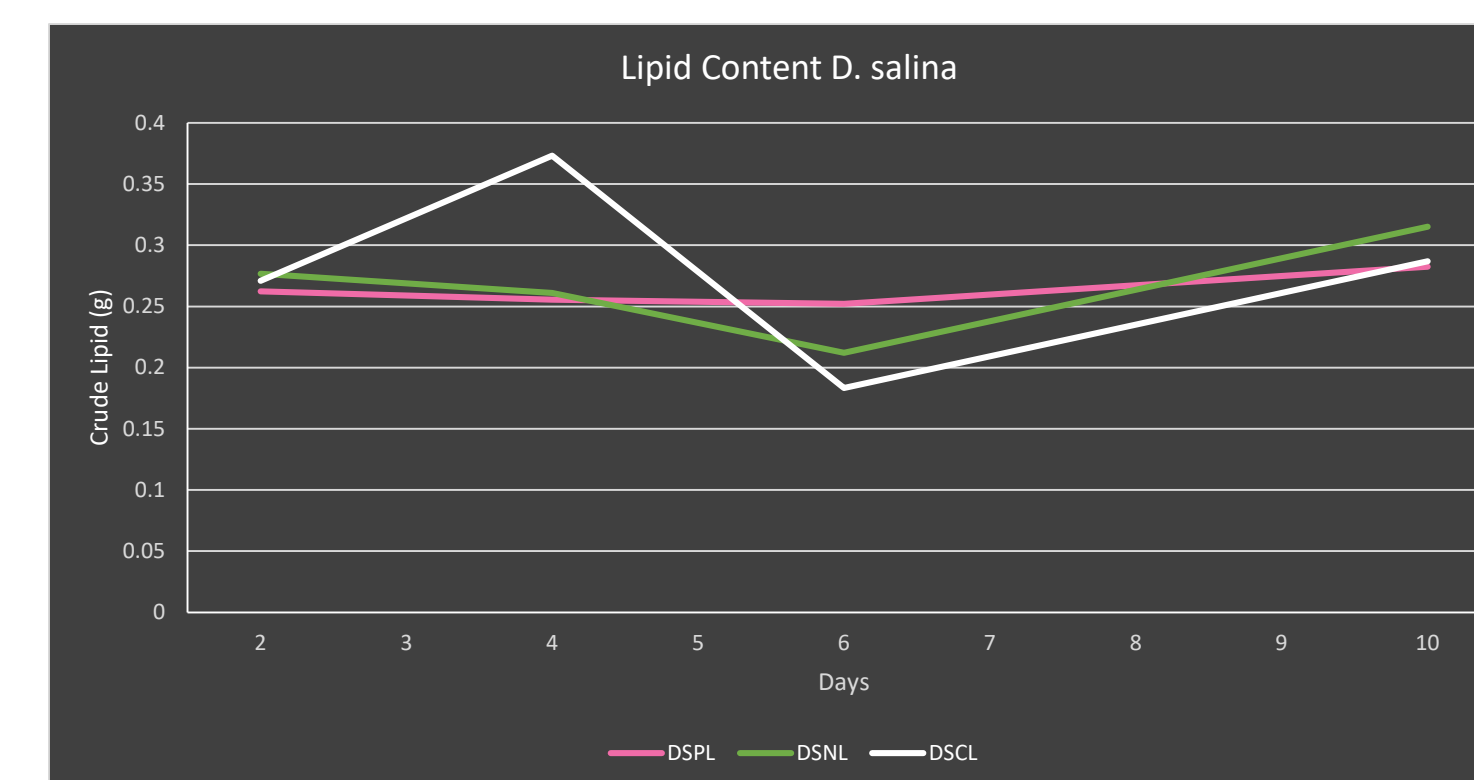
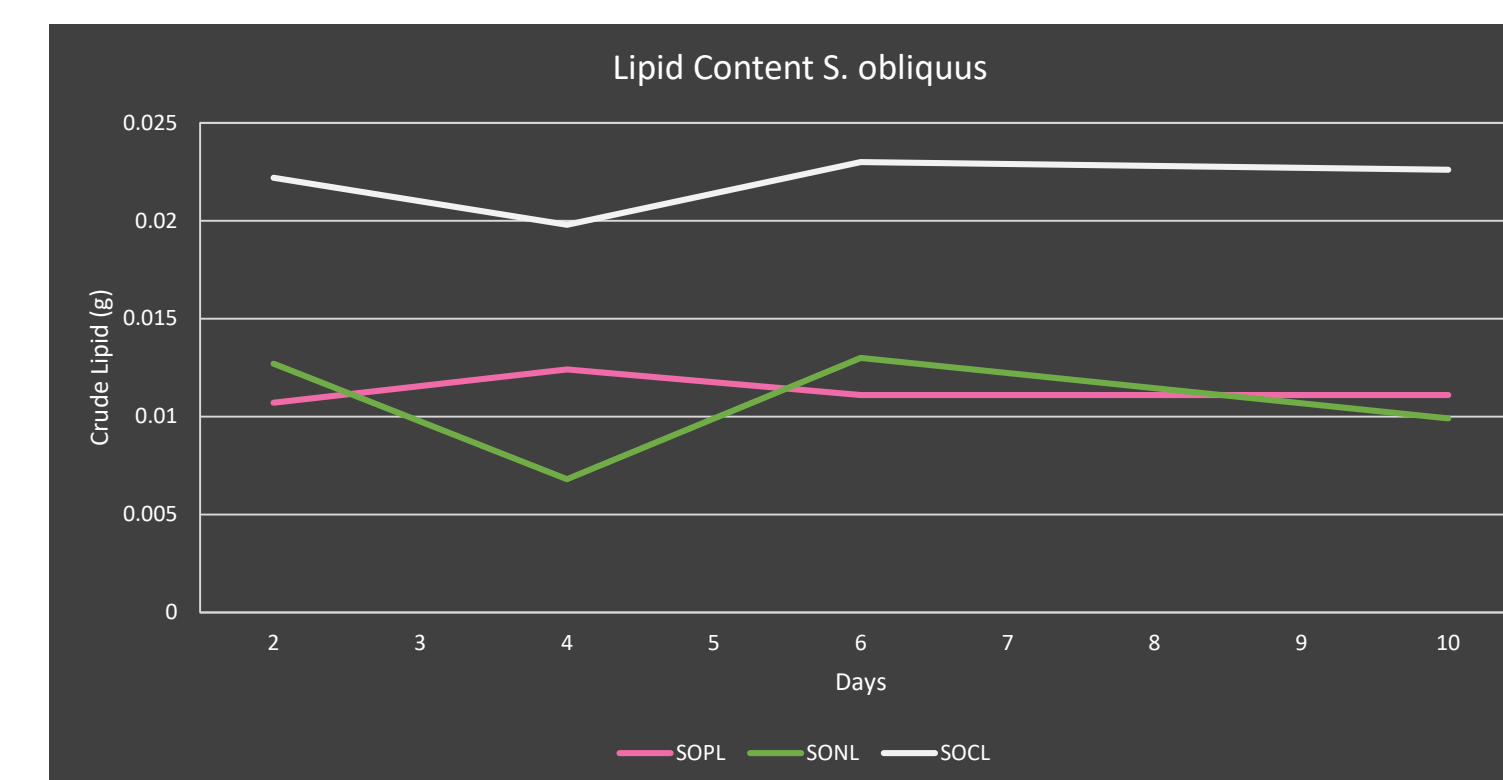
- Compounding rate studies predict depletion of oil reserves by 2044
- Biofuels are renewable and low blends are already compatible with current infrastructure
- Third generation biofuels minimize drawbacks
 - Less land use
 - Less threat to local food supply
- Lipid content acts as a feedstock for biodiesel
 - 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



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
 - DSCL, DSNL, and DSPL appeared to produce equivalent lipid
- Scenedesmus obliquus* O.D. readings grew faster under nutrient scarce conditions.
- Dunaliella salina* O.D. readings matched the literature expectation



DISCUSSION

- The majority of results obtained disagree with current literature
 - This was likely due to uncontrolled variables like temperature, and pH
 - It is highly likely that the use of a non-standard wet inoculation method caused some of the disagreements
- 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
 - Nutrient deplete conditions appeared to induce higher growth rates in the species
 - Despite higher growth rates for nutrient deplete conditions, the control condition outdid the experimental conditions in terms of crude lipid content
 - This may be due to the strain of *S. obliquus* utilized (UTEX 393)
- Both species exhibited strange behavior in relation to crude lipid production
 - Both species showed signs of growth
 - Both species did not show signs of increase in crude lipid/ mL despite growth
 - This suggests that, although the cultures were growing, the total mass of lipid in solution remained constant
 - It is possible that this is due to the introduction of microalgae into a container with a significant amount of room to expand
- Carbohydrate results are still pending
 - It is predicted that no significant results will be observed
 - The current method for harvesting carbohydrates is proving ineffective

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

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ACKNOWLEDGEMENTS

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