Evaluating Golden Alga *Prymnesium parvum* as a Potential Bio-diesel Feedstock

Bruce Culver[1], Gregory E. Welbaum[1], Zhiyou Wen[2]

[1]Department of Horticulture, 306 Saunders Hall, Virginia Tech, Blacksburg, VA 24061, welbaum@vt.edu

[2]Biological Systems Engineering, 200 Seitz Hall, Virginia Tech, Blacksburg, VA 24061, wenz@vt.edu

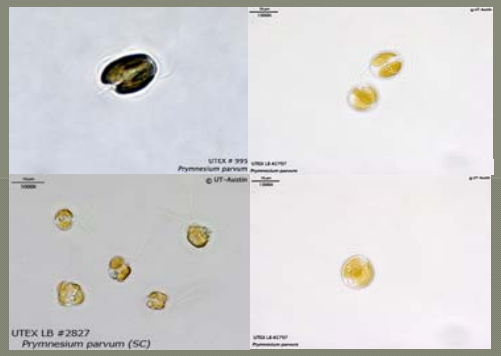
INTRODUCTION

Prymnesium parvum (Haptophyceae) is a golden alga found in both marine and brackish waters worldwide. The distribution of *P. parvum* ranges from the Baltic Sea to South Africa, from China to Australia and from Canada to Texas, making this an ideal species to investigate as a possible feedstock for biodiesel, mainly due to its natural adaptation in temperate regions (Edvardsen and Larsen 2003). This study examined growth and lipid content of three separate strains of *P. parvum* under controlled nutrient, light, temperature and salinity conditions, in an attempt to obtain the optimal condition for maximum biomass and hydrocarbon production.

MATERIALS AND METHODS

Three isolated strains of *Prymnesium parvum* (Phylum Haptophyta) obtained from the Culture Collection of Algae at the University of Texas in Austin (UTEX) were used in this project. The three strains represent areas with diverse climates, ranging salinities and temperatures. Strain LB 995 was isolated in the United Kingdom and is incubated at UTEX in a soil and sea water medium. Strain LB 2827 (SC) and LB 2797 (TX) are incubated at UTEX on Erdschreiber's Medium. All three strains were viewed under an Olympus BH-2 Brightfield Microscope for cell viability and recognition. The culturing method is a Modified Batch Culture Method which allows the ability to scale up to higher quantities for optimum biomass production. This method insures the continuation of the initial cultures after leaving the lag phase and into an exponential growth phase. After 8-days of exponential growth they can be divided into larger vessels and new inoculations can be derived from the exponential cultures.

RESULTS



Prymnesium parvum was cultured in artificial sea water with the salinity adjusted to 14 - 15 (psu) and a pH ranging from 7.8 - 8.5. The culture temperature was 25.7°C under florescent light with a 16:8 (L/D) cycle. The highest total fatty acid producing strain had a mean of 11.7 % ± 0.69 (DW). These percentages were below the 22-38% previously reported (Becker, 1994). The highest total algal biomass produced had a mean yield of 0.34mg ± 0.07 DW L^{-1}.

Biomass, cell densities and lipid analysis, Blacksburg Trial #2

Sample ID (rep)	Cell Counts at Harvest 10^6 cells/mL	TFA %	Mass (DW) grams mL^{-1}
Texas 2797 (1)	2.1	6.50	0.29
Texas 2797 (2)	3.1	10.12	0.54
SC 2827 (1)	2.2	7.13	0.37
SC 2827 (2)	3.1	7.79	0.41

CONCLUSIONS

Prymnesium parvum (Haptophyceae) is a not a good candidate for use as a bio-diesel feed stalk based on the results of this study. Strain Texas 2797 was most productive. The highest total fatty acid producing strain had a mean of 11.7 % ± 0.69 (DW). The highest total algal biomass produced had a mean yield of 0.34mg ± 0.07 DW L^{-1}. In comparison to other algal species used as feedstocks, *P. parvum* produced significantly less fatty acids and biomass. *Prymnesium parvum* also exhibited signs of self toxicity with frequent crash cycles. The self toxicity undoubtedly contributed to its inability to produce both lipids and dry biomass. Further studies for increasing fatty acid production in *P. parvum* may be more productive in a continuous bioreactor system with more controlled conditions to relieve self-toxicity and optimize nutrient concentrations.

REFERENCES

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