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Growing Algae for Biodiesel in the Desert

Microalgae is a potential source for renewable, carbon-neutral biodiesel that could reduce global warming. Microalgae produces more lipids per acre than other crops, and can be grown on non-arable, desert land. One challenge is understanding the effects of heat stress on algae lipid production.

This project investigated the robustness of cell population density, biomass, and lipid productivity of three algal species (Chlorella vulgaris, Nannochloropsis oculata, and Scenedesmus quadricauda) in desert temperatures.

The species were grown for 14 days in six sterilized 450 mL bottles (three controls, three tests) filled with growth media, exposed to a grow light, and bubbled with air. Control temperatures were maintained at approximately 21.1°C, while test temperatures gradually increased from 21.1°C to 40.6°C.

A microscope and Neubauer hemocytometer were used for daily cell counts. On Day 12 (35°C) and Day 14 (40.6°C) of heat stress, biomass was weighed using 1-micron filters and a jewelry scale, and lipids were measured using a spectrofluorophotometer.

The population density of all three species increased at 35°C and decreased at 40.6°C as compared to controls.

Under the heat growth condition of 35°C, C. vulgaris had the highest percentage population gain, S. quadricauda had the highest actual and percentage biomass increase, and N. oculata had the highest increase in lipid density.

Under the heat stress condition of 40.6°C, N. oculata had the least percentage population loss, and S. quadricauda had the highest biomass and least lipid loss. N. oculata and S. quadricauda are potentially good species for biodiesel production in desert conditions.