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Artificial Selection of Microalgae Using Heat Stress: Improving Algae Biodiesel

Microalgae is potentially the most productive biofuel stock per acre, and can be grown on non-arable land. This project investigated if heat stress can be used as a method of artificial selection of microalgae species N. oculata, C. sorokiniana, and S. armartus to optimize microalgae for desert biodiesel production. The microalgae were grown in a bioreactor, where light and nutrients are provided and standardized. Cultures were subjected to artificial selection using desert temperature stress for 1-2 months. Then the same number of cells from each artificial selection culture and controls were inoculated into 1-3 test samples each that were grown for two weeks under the same heat conditions.

Three aspects of the test samples were analyzed: lipid content, cell population, and dry biomass. Cell population was measured using hemocytometry. A sample of algae was filtered, dried and weighed to determine the biomass. Lipid content was determined by fluorometric analysis with a spectrofluorophotometer using three technical replications.

The results showed that artificial selection can produce more productive heat tolerant cultures for certain species, particularly C. sorokiniana.

All C. sorokiniana and S. armartus cultures had higher cells/mL than their controls. No N. oculata culture had higher cells/mL than their control.

One N. oculata culture had equal biomass to its control. No C. sorokiniana or S. armartus culture had higher biomass than their controls.

Two C. sorokiniana cultures had higher lipid readings than their control. No N. oculata or S. armartus culture had higher lipid content than their controls.