Studying Algal Lipid Production Under Nutrient Limitation to Develop a Dynamic Lipid Accumulation Model

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Economic production of algal biofuel requires maximum lipid productivity. Optimizing production is more complex than choosing the best algal strain, since Algal oil content varies with environmental stresses, a process not completely understood. A model that could effectively predict algal lipid accumulation would both enhance understanding of stress-induced lipid accumulation and allow biodiesel plants to culture algae under optimal conditions. This study seeks to run kinetic experiments studying the lipid content of algae under varying conditions, primarily nutrient limiting, and analyze these results in order to determine functional dependencies of lipid productivity. Using this information, it is hoped that oil production can be optimized and better understood. This study utilized qualitative lipid quantification technique using Nile Red, a fluorescent stain soluble in neutral lipids, to measure oil content. Batch cultures, from 200-500 mL, of the strain Chlorella vulgaris were run under different nutrient stresses and the oil contents measured. The data obtained demonstrated success of the Nile Red method and indicated that oil accumulation depends on type and degree of nutrient limitation rather than solely on growth rate. This completes the first part of the study. Coming experiments will take place in a continuous culture and allow for more accurate and useful data.

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