Analyzing Algal Lipid Content to Optimize Biofuel Production

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The concern related to a global energy crisis remains at the forefront of discussion because conventional sources of energy are finite and innovative methods for production of clean energy are sparse. Microalgae are organisms that convert sunlight into energy through photosynthesis and have been identified as a renewable, alternative source of fuel. The purpose of this experiment is to cultivate various genera of algae using a photobioreactor and through an analysis of lipid content, dissolved oxygen content, and water conversion, identify the genus that yields lipids most abundantly, thus representing the best potential source of biofuel. A photobioreactor was designed and constructed to provide the samples of algae with identical environmental conditions during the photosynthetic process. The dissolved oxygen content of each sample was measured daily to determine the carrying capacities and water volume was measured to determine photosynthetic activity. The lipids were extracted using the "Folch method," a 2:1 chloroform methanol (v/v) mixture, washed with sodium chloride and isolated via centrifugation. The resulting lipid content was measured and recorded. The results of the experiment indicated that the peak dissolved oxygen content (mg/L) ranged from 5.6 to 4.4. The water converted through photosynthesis varied from 9.5% to 52%. The lipid yield ranged from 1% to 31%. The genus of algae that proved to be the most efficient for biofuel production was Ankistrodesmus, a result which runs counter to the literature reflecting Chlorella as one of the most prolific and widely used specimens. To maximize the return on investment of an algae-based biofuel made on a commercial scale, it will be necessary to identify an algal specimen with the highest lipid content.

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