The Effect of the Type of Extraction Method on the Amount of Crude Algal Lipids Recovered for Economically Feasible Biofuel Production

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Algae biofuels have the potential to provide many benefits for the growing world; however, the cost of production is still not economically feasible. The purpose of the project was to determine a lipid extraction method of Chlorella vulgaris that is economically feasible for large-scale production. Different extraction methods were analyzed for economic feasibility, including total algal lipid yield, time, cost, and environmental impact. The cheapest method with the highest algal yield was a newly designed method of fungus-assisted algal extraction using electroporation. This method uses the enzymes from the fungal strain, Aspergillus niger, to break down the cell wall of the algae, and the method is statistically significant according to the ANOVA test. This method yielded an average lipid recovery of 20.83% of the total algal mass, whereas the current method commonly used can only extract 9.46% of cell's contents. The cost for this method is only $9.49 per gallon for the three steps described, reducing the original cost by 50%. The original cost for large-scale production of algae biofuels for the three described steps is $17.20 per gallon, estimated by the Department of Energy. This project contributes significantly to the research of algae biofuels and paves the way for more research to come. Possible future research topics include growing the algae with the fungus for wastewater treatment or combining the harvesting and extraction steps, potentially lowering the cost to under $4. These would improve the cost to an even greater extent, eventually making algae biofuels competitive with fossil fuels.

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