The Viability of Switchable Hydrophilicity Solvents for Lipid Extraction in Algal Biofuel Production

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Exploration of alternative fuel like algal biofuel is increasing since the increase in fossil fuel consumption and depletion. Algal biofuel production is a complicated process including cultivating, harvesting, and processing the algae. The Solvents method, current method to process lipids from algal biomass is lengthy, energy intensive, and harmful. The Switchable Hydrophilicity Solvents (SHS) Method is a possible replacement to this method. SHSs can change polarity from hydrophobic to hydrophilic when CO2 is added, extracting lipids from wet algae. In order to determine the viability of SHSs for algal biofuel production, a procedure was developed to test the lipid extraction of three SHSs. Percent yield and time taken for the SHSs and Solvents were analyzed to compare viability. In a MANOVA test, the SHS method showed a statistically significant difference from the Solvents method in both percent yield ($F=404.49$, $p<0.00001$) and processing time ($F=256.08$, $p<0.00001$). To continue viability analysis, toxicity was also compared. The Solvents method is less toxic but more volatile. Therefore, this study demonstrates that the SHS method shows promise as a potential replacement for the Solvents method for lipid extraction in algal biofuel production. Recommended future studies include industrial models and SHS extraction from different algal species.

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