Acid Catalyzed in situ Transesterification of Sargassum for Biodiesel Production

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Sargassum buildup along the coasts has raised environmental concerns and spurred research into its potential as a renewable energy source. This study examines how reaction time influences biodiesel production from Sargassum via acid-catalyzed in situ transesterification with ethanol. The hypothesis is that increasing the reaction time for transesterification would improve the percent yield of fatty acid ethyl esters (FAEE) extraction. This project helps identify optimal reaction times for extracting FAEEs from Sargassum to produce biodiesel as a renewable energy source. Dried sargassum biomass was reacted with ethanol, n-hexane, and sulfuric acid in a three-neck flask. The mixture was refluxed at 65°C with magnetic stirring. Reaction times of 60, 120, and 240 minutes were tested. The independent variable was reaction time (minutes), and the dependent variable was percentage yield of the crude ester-rich organic fraction, determined gravimetrically after solvent evaporation. Residues were removed by filtration, and the organic phase was separated prior to solvent distillation. Results showed that increasing the reaction time increased the crude ester-rich fraction recovered, with the mean percent yield rising from 1.94% at 60 min to 3.24% at 120 min and 6.24% at 240 min. To confirm the presence of FAEE, five samples of the extracted product were analyzed by gas chromatography-mass spectrometry. Results showed the presence of FAEE with a predominant abundance percentage of Ethyl palmitate (37.32%), Ethyl oleate (16.28%), and Ethyl palmitoleate (10.41%). These findings support that longer reaction times increase percent conversion and FAEE yield, with the highest production observed at 240 minutes.

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