From Waste to Fuel: Transforming Southern Louisiana Ditch Biomass into Biodiesel via NaOH-Catalyzed Transesterification

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Abstract

The growing demand for sustainable energy sources has intensified interest in converting locally available biomass into renewable fuels. In this study, biomass collected from drainage ditches in Lafayette, Southern Louisiana, was investigated as a potential feedstock for biodiesel production. The warm climate and nutrient-rich waterways of Southern Louisiana support significant accumulation of organic biomass, including microalgae and plant residues, making these systems an attractive and underutilized resource for renewable energy research.

The collected biomass was harvested, dried, and subjected to lipid extraction using organic solvent systems. The extracted oils were then converted into biodiesel through a base-catalyzed transesterification reaction using sodium hydroxide (NaOH) as the catalyst. Reaction parameters including catalyst concentration, temperature, and reaction time were optimized to improve biodiesel yield. The formation of fatty acid methyl esters (FAMEs) was confirmed using infrared spectroscopy, and product quality was evaluated using chromatographic analysis. Preliminary results demonstrate that biomass from Lafayette drainage systems can serve as an inexpensive and sustainable feedstock for biodiesel production. This approach highlights the potential of transforming locally available waste biomass in Southern Louisiana into valuable renewable energy while simultaneously contributing to environmental management and sustainable fuel development.

Keywords

Biomass, Biodiesel, Transesterification, Southern Louisiana Biomass, Renewable Energy, NaOH Catalysis.