ABSTRAK

PENGARUH KONSENTRASI KATALIS DAN WAKTU REAKSI TERHADAP BIODIESEL DARI MINYAK JELANTAH MENGGUNAKAN BIOKATALIS KEMIRI

Ria Resti Hanifatul Kholifah, 2026, 37 Halaman, 7 Tabel, 8 Gambar, 13 Lampiran

Minyak jelantah memiliki potensi besar sebagai bahan baku biodiesel, namun tingginya kadar asam lemak bebas (FFA) dan viskositas menjadi hambatan utama dalam proses konversi kimia konvensional. Penelitian ini bertujuan untuk mengkaji sintesis biodiesel melalui rute interesterifikasi menggunakan biokatalis alami dari biji kemiri (*Aleurites moluccanus*) yang mengandung enzim lipase terimobilisasi alami. Reaksi dijalankan menggunakan reaktan metil asetat pada suhu konstan 55°C guna menjaga stabilitas termal biokatalis. Variabel bebas yang diteliti meliputi konsentrasi biokatalis kemiri (5% dan 10% b/b minyak) serta waktu reaksi tinggal (20, 40, 60, 80, 100, dan 120 menit). Hasil penelitian menunjukkan bahwa peningkatan konsentrasi katalis dan waktu reaksi secara signifikan mempercepat kinetika pemutusan ikatan ester trigliserida. Kondisi optimum dicapai pada konsentrasi biokatalis 10% dan waktu reaksi 40 menit, menghasilkan rendemen *yield* produk sebesar 73,2%. Pada kondisi optimum ini, nilai FFA berhasil ditekan hingga mencapai titik terendah sebesar 0,0283%. Karakterisasi fisik produk menunjukkan viskositas kinematik sebesar 4,854 cSt, Angka Setana sebesar 62,4, dan Titik Nyala (*flash point*) sebesar 153°C, di mana ketiganya telah lolos uji kelayakan baku mutu standar nasional. Meskipun demikian, nilai densitas produk akhir tercatat sebesar 0,9042 g/cm^3, sedikit di atas ambang batas SNI akibat masih adanya fraksi produk samping triasetin yang terlarut.

Kata Kunci: biodiesel, minyak jelantah, biokatalis, kemiri, kadar FFA, densitas, viskositas, angka setana, titik nyala, SNI

ABSTRACT

THE EFFECT OF CATALYST CONCENTRATION AND REACTION TIME ON BIODIESEL PRODUCTION FROM WASTE COOKING OIL USING CANDLENUT BIOCATALYST

Ria Resti Hanifatul Kholifah, 2026, 37 Pages, 7 Tables, 8 Figures, 13 Attachments

Waste cooking oil (WCO) holds significant potential as a feedstock for biodiesel production; however, its high free fatty acid (FFA) content and elevated viscosity pose major challenges in conventional chemical conversion. This study aims to investigate biodiesel synthesis via the interesterification route utilizing a natural biocatalyst derived from candlenut seeds (Aleurites moluccanus), which naturally contain immobilized lipase enzymes. The reaction was conducted using methyl acetate as the reactant at a constant temperature of 55°C to preserve the thermal stability of the biocatalyst. The independent variables investigated were candlenut biocatalyst concentrations (5% and 10% w/w of oil) and reaction residence times (20, 40, 60, 80, 100, and 120 minutes). The results indicated that increasing both catalyst concentration and reaction time significantly enhanced the kinetics of triglyceride ester bond cleavage. The optimum condition was achieved at a 10% biocatalyst concentration and a 40-minute reaction time, yielding a product conversion of 73.2%. Under this optimum state, the FFA content was successfully reduced to its lowest point of 0.0283%. Physical characterization of the product revealed a kinematic viscosity of 4.854 cSt, a Cetane Number of 62.4, and a Flash Point of 153°C, all of which successfully passed the national quality standards. Nonetheless, the final product density was recorded at 0.9042 g/cm³, slightly exceeding the SNI threshold due to the presence of dissolved triacetin by-product fractions.

Keywords: *biodiesel, waste cooking oil, biocatalyst, candlenut, kadar FFA, densitity, viscosity, cetane number, flash point, SNI*