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Enzymatic Transesterification Using Different Immobilized Lipases and its Biodiesel Effect on Gas Emission
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Abstract
Biodiesel, a third-generation biofuel, offers several advantages over regular diesel fuel. Waste cooking oil (WCO) emerges as an ideal feedstock due to its availability and easy accessibility. In this work, biodiesel was produced from two different types of immobilized lipases: Rhizomucor miehei lipase (RMIM) and Candida antarctica lipase B (CALB). The objective of this study was to evaluate the impact of the molar ratio of WCO to methyl acetate, toward biodiesel yield and triacetin formation, from transesterification reaction when using two different immobilized lipases namely, Rhizomucor miehei lipase (RMIM) and Candida antarctica lipase B (CALB) as catalyst, as well as to assess its resulting biodiesel in a diesel engine. The enzymatic transesterification reaction was carried out with ultrasonic assistance, and the results showed that the greatest yield of 81.20% was achieved at 45 ℃ using CALB as a biocatalyst, with a lipase concentration of 1.8% (w/v) and an oil to methyl acetate molar ratio of 1:12 within 3 h. Triacetin, a by-product was determined their concentration for each molar ratio and analyzed using FTIR range of 500 cm−1 to 4000 cm−1, revealing a significant absorption peak at 1238.90 cm−1. Biodiesel was then blended with commercial diesel fuel in varying quantities of 7, 10, and 20% by volume (B20). The results were compared to Industrial Diesel Fuel 7% (B7) and Commercial Diesel Fuel 10% (B10). NOx and CO2 emission drops as the percentage of diesel/biodiesel blends increases, supporting WCO as a cost-effective biodiesel feedstock with low petrol pollution.

Author Keywords
Biodiesel; Biodiesel Blends; Lipases; Transesterification; Waste Cooking Oil

Index Keywords
Candida, Cost effectiveness, Diesel engines, Diesel fuels, Feedstocks, Gasoline, Isomers, Molar ratio, Transesterification, Yeast; Bio-diesel blends, Candida antarctica lipase B, Enzymatic transesterification, Immobilized lipase, Methyl acetates, Molar ratio, Rhizomucor miehei lipase, Transesterifications, Triacetin, Waste cooking oil; Biodiesel

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