

Green Synthesis of Fatty Alkyl esters (Biolubricants) of Castor Oil by Enzymatic Esterification †

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Abstract: Environmentally benign and easily biodegradable lubricants based on vegetable oil have grown in interest in recent years. When compared to alternative synthetic fluids, using environmentally acceptable vegetable oil-based products as lubricants has numerous advantages. They are non-toxic, biodegradable, sourced from renewable resources, and have a reasonable cost. Transesterification of castor oil was carried in a conventional enzymatic method using *Thermomyces lanuginosus* lipase (TLIM) and *Rhizomucor miehei* lipase ((Lipozyme RMIM) in different alcohols. The reaction was carried out at an oil alcohol molar ratio of 1:3 with 15% enzyme loading at 50 °C and 200 rpm for 24 hrs. The enzymatic reaction was also carried out in Liq CO₂ medium using 15% TLIM with a pressure of 75 bar at temperature 50 °C for 4hrs. Physico-chemical characterization of fatty alkyl esters was done according to ASTM methods. It was found that for C1-C5 alcohols the yield of fatty alkyl esters is higher using RMIM in conventional enzymatic methods. The yield of fatty alkyl esters in Liq CO₂ medium in 4hrs is comparable to a conventional method. Lubricity study of alkyl esters suggests that higher alkyl esters (C4-C8 alcohols) have better lubricity than lower alkyl esters (C1-C3). Alkyl esters' physicochemical qualities imply that they could be employed as a bio additive (bio lubricant) in diesel fuels.

Keywords: Castor oil; Transesterification; RMIM; TLIM; fatty alkyl esters; biolubricant.

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Conflicts of Interest

The authors declare no conflict of interest.