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Statistical approach to the optimization of biodiesel production from *Jatropha curcas* oil

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Jatropha curcas oil (JCO) is a plant-based non-edible feed stock that can be modified in order to enhance its use as biodiesel. In this work, optimization of biodiesel production from Jatropha curcas oil was investigated. Biodiesel was produced via a bath catalyzed transesterification reaction of the oil with methanol. This process was optimized by the application of two-level-four factor (2^4) Factorial design and response surface methodology (RSM) requiring 16 experiments. A linear model of the form y=84.86+4.98x1 – 3.50x2 – 2.50x3+3.10x4+5.13x1x2 – 0.71x1x4+3.02x2x3+0.13x2x4 – 2.31x1x2x4 was obtained to predict the yield of biodiesel (y) as a function of reaction time (x1), Natt catalyst concentration (x2), methanol to oil ratio (x3) and temperature (x4). A modified statistical model comprising of all significant factors obtained by multiple regression predicted that the highest yield of the JCO based biodiesel was 94.03% at the following optimization rules x1=2.50 hrs, x2=1.1; x3=3.1 and x4=70°C. Also, there was significant interaction between x1x2, x2x3 and x2x4. Gas chromatographic analysis of the JCO biodiesel identified myristate and palmitoleate as the major fatty and ethyl esters. The model has been found to describe the experimental range studied adequately.

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