VARIABLES AFFECTING THE PRODUCTION OF BIODIESEL FROM RICE BRAN WITH IN-SITU TWO STEP METHOD

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Abstract

Biodiesel is one of alternative energy that can renewable and environmentally friendly. Utilization of rice bran as raw material and utilization of byproducts of biodiesel will reduce production costs. In this study, two-stage in-situ process is used for the production of biodiesel from rice bran. This is because the two-stage process in-situ to produce biodiesel with high yield (> 95%) and lower production costs due to the extraction and reaction processes take place simultaneously.

This research aims to study the variables affecting the production of biodiesel from rice bran and matters affecting the loss of carbohydrates in rice bran on the production of biodiesel by using two-stage process in-situ.

In this study, the variables used, among others, the volume of methanol 50; 150; 300 mL, reaction time 5, 15, 30, 60 minutes, the amount of acid catalyst (H$_2$SO$_4$) 0.5; 1; 1.5 mL, and the amount of base catalyst (NaOH) 6 ; 8; 10 mL. The method used is a process of in-situ two stages, with the first stage is esterification process with aimed at reducing FFA to <5% prior to the second stage. In esterification, rice bran (10gr) was reacted with methanol and acid catalyst (H$_2$SO$_4$). Reaction takes place at temperature of 60 ° C with a magnetic stirrer. Esterification reaction products of the process is then transesterified to produce biodiesel. This transesterification reaction using alkaline catalyst (NaOH 5N in methanol), at a temperature of 60° C with a a magnetic stirrer.
The results showed that the optimum conditions for esterification is at variable acid catalyst (H$_2$SO$_4$) 1 mL, methanol volume 150 mL, acid reaction time of 15 minutes, at a yield of FAME amounted to 76.02%, FFA contents 3.09%, and % starch loss of 23.22%. Whereas optimum conditions for in-situ two stage is at variable base catalyst (NaOH) 8 mL, acid catalyst (H$_2$SO$_4$) 1mL, methanol volume 150 mL, acid reaction time of 15 minutes, base reaction time of 15 minutes, at a yield of FAME amounted to 94.20%, FFA contents 0.00%, and % starch loss of 16.29%.

Keywords: biodiesel, rice bran, carbohydrates (starch), in-situ two stage