PRODUCTION OF BIODIESEL BY USING GLIRICIDIA(*Gliricidia sepium*) BIOCHAR AS A CATALYST

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ABSTRACT

The utilization of energy sources other than those derived from crude oil has currently increased. This is due to the depletion of fossil fuel supplies, rising crude oil prices, and environmental concerns. Due to their similar fuel qualities and cleaner emissions, alternative fuels like biofuels are becoming more significant as diesel replacements. Biodiesel may be blended with petroleum diesel at any concentration for use in a normal diesel engine. In this study, biodiesel was produced by transesterification with palm oil and methanol. The catalytic activity of gliricidia-biochar was studied and compared with standard catalysts. Compared to sodium hydroxide (NaOH) and potassium hydroxide (KOH), which are commonly used as catalysts, Gliricidia biochar is cheap and easily available. To increase the catalytic activity, biochar was chemically modified with acid (H_2SO_4, HNO_3) and base(KOH) treatments. To check how the standard catalyst affects the biodiesel efficiency, a biodiesel sample was made by adding sodium hydroxide (NaOH), and the properties of all produced biodiesel samples were compared. All Biodiesel samples were produced after the esterification of free fatty acids using the prepared catalysts, palm oil, and methanol at a reaction temperature of 65°C for one hour. The oil-to-methanol ratio was taken as 1:1. The density, viscosity, flash point, fire point, acid value, and yield of the produced biodiesel were examined and tested by the biodiesel IS standard. The parameters of the biodiesel sample produced using unmodified biochar was similar to the biodiesel IS standard values (Density: 892.6kg/m^3, Viscosity: 16cp, flash point: 175°C, fire point: 195°C, Acid value: 0.25mg KOH/g and yield 84%). A maximum yield of 84% biodiesel could be obtained by applying unmodified biochar. The prepared biochar samples were characterized using

Fourier transform infrared (FTIR) analysis and scanning electron microscopy (SEM). The surface functional groups of biochar were identified by FTIR analysis. And the surface structures of biochar were identified by scanning electron microscopy. The findings suggested that an unmodified gliricidia biochar-based catalyst was a very promising choice for biodiesel production.

Keywords: Biodiesel, *Gliricidia biochar(GB)*, *Transesterification*, Biodiesel IS standard, Sulfuric acid(H_2SO_4), Potassium hydroxide(KOH), Nitric acid(HNO_3), Fourier transformed infrared analysis(FTIR).

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