

## Comparative Analysis of Various Waste Oils for Biodiesel Production

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**Abstract :** Biodiesel from waste sources is regarded as an economical and most viable fuel alternative to depleting fossil fuels. In this work, biodiesel was produced from three different sources of waste cooking oil; from cafeterias, which is vegetable-based using the transesterification method. The free fatty acids (% FFA) of the feedstocks were conducted successfully through the titration method. The results for sources 1, 2, and 3 were 0.86 %, 0.54 % and 0.20 %, respectively. The three variables considered in this process were temperature, reaction time, and catalyst concentration within the following range: 50 oC - 70 oC, 30 min - 90 min, and 0.5 % - 1.5 % catalyst. Produced biodiesel was characterized using ASTM standard methods for biodiesel property testing to determine the fuel properties, including kinematic viscosity, specific gravity, flash point, pour point, cloud point, and acid number. The results obtained indicate that the biodiesel yield from source 3 was greater than the other sources. All produced biodiesel fuel properties are within the standard biodiesel fuel specifications ASTM D6751. The optimum yield of biodiesel was obtained at 98.76%, 96.4%, and 94.53% from source 3, source 2, and source 1, respectively at optimum operating variables of 65 oC temperature, 90 minutes reaction time, and 0.5 wt% potassium hydroxide.

**Keywords :** waste cooking oil, biodiesel, free fatty acid content, potassium hydroxide catalyst, optimization analysis

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