



SYNTHESIS OF BIODIESEL FROM TROPICAL ALMOND (*TERMINALIA CATAPPA*) SEED OIL

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ABSTRACT

The objective of this study is extraction and characterization of oil from tropical almond seed, trans-esterification and characterization of tropical almond seed oil biodiesel. All experiments were replicated and average results were evaluated. The moisture content of the seed was 2.04 %; the oil was extracted using solvent method and the percentage of oil yield was 50.33 %. The physicochemical properties of the oil obtained during the experiment were; density (0.90 g/cm³), specific gravity (0.89), kinematic viscosity at 40 °C (14.1 mPa.s), cloud point (16.0 °C), pour point (11.5 °C), smoke point (173.0 °C), flash point (208.0 °C), fire point (271.0 °C), saponification value (199.19 mgKOH/g), acid value (3.37mgKOH/g), FFA (1.68 mgKOH/g), Peroxide value (5.0 meq/kg), and Iodine value (98.0 gI₂/100g). The oil was trans-esterified to biodiesel using oil to alcohol ratio of 4:1 and KOH as catalyst. The percentage of biodiesel yield was 75.0 % averagely. The physicochemical properties of the biodiesel obtained during the experiment were; density (0.96g/cm³), specific gravity (0.90), kinematic viscosity at 40 °C (5.20 mPa.s), kinematic viscosity at 100 °C (4.30 mPa.s) cloud point (7.0 °C), pour point (6.0 °C), smoke point (161.0 °C), flash point (186.0 °C), fire point (216.0 °C), saponification value (182.4 mgKOH/g), acid value (0.84 mgKOH/g), FFA (0.42 mgKOH/g), Peroxide value (8.0 meq/kg), and Iodine value (109.0 gI₂/100g, the calculated cetane number was 51.70. The result obtained for the physicochemical properties of the biodiesel were compared with the ASTM standard and it was concluded that tropical almond seed oil is a good feedstock for biodiesel production since the result is within ASTM specification standard.

Keywords: Almond seed, Biodiesel, Physicochemical properties, Cetane number, Pour point, Oil yield, Iodine value, ASTM specification standard.

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Contribution/ Originality

This study is one of very few studies which have investigated new sources or avenue of novel underutilized sources. Biodiesel production from tropical almond seed oil will be a reasonable alternative to petroleum diesel since the available petroleum based fuels are exhaustive. Biodiesel will be of great advantage as this will reduce the adverse effect caused by the petroleum diesel, which include global warming, air pollution and emission of sulphuric compound. This study will also ensure there is good utilization of tropical almond seed.

1. INTRODUCTION

Tropical Almond (*Terminalia catappa*) is a tropical tree of the *Combretaceae* family that grows mainly in the tropical region of Asia, Africa and Australia. The tree grows up to a height of 20 – 45m and it is tolerant of salt, drought and wind. It produces fruits with a thin flesh surrounding a large fibrous nut which encloses the seed. The