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EXPERIMENTAL STUDIES ON FUEL PROPERTIES OF DIFFERENT BIODIESELS AND THEIR BLENDS WITH 2-PROPANONE

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ABSTRACT

Biodiesels of different oils including mustard oil, sesame oil and cottonseed oil has been prepared. The fuel properties like acid value, density of diesel, different biodiesels and their blends with 2-Propanone were determined. From the present research work it's found that acid value and density of biodiesels blends with acetone decreases linearly with increasing proportion of acetone while acid value and density of some pure biodiesel and their blends with acetone are found very close to diesel fuel value. Hence from above results it has been conclude that, fuel properties like acid value, density of biodiesels minimized by blending with renewable fuel such as 2-Propanone.

KEYWORDS: **Biodiesel, acid value, density, fuel, energy**

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1. INTRODUCTION

Due to increasing industrialization the use of petroleum based fuel such as petrol, diesel, kerosene increases day by day which increases environmental pollution. Hydrocarbon based fuel called as nonrenewable fuel emits more hydrocarbon emission, oxide of nitrogen, oxide of sulphur and carbon monoxide as compare to renewable fuel such as biofuel. Various renewable fuels are considered to substitute for hydrocarbon based fuel. Renewable fuel reduces environmental pollution and decreases the use of petroleum based fuel. Hence many worldwide scientist and researcher have focused on the development of bio based fuel for the use of alternative fuel in diesel engine. ABMS Hossain and A.L. Alsaif[1] studied production of biodiesel from waste cooking soybean oil. This research shown that biodiesel obtained from waste cooking oil was good quality and could be use as diesel fuel. Aldo okullo et al[2] investigated physical and chemical properties of biodiesel obtained from castor oil and jatropha oil from this research work its proved that the oil containing free fatty acid produced low quality of biodiesel while oil containing low amount of free fatty acid produced high quality of biodiesel. Babagana gutti et al.[2] studied characterization of Balanite Aegyptiaca seed oil and its potential as biodiesel feedstock in Nigeria. This study revealed that Balanite Aegyptiaca seed oil exhibit good quality and shows physical and chemical characteristics according to biodiesel standards ASTM 6751. G.S. Chethana et al.[4] explain conservative production of biodiesel from waste vegetable oil. From the given study it's proved that free fatty content of waste vegetable oil is less than pure vegetable oil hence waste vegetable oil is good choice for production of biodiesel. Correlation between physical properties of biodiesel and engine fuel system design requirement was investigated by G. Lakshmi Narayan rao et al.[5] the objective of this study is to investigate the mathematical correlation between viscosities, flash point, density, heating values among the various biodiesels samples. Synthesis of ethyl ester from some common oil by using catalyst produced by Galadima A. and Gabra Z.N.[6] from the results obtained its proved that free fatty acid in melon seed oil and shae butter oil is according to international biodiesel standard but neem seed oil content more percentage of free fatty acid which creates engine failure. Biodiesel obtained from olive and cashew nut oil was studied by Linus N. Okoro et al.[7] from this research work it's found that these biodiesels use as alternative fuel in diesel engine. Engine performance of biodiesel prepared from soybean soapstock was studied by Michall J. Haas et al.[8] from the result obtained its proved that methyl ester of soy soap stock reduces engine emission as compare to diesel fuel. The physicochemical properties of jatropha oil biodiesel were investigated by [9, 10]. Evaluation of predictive model for the viscosity of biodiesel was investigated by Samuel V.D. Frecitas et al.[11] the main objective of this research work is to obtain correlation between viscosities of different biodiesels. Experimental investigation on the fuel properties of and its blends at various temperature investigated by Seung Hyun Yoon et al.[12] from this study its revealed that fuel properties of different biodiesels can be enhance by blending with diesel fuel. From the above research work it's observed that fuel properties like acid value, density of different biodiesels are much higher than diesel fuel. Higher acid value increases concentration of free fatty acid in diesel engine causes corrosion hazards, gum and sludge formation in diesel engine and high density of biodiesel disturb flow of biodiesel in diesel engine. These undesirable properties of different biodiesels can be reduced by decreasing acid value as well as density of different biodiesels. Hence the main objectives of present research work is to carry out studies on fuel properties of biodiesel blends with 2-Propanone in different proportion to check out such an innovative blends which shows minimum acid value and density.

2. MATERIALS AND METHODS

2.1 Experimental Material

Biodiesel Preparation

In present research work biodiesel is prepared by tranesterification process. In this method a known quantity of vegetable oil was taken in round bottom flask. Heat was supplied by heating mantle. A known amount of potassium hydroxide (KOH) in ethanol was added to oil and stirred continuously. Reaction continues up to 2 hours to ensure esterification at above 50^0c temperature. The excess of ethanol from biodiesel was distilled out. After the completion of ethyl ester formation a known amount of mixture of sulphuric acid and ethanol added in ethyl ester for neutralizing sodium hydroxide in ethyl ester. Then ethyl ester washed with distilled water to remove any incomplete reaction products.Jean Baptiste Nduwayezu *et al*.: Biodiesel Production from Unrefined Palm Oil on Pilot Plant Scale

2.2 Preparation of biodiesel blends

In the measurement of fuel properties test biodiesels used in this work were mustard oil biodiesel, sesame oil biodiesel, cottonseed oil biodiesel and their blends with 2-Propanone in different proportion. During blending process biodiesel blends with 2-Propanone stirred continuously to ensure uniform mixing.

2.3 Acid value measurement

Acid value of neat biodiesels, biodiesel blends with 2-Propanone and diesel was measured by ASTM method (ASTM – D 974(00).

2.4 Density measurement

The densities of neat biodiesels, biodiesel blends with 2-Propanone and diesel were determined by ASTM method (D – 1298 – (99).

3. RESULTS AND DISCUSSION

Table 1
Shows acid value, density of different biodiesel

Test fuels	Acid value (mg/liter)	Density(30°C) (g/cm^3)
Sesame oil biodiesel	1.01	0.858
Mustard oil biodiesel	0.81	0.849
Cottonseed oil biodiesel	3.50	0.860
ASTM D6751	0.5(Maximum)	0.812

Table 2
Shows acid value, density of different biodiesel blends with 2-Propanone

Sesame oil biodiesel + 2-Propanone		
Mixture ratio	**Acid value**	**Density**
95 + 5	0.85	0.849
85 + 15	0.69	0.815
75 + 25	0.53	0.807
65 + 35	0.38	0.805

Table 3
Shows acid value, density of different biodiesel blends with 2-Propanone

Cottonseed oil biodiesel + 2-Propanone		
Mixture ratio	**Acid value**	**Density**
95 + 5	2.98	0.839
85 + 15	1.56	0.824
75 + 25	1.27	0.815
65 + 35	1.20	0.807

Table 4
Shows acid value, density of different biodiesel blends with 2-Propanone

Mustard oil biodiesel + 2-Propanone		
Mixture ratio	**Acid value**	**Density**
95 + 5	0.68	0.845
85 + 15	0.56	0.827
75 + 25	0.52	0.822
65 + 35	0.47	0.785

3.1 Acid Value

Acid value denotes the concentration of free fatty acid in given oil sample. From table 1 it's found that acid values of different biodiesels are higher than diesel fuel. This is due to presence of excess quantity of free fatty acid in biodiesels. From table 2 it's observed that acid value of given biodiesels decreases linearly with increasing blending ratios of 2-Propanone. This is due to decreasing amount of free fatty acid in different biodiesels with increasing blending ratio of 2-propanone.

3.2 Density

From table 1 it's found that, densities of different biodiesels are higher than diesel fuel. From table 2 it's observed that density of different biodiesels decreases linearly with increasing blending ratios of 2-Propanone. This is due to decreasing number of fatty acid methyl ester in biodiesels.

4. CONCLUSION

In order to study the effect of blending of biodiesel with 2-Propanone the fuel properties such as acid value and density were measured. On the basis of results obtained the following conclusion are obtained

1. The acid value of different biodiesels is higher than diesel fuel but it's minimized by addition of 2-Propanone in biodiesel.
2. The density of different biodiesels is higher than diesel fuel but it's minimized by addition of 2-Propanone in biodiesel.
3. Biodiesel blends in 2-Propanone directly use as alternative fuel in diesel engine
4. 2-Propanone blending with biodiesels improves the flow properties of biodiesel in diesel engines.

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