Available online at www.derpharmachemica.com

ISSN 0975-413X
CODEN (USA): PCHHAX

Der Pharma Chemica, 2016, 8(3):34-37
(http://derpharmachemica.com/archive.html)

Study of the viscosity and the density of Rapeseed and Lio oils before and after heating treatment

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ABSTRACT

In our study, we report measurements of viscosity and density of vegetable oils (Rapeseed and Lio) depending on the temperature before and a fter heating. These measurements were made between 20°C and 80°C, and show that when the temperature increases, the decrease of the viscosity and the density of the Rapeseedoil is very remarkable compared to the Lio oil. This reduction in viscosity and density of Rapeseed oil allowed us to consider that it can be used as biofuel instead of mineral oils when the temperature is reached until 140° C.

Key words: viscosity, Lio oil, Rapeseed oil, mineral oil.

INTRODUCTION

Vegetable oils are liquid aromatic organic substances found naturally in various parts of trees, plants, spices, etc. They are highly concentrated, volatile, non-oily and susceptible to the decomposition under the heat effect. So vegetable oil is a product obtained from the transformation of organic plant, for example Rapeseed oil. They are highly used in pharmacy, cosmetics etc ... Therefore, several studies have been conducted to study the quality of the oil on the basis of their physical properties: viscosity, density, refractive index, electrical resistivity etc. Pace and al [1] suggested that the electrical properties can be used as indicators of the status and quality of vegetable oils. Several researchers have worked on the chemical and physical properties of vegetable oils [2,3, 4, 5]. Vegetable oils are generally very low toxic substances and have excellent biodegradability; these oils can also be used as alternatives to mineral oils.

MATERIALS AND METHODS

Vegetable oils have very low toxicity and excellent biodegradability. These qualities are due to the low resistance of oxidation and hydrolysis. These two characteristics have eco-friendly toxicological profile. Rapeseed and lio oils has been bought from the market.

2.1 Density change

Density volumetric or mass provide information about the establishment, the gold oxidation state polymerization. The hydrometers are cylindrical tubes of glass, hollow, graduated, weighted with lead shot, and immersed in liquids.

They are penetrated more or less deeply vertically, depending on the forces (downward due to its weight, and upward, due to buoyancy) opposed. The weight of the displaced fluid is equivalent to the volume of the displaced liquid (submerged volume of the hydrometer) that multiple density of the liquid.

The submerged volume of the hydrometer change inversely to the density of the liquid. This means that the lower is the density, the more the hydrometer wills ink in the liquid sample.

Figure 1: standard glass hydrometer weighted with lead

2.2 Viscosity variation

Kinematic viscosity is a measure of the resistive flow of a fluid under the effect of gravity. It is frequently measured using a device called expired a capillary viscometer - Basically a graduated can be with a narrow tube at the bottom. When two fluids of equal volume are placed in identiques capillary viscometers and allowed to flow under the effect of gravity, a viscous fluid takes along than a less viscous fluid to flow through the tube. The results for viscosity measurements (mm² / s) of oil and biodiesel as a function of temperature plotted Were (6).

Viscosity measurement using Ostwald's Viscometer

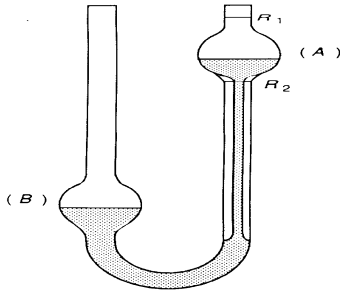

Figure 2: Ostwald viscometer

2.3 Methods:

• Viscosity measurement of rapeseed oil:

Volume flow measurement of fluid through a capillary tube. The viscosity is proportional to the flow time:

$$\nu = K \cdot \Delta t$$

The viscometer constant K is given by the company instrument

RESULTS AND DISCUSSION

We have studied the variation of the viscosity and density based on the temperature of vegetable oils: colza and Lio before and after heating. The results are shown in fig3 and fig4.

3.1 Density

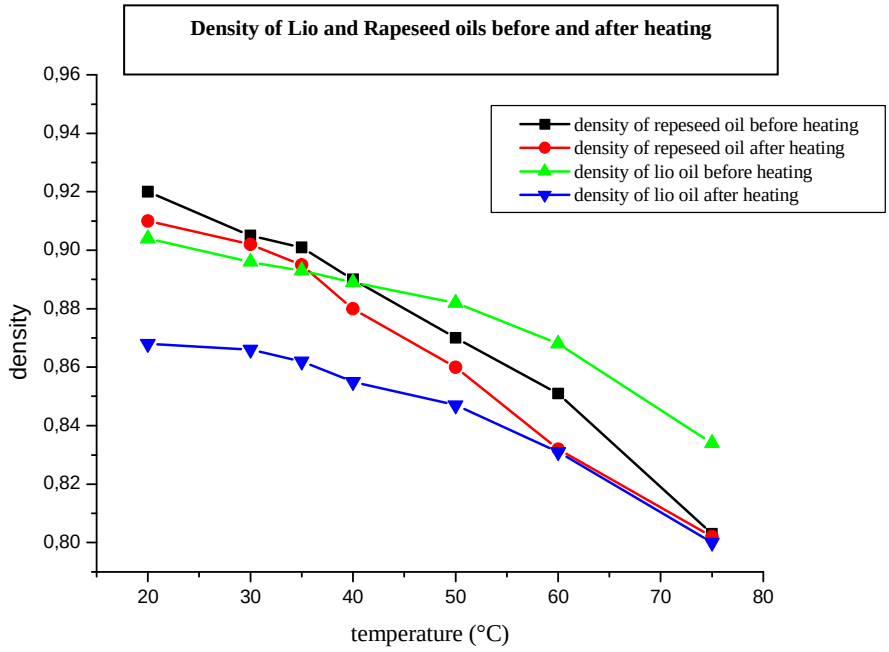

Figure 3: Variation in density depending on the temperature of Lio and Rapeseed before and after heating

According to Figure3, it is very remarkable that the density of the two oils decreases with increasing temperature. On the other hand, this reduction is not similar for both types of oils, the temperature has little effect on the behavior of rapeseed oil, while the density of lio oil is very sensitive to heat and this is probably due to the existence of impurities of lio oil.

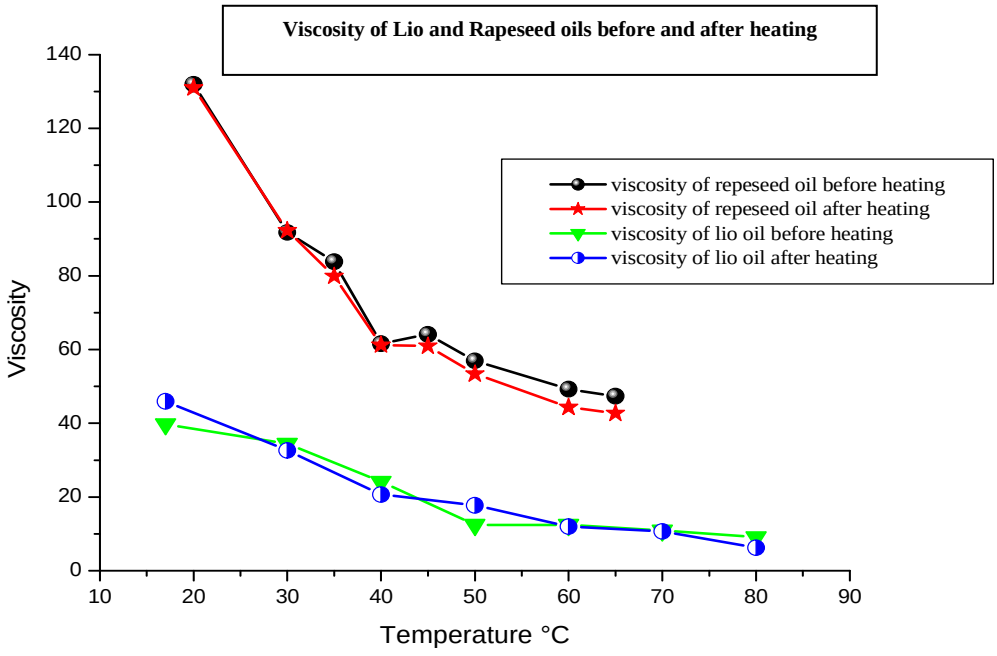

Figure 4: Variation in viscosity depending on the temperature of Lio and Rapeseed before and after heating

3.2 Viscosity Measurement

From Figure 4, it is noted that the difference between the viscosity values of two types of oils are very hight, the two viscosities before and after heating, are almost identical.

CONCLUSION

The study of the density and the viscosity of the oil from rapeseed and Lio and their comparisons before and after heating, can be useful for application in technology (lubricants and biofuels). This study allowed us to compare our results on the behavior of the density and viscosity as a function of temperature with those of other researchers working on the same research topic.

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