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Electrical resistivity of vegetable oils: olive, argan, nigella, prickly pear, palm, colza, linseed, almond and castor.

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ABSTRACT

In our study, we report the measurement of the resistivity of vegetable oils: olive, argan, nigella, Prickly pear, palm, colza, linseed, almond, castor depending on the temperature. This study showed that the electrical resistivity decrease when the temperature T increase (20-100 C°). This diminution was assigned to the effect of thermal stirring on the disorientation of the molecules of the oil.

Keywords: Electrical resistivity, Temperature, olive, argan, nigelle, Prickly pear, palm, colza, linseed, almond, castor.

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INTRODUCTION

Vegetable oils are generally slightly toxic and possessing an excellent biodegradability. These qualities are due to a low resistivity to oxidation and hydrolysis. Both these characteristics are favorable for the eco-toxicological aspect.

Vegetable oils are increasingly used in pharmacy, cosmetics etc… Therefore numerous studies were realized to evaluate the quality of oil on the basis of their physical properties: viscosity, refractive index, electrical resistivity. Pace, Risman, Bengtsson and El-Al Shami [1] suggested that the electrical properties can be used as indicators of the state and the quality of vegetable oils. Several researchers have worked on the chemical and physical properties of vegetable oils [2-5].

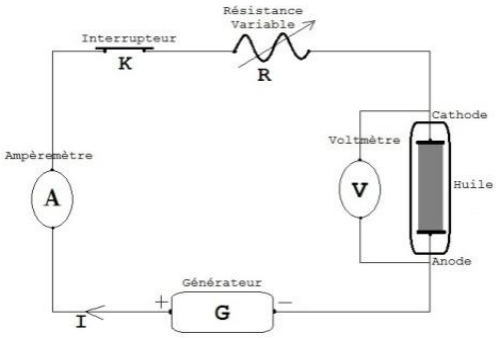
The electrical properties of oils depend on their chemical and molecular composition. The electrical resistivity ρ and dielectric rigidity are the principal electrical characteristic of a substance. The electrical conductivity of oil is due to presence of free charges, and under the influence of an electrical field, these charges move to provide an electrical current. Electrical resistivity is the inverse of electrical conductivityσ.

MATERIALS AND METHODS

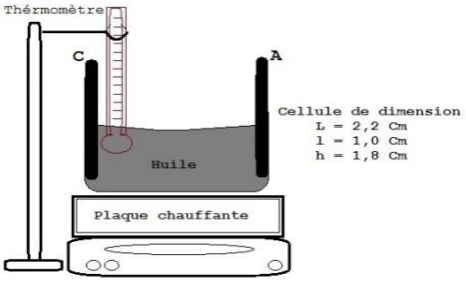
We used the resistivity measuring method known as ''two points method'': electrical resistance of the oil was determined by measuring the current and potential difference (ddp) between the two electrodes of the cell (see montage).

Materiels :

Schema of the cell used for measuring the electrical resistivity.



a. Montage of the equipment used.



b. cell measuring the resistivity.

Methods:

The electrical resistivity ρ was measured using the following formula:

$$\rho = R \times \frac{S}{L}$$

Where,

ρ: Electrical resistivity (Ω.cm); S: Section (cm²); L: Length (cm)
S= l x L ; l =1.1cm ; L= 2.2 cm (distance between the two electrodes).

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RESULTS AND DISCUSSION

Measurements of the electrical resistivity of vegetable oils are shown in Figure 1.

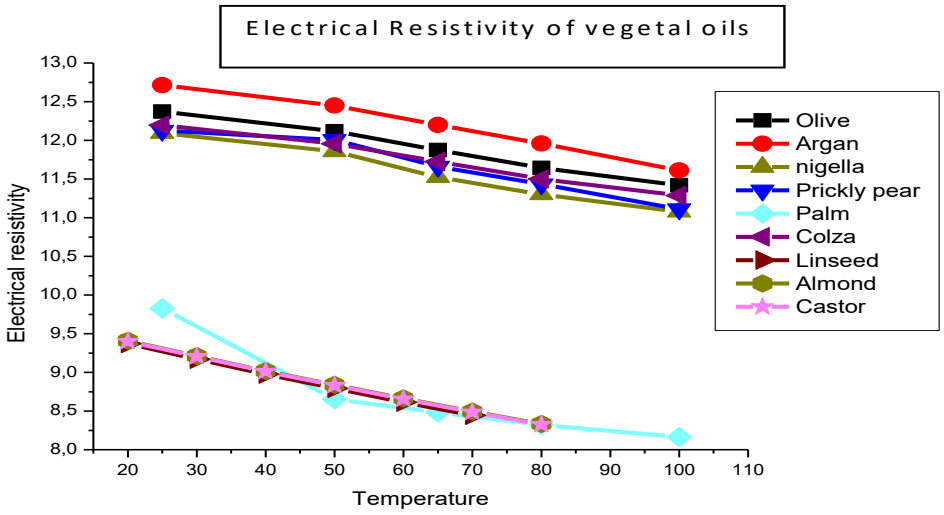

Figure 1 : Electrical resistivity of vegetable oils (olive, argan, nigella, Prickly pear, palm, colza, linseed, almond, castor)

The explanations that can be given to explain this change (decrease in the electrical resistivity depending on temperature) are:

- ✓ Different chemical changes undergone by the oil.
- ✓ Orientation of the molecules (decrease in the viscosity) which facilitates the passage of the current in the oil.

CONCLUSION

The increase of the electrical conductivity of the oils studied was related to the increase of temperature.

The research works of several authors who have already investigated this subject have allowed us to compare the electrical properties of our samples with those obtained by these researchers.

Thereby the results obtained in this study, allowed us to conclude that the change in the electrical measurement of oils depending on the temperature can be used as an indicator of deteriorating food quality of oils at high temperature.

The interest of this study which is the physical and chemical measurement of the oils, is to provide information about the quality of oil studied, we expect to continue on this subject, particularly by making measurement of the viscosity and thermal conductivity depending on the temperature.

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