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Study of the electrical resistivity of vegetable oils: Argan, Palm and castor

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ABSTRACT

The goal of this study is to analyze the behavior of electrical properties versus temperature for vegetable oils: argan, palm and castor. Measurements of electrical conductivity were carried out in the temperature range of 20-100 °C. It was experimentally observed that the electrical resistivity decreased slightly with increasing temperature for all samples investigated. We attributed this decrease to the effect of thermal agitation on the disorientation of the molecules of oil.

Keywords: electrical resistivity, temperature, argan, palm and castor.

INTRODUCTION

Vegetable oils are increasingly used in pharmacy, cosmetics etc. ... Therefore, several studies have been conducted to assess the quality of the oil on the basis of their physical properties: viscosity, refractive index, electrical resistivity etc..Pace, Risman, Bengtsson and El-Shami al [1] suggested that the electrical properties can be used as indicators of the state and quality of vegetable oils. Several researchers have worked on the chemical and physical properties of vegetable oils [2,3,4,5,6,7,8 , 9]

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

The electrical resistivity is a fundamental parameter, non-destructive characterization of compounds [10, 11]. The study of electrical conductivity as a function of temperature of oils: rapeseed and sunflower will allow us to better characterize these oils.

1.1. **characteristics of vegetable oils studied** :
The main physical-chemical constants of oils: argan, palm, and castor reported from the literature are listed in Table 1.

- According to this results, we observe that the physical _chemical constants are close and intersect almost completely.

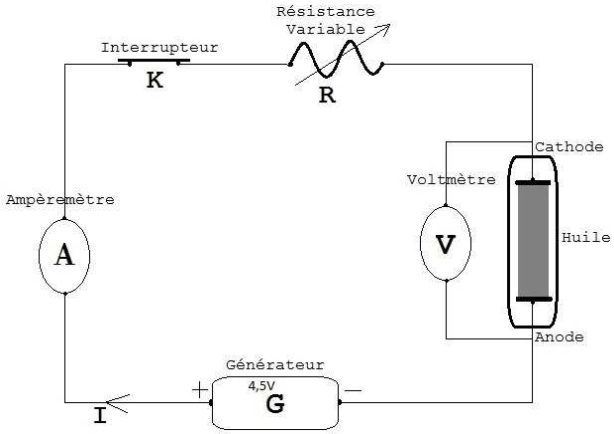
The fatty acid compositions of vegetable oils are determined by gas chromatography, and are listed in Table2 .[6,7,8,9]

• From these results we can conclude that linoleic acid (C18:3) in sunflower does not exceed 0,2%. However, the content of this acid is relatively higher in rapseed oil (7 to 12).[6,7,8,9].

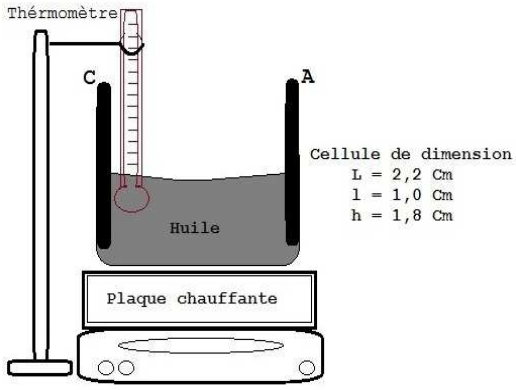
MATERIALS AND METHODS

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

1.2. **Materials :**
Schema of the cell used to measure the electrical resistivity.



a. Montage of the equipment used



b. cell of measurement of reistivity

2.2 **Methods :**
Computation of the resistivity was based on the following formula:

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

Where ρ : Electrical Resistivity (Ω.cm) ; R : Resistance (Ω); S : Section (cm²); L : length(cm)

RESULT

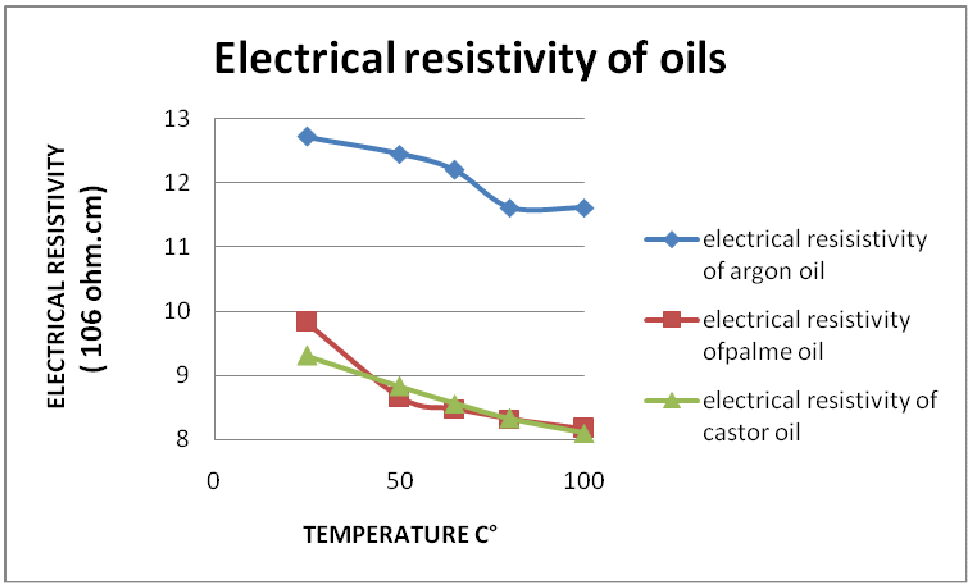


Figure 1: Electrical resistivity of vegetable oils Argan, Palm and Castor

The effect of temperature on the resistivity is represented in Figure 1.

DISCUSSION

The results presented above show clearly that the electrical resistivity decreases when the temperature of the three oils increases. The data of the resistivity have identified a certain number of factors that may explain this increase in conductivity oils depending on the temperature:

• Chemical changes in the condition of the oil when its warm.
• Decrease of the viscosity of the oil as temperature increases,
• The results of the electrical resistivity our oils are fully consistent with those of [11.12] And [13] who made a study of the electrical resistivity.

CONCLUSION

We can conclude that the temperature facilitates when it increases the electrical conductivity of the oils we studied. This study allowed us to compare our results on the behavior of the resistivity as a function of temperature with those of other researchers working on the same research topic [12] [13]. Electrical measurements of oils as a function of temperature, can be used as a strong indicator of the degradation of alimentary quality oils at high temperature [12] [13].

The physical-chemical measures of oils can provide information on the oils studied, looking ahead, we plan to complete our work by a study of the viscosity of these oils, depending on the temperature.

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