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Physicochemical study essential oils of *Laurus nobilis* according to its conservation

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ABSTRACT

Our work aims to study a very aromatic and medicinal plant known by the locals called Laurus nobilis (laurel). The extraction of essential oil of the plant was carried by a drive to steam. The yield is attractive even in terms of industrial exploitation. A number of physicochemical characteristics were determined on freshly extracted oils. The study of the degradation of these oils as a function of time showed a high instability when stored at room temperature and in the presence of light and rather good preservation of the low temperature and protected from light.

Keywords: *Laurus nobilis*, Essential Oils, physicochemical characteristics, chemical and physical indices.

INTRODUCTION

The present work aims to study the physicochemical properties of essential oil of the plant *Laurus nobilis* of the family Lauraceae. The essential oil is used extensively reviewed by humans at least since antiquity for their medicinal, culinary and fragrant. Their use however has always been practiced empirically. We chose to study these two plants for the following reasons:

- It is a wild plant, very abundant in western Algeria;
- It is widely used in herbal medicine especially as antiseptic, antispasmodic and expectorant;
  - they are used as a condiment;
- -They are rich in essential oils that have Digestive, antiseptic, balsamic, carminative, béchique, stimulant, emmenagogue, antispasmodic, expectorant, stomachic [1,2].

MATERIALS AND METHODS

Extraction of essential oil

- Sampling: once the plant picked the month of March, the leaves were dried for 10-15 days in darkness and at room temperature.
- Method of production: distillation by steam distillation of water. For 2h 30mn.
- Organoleptic properties of essential oils extracted:
- Color: Reddish yellow
- Odor: Aromatic, pungent
- Taste: Very spicy
- Calculation of Performance: The essential oil yield is defined as the ratio between the mass of essential oil obtained from the mass of dry vegetation.

The physicochemical indices of essential oils [3]

1. Chemical characteristics

1.1. Acid indices (AI)

The acid expresses the number of milligrams of potassium hydroxide (KOH) required to neutralize the free acids contained in one gram of essential oil.

It weighs 2 grams of essential oil, and is introduced into a glass flask. 5 ml of 95% ethanol and 5 drops of phenolphthalein (PP) at 0.2%. Neutralized by adding a burette through the ethanol solution of KOH (0.1 mol / l) until a pink color. We denote the volume of the ethanolic solution of KOH added. The calculation of AI is given by the formula:

$$\mathbf{AI = 5.61\ xV / M}$$

5.61: Corresponds to 0.1 mol / L KOH
M: mass in grams of the essential oil
V: Volume in milliliters of ethanol solution of KOH (0.1 mol / l) used for titration.

1. 2. Ester indices (IE):

The ester value is the number of milligrams of KOH needed to neutralize the free acids by hydrolysis of esters contained in one gram of essential oil.

It weighs 2 grams of essential oil, and is introduced into a glass flask. Was added through a burette 25ml of ethanol solution of KOH (0.5 mol / l). It adapts the condenser and placed the ball on the heating mantle and allowed to heat for one hour. Allowed to cool then add 20ml of distilled water and 5 drops of 0.2% PP. Finally, as the excess of KOH solution with hydrochloric acid 0.5 mol / l. alongside the operation cited, it makes a blank under the same conditions and with the same reagents. The calculation of EI is given by the formula:

$$\mathbf{IE = (28.05\ x\ (V0-V1) / M)-IA}$$

28.05 g / l corresponding to 0.5 mol / L KOH.
M: mass in grams of the test.
V0: Volume in cl ml solution (0.5 mol / l) used for the blank.
V1: volume in ml of the solution cl (0.5 mol / l) used to determine the IE of the essential oil.

1.3. Peroxide indices (PI):

The peroxide is the number of micrograms of active peroxide content in one gram of products and oxidizing potassium iodide to release iodine under the conditions of the method

described.
Weigh 1g of the oil in a microwave tube you put in an Erlenmeyer flask, add 10 ml of chloroform and shake. Add 15 ml of acetic acid CHCOOH, then 1 ml of saturated aqueous KI, stopper immediately, shake the bottle and leave for 5 min in the dark. 75 ml of distilled water. Titrate carefully in the presence of starch, iodine released with Na2S2O3 solution (0.01 N) until complete discoloration of the solution.

The calculation of PI is given by the formula: **IP = 8000 V / m.**

m: is the mass of the test.
V is the volume of N/100 thiosulphate solution.

1.4. Iodine indices (II)
Iodine is a measure of the unsaturated constituents of the essential oil. Is the mass of iodine that can be set in the double bonds.

Weigh 1g of the oil in a microwave tube you put in an Erlenmeyer flask, add 10 ml of chloroform and 25 ml of HANÜCH. Stopper and shake. Place the solution in the dark for 1 hour. Add 20 mL of saturated aqueous solution of KI to 10% fresh and 150 ml of distilled water, shake to remove the iodine content in the I2 CH2O. Titrate carefully with the solution Na2S2O3 (0.1 N) until the color changes to yellow brown initial. At this point, add 2 drops of starch and fresh color is blue violet. Continue to titrate with Na2S2O3 solution (0.1 N) until discoloration. For the witness, we will follow the same steps using 1g ED. The calculation of PI is given by the formula:

$$II = [AB / m] * f * 12.69$$

m: is the mass of the test.
A: is the volume of N/10 thiosulphate solution of the witness.
B: is the volume of N/10 thiosulphate solution of the sample.
f: factor Na2S2O3 f € [0.99-1.05].

RESULTS AND DISCUSSION

Levels of essential oils
The yield of essential oil of bay is 1.2%. This value is within the range given by Ro G. (2005) [4] (0.8 to 4%) for the same species. Comparing this performance with those given by the literature, we noticed that it is superior to those given by Richard H (1992) (0.5 to 1%) [5], Plate P (1997) [6] (1%) For leaves of the same species and Macchioni & al (2006) (0.6%) [7].

Quality control of essential oil of *Laurus nobilis*
From the physical point of view
The results of the physico-chemical analysis obtained are summarized in the following table 1:

The value of the density of our essential oil is 0.9159. Referring to the following table 2, we note that our oils complex.

Table 1. The physicochemical indices of essential oil of laurel

Property	values
	Essential oil of laurel
density	0.9159
Refractive index at 20 °	1.4744
Rotatory power	-26.4705 (Lévogyre)
Miscibility with ethanol	1ml/0.5ml jusqu'à 20ml d'éthanol
Freezing point <-20 °	< -20°
Acid Indice	2.244
Ester Indice	22.44
Iode Indice	418.77
Peroxyde Indice	9600

	D < 0.9	**0.9 < D < 1**	**D > 1**
Essential oils	rich in terpenes	Have a complex composition	Products still contain the aromatic series, sulfides, nitrites

- The value of the density of our essential oil is within the ranges given by Fesneau M. (2005) [8] (0.915 to 0.93) and Gildemeister & Hoffmann (1959) [9] (0.91 to 0.944) .
- The index of refraction of 1.4744, this result is very close to that given by Fesneau M. (2005) [8] (1.472) and is within the range given by Gildemeisrter and Hoffmann, 1959 [9] (1 0.46 to 1, 477).
- The power of our retatoire essential oil is -26 °, 4705 '. It allowed us to infer that our essential oil is levorotatory. This value is lower than those given by Fesneau M. (2005) [8] (-19 °, -10 °).
- The freezing point is below - 20 ° C.
- Our essential oil is miscible with half its volume of ethanol at 95 °.

From the chemical point of view

- The value of the acid (2244) shows that our essential oil is close to that given by Gildemeisrter and Hoffmann (1959) [9,10].
- The value of the ester value is 22.44. This value is within the range given by Gildemeisrter and Hoffmann (1959) [9].
- The peroxide is 9600.
- The value of the iodine value is equal to 418.77.

Evolution of chemical characteristics over time

In this section, we followed the chemical quality of essential oil for 150 days. To this end, we kept both samples in glass tubes wrapped at two different temperatures, 4 ° C and at room temperature, and a sample in a glass tube unwrapped for 150 days at room temperature. The indices were made each 15 days for three samples. The results are illustrated in Figures 1, 2,3 and 4.

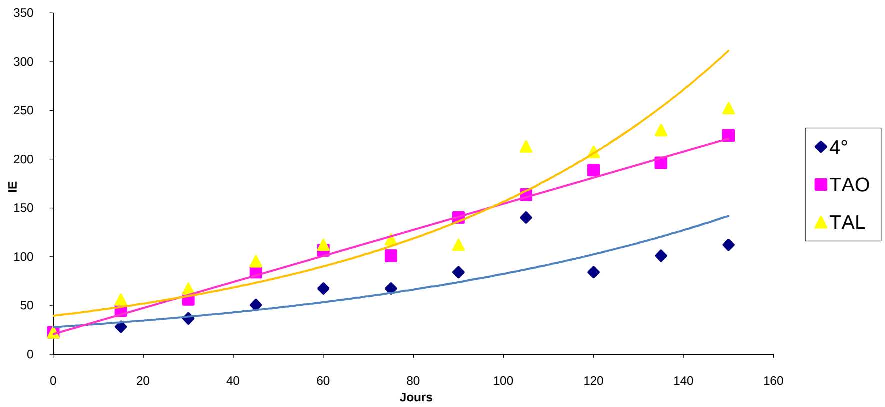

Figure 1. Curve of variation of the AI of the essential oil of *Laurus nobilis*.

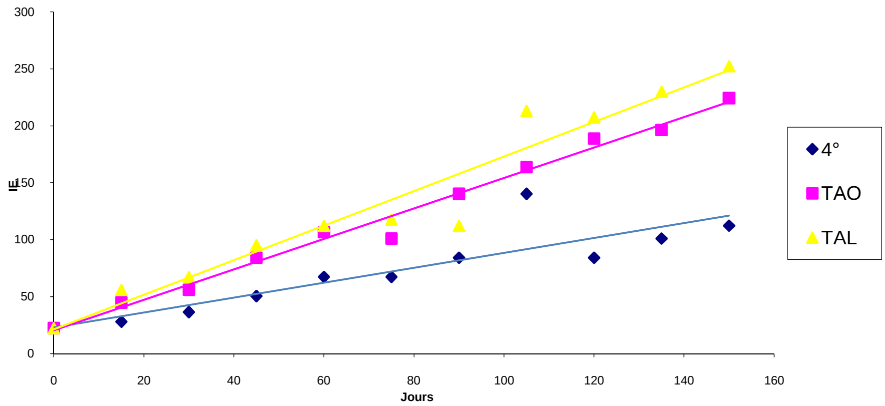

Figure 2. Curve of variation of the EI of the essential oil of Laurus nobilis.

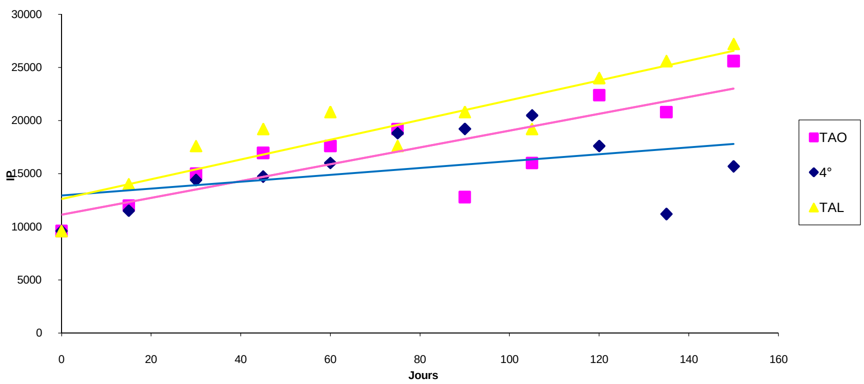

Figure 3. Curve of variation of the PI of the essential oil of *Laurus nobilis*.

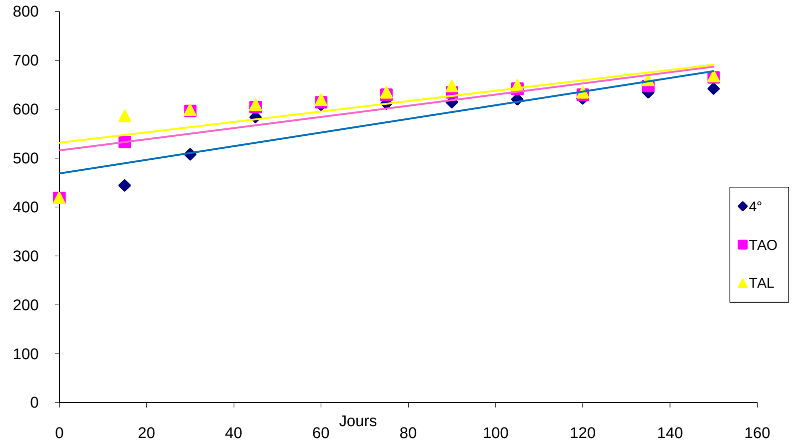

Figure 4. Curve of variation of the II of the essential oil of *Laurus nobilis.*

4 °C: ET stored at 4 ° CTAO: essential oil kept at room temperature in the shade TAL: Essential oil stored at room temperature and exposed to light

The values of the acid number of essential oil samples stored at room temperature increases over time relative to that of freshly extracted oil which is 2244 to a peak of 8.976 for oil stored away from light and 10.09 for the oil that was exposed to light and that after 150 days of storage. While the acid oil stored at 4 ° C with a minor change compared to the other samples, increasing from 2244 to the freshly extracted oil to reach a value of 6.581 at 150^{th} day.

The ester value of oils stored at room temperature varies from 22.44 to increase oil freshly extracted until the value of 224.4 at the 150th day of oil stored away from light and 252.45 for the oil that was exposed to light. While IE oil stored at 4 ° C has suffered a slight increase from 22.44 to 112.2 during the same period of conservation.

The increase in this index for both samples stored at room temperature is not as regular as we notice the drop at day 75 for 2 samples and on day 90 for one that has been exposed to light. This decrease translates into an increase of the acid in both cases.

For 3 samples, the peroxide value was changed in an irregular manner (sawtooth) during the preservation period. At 4 ° C, it increases from 9600 to the freshly extracted oil to a value of 20,480 on the 105th day, where it begins to decrease until the value of 11,200 at the 135^{th} day, then it increases until to 15,680 at the end of storage.

The peroxide value of oil stored at a temperature and light labri increases from 9600 to 19200 at 75^{th} day, 90^{th} day it decreases, then it starts to increase up to a maximum of 25,600 the 150th day. While the increase in this index for the oil exposed to light stops at 60th day, 75th day it decreases, then it increases until it reaches a level of 27,200 to 150^{th} day.

The iodine value increases over time, from 418.77 to 609.12 oil freshly extracted until the 60th day to the oil stored at 4 ° C. While the iodine value of oil stored at room temperature to labri light and one that was exposed to light, stabilizes after 30 days, he arrives at the maximum values of 664.83 (TAO) and 667.5 (TAL).

CONCLUSION

The quality control of our essential oils with the physicochemical characteristics helped to highlight the quality of these oils have a complex composition, high acidity and physicochemical indices comparable to those obtained in the literature.

Monitoring of chemical characteristics (AI, EI, PI, II) essential oils for 150 days under appropriate storage conditions (4 ° C in the shade, ambient temperature in the shade and in the presence of light) showed a slight variation in these indices when the oil is kept away from light and low temperature (4 ° C). These same oils are easily degraded when stored at room temperature and to a lesser degree for those kept in the dark. Result confirmed by several authors in particular Pibiri MC (2006) [11]: "Essential oils are stable at low temperatures if stored properly: to protect from oxidation and polymerization caused by air and by the light".

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