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Physicochemical indices of a medicinal plant oil: *Linum usitatissimum*

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Abstract *The present work is a contribution to the determination of some physicochemical indices of oil obtained from a medicinal plant which is widely known in the Maghreb countries: linum usitatissimum or flax. The oil was extracted from the seeds of this plant by the Soxhlet method which gave an average yield of 35.08%. The physicochemical profile of this oil gave the following indices values: (1.4775), (1.5 % and 2.99%) (8.3 meq O_2 / kg), (159.0435 mg KOH / g of oil) respectively to the refraction index, acid index and acidity, peroxide index and saponification index. The iodine index, determined by a physical assay (reverse assay), gave the value of 4% at a concentration of $8.18x10^{-2}$g/ml.*

***Key Words*:** *Linum usitatissimum, oil, physicochemical indices*

1. Introduction

Fixed oil flax, which represents about 36-40% of seeds, is a clear oil, yellow or yellow brown, becoming darker and gradually thicker when it is exposed to air. It contains 60% alpha linolenic acid omega-3 and only 15% of omega-6 linoleic acid, oleic acid (16 -24%), vitamins A, D, E and minerals. **[1]**, **[2]**
In addition to its culinary and dietary uses, flax is used in traditional medicine for the treatment of many diseases. The various medicinal uses of flax have been subject of several studies whose aim is to promote them scientifically.
This contribution, interested in determination of some physicochemical indices linseed oil, is part of a work that has been undertaken as part of our graduation project entitled under the theme of evaluation of the antifungal effect of separate fractions from the seeds of several medicinal plants including flax.

2. Experiment

- Linseed oil was extracted by Soxhlet method from ground seeds.
-The different indices were measured according to protocols defined by the standards for vegetable oils.
2. 1. flax oil extraction

The extraction of this oil was carried out using soxhlet assembly, the ground seeds are weighed and placed in a cellulose capsule, the latter is subjected to continuous extraction with a solvent (petroleum ether) which gradually dissolves the fat (oil).
After the extraction time (6 to 8 hours), the fat is accumulated in the flask.
Once the extraction is completed, the oil is obtained after removing the solvent by rotary evaporation.

2. 2. Determination of indices

a. Refraction index

On the prism of a refractometer, a few drops of oil are deposited. Reading window gives directly the value of the refraction index at the temperature (t°) in degrees Celsius. If this temperature is higher than the reference temperature (T = 20 ° C), the index given by the refractometer N_D^T is given by the formula: $N_D^T = N_D^t + (t-T) \times F$. In the opposite case, the index of refraction:
$N_D^T = N_D^t + (T-t) \times F$, where F is the correction factor according to the temperature equal to 0.00035 for T = 20 ° C, for oils.

b. Acid index and acidity

The acid index is expressed by the number of milligrams of potassium hydroxide required to neutralize the fatty acidity present in 1g of fat **[4]**. It is given by the formula: $\mathbf{I_A}$ (%) $= \frac{\mathbf{56{,}1 \times V \times C}}{\boldsymbol{m}}$. While the acidity is given by the formula: **Acidité (%)** $= \frac{\mathbf{V \times C \times M}}{\mathbf{10 \times m}}$.

c. Peroxide index

The peroxide index is the number of milliequivalents of active oxygen per kilogram of fat. Treating a test sample of body fat by a solution of acetic acid, chloroform and saturated potassium iodide solution is followed by titration of the liberated iodine with a sodium thiosulfate solution.
Peroxide index (en meq O_2 /Kg of oil) is given by the following formula:

$$I_p = \frac{V - V_0}{P} \; 10$$

d. Iodine index

The iodine index is the weight in grams of iodine attached to the double bonds in 100 g of fat **[5]**. It has been measured in this study by a reverse assay. For this determination 1 ml of oil is put into 10 ml of an iodine solution having a normality of 0.1N. After 24 hours, after filtration of the aqueous phase, a titration was carried by sodium thiosulfate NaS_2O_3. The iodine index is determined as follows:

$\mathbf{II} = \frac{C1-C2}{\Sigma\, C1+C2}$ where **C1**: is the iodine concentration of control, and **C2** is the iodine concentration of the sample.

e. Saponification index

The saponification index is the mass in milligrams of potassium hydroxide required to saponify 1g of fat. Indeed, more acid molecules have carbon atoms, less the saponification index is high. It reports the length of the hydrocarbon chains of fatty acids. **[3]**, **[5]**
The saponification index is equal to:

$$\boldsymbol{I.S.} = \frac{(\boldsymbol{V_0 - V_1}) \times \boldsymbol{T} \times \mathbf{56.1}}{\boldsymbol{m}} \text{ (mg KOH /g of oil)}$$

3. Results and Discussion

3. 1 Oil extraction

The average yield of linseed oil extraction was about 35.07%. This result is in the range published by the Research Centre of Quebec (35-45%).

3. 2 Physicochemical indices

The mean indices values measured in this study are given in the following table:

Table: Indices average values

Index	**$I_{refraction}$**	**I_{acid} and acidity**	**$I_{peroxide}$**	**I_{iodine}**	**$I_{saponification}$**
average value measured	1.4775	1.5 % and 2.99 % respectively	8.3 meq O_2 / kg	4 % at a concentration of 8.18 10^{-2} g/ml	159.042 mg KOH / g of oil

4. Conclusions

This contribution goal was to present the values of some physicochemical indices linseed oil, where the results have shown the quality of this oil of the one part and richness in fatty acids, especially unsaturated fatty acids of the other hand.

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