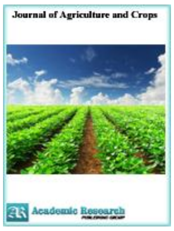

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Physico-Chemical Properties of the Oil Extracted From the Seeds of *Beilschmiedia Mannii (Lauraceae)*

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Abstract: The seed from the fruit of the *Beilschmiedia mannii (Lauraceae)* tree provides edible oil. In order to contribute to the valorization of this seed, which is a traditional Vegetable in Côte d'Ivoire; study of its food potential has been carried out, Particular the determination of some physico-chemical characteristics of its oil. The results obtained are as follows: the yield (8.75%); the refractive index (1.41); the acid index (2.62); the Iodine index (83.8); Saponification index (263.14); the peroxide index (8.97).

Keywords: *Beilschmiedia mannii*; Vegetable oil; seeds; valorization; Index.

1. Introduction

Beilschmiedia mannii (Lauraceae) is an evergreen shrub or small tree to fairly large size up to 35 m high [1]. The area of Beilschmiedia mannii extends from Guinea to Congo. The fruit of the tree Beilschmiedia mannii (Lauraceae) is a tapered bay small (4 to 5.5 cm), red, ripe, one (1) single seed thin seed coat, cotyledon thick, conical. In Ivory Coast the fruit, from Beilschmiedia mannii, is gathered in the forest from October to December [2]. The fruit is consumed in nature and as a sauce ingredient. The seed is roasted and pounded before being consumed and added as a condiment and supplement in soups, rice, vegetables [3]. It serves as the basis for a viscous sauce called Ivory Coast "sauce length" [3, 4]. The Beilschmiedia mannii seeds are also used to produce edible oil [3] the aim of this work is to proceed with the physicochemical analysis of the oil extracted from the seeds, traditional vegetable consumed in Ivory Coast

2. Material and Methods

2.1. Vegetable Material

The Vegetable material consists of dried seeds (Figure 1) of the Beilschmiedia mannii fruit. It was bought at the market of Soubré at 200km from Abidjan (Center-Ouest). The sun-dried Beilschmiedia mannii seed sample was stored in a hermetically sealed plastic bucket and transported to the National Public Health Laboratory of Côte d'Ivoire in Abidjan for analysis. The fruit of Beilschmiedia mannii is a non-wood forest product.

Figure-1. *Beilschmiedia mannii* Seeds

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2.2. Methods

2.2.1. Extraction of the Oil

The extraction of the oil was carried out according to the Soxhlet method [5], A sample of 10 g of dried Beilschmiedia mannii seeds were weighed and ground, The crushed (ground) sample was then packed into a cellulose cartridge which was deposited in the Soxhlet with 1 liter of solvent (petroleum ether) for each extraction, 75cl of solvent were poured directly onto the ground and the remaining 25cl poured into the flask in which a few grains of pumice stones were previously deposited. The whole thing was brought to a boil in the thermostat. The assembly is ready for extraction, This was carried out with the aid of petroleum ether 60-80 at the boiling point which gradually dissolves the vegetable oil, The solvent containing the vegetable oil returns to the flask by successive spills caused by a siphon effect in the lateral band, Fat accumulates in the flask until extraction is complete, After extraction was complete, the petroleum ether was evaporated on a rotary evaporator or vacuum

Oil yield = (MH / MV) $_x$100

With:

MH = oil mass (g)

MV = vegetable material mass (g)

2.2.2. The Refractive Index

It was determined with a refractometer connected to a thermostatic bath. The prisms of the refractometer are first washed with alcohol and wiped with a very clean and soft cloth. Then connect the water circulation to the thermostat at the temperature chosen for the measurement and wait until the temperature equilibrium is reached; pour between the prisms 2 to 3 drops of the filtered fats and dried. Wait for 2 to 3 minutes, so that the sample takes the temperature of the device. • Move the bezel so that the dividing line between the clear and dark areas is at the crossing of the reticle wires; • Read the refractive index of the product studied to selected temperature.

Calibrate the device with distilled water (The refractive index of distilled water at 20 ° C is 1.3330.). The refractive index is a linear function of the temperature in a narrow range (10 ° C.) [6].

2.2.3. The acid Index

The determination of the acid index is performed using the standard AFNOR NFT60-204 (1984). An amount of precise weight of the oil is dissolved in 10 ml of chloroform. The organic solution is then dosed with an ethanolic solution of 0.1N potassium hydroxide until the colored indicator used is turned. The acid number is calculated by the following relationship:

Acid index = V x N x 56, 1 / m

With:

N = normality of the ethanoic KOH solution

V = volume of the ethanoic solution of KOH expressed in ml

m = mass of the oil test sample in gram

56.1 g = molar mass of KOH

2.2.4. The Saponification Index

This is the number of milligrams of KOH needed to turn into soap free fatty acids and glycerides contained in 1 gram of fat. The determination of the saponification index was performed using the standard, AFNOR NF T60-206 (1984) .A quantity of a gram of oil was saponified at reflux with 25 ml ethanoic KOH (0.5N) for one hour. The excess KOH was neutralized with hydrochloric acid (HCl) (0.5N) in the presence of phenophthalein as a color indicator. A blank test was carried out under the same conditions without the oil. The saponification index was calculated by the following relationship:

Saponification index = N (V0 - V1) x 56.1 / m

With:

V0 = volume of HCl in ml in the blank test in ml;

V = volume in ml of HCl required to neutralize the excess potassium hydroxide;

m = mass of oil taken in grams;

N = the normality of the potassium solution. ;

56.1 g = molar mass of KOH

2.2.5. The Iodine index

The iodine index of a fatty substance is the mass of iodine, expressed in grams, which can be fixed per 100g. It measures the degree of unsaturation. The iodine index was determined using the AFNOR NFT 60-203 standard (1984). An amount of 0.2 g of oil was solubilized in 20 ml in CCl4. To this solution was added 20 ml of Wijis reagent (solution of 0.1M concentration of iodine mono chloride (ICl).

The mixture was closed and placed in the dark for 1 hour. To the above mixture was added 20 ml of a solution of 10% w / v potassium iodide (KI) and 100 ml of distilled water and then the excess iodine was added with a sodium thiosulfate solution Na2S2O3 (0.2 N) using starch as an indicator. The iodine value is calculated using the following relationship:

Iodine index = (V0 - V) C x 12.69 / m
With:
V0 = volume of sodium thiosulfate in the blank test in ml;
V = volume of sodium thiosulfate required for neutralization of the excess iodine expressed in ml
C = molar concentration of the sodium thiosulfate solution
m = mass oil test sample in grams
126.9 g mol-1 = molar mass of iodine

2.2.6. The Peroxide Index

This is the amount of peroxide present in the sample of fats, expressed in milliequivalents of active oxygen content in one kg of fatty substances, oxidizing potassium iodide with liberation of iodine. The peroxide index allows us to evaluate the state of freshness of the oil. Take a test sample of 5 to 10 g in a 250 ml bottle. Add 25 ml of the solvent mixture (acetic acid + chloroform) and then 1 ml of potassium iodide. Immediately close the flask, shake for 1 min and 5 min drop away from the light. Add 75 ml of distilled water and titrate the liberated iodine with a 0.01N thiosulfate solution with vigorous stirring in the presence of starch 0.5 to 1% freshly prepared. Make two determinations on two test samples taken from the same sample. Perform parallel and simultaneously in the same way a blank test without fat. If the result of the blank test exceeds 0.05ml of 0.01N solution of sodium thiosulfate, new reagents need to be prepared The peroxide value is given by the following formula [7].
Peroxide value = (V-V0 / P) x 10
With:
V = volume of sodium thiosulfate solution used for the test.
V0 = volume of sodium thiosulfate solution used for the blank test.
P = weight of the sample in grams.

3. Results

Table 1 presents the physicochemical characteristics of the oil of the Beilschmiedia mannii seeds dried in the sun.

3.1. Physical Characteristics

The oil yield of the seeds of Beilschmiedia mannii studied is equal to 8.75%; The refractive index at 20 ° C of the Beilschmiedia mannii seed oil studied is equal to 1.4100.

3.2. Chemical Characteristics

The acid index of the oil of the seeds of Beilschmiedia mannii studied is equal to 2.62; the peroxide index of the seed oil of Beilschmiedia mannii studied is equal to 8.97; the index of Saponification of the oil of the seeds of Beilschmiedia mannii studied is equal to 263.14; the iodine index of the seed oil of Beilschmiedia mannii studied is equal to 5.9.

Table-1. Some physico-chemical characteristics of Beilschmiedia mannii Seeds oïl

Sample	acid Index	Peroxide Index	Refractive Index n^{20}	Saponification Index	Iodine index	Oil yield (%)
Beilschmiedia mannii Seeds oil	2.62 ± 0,07	8.97 ± 0.03	1.41 ± 0.00	263.14 ± 1.34	83.8 ± 0.34	2.91 ± 0.00

The values given represent the mean of three determinations (n = 3)

4. Discussion

4.1. Physical Characteristics

- The oil yield of the seeds of Beilschmiedia mannii is equal to 2.91% (Table 1).

This rate is low compared to other non-wood forest products such as the seeds of Coula edulis: 7.05 g/100 g [8]. This low demonstrated rate can be explained by the climatic conditions, post-harvest treatment and conservation that may influence the chemical composition of the seeds [9].

- Refractive index at 20 ° C of Beilschmiedia mannii seed oil is equal to 1.4100

(Table 1). It is less than the refractive index at 20 ° C of the seed oil Coula edulis: 1.4683 [10] and the refractive index at 20 ° C of Argania spinosa seed oil: 1.4853 [11] two oils from non-wood forest products. This rate is also lower than the refractive index at 40 ° C of two conventional oils corn oil: 1, 4726 and palm oil: 1.453-[12].The refractive index varies depending on the degree of lipid insaturation; it is lower in oils with high levels of insaturation. The oil from the seeds of Beilschmiedia mannii contains more than two polyunsaturated acids (table 1), the rates of which vary from 31.16% (alpha linolenic acid: C18:3) at 40.64 %(linoleic acid: C18:2). This could explain the low Refractive index of the oil studied. Oil with a low refractive index is, it is said, better for the health of the arteries. The refractive index is used for the identification and as a criterion of purity of the oils. Each substance has its specific refractive index. [13].

4.2. Chemical Characteristics

- The acid index of the seed oil of Beilschmiedia Mannii studiedis equal to

2.62 (table 1). It is superior to the acid indices of the seed oil Argania spinosa: 1.30 [11]; and olive Oil: 0.3 – 1.0 [12]. On the other hand this index is lower than the oil acid indices of the seeds of Irvingia gabonensis: 25.18 and the oil of the seeds of Coula edulis: 20, 3 [8]. The acid index of a lipid is the amount of potash in MG indispensable to neutralize its free acidity. The free acid content of the fatty bodies increases over time: The acid index therefore allows judging their deterioration status [14].

- The peroxide index of Beilschmiedia mannii seed oil studied is equal to 8.97

(Table 1). It lies within the range of variation of the peroxide indices of sunflower oils: 1.5 to 24 and olives: 3 to 32 [12]. On the other hand this index is greater than the peroxide indices of the oil of the seeds of Irvingia gabonensis: 1.2 and the oil of the seeds Coula edulis: 4.3 [8]. The peroxide index is used to characterize a vegetable oil. This index is concerned with the number of active oxygen in the organic chains of a fatty body (lipids, free fatty acids, mono-, di-and triglycerides) This active oxygen can be in the form of epoxy or in the form of hydroperoxyde. It evaluates the degree of oxidation of unsaturated fatty acids in the fat (rancidity). The higher it is, the more oxidized the fat. However, the peroxide index is only an early oxidation indicator: it increases with a peak and then decreases with the advanced oxidation state [15].

- The saponification index corresponds to the hydroxide mass of Potassium

KOH (in milligrams) required to saponified fatty acid esters and neutralize non-esterified fatty acids contained in a gram of fat or fatty body. The amount of KOH used varies with the molar mass of the fatty acids. The higher the latter, the lower the saponification index: The Saponification index is, therefore, an indirect measure of the molar mass of fatty acids [16].

The Saponification index of Beilschmiedia mannii seed oil studied is equal to 263.14 (Table 1). It is superior to the acid indices of the Irvingia gabonensis seed oil: 198.93 and oil seeds Coula edulis: 187 [10]. It is also superior to the Saponification index of conventional sunflower oils: 188 – 194; Maize: 187 – 196 [12]. On the other hand this index is less than the acid indices of seeds seed oil Crataegus azarolus: 288, 96 [17].

- The iodine index corresponds to the Mass of iodine halogen expressed in

grams, calculated in I2 fixed on the double bonds of 100 g of fat body. The interest of measuring the iodine index helps to determine the degree of oil insaturation [18]. The iodine index of the oil from the seeds of Beilschmiedia mannii studied is equal to 83.8 (Table 1). It is superior to the iodine indices of the seed oil of Irvingia Gabonensis: 4.9 and slightly lower than that of the seed oil Coula edulis : 85 [10]. It is also inferior to the iodine indices of conventional sunflower oils: 125 – 144; Maize: 109 – 133 [12]. However, this index is within the range of the iodine indices of olive oil: 80-88 [12].

5. Conclusion

The objective of this work was to carry out the physicochemical analysis of the oil extracted from seeds of Beilschmiedia mannii. It is a contribution to the valorization of a traditional vegetable consumed in Ivory Coast. The results obtained show that the physicochemical characteristics of this oil from the seeds of Beilschmiedia mannii, are closer to those of various oils derived from seeds of non-wood forest products: Hazel (Coula edulis), Mango (Irvingia gabonensis) and various other conventional oils (peanut, soybean, sesame)

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