

Fatty Acid Profile of *Beilschmiedia mannii* (Lauraceae) Seeds Oil

Amenan Marguerite Kouamé¹, Drogba Alexis Sahoré¹, Abouattier Levry Joachim²,
Nguessan Gorges Amani¹

¹Department of Foods Science and Technology, Nangui Abrogoua University,
Abidjan, Côte d'Ivoire

²Institute for Research on New Energies (IREN), Nangui Abrogoua University
Abidjan, Côte d'Ivoire

Abstract: *The seed from the fruit of the Beilschmiedia mannii (Lauraceae) tree provides edible oil. To help popularize this seed, which is a traditional vegetable, a study of its food potential is necessary. In this work, the profile oil fatty acid extracted from the seeds was determined. The results obtained showed that this oil is rich in linoleic acid (40.64%); Alpha linolenic acid (31, 16%); Palmitic acid (15.51%); Stearic acid (6.10%) and oleic acid (2.95%)*

Keywords: *Beilschmiedia mannii*, oil, fatty acid, seeds.

1. Introduction

Beilschmiedia (Lauraceae), whose oil of the seed is the subject of our study, is a genus of about 240-250 species that are trees or shrubs,

It has about 80 species in tropical Africa and Madagascar (Louppe *et al* 2008).

In Ivory Coast the fruit, of the tree *Beilschmiedia mannii*, is gathered in the forest from October to December. Seeds are sold for food purposes (Bognon, 1988; Sahoré *et al*, 2011), It is a popular protein crop (Table 1) commonly sold on West African markets; It is roasted and pounded before being eaten, and added as a condiment and supplement in soups, rice and vegetables. But these *Beilschmiedia mannii (Lauraceae)* seeds also provide edible oil (Nyunaï, 2008), and the objective of our work is thus to determine the fatty acid profile of this edible oil extracted from the seeds of *Beilschmiedia mannii*.

It will be necessary to demonstrate the characteristic fatty acids of this vegetable oil.

2. Material and Methods

Vegetable Material

The vegetable material studied was purchased at the market in Soubré, a city located in the center-west of Côte d'Ivoire, about 200 km from Abidjan. These are sun dried seeds and locally called "Bitéi" (Figure 2). This vegetable material was packaged in a plastic bucket and transported to the National Public Health Laboratory (LNSP) in Abidjan where it was studied It has been identified at the Houphouët Boigny University Floristic Institute of Abidjan Cocody, as consisting of *Beilschmiedia mannii (Lauraceae)* seeds. The seed of *Beilschmiedia mannii* (Figure.2) is a non-timber forest product (NTFP) food, It is a traditional vegetable (Sahoré *et al*, 2013), the fruits of the tree *Beilschmiedia mannii (Lauraceae)* (figure.1) are harvested from September to December. The

seeds are then dried in the sun generally before being sold on the markets of Côte d'Ivoire (Kouamé *et al*, 2008),



Figure 1: Fruit of *Beilschmiedia mannii*
(Sahoré *et al*, 2013)



Figure 2: Seeds of *Beilschmiedia mannii*

3. Methods

The extraction of the oil

The extraction of the oil was carried out according to the Soxhlet method (BIPEA, 1976), 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 bend, Fat accumulates in the flask until extraction is complete, After extraction was complete, the petroleum ether was evaporated on a rotary evaporator or vacuum.

Extraction of the oil was made also on the pre-cooked seeds 20 min to water and the effect of hydrothermal treatment on the fatty acid profile was studied

The study of the fatty acids

The study of the fatty acids was carried out by the injection of 1 µl of methyl esters, prepared according to the standard NF EN ISO 5509 (2000), to an HP 6890 chromatograph. We used a mass spectrometer HP 5973 MSD Electron impact,

4. Results

Fatty acid profile of oil

Chromatographic spectrum of *Beilschmiedia mannii* oil (figure: 3) indicates 24 fatty acids of which 13 have no peaks on the spectrum (fig. 2). The main eleven fatty acids, contained in the oil extracted from the *Beilschmiedia mannii* seeds and which gave peaks, are shown in Table 1. They are broken down as follows:

- Six saturated fatty acids with

Levels ranging from 0.07 % (Myristic acid) to 15.51 % (Palmitic Acid)

In this group, stearic acid and palmitic acid have remarkable levels (6.10%, 15.51%), respectively.

- Five monounsaturated fatty

Acids with levels ranging from 0.15 % (Acid Palmitoleic) to 2.95 % (Oleic Acid) Oleic acid have a remarkable rate (2.95%) in this group.

- Two polyunsaturated acids with

Levels varying from 31.16% (alpha linolenic acid) to 40.64% (Linoleic acid). In this group, the linoleic acid and alpha linolenic acid have respectively the remarkable levels (31, 16%, and 40.64%).

Effect of seed pre-cooking on fatty acid profile of oil

Chromatographic spectrum of *Beilschmiedia mannii* oil (figure: 4) indicates 50 fatty acids of which 42 have no peaks on the spectrum (fig. 4). The main fatty acids contained in the oil extracted from the pre-cooked *Beilschmiedia mannii* seeds and which gave peaks fig. 4) are shown in Table 2. They are broken down as follows:

- Five saturated fatty acids with

levels ranging from 0.53% (behenic acid) to 19.37% (palmitic acid). In this group stearic acid and palmitic acid have the remarkable rate respectively (6.21%; 19, 37%).

- One monounsaturated fatty acid

with a rate 2.79% (Oleic Acid)

- Two polyunsaturated acids with

rates varying from 24.99 % (alpha linolenic acid) to 34.86% (Linoleic Acid). In this group, linoleic acid and alpha linolenic acid have respectively the remarkable rates (24.99%, 34.86%)

Discussion

Fatty acid profile of oil

Oil *Beilschmiedia mannii* is of the unsaturated type (75.58% unsaturated fatty acids). This oil is composed mainly: palmitic acids (15, 51%), stearic (6.10%), oleic acid (2.95%), linoleic acid (40.64%) and α -linolenic (31.16%). linoleic acid (C18: 2) and α -linolenic acid (C18: 3) are called essential fatty acids necessary for the growth and physiological activity of all tissues. They are involved in the regulation of cardiovascular disorders (Grandgirard 1992). One of the main representatives of polyunsaturated fatty acids is Linoleic acid (18: 2). They are essential to man: he must find them in his diet because he cannot synthesize them. A deficiency in polyunsaturated leads to a slowing of growth and development, an alteration of the integrity of the skin and Kidneys, reproductive problems, etc. (Bourre, 1991). It is now believed that linoleic acid should represent 3 to 5% of the caloric intake, and linolenic acid 0.5 to 1% (Either for a calorie intake of 2000 kcal / day, 7-11 grams of linoleic acid and 1 to 2 grams of linolenic acid) (Grandgirard, 1992).

Some recent work suggests that the fatty acids such as linolenic acid (n-3) may have an anticancer effect (Simopoulos *et al.* 1991). The ratio of polyunsaturated fatty acids to that of saturated fatty acids of this oil is 2.55, it remains above the ideal ratio (0.7) recommended by nutritionists (Fossati, 2000). The content of this oil in alpha linolenic acid would render it unusable for frying (Dilmi-Bouras, 1998).

Effect of seed pre-cooking on Fatty Acid Profile of oil

The main eight fatty acids contained in the oil extracted from the *Beilschmiedia mannii* seeds pre-cooked and which gave peaks (fig: 4) are shown in Table 2

Examination of the spectrum revealed that after the hydrothermal treatment the acid levels varied differently in oil some destroyed fatty acids no longer give a peak (fig: 4) others appeared in the medium. Under the effect of heat, the seed cells released their acidic components. The number of fatty acids which was equal to 24 (before pre-baking) is increased to 50 (after pre-baking). The number of fatty acids revealed by the analysis in the oil extracted from the pre-cooked seeds is equal to 50,

5. Conclusion

fatty acid composition of *Beilschmiedia mannii* oil showed a low percentage of saturated fatty acids, although the percentages of palmitic acid (15.51%), stearic acid (6.10%), oleic acid (2.95%) were and a high amount of unsaturated fatty acid characterized by the high percentage of 2 essential polyunsaturated fatty acids (linoleic acid (C18: 2) and α -linolenic acid (C18: 3). This would make it very useful for Food preparation that can reduce the incidence of heart attack (arteriosclerosis)

References

- [1] **BIPEA, 1976** Recueil des méthodes d'analyse des communautés européennes 140p
- [2] **Bognon C. 1988.** Les végétaux dans la vie du peuple WE, Côte d'Ivoire. *Thèse de Doctorat de l'Université Pierre et Marie Curie. Journal d'agriculture traditionnelle et de botanique appliquée* Année 1987 Volume 34 Numéro 1p. 187
- [3] **Bourre, J.M.** - Les bonnes graisses ed. *Odile Jacob* ; 1991.
- [4] **Dilmi-Bouras A. 1998.** Les constituants alimentaires et leur rapport avec la santé. Alger: Ed. O.P.U.
- [5] **Fossati, P. 2000.** Base Nutritionnelles de l'alimentation lipidique normale. *Thérapie*, 51: 615-621
- [6] **Grandgirard A. 1992-** Transformations des lipides au cours des traitements thermiques. Effets nutritionnels et toxicologiques. *Cahiers de l'ENSBANA*: 8 : 49-67.
- [7] **Karleskind, A. 1992 -** Manuel des corps gras. Ed. *Techniques et Documentation- Lavoisier* : 2 tomes, 1580 p.
- [8] **Kouamé N. M. T and Gnahoua G. M. 2008** "Spontaneous Food Trees and Lianas of the Semi Deciduous Forest Zone (Center-West of Ivory Coast): Species Encountered, Plant Parts Consumed and Food Values," *Proceedings of International Conference on Traditional Forest Knowledge*, Accra, 15-18, pp. 1-34
- [9] **Loupe D, Oteng-Amoako A. A, Brink M. 2008** .Timbers 1 Prota Plant Resources of Tropical Africa, 7 (1)
- [10] **NF EN ISO 5509 2000** Préparation des esters méthyliques d'acides gras *Association Française de Normalisation AFNOR, Paris, France*
- [11] **Nyunai N. 2008.** *Beilschmiedia mannii* (Meisn.) Benth Hook.f. In: Loupe, D., Oteng-Amoako, A.A. & Brink, M. (Editors).PROTA (Plant Resources of Tropical Africa / Ressources végétales de l'Afrique tropicale), Wageningen, Netherlands.
- [12] **Simopoulos A.P., Kifer R.R., Martin, R.E., Barlow S.M. 1991,** *Health effects of w3 fatty acids in sea foods.* World Rev. Nutr. Diet. 66.
- [13] **Sahore D.A., Kouame M. et Nemlin G. 2011.** Physicochemical properties of some traditional vegetables in Côte d'Ivoire: seeds of *Beilschmiedia mannii* (Lauraceae), seeds of *Irvingia gabonensis* (Irvingiaceae) and mushroom *Volvariella volvacea*. *J. Food Technol.*, 9 (2): 57-60
- [14] **Sahoré A D., Koffi L B. 2013.** Technical Sheet of *Beilschmiedia mannii* Seeds Preparation in Ivory Coast. *JPSI* 2(4):62-64

Author Profile

Amenan Margueritte Kouame: Étudiante
Drogba Alexis Sahoré: PhD, Chercheur
Abouattier Levry Joachim Doctor, Chercheur
N'guessan Gorges Amani PhD, Professeur Titulaire

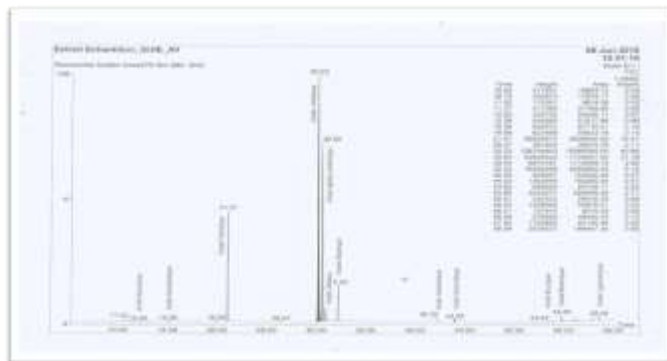


Figure 3: Chromatographic spectrum of *Beilschmiedia mannii* oil

Table 1: Fatty acid profile of *Beilschmiedia mannii* (Lauraceae) seeds oil

| Fatty Acids Profile | Number of Carbon Atoms | Type of fatty acid | % |
|----------------------|------------------------|----------------------------|--------------|
| Myristic Acid | C14 : 0 | Saturated fatty acid | 0,07 |
| Palmitic Acid | C16 : 0 | Saturated fatty acid | 15,51 |
| Stearic Acid | C18 : 0 | Saturated fatty acid | 6,10 |
| Peanut Acid | C20 : 0 | Saturated fatty acid | 0,51 |
| Behnic Acid | C22 : 0 | Saturated fatty acid | 0,71 |
| Lignoceric Acid | C24 : 0 | Saturated fatty acid | 0,50 |
| Oleic Acid | C18 : 1 | Monounsaturated fatty acid | 2,95 |
| Gadoleic Acid | C20 : 1 | Monounsaturated fatty acid | 0,27 |
| Eucalyptic Acid | C22 : 1 | Monounsaturated fatty acid | 0,23 |
| Myristoleic Acid | C14 : 1 | Monounsaturated fatty acid | 0,18 |
| Palmitoleic Acid | C16 : 1 | Monounsaturated fatty acid | 0,15 |
| Linoleic Acid | C18 : 2 | Polyunsaturated fatty acid | 40,64 |
| Alpha Linolenic Acid | C18 : 3 | Polyunsaturated fatty acid | 31,16 |

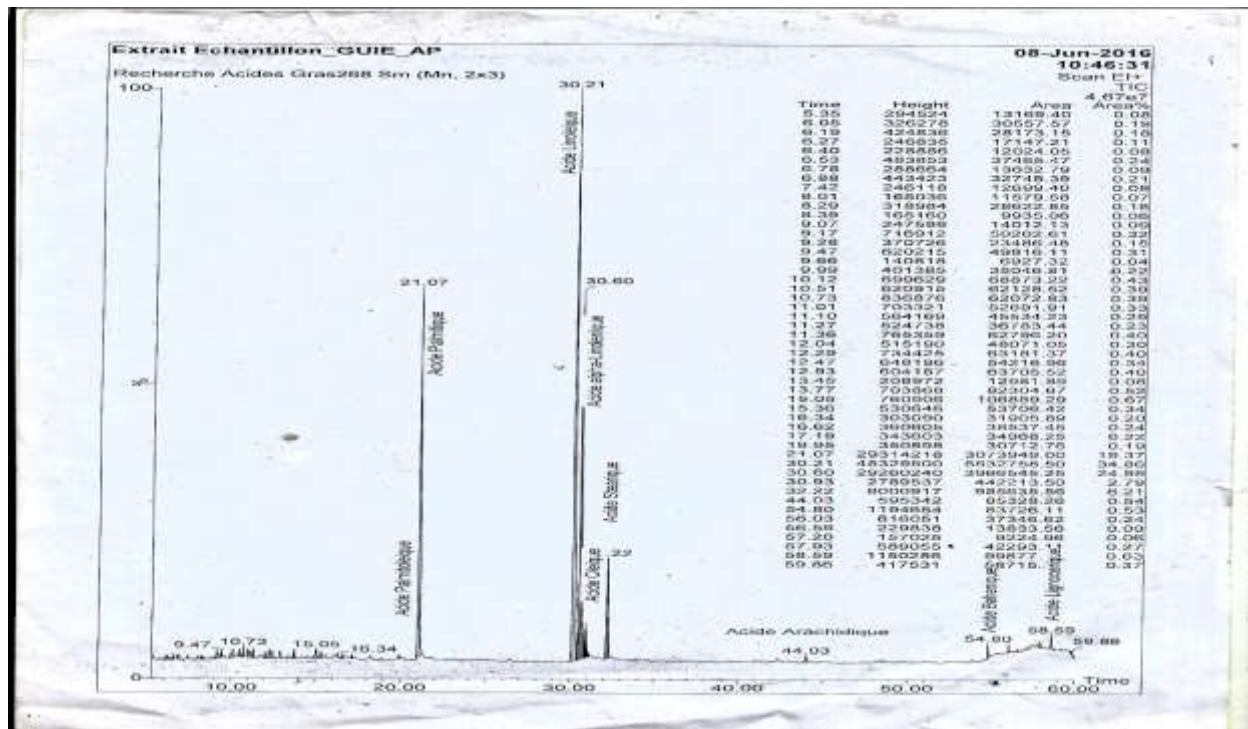


Figure 4. Chromatographic spectrum of oil extracted from the seeds *Beilschmiedia mannii* precooked 20mn

Table 2 :: Fatty acid profile of the oil extracted from the *Beilschmiedia mannii* pre-cooked seeds

| Fatty Acids Profile | Type of fatty acid | Number of Carbon Atoms | % |
|----------------------|----------------------------|------------------------|-------|
| Palmitic Acid | Saturated fatty acid | C16 : 0 | 19,37 |
| Stearic Acid | Saturated fatty acid | C18 : 0 | 6,21 |
| Peanut Acid | Saturated fatty acid | C20 : 0 | 0,54 |
| Behnic Acid | Saturated fatty acid | C22 : 0 | 0,53 |
| Lignoceric Acid | Acide gras saturé | C24 : 0 | 0,63 |
| Oleic Acid | Monounsaturated fatty acid | C18 : 1 | 2,79 |
| Linoleic Acid | Polyunsaturated fatty acid | C18 : 2 | 34,86 |
| Alpha Linolenic Acid | Polyunsaturated fatty acid | C18 : 3 | 24,99 |