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Studies of *Irvingia gabonensis* Seed Kernels: Oil Technological Applications

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Abstract: *Irvingia gabonensis* seed kernels of two Congo Brazzaville localities (Ouesso and Sibiti) were analyzed for their main chemical composition. Studies were also conducted on properties of oil extracted from *Irvingia gabonensis* seed kernels and margarines. The following values were obtained for two seed kernels cultivars respectively: protein (8.33-8.71%), oil (34.28-73.82%), ash (2.06-3.8%) and carbohydrate (15.71-55%). Gas-liquid chromatography revealed that the major fatty acid was, C12:0 (36.6-39.37%), C14:0 (50.92-53.71%) and C16:0 (4.97-5.23%) in oil extracted from *Irvingia gabonensis* and in the margarines, there is C12:0 (13.7-14.5%), C14:0 (18.46-18.54%), C16:0 (18.81-19.3%) and C18:1n-9 (36.35%), the unsaturated fatty acids such as C16:1 (0.33-0.385%), C18:3n-3 (0.62-0.64%) and C22:1n-9 (0.35-0.38%) are present. The margarines thus manufactured can tolerate temperatures of crackling because their linolenic acid content is lower than 2%. The differential thermal analysis shows the existence of two processes; crystallization and fusion. Crystallization in oil is done between 2 and 2.5°C and between -3.88 and 5.13°C in the margarine on the other hand fusion is carried out at high temperatures between 30 and 40°C. The addition of thin oils to *Irvingia gabonensis* oil during the margarine manufacture causes: increase in the unsaturated fatty acid content which results in the displacement of the peaks into the low melting point. The small percentages in lauric acid indicate that these greasy substances can be stored for a long time without fearing deterioration due to oxidizing rancidity. The margarine based on *Irvingia gabonensis* oil is an alternative to the Trans fatty acids obtained during hydrogenation and other reactions used in margarinery.

Key words: *Irvingia gabonensis*, lauric and myristic acids, margarine, unconventional oilseed, proximate analysis

Introduction

Irvingia gabonensis (Aubry Lecomte ex O'Rorke) Baill., commonly known as "African mango", "Dika nut"or "bush mango" is a tree of 15-40m, with bole slightly buttressed. *Irvingia gabonensis* occurs in the wild lowland forest; 2-3 trees occur together and in some areas, it is reported to be gregarious. It is largely distributed in Africa (Leakey, 1999; Burkill, 1994; Leakey and Tchoundjeu, 2001). This plant with edible fruits is largely used in traditional and modern medicine for the treatment of several illnesses, as well as in industry (Lowe *et al.*, 2000; Anegbeh *et al.*, 2003).

Ethnocultural specificities on *Irvingia gabonensis* and *Irvingia spp.* products (Irvingiaceae) in Congo-Brazzaville, this study showed food properties of Irvingia gabonensis (Aubry-Lecomte ex O' Rorke) Baill. and Irvingia sp. is centered on the contribution of almonds to the art of cooking of the forest communities to Congo (Kimpouni *et al.*, 2007).

Many studies were undertaken on the nutritional or medicinal value of *Irvingia gabonensis* have been reported (Surville, 1955; Berhaut, 1975; Adamson *et al.*, 1986; Adamson *et al.*, 1990; Okolo *et al.*, 1995; Ngondi *et al.*, 2005).

Methanolic extract of *Irvingia gabonensis* are use in the treatment of bacterial and fungal infections (Kuete *et al.*, 2007).

Margarine is a butter-like product obtained from mixtures of various edible fats and oils. Usually margarine contains appropriate ratios of hard vegetable fats from coconut, palm kernel, interesterified vegetable oils and/or hydrogenated vegetable oils. Mostly in the industrial catalytic hydrogenation process some natural fatty acids are destroyed and new artificial trans isomers are produced that behave similar to saturated fats. These isomers lack the essential metabolic activity of the parent compounds and inhibit the enzymatic desaturation of essential fatty acids (Kandhro *et al.*, 2008).

The production of margarines, fat content to paste and shortenings appeals, to satisfy the necessary functionalities (consistency), with processes of transformation of the refined greasy substances: fractionation, inter esterification and hydrogenation (total or partial), among which only partial hydrogenation generates the Trans fatty acids (TFA) (Morin, 2007).

The aim of this work is a contribution of the *Irvingia gabonensis* seed kernels valorization by an oil extraction and one of the technological applications of this one by margarine manufacturing. All this in the objective to diversify the sources lipids that have good food qualities for the Congolese populations and certainly those of under area.

Materiels and Methods

Vegetable material: Vegetable material used is *Irvingia gabonensis* seed kernels coming from two Congo Brazzaville localities: Sibiti (3.69°S; 13.35°E) and Ouesso (1.61°N; 16.05°E); IGS and IGO.

Chemical composition of powdered seeds:

Protein content: Proteins are polymers of amino acids. Total protein was determined by the Kjeldahl method. Protein was calculated using a nitrogen conversion factor of 6.25 (Al-Gaby, 1998). Data were expressed as percent of dry weight.

Carbohydrate and energy content: Total carbohydrate was obtained by difference; the energy content was calculated by multiplying the mean values of crude protein, crude fat and total carbohydrate by At water factors of 4, 9 and 4, respectively, taking the sum of the products and expressing the result in kilocalories per 100g sample

Carbohydrate content = 100 - [%Lipids + %Proteins + %Ash + %Moisture]

Ash content: To remove carbon, about 0.5g of powdered seed samples were ignited and incinerated in the muffle furnace at 550°C for about 12h. The ashes were dissolved in H_2SO_4 and the mineral constituents (Ca, Na, K and Mg) were determined using an atomic absorption spectrophotometer (Perkin-Elmer, model HGA 700).

Dry matter: The dry matter was determined according to the Association of Official Analytical Chemists (AOAC, 1990).

Oil extraction:

Press method: For *Irvingia gabonensis* oil extraction by press, 100mg of seed powder are placed in autoclave and to heat with 110°C during 20 minutes under a pressure of 1bar and to press hot.

Soxhlet method: The weight of fat extracted from 40g of *Irvingia gabonensis* seed kernels powder was determined to calculate the lipid content. Seed kernels oils were extracted using the continuous Soxhlet extraction technique with petroleum ether (40-60°C) for 5h. After removing solvent, using a Rotavapor apparatus, the seed oil obtained was drained under a stream of nitrogen and stored in freezer (-30°C) for subsequent chemical analysis. Result was expressed as the percentage of lipids in the dry matter of seed powder.

Bligh and dyer method: According to Bligh and Dyer (1959), 100mg of seed powder are homogenized with a chloroform mixture: methanol (1:1) and water. We obtain two phases, aqueous layer (methanol-water) and organic layer (chloroform).

Folch method: Oils from the seeds were extracted mainly according to Folch (1957), this chemical method makes it possible to obtain the cold lipids in anhydrous mixture chloroform: methanol (2:1; v/v).
The oils were recovered by distilling the solvent in a rotary evaporator at 45°C, then dried to constant weight in a vacuum oven at 90°C for 1h and weighed.

Seed oil physicochemical analysis:

Chemicals analysis: The various indexes were obtained according to the Association of Official Analytical Chemists.
Acid value (AOAC, standard 969.17, 1997); Iodine value (AOAC, standard 993.20, 1997); Peroxide value (AOAC, standard 965.33, 1997); Saponification value (AOAC, standard 920.160, 1997) (Nzikou *et al.,* 2007).

Acid value, %FFA: Acid value of *Irvingia gabonensis* oil and margarines was determined according to AOAC Official Method Cd 3a-63. Percentage free fatty acids (FFAs) were calculated using lauric acid as factor.

Iodine value: Iodine value of seed oil was determined according to AOAC Official Method 993.20,1997.

Saponification value: Saponification value was determined according to AOAC Official Method 920.160,1997.

Peroxide value: Peroxide value was determined according to AOAC Official Method 965.33,1997.

Differential scanning calorimetry (DSC): Calorimetric evaluations of sample melting behavior were performed in a Perkin-Elmer (Model Pyris 1, Perkin Elmer Corp., and Norwalk CT). All samples were tempered in the DSC cell according to the following conditions: samples were tempered at -60°C during 10 min. DSC analysis were performed from -60°C to 60°C at a scan rate of 5°C/min. The onset, major peak maximum temperatures and enthalpy of melting (J/g) were analyzed from thermograms using the Pyris software (version 2.04, 1997).

Fatty acids composition by Gas chromatography (GC): Fatty acid composition of each lipid classes was determined after transmethylation using potassium hydroxide in methanol (2N) by gas chromatography. A Perichrom™ 2000 system gas chromatographs (Perichrom, Saulx les Chartreux, France), equipped with a flame-ionization detector and was used for analyzing FAME. Chromatographic parameters were set as fellows: fused silica capillary column (30m x 0.22mm id. x 0.25µm film thickness, BPX 70 SGE Australia Pty. Ltd., analytical products); injector and detector temperatures 260°C; oven temperature programming: held 5 min at 145°C then ramped to 210°C at 2°C/min followed by a hold period of 10 min. Fatty acid were identified by comparison of their retention times with standard mixtures ($PUFA_1$ from marine source and PUFA $_2$from animal source; Supelco, Bellfonte, P.A.).

Statistical analysis: Each reported value is the mean of determinations for triplicate samples. The statistical processing was carried out with Microsoft Excel 8.0 software.

Results and Discussion

Physicochemical characterization of powdered seed kernel:

Oil content: *Irvingia gabonensis* oil content varies between 34.28 and 62.67% for IGO var (Table 1) and between 34.55 and 73.82% for IGS var (Table 2). These seed kernels are richer in lipids than other unconventional oilseeds such as *Canarium schwenfurthii* fruits (36.1%), *Balanites aegyptiaca* almonds (48.3%) (Nzikou *et al.*, 2006) and *Dacryodes edulis* pulp (29-67.5%) (Silou *et al.*, 2006; Dzondo *et al.*, 2005) (Table 3). Their oil content is also higher than that of some conventional oilseeds: cotton seed, soybean, sunflower and rapeseed and palm fruit (Table 3). The quantity of oil extracted by solvent (51.04-73.82%) is higher than that obtained by press (34.55%).

The preceding work carried out by Womeni *et al.* (2006a,b) made it possible to extract a significant quantity of fat (70.11%) however Ekpe *et al.* (2007) obtained 66.6%.

With the aqueous extraction without enzyme, they could obtain 27.36% fat content of almonds. When one adds separately of Alcalase, Pectinex and Viscozyme one respectively obtains 34.86%, 42.24% and 67.97%.

Protein, ash and dry matter content: The ash content is 3.8%, the almond used are thus relatively pure. They must contain biogenic salts. With a proteins content of 8.71%, *Irvingia gabonensis* almonds are less rich than *Dacryodes edulis* pulp (34%) and certain current oilseeds: groundnut (48%), sunflower (34%) soya (40%) (Nzikou *et al.*, 2007).

But it is high compared to that of the majority of the cereals which return in our daily food (corn, sorghum, corn, rice etc), which generally does not exceed 13%. The content of rather high matter (99.98%) indicates that the samples are dry.

Carbohydrate and energy content: Total carbohydrate ranged from 24.80±0.10% to 30.03±0.08% in IGO and from 15.77±0.21% to 38.54± 0.78% but was generally low, due to the high levels of crude fat and crude protein. The calorific value (kcal/g sample) was highest in IGS (693.83) followed by IGO (685.29).

These energy values would meet the Food and Agriculture Organization's (FAO, 1973) recommended value of 800 to 1200 kcal if the samples were consumed at 173g per day. Individuals requiring oil-free or low oil diets should be mindful of diets prepared using the seeds investigated in this study. However, the speculation that the high lipid levels in all the samples studied may give rise to hyperlipidaemia and the associated coronary heart diseases may not be of concern due to the fact that the amount consumed per day is not high, but adequate to supply the daily energy need of the individual.

Physicochemical characterizations of oils and margarines: Oils obtained have a acidity ranging between 1.98 and 4.61% lauric acid for IGO var (Table 1) and to 1.52 and 8.97% lauric acid for IGS var (Table 2).

Each oil has a rate in free fatty acid below the limit of which the maximum is 5.0% according to NIFOR (NIFOR, 1989). The food value of a greasy substance depends on the quantity of free fatty acids (for example, butyric acid out of butter, lauric acid for lauric oils).

According to, Bassir (1971); Onyeike and Acheru (2002), an oil of kitchen must have an acid content fatty free below 3%. Oils extracted by the Soxhlet method are not specific to consumption.

The bottom grades of the % FFA indicate that these oils would be good salad oils and who can be stored for a long time without fearing deterioration due to oxidizing rancidity.

Saponification value varies between 189.92± 4.6 and 237.69± 7.2mg KOH/g for IGO var (Table 1), of 196.32±6.2 and 277.69±2.5mg KOH/g for IGS var (Table 2). The oil extracted by the method of Folch has the highest of saponification value (204.17-277.4mg KOH/g). For each var SV average value is 207.82mg KOH/g for IGO var and is 230.96mg KOH/g for IGS var. *Irvingia gabonensis* saponification value is higher than that *Dacryodes edulis* pulp oil (201) (Nzikou *et al.*, 2007) and those of oils extracted of conventional oilseeds as soya (189-195), the groundnut (187-196) and cotton (189-198) (Alimentarius Codex, 1993). The high saponification values of *Irvingia gabonensis* oil (207.82-230.96mg KOH/g) suggest that the oils could be good for soap making and in the manufacture for lather shaving cream (Eka, 1980; Nzikou *et al.*, 2007)

The iodine value lies between 4.3±0.10 and 4.8±0.09 for IGO var (Table 1) and it varies to 4.1±0. 01 and 4.9±0.05 for IGS var (Table 2). It is noted that there is no considerable difference. With an average value of 4.5, this oil is saturated in comparison with that of the pulp of

Table 1: Physicochemical properties of *Irvingia gabonensis almond* and its oil (IGO)

	Soxhlet	Folch	Bligh and Dyer	Press
Oil yield (%)	62.67±0.23	57.44±0.15	60.24±0.3	34.28±0.1
Proteins (%)		8.71±0.07		
Carbohydrate (%)	24.80±0.10	30.03±0.08	27.23±0.11	53.19±0.06
R_1	7.20±3.29	6.59±2.14	6.92±4.29	3.94±1.43
Calorific value	698.058±2.75	671.908±1.95	685.908±3.42	556.108±1.42
Ash (%)		3.8±0.08		
Moisture (%)		0.023±0.005		
AV	12.94±0.03	8.29±0.04	5.56±0.93	5.86±0.55
SV	199.50±0.04	189.92±0.06	204.17±0.09	237.69±0.1
PV	1.9±0.07	1.45±0.04	0.95±0.07	0.75±0.01
IV	4.3±0.1	4.5±0.07	4.8±0.09	4.4±0.01
Free fatty acidity (% lauric acid)	4.61	2.95	1.98	2.08

Table 2: Physicochemical properties of *Irvingia gabonensis almond* and its oil (IGS)

	Soxhlet	Folch	Bligh and Dyer	Press
Oil yield (%)	73.82±3.8	51.04±0.05	56.54±0.5	34.55±0.5
Proteins (%)		8.33±0.09		
Carbohydrate (%)	15.77±0.21	38.54±0.78	33.04±0.18	55.035±0.96
R_1	8.86±3.29	6.12±2.14	6.78±4.29	4.15±1.43
Calorific value	760.66±2.75	646.48±1.95	674.34±3.42	564.41±1.42
Ash (%)		2.06±0.03		
Moisture (%)		0.025±0.003		
AV	25.18±0.39	4.28 ±0.27	6.84 ±0.27	4.84 ±0.51
SV	198.93±0.85	251.18±1.18	277.4±0.05	196.32±0.18
PV	1.2±0.07	0.85±0.06	0.95±0.07	0.75±0.01
IV	4.9±0.05	4.4±0.3	4.7±0.02	4.1±0.01
Free fatty acidity (% lauric acid)	8.97	1.52	2.31	1.72

Proteins = N_T x 6.25; R_1= % lipids/% proteins, % Carbohydrate = 100 - [% Lipids + % Proteins + % Ash + % Moisture]
Minerals (mg/100g); Calorific value (kcalg^{-1})

Table 3: Typical oil extraction from 100kg of oilseeds

Oilseeds	Oil content from 100kg of oil seed
Cotton Seed	13
Soybean	14
Palm Fruit	20
Sunflower	32
Mustard	35
Palm Kernel	36
Canarium schwenfurthii	36.1
Rapeseed	37
Solanum nigrum L	38.00
Groundnut Kernel	42
Balanites aegyptiaca	48.3
Sesame	50
Castor Seed	*50*
Copra	62
Dacryodes edulis	29 -67.5%*
Irvingia gabonensis	34.3 -73.82

*(Silou *et al.*, 2006). The others from Nzikou *et al.*, 2007

Dacryodes edulis (60-85) (Dzondo *et al.*, 2005), *Coula edulis* (90-95), *Canarium schwenfurthii* (71-95) (Abayeh *et al.*, 1999), *Abelmoschus esculentus* (124.7) (Nzikou *et al.*, 2006), *Solanum nigrum* L (111.89) (Nzikou *et al.*, 2007).

The oils peroxide contents are Soxhlet (1.2±0.05-1.9±0.07meqO_2/kg), Bligh and Dyer (0.95±0.07meqO_2/kg) and Folch (0.85±0.06-1.45±0.04meqO_2/kg). These oils are fresh because the content peroxide lower than 10 méqO_2/kg and bus oils grow rancid when the content peroxide lies between 20.0 and 40.0méqO_2/kg (Pearson, 1976; Ojeh, 1981). In the contrary case, oils having high percentages of peroxide are unstable and grow rancid easily (an unpleasant odor). These oils are saturated; therefore there is no risk of formation of peroxides.

Fatty acids composition of oils and margarine: Fatty acid composition of the two studied seed oils is shown in Table 4.

In oil seven fatty acids were present, five of which were saturated. The most abundant fatty acids of *Irvingia gabonensis* seed kernels oil were myristic (C14:0), lauric (C12:0) and palmitic (C16:0) which together composed about 95% of the total fatty acids. The major fatty acids found in those cultivars were myristic acid (C14:0) (50.92-53.71%) and lauric acid (C12:0) (36.60-39.37%). This is in agreement with previous reports (Womeni *et al.*, 2006a; Womeni *et al.*, 2006b) who found myristic acid (C14:0) (52%) and lauric acid (C12:0) (38%) in *Irvingia gabonensis* seed kernels oil extracted by several method (aqueous with and without enzyme and solvent) from Cameroon var.

Those differences may be attributed to the variability of the studied cultivars.

Several authors reported that *Irvingia gabonensis* seed kernels oil may be regarded as myristic-lauric oil

Table 4: *Irvingia gabonensis* oil and margarines physicochemical properties

	IGS			IGO		
		Margarine			Margarine	
Fatty acids	Oil press	without lecithin	with lecithin	Oil press	without lecithin	with lecithin
C10:0	1.11	0.5	0.42	1.34	0.57	0.51
C12:0	36.60	14.24	13.17	39.37	15.13	13.83
C14:0	53.71	18.45	18.47	50.92	19.3	17.78
C14:1	0.00		0.00			
C16:0	5.23	19.01	19.56	4.97	18.47	19.15
C16:1	0.00	0.43	0.34	0.00	0.27	0.39
C18:0	0.80	2.94	2.99	0.73	2.89	3.02
C18:1n-9	1.82	36.17	36.53	1.97	35.51	37
C18:2n-6	0.49	7.07	7.23	0.48	6.85	7.11
C18:3n-3	0.00	0.61	0.63	0.00	0.63	0.64
C20:0	0.00	0.18	0.17	0.00	0.17	
C22:1n-9	0.00	0.31	0.39	0.00	0.38	0.39
SFA	97.45	55.32	54.78	97.33	56.36	54.46
MUFA	1.82	36.91	37.26	1.97	36.16	37.78
PUFA	0.49	7.68	7.86	0.48	7.48	7.75
UFA	2.30	44.59	45.12	2.45	43.64	45.53
UFA/SFA	0.02	0.81	0.82	0.03	0.77	0.84
n-3/n-6	0.00	0.09	0.09	0.00	0.09	0.09
FFA(% lauric acid)	1.72 ±0.18	1.96±0.25	1.95±0.20	2.08±0.19	2.11±0.11	1.62±0.03

Table 5: Irvingia gabonensis oil and margarines thermal analysis

	IGS			IGO		
		Margarine			Margarine	
	Oil press	without lecithin.	with lecithin	Oil press	without lecithin.	with lecithin
Peak 1 (°C)	2.07	-4.19	-3.88	2.53	-5.13	-3.88
Area (mJ)	-120.95	1.92	0.69	-122.87	1.95	-4.52
ΔH (J/g)	-12.1	0.16	0.07	-12.3	0.16	-0.45
Peak 2 (°C)	36.08	30.42	29.92	39.66	28.59	29.92
Area (mJ)	152.81	30.48	10.21	138.97	25.21	6.52
ΔH (J/g)	10.91	3.05	1.02	9.93	2.1	0.65

because myristic acid was most abundant, followed by lauric acid.

In margarine six fatty acids were present, four of which were saturated and the others are unsaturated.

The most abundant fatty acids of were margarine containing *Irvingia gabonensis* seed kernels oil were oleic (C18:1n-9), palmitic (C16:0), myristic (C14:0) and lauric (C12:0). The major fatty acids found in those margarines (with and without lecithin) were oleic acid (35.51-37%) followed by palmitic acid (18.47-19.56%) and myristic acid (18.45-19.3%) and lauric acid (13.17-15.13%). Margarine is more unsaturated than the oil which was used as raw material; it can be regarded as oleic acid source. The average contents of linoleic acid and linolenic acid are respectively of 7.07% and 0.63%, these margarines can be used for food frying (%C18:3n-3 lower than 2%).

In comparison with other oils and fat (Table 6), we note that; *Irvingia gabonensis* seed kernels oil is oil which more saturated than conventional oils saturated such as coconut oil and palm oil, it is an oil of major food frying.

Many studies showed that the Congolese mother's milk is rich in poly unsaturated fatty acids and presents also a good ratio 18:2n-6/18: 3n-3 whereas it's better between 1 and 12 (Dhellot *et al.,* 2006), in margarine the ratio is an around 11.

With UFA/SFA = 0.81, margarine (IGO-IGS) is more saturated than Butter (0.52), Ghee clarified butter (0.54) and hard margarine (0.38), however it's less unsaturated than soft margarine.

Thermal profile of oils and margarine: Differential Scanning Calorimetry (DSC) is a fast and direct way to assess the quality of oil (Gloria and Aguilera, 1998). Using this method, various physical properties of *Irvingia gabonensis* seed kernels oil can be studied.

The thermal analysis makes it possible to determine the variations of bound energy on a change of state. The temperatures of the peaks and the fusion or crystallization enthalpy are obtained by analyzing the thermo grams using the software Pyris I (Perkin Elmer Corp, Norwalk, the USA).

Table 6: Fatty acids classes content of usual edibles oils and fats (from CIQUAL Databases, AFSSA report, 2003).

Oil or Fat	SFA (%)	MUFA (%)	PUFA (%)	UFA/ SFA
Butter	66	30	4	0.52
Ghee, clarified butter	65	32	3	0.54
Canola oil	6	62	32	15.67
Coconut oil	92	6	2	0.09
Corn oil	13	25	62	6.69
Cottonseed oil	24	26	50	3.17
Grape seed oil	12	17	71	7.33
Lard	41	47	12	1.44
Hard margarine	80	14	16	0.38
Soft margarine	20	47	33	4.00
Olive oil	14	77	9	6.14
Palm oil	52	38	10	0.92
Peanut oil	18	49	33	4.56
Safflower oil	10	13	77	9.00
Soybean oil	15	24	61	5.67
Irvingia gabonensis oil	97.4	1.89	0.71	0.03
Margarine (IGO-IGS)	55.23	37.03	7.74	0.81
Sunflower oil	11	20	69	8.09

The differential thermal analysis enabled us to determine the thermo grams of fusion and crystallization of *Irvingia gabonensis* oil and margarine manufactured containing these oils. Thermogramm shows that oils and margarines have a simple polymorphism.

IGO oil exhibited a melting peak (2.53°C), a melting enthalpy (-12.29J/g) for crystallization process and second fusion peak (39.66°C) enthalpy is 9.93J/g slightly different from those of IGS oil (2.07°C, -12.1J/g and 36.08°C, 10.91J/g, respectively) (Table 5).

Margarine manufactured containing these oils exhibited a first peak at low temperature at -4°C and a second fusion peak at (30-36°C). Margarine contains two fatty acids classes (UFA and SFA).

Conclusion: Proximate analysis of *Irvingia gabonensis* seed kernels showed that they are lipids sources (34.5-73.82%). Oil extracted of *Irvingia gabonensis* seed kernels is saturated, a source of lauric and myristic acids. The thermograms analysis showed the presence of a simple polymorphism, with a fusion peak with (2.07-2.53°C) and a crystallization peak with (36.08 - 39.66°C) It is a technical fat (major frying oil) because it resists thermo oxidative, hydrolytic and enzymatic adulterations. It is a natural shortening.

The margarine manufactured with *Irvingia gabonensis* seed kernels oil has a nutritional value because it is rich in oleic acid (35.51-37%), it is an alternative solution with the trans fatty acids which have bad effects on health.

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Abbreviations: AV: Acid Value, DSC: Differential Scanning Calorimetry; FAME: Fatty Acid Methyl Ester; FFA: Free Fatty Acid
GC: Gas Chromatography, IGO: *Irvingia gabonensis* Ouesso, IGS: *Irvingia gabonensis* Sibiti, IV: Iodine Value, PUFA: Poly Unsaturated Fatty Acid, PV: Peroxide Value, SFA: Saturated Fatty Acid, SV: Saponification Value, TFA: Trans Fatty Acid, UFA: Unsaturated Fatty Acid.