Physicochemical Characterisation and Fatty Acid Profile Of *Carapa Procera* Vegetable Oil From Côte D'ivoire

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Abstract

The present work on the *Carapa procera* from Côte d’Ivoire focused on the chemical and physicochemical characterisation of the oil extracted from the seeds in view of its valorisation. The chemical and physicochemical parameters (acid number, peroxide number, iodine number, saponification number, refractive index, relative density, specific extinctions K232 and K270) were determined by assay and spectrophotometry before proceeding to the determination of its fatty acid profile by the GC/MS method. From these investigations, the following can be seen:

● Physicochemical characteristics : acid number (14±0.26), peroxide number (2.5±0.16), iodine number (74±1.57), saponification number (192.68±0.62), refractive index (1.465±0.004), relative density (0.910±0.007), specific extinctions K232 and K270 respectively (2.590±0.006 and 0.237±0.003)

● Fatty acid profile: Oleic acid (51.36%), Palmitic acid (24.97%), Stearic acid (11.1%), Linoleic acid (10.06%), Arachidic acid (1.1%), Trans-vaccenic acid (1.41%).

The characteristics determined show that the oil of *Carapa procera* from the Ivory Coast has interesting properties on the whole; therefore this oil is highly desirable for use in phytotherapy, pharmacology, and cosmetology.

Key words: Carapa procera oil, physicochemical indices, fatty acid profile.

1-Introduction

In the tropics, many plant resources with oilseeds and fruits have been exploited since ancient times by local populations [1]. The fats extracted from these oleaginous matrices are used in culinary recipes, remedies for various ailments, cosmetic products, and as a source of energy [2, 3]. Mostly called non-conventional oilseeds as opposed to conventional oilseeds such as palm oil, soybean, olive, sunflower, groundnut, etc., they are not optimally exploited due to the lack of sufficient work on the characterisation of the seeds and their oils [4]. *Carapa procera* falls within this range of plants. The species belongs to the Meliaceae family. Trees of the genus Carapa in this family are found in Africa and tropical America. The oil produced from the seeds of various species of Carapa, which is better known beyond our borders (Brazil), is now experiencing a revival in the field of organic cosmetics and parapharmaceuticals [5]. In tropical Africa, *Carapa procera* oil has many applications, but its use remains relatively marginal. Studies in the sub-region, particularly in Senegal, have shown that *Carapa procera* oil has cosmetic properties [6]. In Congo, some studies have shown that the oil has antibacterial properties [7]. It should also be noted that the work carried out in Kisangani (DRC) has shown its antibacterial properties and its effectiveness in the treatment of asthma [8]. Revealed in Côte d’Ivoire, *Carapa procera* is the only species of the genus Carapa listed by the Centre de floristique d’Aké Assi of the Université Félix Houphouët Boigny in Cocody. The extraction of the oil from the seeds and its application are still traditional. However, the oil is highly prized by indigenous populations for its analgesic, antibacterial, anti-inflammatory, antimalarial, febrifuge, and vermifuge properties during the ethnobotanical surveys conducted in local markets and in certain areas where the plant is distributed. Sylla et al. used it in combination with cocoa and palm kernel oil to make a cream and lotion against *Simulium damnosum* bites [9]. It is also used to make local soap from the crude oil plus potassium salts extracted from the ash filtrate of certain plants such as cheese and cocoa pod skins. This soap is sold here and there on the markets of the cities (Abidjan, Bouaké, and others).
under the vernacular name of black soap. Despite these noble titles, very few scientific works have focused on the characterisation of *Carapa procera* oil in Côte d'Ivoire. The objective of this work is in line with the growing interest in non-timber forest products by research in recent decades with a view to their valorisation. The present study devoted to this oil highlights the analysis of its physicochemical characteristics and the fatty acid profile.

**2- Materials and methods**

2-1- Material

The study plant material consisted of seeds from the fruits of *Carapa procera* (picture 1)

![Picture 1: Fruits and seeds of Carapa procera](image)

collected in the department of Tièbissou : 7°9’39.06”North ; 5°14’5.946”West (Aries region) Côte d'Ivoire, which is a distribution area of *Carapa procera*. The authentication of the plant was previously done from its leaves and fruits by botanists of the Centre de floristique d'ÃKé Assi of the Université Félix Houphouët Boigny de Cocody in accordance with existing herbaria. The seeds were collected from the feet of the trees in May 2019. They were then dehulled and the kernels dried in an air-conditioned room (18°C) for 21 days, then preserved in an oven (50°C) for 7 days in the laboratory of the Chemistry of Water and Natural Substances Unit, Institut National Polytechnique Houphouët-Boigny, Yamoussoukro (Côte d'Ivoire).

2-2- Methods

2-2-1- Extraction of the fat

In an agate mortar, the ground seeds (10 g) were mixed with 3 g of anhydrous sodium sulphate (Na2SO4). The mixture was placed in a cotton-covered Wattman cartridge and in an extraction chamber that was connected to a ground monocle flask. The extraction flask was filled to 3/4 of its volume with hexane and then heated for 3 h in a heating cap. The oils were obtained after removal of the solvent with a rotary evaporator (BÜCHI, rotavapor R-300) [10] and the yields were calculated according to the following Eq. (1):

\[
Rdt = \frac{m_0}{m_1} \times 100 (/) \tag{1}
\]

\[ m_0: \text{mass of extracted oil (g)} \]

\[ m_1: \text{mass of the vegetable powder (g)} \]

2-2-2- Physical and chemical analysis of the oil

2-2-2-1 Determination of physical parameters

- **Density**

Using a precision balance and a graduated tube of known mass, the density was determined according to the following Eq. (2):

\[
d = \frac{m}{V_{ae}} (2)
\]

\[ d: \text{density} \; ; \; V: \text{volume of oil} \; ; \; a_e: \text{density} \; ; \; m: \text{mass of oil used.} \]
Refraction index

The refraction index was determined with a digital refractometer (Leica AR 200 Barloworld). A volume of 2.5 mL of fatty mass (FM) was poured into the crucible of the apparatus. The reading window gives the value of the refraction index of the oil directly.

Determination of the specific extinctions K232 and K270 of the oil

The extinction coefficients K232 and K270 of the MG were defined according to the recommendations of [11]. 0.1g of oil was taken up in 10 mL of cyclohexane. After homogenisation, the specific extinctions (K232 and K270) were measured at wavelengths 232 and 270 nm using the UV-vis spectrophotometer (JASCO 530). Cyclohexane was used as a reference. The specific extinctions were calculated as Eq.(3):

\[ K_\lambda = \frac{A(\lambda)}{CS} \]  

KI : Specific extinction at wavelength \( \lambda \); \( A(\lambda) \) : Absorbance at wavelength \( \lambda \); S : Cell thickness (1cm); C : Concentration of test solution (1g/100mL)

Determination of chemical parameters

Saponification value

25 mL of 0.2 N alcoholic potassium hydroxide (KOH) are added to a ground-neck flask with a cooler, containing 0.4 g of oil. The whole is heated under reflux with constant stirring for 1 hour. Then 2 drops of phenolphthalein are added. The excess KOH is determined while hot with 0.2 N HCl under permanent stirring until the phenolphthalein is discoloured to obtain an equivalent volume (VE) [10, 12]. The determination of an oil-free control is carried out in parallel under the same conditions to provide the equivalent volume (VT). The value of the saponification number is calculated according Eq. (4):

\[ I_S = \frac{N_{HCl}(V_T - V_E)}{m} \times 56.1 \]  

\( I_s \) saponification value (mg/g); \( V_T \) : volume of HCl in the control test (mL); \( V_E \) : volume of HCl required to neutralise excess KOH (mL); \( N \) : normality of KOH; \( m \) : mass of oil (g); 56.1 : molecular weight of KOH g/mol.

Acid value

To an Erlenmeyer flask (250 mL) containing 0.4 g of the oil, 10 mL of alcoholic KOH (0.2 N) and 2 drops of phenolphthalein were added respectively. The resulting mixture was titrated with HCl (0.2 N) until the colour indicator was discoloured. The determination of a control (without oil) was carried out in parallel under the same conditions [12, 13]. The acid number is calculated according Eq. (5):

\[ I_a = \frac{N_{HCl}(V_T - V_E)}{m} \times 56.1 \]  

\( I_a \) : acid number (mg/g); \( N \) : normality of KOH; \( V_T \) : volume of KOH (mL); \( V_E \) : volume of HCl (mL); \( m \) : mass of oil (g); 56.1 : molecular weight of KOH g/mol.

Iodine value

In a ground-neck flask, 300 mg of oil was dissolved in 10 mL of chloroform (CHCl3). 2 mL of the collected solution was added to an Erlenmeyer flask (250 mL). At the same time, 2 mL of CHCl3 was added to another Erlenmeyer flask to perform the determination as a control. 2 mL of Wijs’ reagent was added to the Erlenmeyer flasks, which were allowed to
stand in the dark for 1 h. 6 mL of 10% (w/v) potassium iodide (KI) and 50 mL of distilled water were added to each Erlenmeyer flask. In both cases, with sodium thiosulphate (Na₂S₂O₃, 0.1 N), the released diiodine (I₂) was determined until the reaction mass turned pale yellow. At this point, 1 mL of starch paste was added, and the determination was carried out until decolourisation [10, 14]. The iodine value was calculated using the expression Eq. (6):

\[
I_i = \frac{N\text{H}_2\text{O}(V_T-V_E)}{m} \times 56.1 \tag{6}
\]

\(I_i\): Iodine value (g I₂/100g); \(V_T\): volume of Na₂S₂O₃ in the control test (mL); \(V_E\): volume of Na₂S₂O₃ needed to neutralise excess I₂ (mL); \(m\): mass of oil (g).

□ Peroxide value

To an Erlenmeyer flask containing 0.5 g of oil, 25 mL of a solvent mixture [15 mL acetic acid (AcOH) + 10 mL (CHCl₃) and 1 mL KI (0.2 N)] was added. The resulting mixture was stirred vigorously for 1 min and then kept in the dark for 30 min. Then 75 mL of distilled water was added. The released diiodine (I₂) was titrated with 0.1N Na₂S₂O₃ under stirring in the presence of starch paste (1mL). The determination of a control was carried out in parallel under the same conditions [10, 15]. The iodine value is calculated according to the expression Eq. (7):

\[
I_{p} = \frac{(V_E-V_T) \times N \times 1000}{m} \tag{7}
\]

\(I_{p}\): peroxide value (m₂eq of O₂/Kg of oil); \(V_T\): volume of Na₂S₂O₃ used to determine the control (mL); \(V_E\): volume of Na₂S₂O₃ used to determine the sample to be analysed (mL); \(m\): mass of the oil (g).

2-2-3 Biochemical analysis of fatty acids in Carapa procera oil

Extraction of fatty acids (FA)

After saponification, the soaps present in the aqueous phase were decomposed by the addition of 1 mL HCl (5N). The FAs were extracted with (3 × 25 mL) ethyl acetate (AcOEt). The solvent was then removed under reduced pressure with a rotary evaporator to provide a dry concentrate of FA [10] according Eq. (8):

\[
FA(\%) = \left(\frac{m'_{1}}{m'_{2}}\right) \times 100 \tag{8}
\]

\(FA\): fatty acid content; \(m'_{1}\) (g): mass of fatty acids; \(m'_{2}\) (g): mass of oil.

Determination of the lipid profile of the oil

➢ Preparation of methyl esters (micromethod for the preparation of methyl esters from a neutral fat) [16]

The methylation of the fatty acids was carried out by adding 2 drops of oil (approximately 56 mg) and 1 ml of Hexane to a 5 ml test tube, shaking the sealed tube for 2 seconds and pipetting in 0.2 ml of 2N NaOH methanolic. The stoppered tube is shaken vigorously for 10 s and then heated in a water bath at 50°C for 20 s. The removed tube is shaken for 2 s and 0.2 ml of methanolic 2N HCl is added. After shaking, the contents are left to decant. Using a syringe, the necessary quantity of supernatant for the chromatographic analysis is taken.

➢ Chromatographic analysis

The fatty acids were analysed using a gas chromatograph type HPGC Mega 2 (Carlo Erba) equipped with a vapourising injector at a temperature of 150°C. The column used was a DB5 capillary type [CPhenyl (5%), methyl (95°), polysiloxane], 30 m long, 0.32 mm internal diameter and a particle size of 0.25 mm. The temperature was programmed as follows: hold at 60°C for one minute, increase by 20°C/min to 120°C, then by 10°C/min to 280°C. Detection was carried out using a flame ionisation detector with the temperature set at 275°C. Sample injection was carried out in on-column mode and the volume injected was 1 µL. The carrier gas used was helium. External calibration was performed for each fatty acid investigated [16].
3-Results and discussion

3-1 Results

3-1-1 Fats content

The percentage of fats found in *Carapa procera* seeds (54.26%); (Table 1) shows that the oil content is above some known food oilseeds.

<table>
<thead>
<tr>
<th>Oil matrices</th>
<th>Form</th>
<th>% of oil</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Carapa procera</em></td>
<td>Seed</td>
<td>54.26</td>
<td>[24]</td>
</tr>
<tr>
<td><em>Arachis hypogea L.</em></td>
<td>Seed</td>
<td>54.5</td>
<td>[25]</td>
</tr>
<tr>
<td><em>Myrianthus arboreus</em></td>
<td>Seed</td>
<td>48.63</td>
<td>[26]</td>
</tr>
<tr>
<td><em>Afraegle paniculata</em></td>
<td>Seed</td>
<td>42.5</td>
<td>[27]</td>
</tr>
<tr>
<td>Cashew nut</td>
<td>Seed</td>
<td>49.5</td>
<td>[28]</td>
</tr>
<tr>
<td>Sesame</td>
<td>Seed</td>
<td>49.7</td>
<td>[28]</td>
</tr>
<tr>
<td>Argan</td>
<td>Seed</td>
<td>50.56</td>
<td>[29]</td>
</tr>
<tr>
<td>Rapeseed</td>
<td>Seed</td>
<td>42-43</td>
<td>[30]</td>
</tr>
<tr>
<td>Sunflower</td>
<td>Seed</td>
<td>55.5</td>
<td>[28]</td>
</tr>
<tr>
<td>Soybean</td>
<td>Seed</td>
<td>18-19</td>
<td>[29]</td>
</tr>
<tr>
<td>Olive</td>
<td>Fruit</td>
<td>18-22</td>
<td>[29]</td>
</tr>
</tbody>
</table>

*Carapa procera* oil has a golden yellow colour (picture 2).

3-1-2 Physico-chemical and biochemical characterisation of the fats

3-1-2-1 Physical parameters

The physical parameters of the fats extracted from *Carapa procera* seeds were determined. Table 2 shows the results obtained.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Mean± St. deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>K&lt;sub&gt;270&lt;/sub&gt;</em></td>
<td>0.237 ± 0.003</td>
</tr>
<tr>
<td><em>K&lt;sub&gt;232&lt;/sub&gt;</em></td>
<td>2.590 ± 0.006</td>
</tr>
<tr>
<td>Density</td>
<td>0.910 ± 0.007</td>
</tr>
<tr>
<td>Refraction index (25°C)</td>
<td>1.465 ± 0.004</td>
</tr>
</tbody>
</table>

*Mean± St. deviation: mean ± Standard deviation*
3-1-2-2 Chemical parameters

The chemical parameters of the fats of *Carapa procera* seeds were evaluated and reported in Table 3.

<table>
<thead>
<tr>
<th>Chemical parameters</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saponification value (SV)</td>
<td>192.68 ± 0.62</td>
</tr>
<tr>
<td>Acid value (AV)</td>
<td>14 ± 0.26</td>
</tr>
<tr>
<td>Iodine value (IV)</td>
<td>74 ± 1.57</td>
</tr>
<tr>
<td>Peroxide value (PV)</td>
<td>2.5 ± 0.16</td>
</tr>
</tbody>
</table>

3-1-2-3 Biochemical composition of oil

➢ Fatty acid content

The fatty acid content of *Carapa procera* oil is 78%. This confirms the generally very high fatty acid content of vegetable oils.

➢ Fatty acid profile of *Carapa procera* oil

In order to get a clear picture of the fatty acid composition of the *Carapa procera* oil, the extracted oil sample was analysed using a gas chromatogram of the HPGC type. The GC chromatogram obtained is shown in picture 4.

![Picture 4: GC chromatogram of fatty acids](image)

The peaks obtained are those of the different methylated fatty acids identified and presented in Table 4 below:
Table 4: Fatty acid composition of Carapa procera oil

<table>
<thead>
<tr>
<th>Pics</th>
<th>T.R (min)</th>
<th>Fatty acids</th>
<th>Content (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>18.53</td>
<td>Palmitic</td>
<td>24.97</td>
</tr>
<tr>
<td>2</td>
<td>27.14</td>
<td>Linoleic</td>
<td>10.06</td>
</tr>
<tr>
<td>3</td>
<td>27.75</td>
<td>Oleic</td>
<td>51.36</td>
</tr>
<tr>
<td>4</td>
<td>27.88</td>
<td>Trans-vaccenic</td>
<td>1.41</td>
</tr>
<tr>
<td>5</td>
<td>29.13</td>
<td>Stearic</td>
<td>11.1</td>
</tr>
<tr>
<td>6</td>
<td>40.53</td>
<td>Arachidic</td>
<td>1.1</td>
</tr>
</tbody>
</table>

While Table 5 shows the balance of saturated, mono- and polyunsaturated fatty acids:

Table 5: Fatty acid balance of Carapa procera oil

<table>
<thead>
<tr>
<th>Review</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>∑Saturated fatty acids SFA</td>
<td>37.17</td>
</tr>
<tr>
<td>∑Unsaturated fatty acids UFA</td>
<td>62.83</td>
</tr>
<tr>
<td>∑ Polyunsaturated fatty acids PUFAs</td>
<td>10.06</td>
</tr>
<tr>
<td>∑ Monounsaturated fatty acids MUFAs</td>
<td>52.77</td>
</tr>
<tr>
<td>SFA/UFA</td>
<td>1.69</td>
</tr>
</tbody>
</table>

3-2 Discussion
3-2-1 Fats content

The high percentage of fats found in Carapa procera seeds (54.26%) in our study confirms the hypothesis that the low water content of the seed is an indicator of a better oil yield. This rate is in line with the results reported by other authors: (55%) for Kapseu [17], (56%) for Guillemot [18], and 58% for Bazongo P., et al. in Burkina Faso [19]. However, the oil content of the seeds studied is much lower than that obtained by Nonviho in Benin (>70%) for the same sheath species [20]. The harvesting period, the extraction method, and other edaphic or environmental parameters could influence the difference in yield observed in this study. The oil content of Carapa procera seeds compared to other oilseed matrices (Table 1) shows that the oil content is above some known food oilseeds: groundnut (45-50%), sesame (49.7%), cashew (49.5%), palm kernel (48%) Benseghier [21], maize (18%-50%) (Foidl)[22]. A plant is said to be oleaginous if it contains more than 35% fats [23]. From this point of view, the percentage of fats found in Carapa procera seeds (54.26%) gives it an undisputed place in the oilseed family and makes it an important potential for oil industries.

3-2-2 Physico-chemical and biochemical characterisation of the fats

3-2-2-1 Physical parameters

The specific extinction coefficients $K_{270}$ (0.237±0.003) and $K_{232}$ (2.590±0.006) provide information on the presence or absence of secondary oxidation products in the fats because on the one hand, low values of $IP$ ($IP \leq 10$ meq O₂/Kg) in the oil do not always mean that oxidation phenomena are absent. The use of ultraviolet absorbance coefficients ($K_{232}, K_{270}$) is justified by the fact that hydroperoxides in the first stage of oxidation absorb at 232 nm, whereas secondary oxidation products (unsaturated ketones and diketones) absorb in the vicinity of 270 nm [26, 27, 31, 32]. Ultraviolet absorbance is a means of assessing the state of preservation of an oil. It is also an indicator of the influence of the extraction method and of oxidation by overexposure of an oil to air during crushing. The lower the extraction temperature (< 28°C) and the less contact with air during extraction, the lower the values for $K_{232}, K_{270}$. Their values are almost within the standard ($K_{270} \leq 0.25; K_{232} \leq 2.5$) [27, 33].
The refraction index provides information on the purity and group of the oil. With a value of around 1.467 ± 0.001, *Carapa procera* oil can be classified as a non-drying oil. This value is comparable to the refractive indices of certain vegetable oils: cotton (1.470), groundnut (1.470), *Jatropha curcas* (1.468) [34].

The density of a fat is one of the criteria for its purity. It indicates the presence of foreign bodies. The value of the density of the fats of *Carapa procera* seeds (0.910± 0.007) is almost equal to that of some known edible oils: olive (0.914-0.918), soybean (0.919-0.925), sunflower (0.918-0.923), and rapeseed (0.916).

**3-2-2- Chemical parameters**

The saponification value of the oil 192.68 ± 0.62 mg KOH/g oil (Table 3) is comparable to that determined on *Carapa procera* oil from Senegal (191.45 mg/g) [35] and Burkina Faso (193 mg/g) [19]. It is also comparable to that of soybean oil (189 - 195 mg/g), groundnut oil (187-196 mg/g), cottonseed oil (189-198 mg/g) and olive oil (184 -196 mg/g)[36]. However, this value is lower than the saponification value of coconut (248-265 mg/g) and palm kernel (230-254 mg/g) oils commonly used in soap making [37]. Other studies indicate that a saponification number lower than 200 suggests that the oil contains long chain fatty acids [38]. Thus, we are entitled to think that *Carapa procera* fats would contain mostly long chain fatty acids, and therefore could be recommended as an input in soap making [15]. It would therefore be appropriate to encourage village communities that already use *Carapa procera* oil in the manufacture of soap known under the vernacular name of koundou soap in the Baule ethnic group of the population of central Côte d'Ivoire) by traditional processes and sold on local markets. (Picture 3)

![Picture 3: handmade soap from *carapa procera* oil](image)

The acid value indicates the free fatty acids present in an oil and allows us to assess its state of deterioration. It is a measure of its stability and purity. The oil extracted from *Carapa procera* seeds has a relatively high free fatty acid content because the value of this parameter (14 ± 0.26 mg KOH/g) (Table 3) is above the required standard (< 4 mg KOH/g) [39]. This value is in the same range as (AI) determined by Medina Fall [40] in Senegal for the same species, which is (10-20 mg KOH/g) as well as that of olive oil, which varies from 2 to 16 mg/g. This high (AI) value can be attributed to the treatment of the seeds before extraction and the conservation of the oil. However, if such an oil is to be consumed, it should be refined to reduce the free acidity, as are many other known common oils whose acid value is above the required standard: coconut (4-7), palm kernel (4.7), groundnut (6) and soybean (7) [38], prior to food use.

The iodine value of a lipid is the mass of I₂ expressed in mg that binds to the double bonds of the fatty acids in 100 g of sample. It measures the degree of unsaturation of the fatty acids. The iodine value of the analysed oil is (74 ± 1.57) g iodine/100g oil (Table 3). Based on this value, we can conclude that *Carapa procera* seed oil is rich in moderately unsaturated fatty acids [41]. This oil could have the same unsaturated fatty acid composition as olive oil. It should be remembered here that the iodine value of olive oil is (75-94) [38]. The iodine index (Ii) makes it possible to highlight the drying properties of oils. Thus, an oil is said to be non-siccative when Ii < 100, semi-siccative when 100 < Ii <130 and siccative when 130 < Ii [42]. With regard to these values, we can classify *Carapa procera* oil from Côte d'Ivoire as a non-siccative oil.

Determination of the peroxide value makes it possible to assess their level of primary oxidation by oxygen. The value obtained 2.5 ± 0.16 meq O₂/kg for *Carapa procera* oil (Table 3) is relatively low ; a value lower than the 10 meq O₂/kg oil limit required for most conventional oils [39,43]. This low PV value can be explained by the richness of *Carapa procera* oil in natural antioxidant substances (tocopherols, polyphenols, and carotenoids). This also shows that it is protected from oxidation. The peroxide value is an indicator of quality and not of safety, as its high value means a high presence of...
The oil extracted from carapa procera seeds occupies an important place in the lives of rural populations in many African countries, especially in the West African zone. In Côte d’Ivoire, the oil has been used traditionally for generations for various applications (soap making, treatment of skin diseases, incurable wounds, coughs, massage against rheumatism and inflammations, and for coating art objects). In a perspective of its valorisation, this work has been given as a first step the characterisation of the Carapa procera seed oil. Thus, the physicochemical indices determined indicate interesting physicochemical properties on the whole. However, the high acid index (14 ± 0.26) shows that precautions must be taken during the extraction and conditioning of the oil in order to limit a degradation of its physicochemical and functional quality. The overall analysis of the different properties studied shows that this oil could be used in several fields, including agri-food, oleochemistry, pharmacology and cosmetology. May this work serve as a support to initiatives of projects of valorisation of this very used species, however threatened by bush fires and deforestation.
Références


