



Phytochemicals, Physico-Chemical and Fatty Acid Composition of Oil Extracted from *Carica Papaya* (Papaw) Seed

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ABSTRACT

Carica Papaya is an economically important tropical herbaceous plant with numerous biological activities. In local medicine, different parts of *C. Papaya* (leaves, stems, roots, fruits, and seeds) are utilized in the treatment of various ailments. The seeds are rich in fibre and thus have the ability to regulate our bowel movements, removing toxins from the body and maintaining a healthy gut. The carpain present in *Carica papaya* helps kill bacteria and parasites thus keeping our digestive system healthy. This study investigated the phytochemicals, physicochemical properties, and fatty acid characterization of oil extracts of *Carica Papaya* (Papaw) Seed flour. Fatty acid composition was determined using a Gas chromatograph (model 8700; Perkin Elmer) and phytochemicals as well as physicochemical properties were determined using standard analytical methods. The results of the physicochemical properties of the oil were 2.810 ± 1.040 mg KOH/g for acid value, iodine value 22.000 ± 8.000^c peroxide values 17.000 ± 2.646^b, Free fatty acid (FFA) 0.180 ± 0.009^a mEq/kg, refractive index 1.335 ± 1.010^a and specific gravity 0.895 ± 0.052^a. The low acid, free fatty acid and peroxide value suggested the edibility of oil and stability to oxidative rancidity during storage. The fatty acid profile revealed that the oil contained appreciable amount of unsaturated fatty acids such as Oleic acid (13.420 ± 0.026%), Linoleic acid, 24.640 ± 0.040 %, Linolenic Acid 4.750 ± 0.026^c%, Arachidonic acid, 2.950 ± 0.160^b and Palmitoleic acid 2.290 ± 0.173 % with Linoleic acid, being the most abundant fatty acid. However, the result of total fatty acid composition showed that seed oil contained relatively the same amount of unsaturated fatty (48.05 %) and saturated fatty acid (51.95%), thus making it nutritionally important if properly refined and industrially valuable. The results in this study suggested the *C. papaya* seed might be incorporated into existing foods, to solve the problems of malnutrition and other health related issue.

Keywords: *Carica Papaya*, oil seed, phytochemicals, physicochemical properties, fatty acid

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Introduction

The zeal to reduce the huge amount of money spent on the importation of oil for domestic and industrial utilization has given renewed hope and interest in searching for new sources of energy to complement the locally available ones. One of the main problems in the full utilization of under-estimated oil is inadequate scientific information on its chemical, nutritional and toxicological properties. Apart from the utilization of oils, in general, primarily as edible ones for human consumption or as non-edible grades in industries. Studies have shown that they may be profitably used as raw materials for biodiesel production if their physicochemical properties are suitable (Achten *et al.*, 2008; Divakara *et al.*, 2010) There are several under-valued plant seeds in Nigeria. They are important source of domestic, industrial and medicinal importance (Lateef, 2018). Thus, attention has been shifted to these underutilized seeds for possible utilization in Nigeria.

Pawpaw (*Carica papaya*) is a member of *Caricaceae* family. It is a widely grown perennial, tropical tree and important fruit cultivated throughout the tropical and sub-tropical region of the world. Papaya is short lived, fast growing, woody, large, perennial herb, up to 10m height with self-supporting stems. Papaya normally grows as single stemmed plant but may become multi-stemmed when damaged. Makanjuola *et al.* (2018) reported that ripe papaya is consumed as fruit, un-ripe papaya as cooked vegetable, as ingredient in papaya salad and cooked dished as well. The attention has now been shifted to the use of underutilized seeds for as alternative to the expensive commercially available oils in the market. Thus, this research work focused on the determination of phytochemicals, physicochemical properties, and fatty acid composition of oilseed in order to know their suitability for edible purposes and as a raw material for biodiesel production in industries.

Materials and Methods

Collection of Pawpaw (Carica papaya) Seeds

Pawpaw (*Carica papaya*) seeds were purchased from Orisumibare market in Osogbo Local Government Area of Osun state, the South-West part of Nigeria. The seeds were carefully removed from pods, thoroughly washed, sun-dried, ground into powder and kept in an air-tight container prior to analysis.

Oil Extraction

The seed oil was extracted separately using the continuous Soxhlet extraction method with petroleum ether (60 °C.) for 7 h. The solvent was removed completely and the oil obtained was used for both fatty acid and physicochemical properties determination. All the reagents used are analytical grade and apparatus used were obtained from the chemistry lab at Adeleke University.

Determination of total phenolic content

The determination of total phenolic content was carried out according to the AOAC, (2005).

The samples (100 g) were extracted, by stirring with 250 mL of methanol for 3 h. The extracted samples were then filtered through Whatman No. 1 filter paper, the residue was washed with 100 mL methanol, and the extracts were cooled. The extracts were evaporated to dryness under vacuum, using a rotary evaporator. The residues were dissolved with 10 mL of methanol and used for determination of total phenolic compounds. This determination was performed as gallic acid equivalents (mg/ 100 g), by using Folin-Ciocalteu phenol reagent. The diluted methanol extracts (0.2 mL) were added, with 0.8 mL of Folin-Ciocalteu phenol reagent and 2.0 mL of sodium carbonate (7.5%), in the given order. The mixtures were vigorously vortex-mixed and diluted to 7 mL of demonized water. The reaction was allowed to complete for 2 h in the dark, at room temperature, prior to being centrifuged for 5 min at 125 g. The

supernatant was measured at 756 nm on a spectrophotometer. Methanol was applied as a control, by replacing the sample. Gallic acid was used as a standard and the results were calculated as gallic acid equivalents (mg/100 g) of the sample.

The reaction was conducted in triplicate and the results were averaged.

Determination of total flavonoid

This was determined according to the method recommended by Harborne, (1973). About 5g of the sample was boiled in 50 mL of 2 mol/L HCl solution for 30 min under reflux. The contents were allowed to cool and then filtered through a Whatman No. 42 filter paper. A measured volume of the extract was treated with equal volume of ethyl acetate starting with a drop. The flavonoid precipitated was recovered by filtration using weighed filter paper. The resulting weight difference gave the weight of flavonoid in the sample.

Determination of tannin content

Tannin content of the flour samples was determined using the methods described (Kirk and Sawyer, 1991). The sample (0.2 g) was measured in a 50mL beaker; 20 mL of 50% methanol was added, covered with homogenizer, placed in a water bath at 77–80°C for 1 h, and the contents stirred with a glass rod to prevent lumping. The mixture was filtered using a double-layered Whatman No. 1 filter paper into a 100mL volumetric flask using 50% methanol to rinse. This was made up to mark with distilled water and thoroughly mixed. One milliliter of the sample extract was homogenized into a 50mL volumetric flask, and 20 mL distilled water, 2.5 mL Folin-Denis reagent, and 10 mL of 17% Na₂CO₃ were added and mixed. The mixture was made up to mark with distilled water, thoroughly mixed, and allowed to stand for 20 min when a bluish-green coloration developed. Standard tannic acid solutions in the range of 0–10 ppm were treated similarly as the 1 mL sample above. The

absorbance of the tannic acid standard solutions as well as samples was read after color development on a Spectronic 21D spectrophotometer at a wavelength of 760 nm.

Determination of alkaloid

Determination of alkaloid was made by the method described by Harborne (1973). The alkaloid content was determined gravimetrically. About 5g of the sample was weighed and dispersed in 10% acetic acid solution in ethanol to form a ratio of 1:10 (10%). The mixture was allowed to stand for 4 h at 28°C. It was later filtered via Whatman No. 42 grade of filter paper. The filtrate was concentrated to one quarter of its original volume by evaporation and treated with drop wise addition of concentrated aqueous NH₄OH until the alkaloid was precipitated. The alkaloid precipitated was received in a weighed filter paper, washed with 1% ammonia solution, and dried in the oven at 80°C. Alkaloid content was calculated and expressed as a percentage of the weight of sample analyzed.

Determination of Saponins

The spectrophotometric method was used for Saponins analysis as described by Brunner (1984). About 1g of the flour sample was weighed into a 250mL beaker and 100 mL isobutyl alcohol was added. The mixture was shaken on a UDY shaker (UDY Corporation, Fort Collins, CO) for 5 h to ensure uniform mixing. The mixture was filtered through a Whatman No. 1 filter paper into a 100mL beaker and 20 mL of 40% saturated solution of magnesium carbonate was added. The mixture obtained was further filtered through a Whatman No. 1 filter paper to obtain a clear colorless solution. One milliliter of the colorless solution was homogenized into a 50-mL volumetric flask and 2 mL of 5% FeCl₃ solution was added and made up to mark with distilled water and allowed to stand for 30 min for blood red color to develop. Standard Saponins solutions (0–10 ppm) were prepared from Saponins stock solution and treated with 2 mL of 5% FeCl solution as done for

experimental samples. The absorbance of the sample as well as standard Saponins solutions were read after color development on a Spectronic 21D spectrophotometer

Determination of Phytates

The bi-pyridine colorimetric method (Kirk and Sawyer, 1991) was used. 5 cm³ of sample was mixed with 50 cm³ of dilute HCl solution for 30 minutes. It was filtered and the filtrate (extract) was used for the analysis. About 5cm³ of the extract was dispensed into a flask and treated with 1 cm³ of the 2, 2-bipyridine solution. Meanwhile, standard Phytate solution (sodium phytate) was prepared and 1 cm³ portion of it was treated with the bi-pyridine solution as described for the sample extract. The absorbance of the sample extract and the standard Phytate solution were read in a spectrophotometer at 510 nm with the reagent blank at zero.

Determination of oxalate content

Oxalate was determined by (AOAC, 2005) method. One gram of the sample was weighed in a 100-mL conical flask. Seventy-five milliliters of 3 mol/L H₂SO₄ was added and the solution was stirred intermittently with a magnetic stirrer for about 1 h and then filtered using Whatman No. 1 filter paper. The sample filtrate (extract) (25 mL) was collected and titrated against hot (80–90°C) 0.1 N KMnO₄ solution to the point when a faint pink color appeared that persisted for at least 30 sec. The concentration of oxalate in each sample was obtained from the calculation

Determination of Acid Value

The acid value was determined according to AOAC, 2005).

About 1.0g of oil was weighed and dissolved with 50 ml of ethanol in a conical flask. Two drops of phenolphthalein indicator were added and titrated to pink colour end point (which persisted for 15

minutes) with 0.1 N Potassium Hydroxide solutions (KOH).

$$\text{Acid value} = \frac{56.1 \times V \times C}{m}$$

Where 56.1 is equivalent weight of KOH,

V is the volume in ml of standard KOH solution

C is the molar concentration of KOH solution

m is the weight of oil (1 g).

Determination of Peroxide Value

The peroxide value of the oil was measured according to Association of Official Analytical Chemists (AOAC) method (Horwitz, 2005).

About 5g of each oil sample was weighed into 250 mL glass stopper flask, 20 mL of acetic acid -20 mL chloroform mixture was added and heated gently and mixed. About 0.5 mL of saturated KI solution was also added, followed by the addition of 30 mL of distilled water. It was shaken and allowed to stand for 1 minute. This was slowly titrated with 0.1 N Na₂S₂O₃ with thorough shaken until the yellow is almost disappeared. 0.5 mL 1% starch solution was added, and the titration continued with shaking until the blue color just disappeared. Blank titration was also carried out using the same procedure as oil sample.

$$\text{Peroxide value} = \frac{(S - b) \times N \times 1000}{\text{Weight (g)}}$$

Where:

S = titre value of the oil sample

b = titre value of the blank sample

N = Normality of Na₂S₂O₃ solution.

Determination of Iodine Value

The Iodine value of the oil was carried out by the method of Association of Official Analytical Chemists (AOAC) (Horwitz, 2005).

About 0.1g of oil sample was weighed into a dry glass stopper bottle of 250 mL capacity. About 10

mL of carbon tetrachloride was added. 20 mL of wajs solution was also added and the stopper was inserted (previously christened with potassium iodine solution) and allowed to stand in the dark for 30 minutes. About 5mL of potassium iodine solution (10%) and 100 mL of water were added and mixed. It was then titrated with 0.1 M thiosulphate solution using starch indicators just before the end point. Blank titrations were also carried out at the same time.

$$\text{Iodine Value} = \frac{(B - A) \times N \times 12.69}{\text{Wt. (g)}}$$

Where:

A = titre value of the sample

B = titre value of the blank

N = Normality of thiosulphate solution

Determination of Refractive Index

The refractive index (RI) of the oil samples were measured using a precision Abbé refractometer (Bellingham & Stanley, U.K.) having a measuring range of refractive index of 1.300–1.700 with the accuracy within ± 0.0002 . A thin layer of oil was sandwiched between illuminating and refracting prisms. The sample was then illuminated with monochromatic light from sodium vapor lamp, and the refracting index was taken.

Determination of Free Fatty Acid

The free fatty acid (FFA) content of the oil was measured according to Association of Official Analytical Chemists (AOAC) method (Horwitz, 2000). About 1 g of each oil sample was mixed with 2 ml phenolphthalein solution and a few drops of 0.1 M NaOH. 50 ml of ethanol was then added to the solution and vigorously shaken until a permanent faint pink solution remained, which was then titrated with 0.25N NaOH. The volume of spent NaOH was recorded as S(amount of free acid). For the control measurement, the titration step was repeated on a blank solution without the oil sample and the volume of spent NaOH was

taken as B. The percentage of Free Fatty Acid was calculated as;

$$\% \text{ FFA} = \frac{(B - S) \text{ ml of NaOH} \times N \times 56}{1.99 \times \text{weight of sample}}$$

Where N is the normality of titrant NaOH

Determination of Specific Gravity

Specific gravity bottle was used in measuring the density/specific gravity. Cleaned, dried pycnometer was weighed. It was filled with water maintained at 20 °C and weighed again. The bottle was emptied, dried, filled with oil and weighed. The value was calculated as:

$$\text{Specific gravity} = \frac{\text{Weight of oil}}{\text{Weight of water } 20^\circ \text{C}}$$

Results and Discussion

Table 1 presented the results of the phytochemicals screening of *Carica papaya* (pawpaw) seed oil. Phytochemicals are non-nutritive chemicals found in plants. They were reported as antibiotic principles of plants and they offer health benefits (prevent cell damage and fight infections) in plants and animals when ingested by them in food (Ajayi, *et al.*, 2011). The phenolic content 148.857 ± 1.286 in this study was significantly higher than 40.00 ± 0.00 and $23.00 \pm 1.00^\circ$ reported for raw and fermented *Moringa oleifera* seed flours (Ijarotimi *et al.*, 2013). Flavonoids have been reported to possess substantial anti-carcinogenic and anti-mutagenic activities due to their anti-oxidant, anti-inflammatory properties and also active in reducing high blood pressure (Ayinde *et al.*, 2007 ;Li-Weber, 2009). The flavonoid content of 40.901 ± 0.852 reported in this study was higher than watermelon seed 16.08° , pear seed 14.07 and Benoil seed flour 13.09 (Olorode *et al.*, 2014). However, reports showed that tannins possess medicinal and health benefits including inhibition of pathogenic fungi, stimulation of phagocytic cell for body defense and lost mediated tumor activity. The tannin content 7.849 ± 0.408 obtained in this

study was significantly lower than raw 241.67±1.67 and fermented 146.673±3.33° *Moringa oleifera* seed flour (Ijarotimi *et al.*, 2013). However, this value was a bit higher than *P. macrophylla*, 0.67 ± 0.01, *I. gabonensis*, 0.51 ± 0.03, *T. conophorum* seed flour 0.67 ± 0.01 (Okwulehie and Ukasoanya, 2021) and in agreement with 6.883±0.102 reported for watermelon seeds flour (Olorode *et al.*, 2014) and bitter gourd (*M. charantia*) seed flour 6.20±0.5 (Oyeleke *et al.*, 2023)The appreciable amount of tannin reported in this study implied that *Carica papaya seed* flour might possess some health benefits when used as supplement in baby foods. Alkaloids are widely used as basic medicinal agents for their analgesic, antispasmodic and bactericidal effects (stray, 1998). The alkaloid content of the seed flour (2.267± 0.153%) was lower when compared with Bitter gourd (*M. charantia*) seed flour 14.41 + 0.05% (Oyeleke *et al.*, 2023) and in close range with 3.09% reported for soursop seed flour (Onyechi *et al.*, 2014).This suggested that seed flour could be used as a source of photochemical to combat heart related ailments.

Table 1: Phytochemicals of seed oil

Parameter	Amount
Phenolic	148.857 ± 1.286
Flavonoid	40.901 ± 0.852
Tannins	7.849 ± 0.408
Carotenoid	7.665x10 ⁻⁶ ± 0.000
Alkaloid	2.267 ± 0.153
Terpenoid	3.433 ± 0.208
Oxalate	0.155 ± 0.110
Phytate	3.715 ± 0.190
Saponin	1.300 ± 0.200

The terpenoid content 3.433 ± 0.208 obtained in this study was lower than 20.00 ± 0.11 and 25.00 ± 0.13 reported for raw and fermented *Moringa oleifera* seed flour (Ijarotimi *et al.*, 2013). Phytates and oxalate are recognized as anti-nutrient because both interfere with digestion and

absorption of dietary mineral by chelating which render such mineral insoluble in their new forms and hence unavailable for absorption and utilization in the body. The Phytates content 3.715 ± 0.190 of the seed flour was lower when compared with 78.33±1.67for *Moringa oleifera* seed flour (Ijarotimi *et al.*, 2013) and higher than 0.61 ± 0.03, 0.35 ± 0.02 and 0.50 ± 0.03 reported for *Pentaclethra macrophylla*, *Irvingia gabonensis* and *Tetracarpidium conophorum* (Okwulehie and Ukasoanya, 2021).

The oxalate content 0.155 ± 0.110 of the seed flour was lower when compared with *P. macrophylla* 0.45 ± 0.02, *I. gabonensis* 0.43 ± 0.01, *T. conophorum* seed flour 0.51 ± 0.02 (Okwulehie and Ukasoanya, 2021). The low content of Phytates and oxalate reported in this study indicated that there wouldn't be interference with the absorption of dietary minerals in the body when consumed as supplement for maximum utilization. Certain phytochemicals (such as Saponins) were reported to have pharmacologically active effects on seed flour (Soetan and Oyewole, 2009). Saponins content 1.300 ± 0.200 reported in this study was lower than 8.41±0.01reported for soursop (*Annona muricata*) seed flour (Onyechi *et al.*, 2014) and 3.42± 0.01for Bitter Gourd (*M. charantia*) seed flour (Oyeleke *et al.*, 2023) The Saponin content in this study compared favourably with the report of (Oseni and Okoye, 2013) on watermelon seed.

Table 2 presented the results of the physiochemical analysis of *Carica papaya* pawpaw seed oil. The specific gravity value obtained in this study was 0.895 ± 0.052. This value was a bit higher than 0.6271 for *N. sativa* oil, (Adeleke *et al.*, 2021) and lower than castor seed oil 0.958 (Akpan *et al.*, 2007). The refractive index reported in this study was 1.335± 1.010 which was in close range with 1.462 of Akee pulp seed oil (Akintayo and Bayer, 2002) and 1.468 (Akpan *et al.*, 2007). This indicated that seed oil was less thick than most of drying oils whose refractive indices range from 1.475 to 1.485 (Andualem and Gessesses, 2014).

Table 2: Physiochemical properties of *Carica papaya* oil

Parameters	Amount
Acid value (mgKOH/g)	2.810 ±1.040
Iodine value (g/100g)	22.000 ±8.000
Peroxide value (mEq/kg)	17.000 ±2.646
Refractive index (RI)	1.335 ±1.010
Free fatty acid (FFA)	0.180 ±0.009
Specific gravity	0.895 ±0.052

The acid value obtained in this study was 2.810 ±1.040. This value was lower when compared with 9.02±0.34 reported for *Blighia sapida* seed oil (Tsado *et al.*, 2018) *Plukenetia Conophora* seed oil 11.5 mg/g (Akintayo and Bayer, 2002) and in agreement with 2.02 mg KOH/g for *N. sativa* seed oil (Adeleke *et al.*, 2021). However, the value reported in this study fell within the permissible limit of 3.0 mg KOH/g for edible oils, thus indicating that the oil is edible and good for consumption. The free fatty acid is an indication of edibility of oil. The value in this study was 0.180 ±0.009 mg KOH/g. This value was lower than 1.10 ± 0.53 % reported for *Tamarindus indica* oil (Adeleke *et al.*, 2021) and 5.4mg KOH/g cashew kernel oil (Akinhanmi and Atasi, 2018). The iodine value measures the degree of unsaturation in oil and is a useful indicator in quantifying the amount of double bonds present in the oil which in turn reflects its susceptibility to oxidation (Bello *et al.*, 2011). The iodine value in this study was 22.000 ±8.00 mg I₂/g. The value was significantly lower than 0.92 ml₂/g, *Piper guineense* oil, (Ogbonna *et al.*, 2015) and in agreement with 2018 mg I₂/g for *Hura crepitans* seed oil (Oderinde *et al.*, 2009). Oils with iodine values less than 100 ml₂/g are known as non-drying oils. This suggested that *Carica papaya* oil was non-drying oil and could be useful in the manufacture of soaps and can be regarded as liquid oil (Aremu, 2006). The peroxide

value is a measure of rancidity in oils, thus a high peroxide value of oil indicates a poor resistance of the oil to peroxidation during storage (Mohammed and Hamza, 2008). The low peroxide value in this study implied that the oil is stable and would not go rancid during storage.

Table 3 presented the fatty acid composition of *Carica papaya* seed oil. The GC-MS spectrum of the oil revealed the presence of seven compounds with their percentage concentrations. The saturated (nonessential fatty acid) present in pawpaw seed oil were Lauric acid (2.100 ±0.010), Palmitic acid (20.180 ± 0.010 %), Stearic acid (8.390± 00.355^d%), capric acid (2.920 ± 0.010%), caprylic acid (4.000 ± 1.000^c%), Margoric acid (10.380 ± 0.040%), and, Lignoceric acid(3.980 ± 0.026%). While the unsaturated (essential fatty acids) were; Oleic acid (C₁₈H₃₄O₂ 13.420 ±0.026% Linoleic acid (C₁₈:2) 24.64 ±0.026 % and Arachidonic acid 2.905 % and Palmitoleic acid 2.290 ± 0.173 % respectively. The predominant fatty acids were Linoleic acid (24.640 ± 0.040 %), oleic acid (13.420 ±0.026) and palmitic acid (20.180 ± 0.010 %) respectively while Arachidonic acid (C₂₀H₃₂O₂) 2.950 ±0.160, Palmitoleic acid (C₁₆H₃₀O₂) 2.290 ±0.173. Capric acid (C₁₀:0) 2.920 ±0.010 and Lauric acid 2.100 ± 0.010 were the least abundant acids. The total saturated fatty acid (51.95 %) was slightly higher than the unsaturated fatty acids (48.05 ± 0.026^c± 0.010 %). These oils contain important fatty acid which are major sources of energy and are also needed in the body for proper functioning (Derle *et al.*, 2016). Linolenic acid derivatives serve as structural components of the plasma membranes and are precursors of some metabolic regulatory compounds Ajayi *et al.*, 2004). The linolenic acid content 4.750 ± 0.026^f in this study was higher than (0.618%) (4.10%) and (1.50%) reported for Baobab (*Adenosine digitations*) seed oil (Tsado *et al.*, 2018). Linoleic acid content (C₁₈:2) 24.640 ± 0.040 % reported in this study was lower when compared with (44.967%) for *Tamarindus indica* oil (Adeleke *et al.*, 2021).

Oleic acid which is the mono-unsaturated fatty acid playing the role of anti-inflammatory fatty acid, and in the activation of different pathways of immune competent cells (Jacobsen *et al.*, 2010). The Oleic acid (13.420 ± 0.026) in this study was lower than 25.260 reported for *Nigella sativa* seed oil and in close range with 15.19% for *Blighia sapida* seed oil (Tsado *et al.*, 2018). The presence of oleic acid and linolenic acid made the seed oil nutritionally valuable.

Table 3: Fatty Acid Composition in Pawpaw and Black Plum Seed

Fatty acids	(wt %)
Palmitoleic acid (C ₁₈ H ₃₄ O ₂)	2.290 ±0.173
Myristic acid (C ₁₄ H ₂₈ O ₂)	Nil
Stearic acid (C ₁₈ H ₃₆ O ₂)	8.390±00.355
Palmitic acid (C ₁₆ H ₃₂ O ₂)	20.180 0.010
Oleic acid (C ₁₈ H ₃₄ O ₂)	13.420±0.026
Lauric acid (C ₁₂ H ₂₄ O ₂)	2.100 ±0.010
Margaric acid (C ₁₇ H ₃₄ O ₂)	10.380±0.040
Arachidonic acid (C ₂₂ H ₄₂ O ₂)	2.950 ±0.160
Caprylic acid (C8:0)	4.000 ±1.000
Capric acid (C10:0)	2.920 ±0.010
Linoleic acid (C18:2)	24.640±0.040
Lignoceric acid (C24:0)	3.980 ±0.026 ^e
Linolenic Acid (C18:1)	4.750 ±0.026 ^f
TSFA	51.95 %
TUSFA	48.05 %
PSFA	32.34%
PUFA	32.34%
MSFA	19.61 %
MUFA	15.71%
Total	100

PSFA- Polysaturated Fatty Acid
SFA- Saturated Fatty Acid
USFA - Unsaturated Fatty Acid
MUFA- Monosaturated Fatty Acid

The Linoleic acid ($24.640 \pm 0.040\%$) in this study was lower than (42.6%) reported for *Ceiba pentandra* seed oil (Ajayi *et al.*, 2014) and significantly higher than (7.85%) for *C.bonduc* seed oil (Adeleke *et al.*, 2021). Fermented $0.810 \pm 0.011^b\%$ and unfermented $0.330 \pm 0.001^a\%$ *Annona. squamosa* seed oil (Awojide *et al.*, 2023). The Linoleic and oleic acid values reported in this study showed that *Carica papaya* seed oil has high nutritive value. However, the value was greatly lower than $54.356 \pm 1.52 \%$ for *Nigella sativa* seed oil reported by Adeleke *et al.* (2023). This result was somewhat different from that reported by Sarkiyayi *et al.* (2009) who reported 42.6, 20.9, 20.8, 13.7 and 1.9% for Linoleic, palmitic, oleic, Stearic, and linolenic acids respectively in *Ceiba pentandra* seed oil and Stearic Acid ($3.426 \pm 0.27\%$), Behenic Acid ($0.356 \pm 0.13 \%$) and Lignoceric Acid (0.960%) reported by Adeleke *et al.* (2023) for Black plum seed oil. *Carica papaya* seed oil contained total saturated fatty acids of 51.95% and unsaturated fatty acids of 48.05% respectively. The appreciable amount of saturated and unsaturated fatty acids in seed oil suggested its usefulness in both domestic and industry.

Conclusion

The present study on phytochemicals, physicochemical properties, and fatty acid composition of *Carica papaya* pawpaw seed oil revealed that the seed flour is a good source of phytochemicals that are very effective in combating the free radicals responsible for cancer and many hearty related diseases in the body, The results of physicochemical properties suggested that *Carica papaya* oil was a non-drying oil, edible, more stable to oxidative rancidity and could be useful in the manufacture of soaps and vegetable oil based cream. The fatty acid analysis revealed that the oil might be useful domestically and industrially due to the appreciable amount of saturated and unsaturated fatty acid contents.

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Conflicts of Interest

The authors declare that they do not have any conflicts of interest regarding the publication of this paper.

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