Comparative Assessment of the Physicochemical Properties and Fatty Acid Profile OF Virgin coconut Oil with Some Commercial Vegetable Oils in Rivers State, Nigeria

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Abstract

The objective of this work was to characterize and compare the physicochemical properties and fatty acid profile of virgin coconut oil with some commercial vegetable oils used in Rivers State, Nigeria. The commercial vegetable oils were: soyabean, groundnut, palm olein and sunflower oils. Virgin coconut oil was extracted using the cold press method. The oils were analysed for chemical composition, physical properties, and fatty acid profile. cloud point (CP) and slip melting points (SMP) ranged from 0.00 to 9.00 °C and 0.60 to 24.12 °C. Cloud point and melting point of coconut oil was significantly higher with values of 9.00 and 24.12 °C, respectively. Smoke and flash points of sunflower oil were significantly higher, with values of 247.50 and 309.50 °C, respectively. Density of the oils ranged from 0.9005 to 0.9096 g/ml. There was no significant difference (p>0.05) in the specific gravity of virgin coconut oil (VCO) and that of palm olein. Ester value and saponification value of VCO were respectively 260.60 and 260.71 mgKOH/g. Iodine value (IV) of VCO was 5.72 g/100g, while soyabean oil gave significantly higher IV of 127.70 g/100g. Lauric acid (C12:0) was the predominant fatty acid in VCO (48.76 %), while soyabean and sunflower oils contained 8.01 and 4.07 % omega-3 fatty acid, respectively. Coconut oil is recommended for culinary operations due to its high content of lauric acid.

***Key Words**: Coconut oil, Commercial Vegetable Oils, Physicochemical, Fatty Acid Profile*

1. Introduction

The need for food and nutrition security is a major concern in most developing countries. Fats and oil are major nutrients noted for their high energy potentials. They provide essential fatty acids which are the building blocks for the hormones needed to regulate body systems. Fats and oil are concentrated sources of energy, and a carrier for vitamins A, D, E, and K (Stevenson *et al.*, 2007). They provide mouth feel, texture, and impart flavour, thus enhancing the quality of food we eat, and also contributes to the feeling of satiety after eating (Stevenson et al., 2007). Fats and oils find functional application in food processing and food preparation, as tenderizing agents, enhancing dough aeration and shortening functions (CIA, 1996). They carry flavors, and colour. Lipids (fats and oil) also provide a heating medium for food preparation (Katragadda *et al*., 2010). This all-important nutrient is sourced in many foods, such as fish, meats, dairy products, seeds and nuts. Commercially available vegetable oils in Nigeria are sourced predominately from palm fruits/kernel, groundnuts, and soyabeans. Insufficient vegetable oils in Nigeria markets and its corresponding high cost now call for greater attention to be given to sourcing vegetable oils from other underutilized oil seeds.

Coconut (Cocos nucifera L) has been described as the most important and extensively grown palm tree worldwide providing food for millions of people especially in the tropical and sub-tropical regions. The most important coconut producing countries in the world include the Philippines, Ceylon, India, Malaysia, Oceania and parts of West Africa including Nigeria (Prades et al., 2012). It is one of the oldest crops grown in India and presently covers 1.5 million hectares in this country with a total production of over 10,000 million nuts. Every part of the plant is useful and, in many ways, support human life (Chan and Elevitch, 2006). The fruit has multifarious utility; the tender coconut water is a sweet refreshing drink taken directly from the inner parts of coconut fruit (Steiner and Desser, 2008). For years' coconut has been produced in Nigeria for human consumption while in some countries in the world it is one of the economic legacies. Recently Nigeria is becoming conscious of its economic importance. Research and development on coconut-based food products has taken place over a long period of time and new knowledge and technologies have contributed to the diversification of products and byproducts which have in turn opened up new industries in world. Coconut fruit is very important fruit because of the nutritional value and the critical role that it plays in improving food security in the world. Its classified as a 'functional' food. Due to the healing properties and health benefits, coconut fruit is of special interest beyond its nutritional content, especially in traditional medicine. It is used in the alleviation of asthma, bronchitis, dysentery, flu, irregular or painful menstruation, ulcers and kidney stones (Chan and Elevitch, 2006). The oil is also used to treat blisters and burns, improve skin tone and soothe sunburns. The oil provides health benefits such as; help prevent obesity by speeding up metabolism. Providing an immediate source of energy with fewer calories than other fats. It is a treasure trove of minerals, vitamins, antioxidants and is an excellent nutraceutical. It has about 50 percent lauric acids, having qualities similar to mother's milk, thus confirming its disease-fighting ability (Che Man and Marina, 2006). Virgin coconut oil (VCO) is produced from the fresh coconut milk and can be defined as "oil obtained from the fresh, mature kernel of coconut by mechanical or natural means, with or without the use of heat, without undergoing chemical refining, bleaching or deodorizing, which does not lead to the alteration of the nature of oil" (Marina and Che Man, 2009). This method of extraction of coconut oil from coconut milk eliminates the use of solvent which may considerably reduce the investment cost and energy requirements. Moreover, it eliminates the RBD (refining, bleaching and deodorizing) process (Villarino et al., 2007). A number of previous reports confirmed the presence of higher amount of phenolic contents, which correlated with higher antioxidant activity in virgin coconut oil, compared with refined coconut oil (Marina and Che Man, 2009). Virgin Coconut oil helps to boost metabolism and raise body temperatures to promote thyroid health. It also heals the bruises, cures damaged tissues, moisturizes the skin, nourishes the brain, reverses the neurodegenerative diseases and prevents gastrointestinal mal absorption diseases. Coconut oil is becoming increasingly used worldwide for its nutritional and medical benefits.

They're rich in lauric acid, which converts to monolaurin. Monolaurin is the compound found in breast milk that strengthens a baby's immunity, Lauric acid has been documented to be converted to monolaurin in the human body and it is the antimicrobial agent found in human milk (Marina and Che Man, 2009). A great deal of research has been done to establish the ability of lauric acid to enhance immunity. This medium-chain fatty acid (MCFA) actually disrupts the lipid membranes of offending organisms. They offer high levels of manganese, potassium, and phosphorus. About 60 per cent of the coconut produce in Nigeria is consumed in the raw form, leaving the remaining for copra production and oil milling. Rethinam and Kumar (2001) reported that world coconut oil production has increased from 1,993000 MT (1960-1990) to 4,036,000MT in 200I, but the per cent share of coconut oil has considerably reduced from 9.58 to 5.99 per cent for the above period. According to (Rajamohan, 2003) coconut oil contains 15% of the total fatty acids as the saturated short chain C6:0, C8:0 and C 10: 0 fatty acids.

In spite of its numerous nutritional, physicochemical and economic benefits, the use of coconut oil commercially for domestic and industrial applications is yet to be maximized in Rivers State, Nigeria, thus, the objective of this work was to assess the physicochemical characteristics and fatty acid profile of virgin coconut oil and compare with some commercial vegetable oils sold in Rivers State, Nigeria.

2.0 Materials and Methods

2.1 Materials

Full ripe coconut fruits were bought in an open market in Port Harcourt, Rivers State, Nigeria for virgin coconut oil extraction. Laziz oil (SBO), Kings oil (GNO), Sunflower oil and Power oil (Palm Olein) were procured from Spar supermarket in Port Harcourt, the Regent used for the analysis were gotten from Food Science and technology lab in Rivers State University.

2.2 Extraction of Virgin Coconut Oil

The virgin coconut oil was extracted using the cold press method described by Ajogun *et al* 2020. The matured coconut fruits were crack open, and the fruit removed for grinding. The grinded fruit was squeezed in a clean cheesecloth bag to extract the milk. The extracted milk was allowed to stand for 36 hours. As the layers of oil and water(cream) became separated, the upper oil layer was simply decanted and the acquired oil prepared in triplicate and kept for further analysis which is the cold process method (Figure 1).

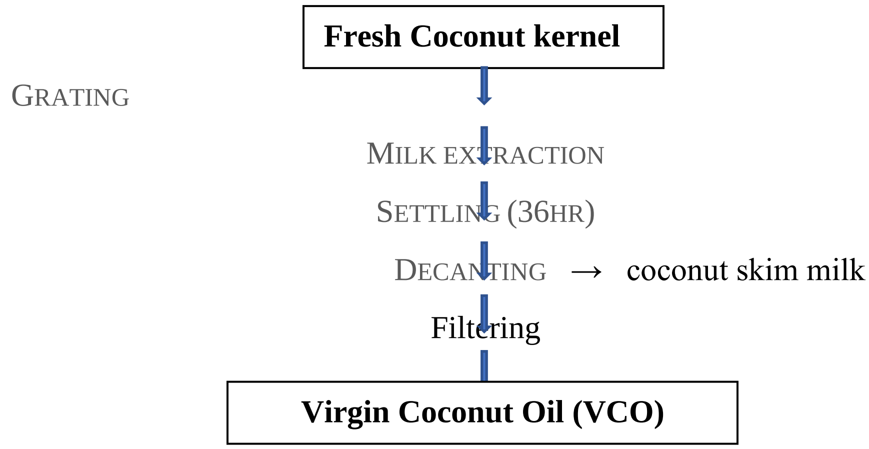

Figure 1 Extreaction of Virgin Coconut Oil

2.3 Physicochemical Properties

Physicochemical properties including; Moisture impurities and volatile matters, Refractive index, specific gravity, cloud point, melting point, smoke point, flash point, viscosity, free fatty acid, peroxide value, iodine value, saponification value, unsaponifiable matter, and acid value were determined by the method of AOAC (2012). Ester value (EV) was evaluated by calculation, as described by (Aremu *et al.*, 2015). EV=SV-AV (Saponification Value-Acid value).

2.4 Fatty Acid Profile

The individual fatty acids in the oils were determine using the AOAC (2012) methods as described by Chibor *et al.* (2017). Fatty acid methyl esters (FAME) were prepared from the extracted oils. In 50 ml round bottom flasks, 50 mg of each sample was kept in separate flasks and 3 ml of sodium methylate solution (0.5mol/l of methanolic solution of NaOH) was added. The reaction medium was refluxed for 10 minutes; 3 ml of acetyl chloride was added; mixture was refluxed again for 10 minutes and then cooled to ambient temperature; 8 ml hexane and 10 ml of distilled water was added and allowed to stand for 5 minutes to establish a two phase solution. The upper organic phase was recovered into a vial for GC analysis, using Agilent 7890A, coupled with flame-ionization detector (FID).

2.5 Statistical Analysis

All the analyses were carried out in triplicate. Data obtained were subjected to Analysis of variance (ANOVA), differences between means were evaluated using Tukey's multiple comparison test, and significance accepted at $p \leq 0.05$ level. The statistical package in Minitab 20 computer program was used.

3. Results and Discussion

3.1 Physical Properties

From the result (Table 1), cloud point (CP) and slip melting points (SMP) ranged from 0.00 to 9.00 ^{o}C and 0.60 to 24.12 ^{o}C, respectively, with significantly ($p<0.05$) higher CP and SMP seen in virgin coconu oil. The cloud point and slip melting point of sunflower oil were significantly ($p<0.05$) low. Higher cloud point indicates higher crystallization potential. Low Cloud point of 0.00 and 0.45 ^{o}C seen in sunflower oil and palm olein respectively, showed that the oils could stay liquid with less crystals at a wide range of temperature (Chibor *et al*., 2023). The melting point of all the oil samples were < 24 ^{o}C, showing that they will remain liquid at temperature lower than ambient. Smoke point (SP) and flash point (FP) of the oils ranged from 130.00 to 247.50 ^{o}C and 200.00 to 309.50 ^{o}C, respectively. Sunflower oil gave significantly ($p<0.05$) higher smoke and flash points. High smoke point of sunflower oil, groundnut oil and palm olein showed that the oils are suitable for a wide range of cooking operations, as supported by earlier researchers (Chibor *et al.*, 2017). The smoke point serves as an indicator to the temperature limit which a particular cooking oil can be used, it increases when the degree and efficiency of refinement increases (Bockish, 1998). Lower smoke point results probably due to the presence of hydrocolloids and free fatty acids. Smoke point has a negative correlation with the percentage free fatty acid of the oil (Thomas 2002). Flash points of coconut oil was appreciably high as compared to the Indian specification for coconut oil (IS:6220) of FP value ≥225^{0}C (Gopala-Krishna *et al*., 2010).
Values for density, specific gravity and refractive index (RI) were shown raging from 0.9005 to 0.9096 g/ml, 0.9035 to 0.9170 and 1.448 to 1.472, respectively. There was no significant difference ($p>0.05$) in the density of soyabean and sunflower oils. The density (DN) and Specific Gravity (SG) of coconut oil agreed with CODEX standard SG of 0.908 – 0.921 for virgin coconut oil (CODEX STAN 210, 2009) and Indian Standard (IS:6220) of 0.915 – 0.920 for coconut oil (Gopala *et al*., 2010). The density provides information on the solid content of the fat as well as its weight at a particular temperature (Bamidele *et al*., 2015). It is the ratio of the weight of the oil to its volume, while the SG is the ratio of the density of oil to the density of equal volume of water at a particular temperature.
The refractive index of virgin coconut oil was significantly ($p<0.05$) low, while higher value of 1.472 was seen in soyabean oil, this value was however not significantly different ($p>0.05$) from RI of palm olein. Refractive index of fat had been reported to increase with increase in chain length of the fat, and also with the number of unsaturated bonds present in the fat (Nielson, 1994). Refractive Index also depend on the degree of conjugation as well as the degree of unsaturation of the oil (Shahidi, 2005). Higher value of RI recorded by soyabean oil and palm olein is an indication that the oils contain more unsaturated fatty acids than coconut oil.

Table1 Physical Properties

Samples	CP (ºC)	SMP (ºC)	SP (ºC)	FP (ºC)	Dn (g/ml)	SG	RI
VCO	$9.00^{a}\pm0.000$	$24.12^{a}\pm0.028$	$178.50^{d}\pm0.141$	$287.78^{b}\pm0.035$	$0.9096^{a}\pm0.001$	$0.9163^{a}\pm0.001$	$1.448^{c}\pm0.000$
SBO	$4.50^{b}\pm0.707$	$20.50^{b}\pm0.707$	$130.00^{e}\pm0.000$	$200.00^{e}\pm1.410$	$0.9005^{b}\pm0.001$	$0.9040^{b}\pm0.001$	$1.472^{a}\pm0.002$
GNO	$5.75^{b}\pm0.354$	$19.00^{b}\pm1.410$	$210.00^{b}\pm0.000$	$259.00^{c}\pm1.410$	$0.9075^{a}\pm0.001$	$0.9125^{a}\pm0.002$	$1.464^{b}\pm0.001$
SFO	$0.00^{c}\pm0.000$	$0.60^{d}\pm0.071$	$247.50^{a}\pm0.707$	$309.50^{a}\pm0.707$	$0.9005^{b}\pm0.001$	$0.9035^{b}\pm0.001$	$1.465^{b}\pm0.001$
PO	$0.45^{c}\pm0.071$	$1.88^{c}\pm0.106$	$198.40^{c}\pm2.26$	$247.50^{d}\pm0.707$	$0.9070^{a}\pm0.578$	$0.9170^{a}\pm0.001$	$1.469^{a}\pm0.001$

Values are means ± SD of triplicate samples
Mean values bearing different superscripts in the same column differ significantly ($P< 0.05$).

Key: CP=cloud point, SMP=slip melting point, SP=smoke point, FP=flash point, Dn=density, SG=spesific gravity, RI=refractive index, VCO=virgin coconut oil, SBO=soyabean oil, SFO=sunflower oil, GNO=groundnut oil, PO=palm olein.

3.2 Chemical Properties

The acid value (AV), Ester value (ESV), and percentage free fatty acid (FFA) of the oils were seen ranging from 0.11 to 0.24 mgKOF/g, 199.19 to 260.60 mgKOH/g and 0.025 to 1.045%, respectively. Acid value of the oils were all within acceptable range of < 0.60 mgKOH/g (NIS, 1992; CODEX, 1999) A low AV means that an oil sample contains less free acids thus reducing its exposure to rancidity (Asuquo et al., 2012; Anderson-Foster et al., 2012) Low free fatty acid of 0.061 % seen in virgin coconut oil is an indication that it is chemically safe for use and need no further refining. FFA of the vegetable oils were ≤0.25%, which is the standard value of free fatty acid for refined vegetable oil (IS:8323 2014; CODEX 1999). However, groundnut oil gave significantly ($p<0.05$) higher FFA of 1.045 %, probably due to storage challenge from the coomercial sauce. Virgin coconut oil gave significantly ($p<0.05$) higher ester value of 260.60 mgKOH/g. The high ester value of Virgin coconut oil is an indication that the oil has good flavour suitable for culinary purposes. The ester value of a fat is determined by the saponification value and the acid value. It is an indication of the saponifiable fatty acids excluding the free acids of the fat (Aremu *et al*. 2015). Iodine value of coconut oil was significantly low (5.72 g/100g) which is an indication of high content of saturated fatty acids. These values were relatively lower than the Indian standard of 7.50g/100g – 10.00g/100g (Gopala *et al*., 2010), this was probably due to varietal differences.
The IV however, fall within the CODEX standard range of 6.0 g/100g to 10.6 g/100g for coconut oil (CODEX STAN. 210, 2009). Significantly ($p<0.05$) higher iodine value of 127.60 g/100g was shown in soyabean oil. Iodine value is a simple chemical constant used to measure the degree of

unsaturation or the average number of double bonds in an oil sample. It is the number of grams of iodine that could be used to halogenate 100 g of oil (Chibor *et al*., 2018; Shahidi, 2005). Moisture content of the oils ranged from 0.010 to 0.069%. These values were within the recommended moisture level of < 0.20%, which is the maximum allowable moisture content for refined vegetable oil (CODEX-STAN-192, 2009). Low moisture content of oil enhances oxidative stability (Chibor *et al*., 2023).

Peroxide value, saponification value and unsaponifiable matter content ranged respectively from 0.11 to 1.20 mEq/kg, 182.75 to 260.71mgKOH/g and 0.095 to 0.420%. Peroxide value gives an indication of the degree of oil oxidization (Okashi *et al.*, 2013). Oxidation of an unsaturated oil takes place through the formation of hydroperoxides. The hydroperoxides being the primary products of oxidation. Peroxide value of the oil samples were lower than 10.00 mEq/kg and 3.00 mEq/kg recommended maximum for virgin and refined vegetable oil, respectively (CODEX 1999; NIS:289 1992), indicating that the oils were not rancid but suitable for culinary purposes. Peroxide value (PV) gives an indication of the degree of fat oxidized (Ononogbu, 2002; Okashiet al., 2013). Relatively high saponification value noticed in coconut oil samples is an indication of the presence of short/medium chain triacylglyceride. Saponification value is an indication of the molecular weight and the percentage concentration of fatty acids components presents in oil (Jan *et al*., 2010). Saponification value is a measure of the content of ester linkages (Wypych, 2017). It is an indicator for fat/oil suitability for industrial use (Chibor *et al*., 2023).

The Unsaponifiable fraction comprises only a small part of the vegetable oils compared to their triglyceride fraction. Unsaponifiable matter (USM) shows the presence of desirable bioactive components such as antimicrobial, antioxidants, and anti-inflammatory substances, including the fat-soluble vitamins (Nahm 2011). The USM value of 0.095 % in soyabean corroborated with those reported by earlier researchers (Chibor *et al*., 2023). The unsaponifiable matter of oil serves as a check for contamination by foreign materials such as mineral oils and damage to the oil by oxidation. Highly oxidized oils contain polymerized fatty acids which are extracted together with the unsaponifiable matter (Kamariah *et al*., 2008).

Table 2. Chemical Properties

	Samples				
Properties	**VCO**	**SBO**	**SFO**	**GNO**	**PO**
AV (mgKOH/g)	$0.11^{c}\pm0.000$	$0.11^{c}\pm0.001$	$0.13^{b}\pm0.001$	$0.24^{a}\pm0.035$	$0.19^{a}\pm0.021$
ESV (mgKOH/g)	$260.60^{a}\pm0.007$	$199.19^{d}\pm0.426$	$182.620^{c}\pm0.509$	$249.965^{b}\pm0.247$	$203.81^{c}\pm1.44$
FFA (%)	$0.061^{b}\pm0.000$	$0.060^{b}\pm0.000$	$0.025^{c}\pm0.007$	$1.045^{a}\pm0.007$	$0.062^{b}\pm0.000$
IV (g/100g)	$5.72^{e}\pm0.014$	$127.70^{a}\pm0.566$	$119.75^{b}\pm0.495$	$92.850^{c}\pm0.354$	$85.00^{d}\pm0.00$
MIV (%)	$0.069^{a}\pm0.008$	$0.040^{b}\pm0.014$	$0.015^{c}\pm0.007$	$0.010^{d}\pm0.000$	$0.042^{b}\pm0.000$
PV (mEq/kg)	$1.170^{b}\pm0.005$	$1.030^{c}\pm0.000$	$1.200^{a}\pm0.003$	$1.125^{c}\pm0.021$	$0.110^{d}\pm0.014$
SV (mg koH/g)	$260.71^{a}\pm0.134$	$199.30^{d}\pm0.424$	$182.75^{e}\pm0.495$	$250.20^{b}\pm0.283$	$204.00^{c}\pm0.41$

USM (%)	0.115^{c} ±0.001	0.095^{cd} ±0.007	0.185^{b}±0.050	0.420^{a} ±0.014	0.100^{c} ±0.000

Values are means ± SD of triplicate samples
Mean values bearing different superscripts in the same row differ significantly ($P< 0.05$).

Key: AV=acid value, ESV=ester value, FFA=free fatty acid, MIV=moisture impurity and volatile matters, PV=peroxide value, SV=saponification value, USM=unsaponifiable matter, VCO=virgin coconut oil, SBO=soyabean oil, SFO=sunflower oil, GNO=groundnut oil, PO=palm olein.

3.3 Fatty Acid Profile

Total saturated fatty acids for virgin coconut oil, soyabean oil, groundnut oil, sunflower oil and palm olein were respectively 90.93, 38.57, 10.31, 25.36 and 21.27 % (Table 3). Coconut oil with high saturated fatty acid content was liquid and stable at room temperature (28 ±2^{o}C). This was probably due to high content of lauric acid (48.76 %). High content of lauric acid corroborated with 48.7 % reported by Ajogun *et al*. (2020), 47 to 50% reported by Nwabanna (2012)) and CODEX standard range of 45.1% - 53.2% (Shahidi, 2005). This result showed that coconut provide fat that is mostly in the form of medium chain saturated fatty acids (MCFAs). MCFAs are saturated fatty acids with a carbon chain of 6 to 12 atoms. Of these MCFAs, lauric acid (C12) is predominant with antiviral and antimicrobial properties similar to monolaurin in human milk (Ajogun *et al*., 2020). Monolaurin is antiviral and antibacterial, can destroys a wide variety of disease causing organisms (Alyaqoubi *et al*., 2015). It gives babies immunity to diseases and similar beneficial effects in adults (Kabara, 2000).
According to the National Center for Biotechnology Information, lauric acid has many germ fighting, antifungal and antiviral properties that are very effective at ridding the body of viruses, bacteria and countless illnesses (Ajogun *et al.*, 2020). Lauric acid may also reduce cholesterol and triglyceride levels, which lowers heart disease and stroke risks (Brown, 2014). Furthermore, the fats that are present in coconuts are less likely to clog arteries, because the body does not store coconut fats which makes coconut milk a healthy alternative to cow's milk when it comes to preserving heart's health (Brown, 2014). It possesses anti-inflammatory, antimicrobial and antioxidant properties (Fife, 2004). High content of MCFAs in virgin coconut oil make it a basic component for nutraceuticals and functional foods (Bawalan and Chapman, 2006). It is reported to be the world's only natural low-calorie fat, prevents deposition of fats thereby preventing obesity (Dayrit, 2003). Omega-3 fatty acids were noticed in soyabean and sunflower oils (Fig. 3 and 5).

Table 3. Fatty Acid Profile

Fatty Acids (%)		**Oil samples**				
		VCO	**SBO**	**GNO**	**SFO**	**PO**
Caprylic	C8:0	6.45				
Caprioc	C10:0	5.56				
Lauric	C12:0	48.76				
Myristic	C14:0	20.92				0.35
Palmitic	C16:0	7.21	14.84	2.54	17.43	5.65
Palmitoleic	C16:1			0.06		0.05
Margaric	C17:1				0.29	
Stearic	C18:0	2.03	23.33	7.40	6.69	10.53
Oleic	C18:1	6.85	40.05	58.70	58.57	47.72
Linoleic	C18:2	2.22	13.37	27.00	11.27	30.57
Linolenic	C18:3		8.01		4.07	
Arachidic	C20:0		0.32	0.07	1.24	4.74
Eicosenoic	C20:1			0.77		0.13
Eicosadienoic	C20:2			3.06		0.10
D-y-linolenic	C20:3					0.08
Arachidonic	C20:4					0.08
Docosanoic	C22:0		0.08	0.20		
Erucic	C22:1				0.44	
Ignoceric	C24:0			0.10		
Total Saturated		**90.93**	**38.57**	**10.31**	**25.36**	**21.27**
Total unsaturated		**9.07**	**61.43**	**89.69**	**74.64**	**78.73**
Omega-9		**6.85**	**40.05**	**59.53**	**59.30**	**47.90**
Omega-6		**2.22**	**13.37**	**30.06**	**11.27**	**30.83**
Omega-3			**8.01**		**4.07**	

Key: VCO=virgin coconut oil, SBO=soyabean oil, SFO=sunflower oil, GNO=groundnut oil, PO=palm olein.

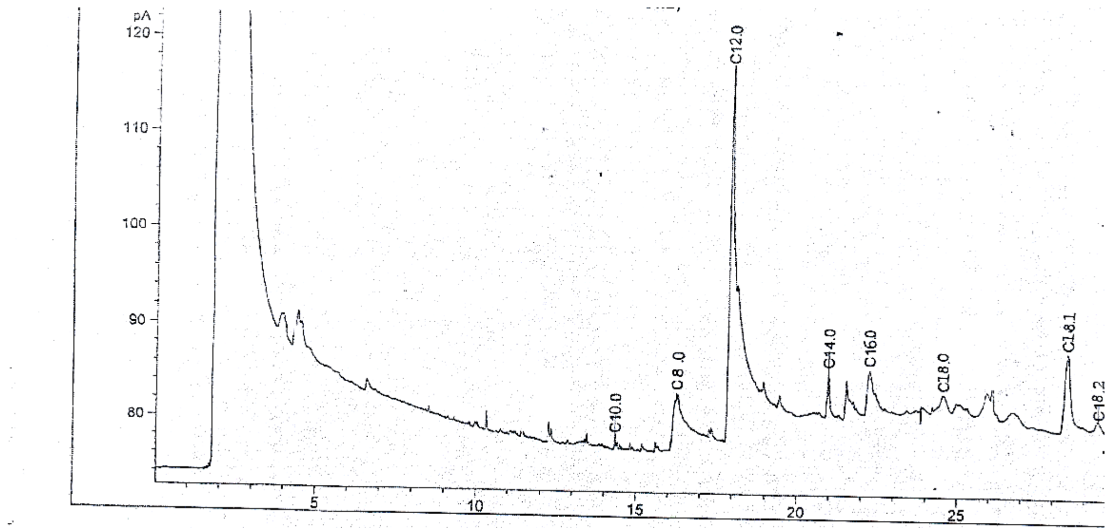

Figure 2. Fatty acid GC Chromatogram of Virgin Coconut Oil

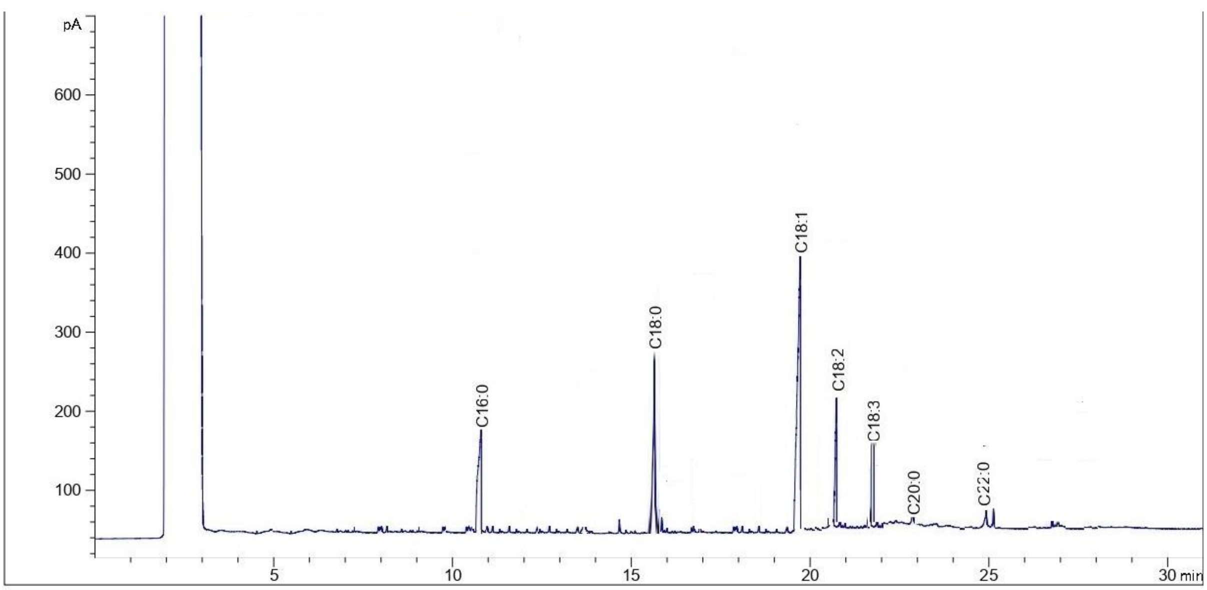

Figure 3. Fatty acid GC Chromatogram of Soyabean Oil

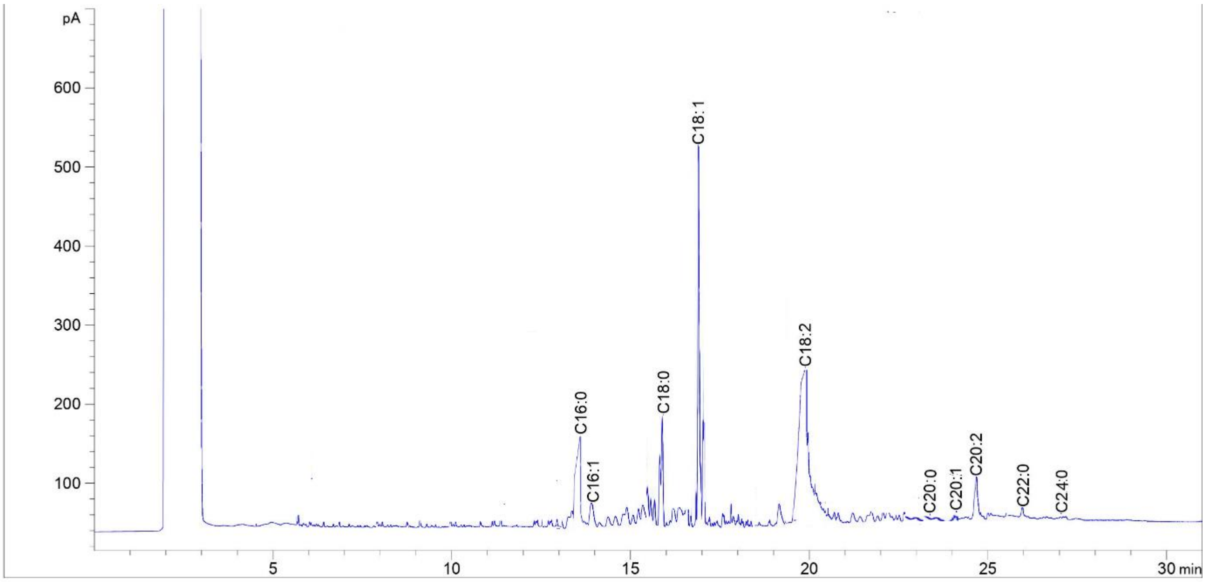

Figure 4. Fatty acid GC Chromatogram of Groundnut Oil

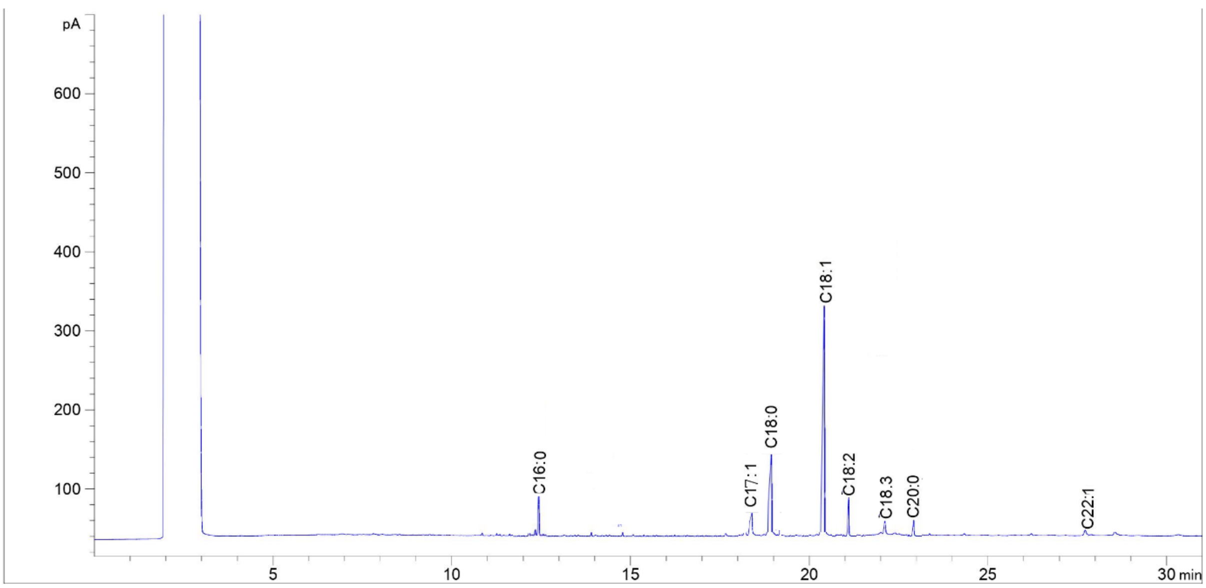

Figure 5. Fatty acid GC Chromatogram of Sunflower Oil

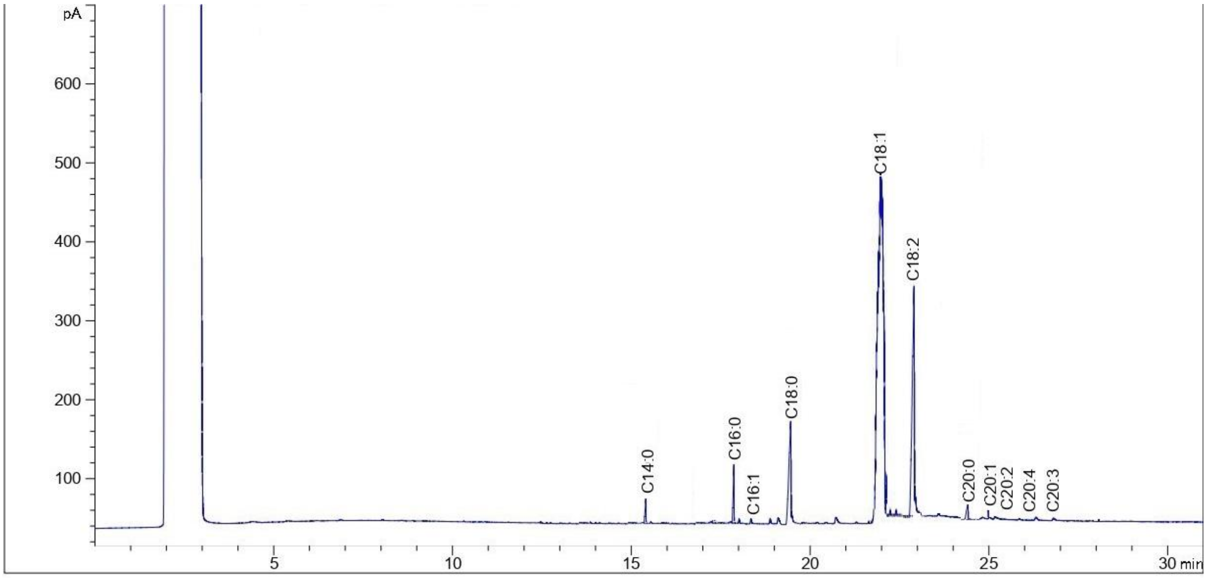

Figure 6. Fatty acid GC Chromatogram of Palm Olein

4. Conclussion

From the results, virgin coconut oil gave high smoke and flash points, with values of 178.50 and 287.78 oC, respectively. Thus, the oil can be used for a wide range of cooking and industrial operations. There was no significant difference ($p>0.05$) in the specific gravity of virgin coconut oil (VCO) and that of palm olein. Ester value and saponification value of VCO were respectively 260.60 and 260.71 mgKOH/g. Iodine value (IV) of VCO was 5.72 g/100g, showing that it has less polyunsaturated fatty acids, thus enhanced storability. Lauric acid (C12:0) was the predominant fatty acid in VCO (48.76 %), while soyabean and sunflower oils contained 8.01 and 4.07 % omega-3 fatty acid, respectively. Coconut oil is recommended for culinary operations due to its high content of lauric acid.

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