PROXIMATE AND ELEMENTAL ANALYSIS OF AVOCADO FRUIT OBTAINED FROM TARABA STATE, NIGERIA

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ABSTRACT
Avocado fruits obtained from Gembu, Taraba State was analysed for proximate and elemental composition. Samples were taken randomly in a farm in Gembu. The moisture content was found 64.73% while oil content was extracted by soxlet extraction and was found to be 36.5%. The fruits were wet digested for some mineral elements; these elements and their respective composition are as follows: Na, 0.23mg/kg, K 2.04mg/kg, Fe 0.069mg/kg, Ca 0.064mg/kg and Mg 0.103mg/kg. Other parameters studied include crude fibre 4.03%, crude protein 1.65% and ash content 12.36%. The extracted oil was characterized and the results are: saponification value (as in oleic acid) 0.186mgKOH/g, free fatty acid 0.180mgKOH/g, Iodine value 0.82gI₂/100g, and specific gravity obtained at 25°C was 0.915. The oil content of Nigerian avocado found from this study varies from the ones reported from South Africa, Morocco and Brazil. This shows that avocado content varies with geographical location.

Key Words: Avocado, Proximate, Elemental, Extraction and Parameter

INTRODUCTION
The avocado (Persea americana) belongs to the Lauraceae family of tropical and mediterranean trees and shrubs; other members of this family include: laurel, cinnamon, saffras and green-heart (a timber of the Guianas). The English name is derived from the Spanish word ‘abogado’, which was avocet in French. The avocado is thought to have originated from Mexico and Central and South America; for thousands of years and till today, it has been a popular food in those places. The avocado is one of the fruits with an excellent nutritional quality. It has low sugar content; this makes avocado very recommendable source of high energy food for those who are diabetic. The avocado is highly consumed in the world due to the presence of unsaturated lipids and its relevance in improving and maintaining healthy heart and circulatory system. Several studies have focused on the composition of avocado.

The oil content of the fruit depends upon its ecological origin and on the cultivar, as for example, in Guatemalan and Mexican cultivars, the oil content varies from 10 to 13% and from 15 to 25%, respectively (Biale & Young, 1971) while in the fruits from Caribbean, a low fat (2.5 to 5%) has been reported (Hatton et al., 1964). Adulteration of olive oil with avocado oil to a level of 35% is undetectable on the basis of flavour as the avocado oil possesses similar characteristics to that of olive oil (Gutfinger & Letan 1974; Freitas et al., 1993). The edible part (pulp) is fleshy and contains 65-80% water; 1-4% protein; 1-2% sugar and 3-30% oil. The avocado is naturally enriched with plenty of B vitamins, and moderate amount of vitamins A, D and E. The presence of digestible oil makes it to have the highest energy than any other fruits. The avocado mesocarp contains the long type fatty acid with 16 or more carbon atoms. The major constituent of the avocado volatiles were found to be sesquiterpenes, which had β-caryophyllene as its main component. The main components of the other volatiles include: caryophyllene oxide, humulene, copaene, cadinene and farnensene. Gas chromatography is the standard technique of detailed analysis of fatty acids of avocado.

Fats and oil
Fat and oil are obtained from vegetable and animal and their main constituents are mixed triglycerides (the fatty acids to which the glyceride backbone is attached are non-identical) of the C₁₀ to C₁₈ acids. Some solid vegetable oils such as palm-kernel oil and coconut oil contains large proportion of C₆ to C₁₄ saturated fatty acids while others contain mainly saturated C₁₆ and C₁₈ acids and unsaturated C₁₈ fatty acids. Liquid vegetable oils such as avocado, cotton seed oil and soya oil contain mainly unsaturated C₁₈ acids (oleic, linoleic)

Animal fats contain mainly saturated C₁₆ and C₁₈ acids with small amounts of unsaturated C₁₈ acids. Oil from fish contains highly unsaturated C₁₆ acids. The fatty acids can be esterified to glycerol and are the main constituents of oils and fats. Fatty acids are almost entirely straight chain aliphatic carboxylic acids. The broadest definition includes all chain lengths, but most natural fatty acids are C₁₀ to C₂₀, with C₁₈ most common. Naturally occurring fatty acids share a common biosynthesis. The chain is built from two carbon units, and cis double bonds are inserted by de-saturase enzymes at specific positions relative to the carboxyl group. This results in even-chain-length fatty acids with a characteristic pattern of methylene interrupted cis double bonds. A large number of fatty acids varying
in chain length and instaruration results from this pathway. The industrial exploitation of oils and fats, both for food and oleochemical products, is based on chemical modification of both the carboxyl and unsaturated groups present in fatty acids. Although the most reactive sites in fatty acids are the carboxyl group and double bonds, methylenes adjacent to them are activated, increasing their reactivity. Only rarely do saturated chains show reactivity. Carboxyl groups and unsaturated centers usually react independently, but when in close proximity, both may react through neighboring group participation. In enzymatic reactions, the reactivity of the carboxyl group can be influenced by the presence of a nearby double bond. The industrial chemistry of oils and fats is a mature technology, with decades of experience and refinement behind current practices. It is not, however, static. Environmental pressures demand cleaner processes, and there is a market for new products. Current developments are in three areas: “green” chemistry, using cleaner processes, less energy, and renewable resources; enzyme catalyzed reactions, used both as environmentally friendly processes and to produce tailor-made products; and novel chemistry to functionalize the carbon chain, leading to new. Changing perceptions of what is nutritionally desirable in fat-based products also drives changing technology; inter-esterification is more widely used and may replace partial hydrogenation in the formulation of some modified fats. It is necessary to focuses on aspects of fatty acid and lipid chemistry relevant to the analysis and industrial exploitation of oils and fats. The emphasis is on fatty acids and acylglycerols found in commodity oils and the reactions used in the food and oleochemical industries.

Methods for Percent Oil Analysis of Avocado Fruit
The 8% oil criterion for avocado was established in 1925 to insure minimum maturity and quality. However, determination of the oil content of avocado fruit is expensive, time consuming, and tedious, especially for growers who lack the necessary laboratory and equipment. A simpler method would be more useful for growers and also for packers. The standard method for analyzing the oil content is done by the petroleum ether extraction of dried material in a Soxhlet extractor. However, this method is too expensive and requires too much time to be generally useful in the avocado industry. Two other methods, the NMR method and the simplified method (oil- plus-water constant method), have been tested in connection with oil content determination. Profiling is another method of determination of content and composition of oil. Profiling refers to detailed analysis using hyphenated techniques such as link gas chromatography-mass spectrometry (GC/MS), liquid chromatography-mass spectrometry (LC/MS), capillary electrophoresis- mass spectrometry (CE/MS), etc. such techniques provide detailed chromatographic profile of the sample and consequently measurement of the relative or absolute amounts of the components. This technique is however very expensive as the equipment is not readily available due to its high cost.

The avocado is an unusual fruit because its characteristic composition varies with time in the season, environment and variety. Hence the oil content and inorganic composition of Nigerian avocado is unique. This study is focused on determining the inorganic constituent of avocado obtained from Gembu, Taraba state, Nigeria. With the main aim of determining the proximate and some elemental constituents of avocado edible pulp by extracting the oil content of avocado fruit using petroleum ether as solvent and characterizing the oil.

The knowledge of the level and composition of lipids in avocado from Nigeria is very important to the Taraba State and the country at large. Some constituent may be present in amount that adds value to the avocado fruit. This will enhance the current effort to resuscitate the falling agricultural sector.

A brief description of the Avocado
The avocado (persea americana) is a fruit tree native to Mexico classified in the flowering plants family Lauraceae along with cinnamon, camphor and bay laurel. Avocado or alligator pear as it was called by the English in Jamaica, also refers to the fruit; a large berry with a single seed in the centre (California Avocado Society yearbook) of the tree. The fruit could be pear-shaped, egg-shaped or spherical, about and 7-20cm long, weighing between 100-1000g; depending on the variety. It contains a central seed of 5-6.4cm long. Just like banana, the avocado is a climatic fruit. That means it matures on the tree but ripens off the tree. The tree can grow to a height of about 20m. Its leaves are alternately arranged and are 12-25cm long the inconspicuous greenish-yellow flowers are 5-10mm wide. The avocado pear Persea americana, Mill is a highly nutritious fruit that is widely cultivated in the tropical and subtropical regions, up to 43° latitude. It contains about 5-36% lipids and has become an accepted part of the diet of many people in developed countries where it is eaten as fresh fruit (Verhiji & Coronel, 1996). Its fat contents make it a valuable source of energy as well as a potential raw material for the manufacture of pleasantly tasting spreads for breads and biscuits. Besides, the lipids contain linoleic acid (Jackson, 2003 and Bergh, 1998) a polysaturated fatty acid which together with alpha linoleic acid (Omega-3 fatty acid) form vital parts of body structures, perform important roles in immune system and vision, help form cell membranes and produce hormone-like compounds called eicocasnoids (Warlaw & Kessel, 2002). Fats and oils play important roles in human nutrition and their sources, composition and extraction process determine their end use. Oils from major oilseeds like groundnuts, palm fruits, sunflower seed, safflower seed and soybean have been utilized in the manufacture of margarine with success.
(Ihekoronye, 1999). However fats and oils from lesser-known vegetable sources such as the avocado pear, African oil bean and melon seed are yet to be investigated and their potentials for wider application in various food formulations exploited. Ripe avocado pear deteriorates rapidly (Nwufo et al., 1996) due to softening and discoloration of fruit pulp that is attributable to microbial attack and oxidative changes (Okaka, 2005).

**Historical view at avocado**

*Persea Americana* is believed to have originated from Puebla State in Mexico. The native undomesticated variety is called criollo, and is small with large seed. The oldest evidence of the use of avocado was found in a cave located in Coxclatan, Puebla in Mexico, it dates around 10, 000 BC. The first published record that describes the avocado was written by Martin Fernandez (1470-1528) in 1518 in his book, Suma De GeogafiaaQueTrata De TodasLasPatridas Del Mundo, as commonly grown near Santa Marta, Colombia. He was a Spanish conquistador and cosmographer. The Spaniard also found that the reddish brown or even blackish inedible oil from the seed could be used as ink for writing on documents. Some of these documents are still in existence today.

**Nutritional value and health benefits of avocado**

The avocados have diverse fats yet they are one of the best foods one can eat. They are full of nutrients and heart-healthy compounds. According to USDA report in 2004, each 100g (3.5oz) of avocado pulp gives 670KJ (160Kcal) of energy; 75% of which is from its fat. It contains 2.13g saturated fatty acid, 9.80g monounsaturated and 1.82g polyunsaturated fatty acids. 2g of that amount was protein while water was 73.23g. The avocado also contains the following: thiamine (Vitamin B1); riboflavin (vitaminB2); niacin (vitamin B3); pantothenic acid (vitamin B5); vitamin B6; folate (vitamin B9); and vitamins C, E and K. The recorded mineral elements include calcium 12mg; iron 0.55mg; magnesium 29mg; phosphorus 52mg; zinc 0.64mg and potassium 485mg. avocado contain 35% more potassium than banana which has 358mg per 100g. 75% of the high fibre content is insoluble while 25% is soluble (Naveh et al., 2002). The health benefits of avocados are quite obvious, from their nutritional components and hence cannot be overemphasized. A preliminary study showed that high intake of avocados lowers blood cholesterol levels. This comes about due to high amount of High density lipoproteins (HDL), helpful cholesterol. The study shows that after seven-day diet rich in avocado, mild hypercholesterol mania patients showed 17% decrease in total serum cholesterol level. These subjects also showed 22% decrease in blood low density lipoprotein (LDL), a harmful cholesterol; and triglyceride levels. There was 11% increase in HDL levels in the subjects (Naveh et al., 2002).

The avocados are a great source of luteine, a carotenoid that works as an antioxidant and helps protect against eye disease. Avocado helps in weight loss because the monounsaturated fats make one feel full and resist temptation to eat. It contains good amount of fiber both soluble and insoluble. Fiber is needed by the digestive system to run smoothly. Oleic acid is a fat that activates the part of the brain that makes one feel full, and it is also present in avocado. Oleic acid in avocado has been shown to produce greater level of satiety than less healthy saturated fats and Trans fats contained in processed food.

**Chemical composition of avocado**

The pulp of *P. americana* is packed with 65-80% water, 1-4% proteins, 6-9% carbohydrates and sugar. The types of sugar present are glucose, fructose, D-mannoheptulose, a taloheptulose and an alloheptulose. Two bitter substances are also present they are 1-acetoxy-2, 4-dihydroxyheptadeca-16-ene. Depending on the location, season, climate etc, the fatty acids are 4-40% in composition. Unsaponifiable matters are present in the range 1.6-11.3%. These unsaponifiable matters consist of sterols (b-sistosterol, campesterol, 24-methylene cycloartanol, citrostadienol, etc). The main components of the fatty oils are hydrocarbons and glycerides of oleic acid. (Leung B49). The distribution of the chemical composition of the avocado varies in the fruit. For instance the content in the tip halves varies from that at the stem halves; so also does the content vary from between the pulp close to the skin and the pulp close to the seed. The acidity increases outward towards the skin and also from the stem to the tip both inward and outward (Haas, 1995). This is explained by the rapid removal of carbondioxide which would have made the tissues more alkaline.

**Composition and structure of fatty acids**

Fatty acids are almost entirely straight chain aliphatic carboxylic acids. The broadest definition includes all chain lengths, but most natural fatty acids are C4 to C22, with C18 most common. Naturally occurring fatty acids share a common biosynthesis. The chain is built from two carbon units, and cis double bonds are inserted by de-saturase enzymes at specific positions relative to the carboxyl group. This results in even-chain-length fatty acids with a characteristic pattern of methylene interrupted cis double bonds. A large number of fatty acids varying in chain length and unsaturation results from this pathway. Systematic names for fatty acids are too cumbersome for general use, and shorter alternatives are widely used. Two numbers separated by a colon give, respectively, the chain length and number of double bonds: octadecenoic acid with 18 carbons and 1 double bond is therefore 18:1. The position
of double bonds is indicated in a number of ways: explicitly, defining the position and configuration; or locating double bonds relative to the methyl or carboxyl ends of the chain. Soxhlet extraction of oil is the American Official Agricultural Chemists' method for determination of oil content in plant materials. Oil is extracted with a continuous reflux of petroleum ether over dried tissue material in a Soxhlet extractor. This method has the disadvantage of being cumbersome, too expensive, and requires too much time. Oil content of avocado fruit can be tested with a Newport Analyser Mark III (Newport Oxford Instruments). This analyser is a unique instrument which provides a direct reading of the quantity of liquid oil. It is a low resolution NMR spectrometer which can measure the nuclear magnetic resonance of hydrogen contained in liquid (e.g. oil, water). Therefore, water must be removed by drying before the oil is measured. The main features of this machine are its rapidity, accuracy, and simplicity of operation. The difficulty here is however connected with the cost of getting an NMR, and the necessity for complete dryness of sample. For many varieties, the sum of the amount of oil and water in percent by weight is nearly constant during fruit development. Therefore, the percent oil can be calculated by subtracting percent water from the constant. The water content is determined by drying samples in a microwave oven. This method is so simple that growers would not need a laboratory for this operation. This would be a practical method for both growers and packing houses. This method is difficult because the constant may not be the same for all varieties and locations. Constants for more varieties and more locations should be checked in the future.

Previous work
Haas (1995) gave a report of the mineral constituent avocado fruit cultivated in California. He found out that the tip halves of the avocado fruit contain greater percentage of dry matter and ash content as a percentage of the dry matter. This difference was not observed for the fat content and sugar content. Potassium was the most abundant constituent of the ash and occurs in greater concentration in the tip halves of the pulp of the fruit than the stem halves. Calcium on the other hand was found to be more concentrated in the stem halves than the tip halves of the fruit. Haas, (1995) also reported that the concentration of manganese was greater at the tip halves than the stem halves of the fruit. The difference is insignificant for iron concentration. Copper was also found to be present in the avocado fruit. The crude protein was found to be in greater concentrations at the tip halves than the stem halves. This contrasts with distribution of sulphur and chlorine, which was greater at the stem halves than at the tip.

MATERIALS AND METHODS
Sampling and sample preparation
Avocado pear was picked at the mature green stage of development from eight stands at different locations on a farm in Gembu, Taraba State. The fruits were allowed to ripen off the plant at room temperature within 3-4 days, to allow for optimum processing quality (Verhiji, 1996). The criteria for ripening adopted for the avocado pear followed those of the natives: changing of fruits from green to brown and softening of pulp of fruit. The ripped avocado fruits were wiped of any dust, washed with distilled water and dried with the filter paper, and then weighed. The pulp of the fruit was cut into halves from the stem to the tip end. For some other samples, the halves were further subdivided into outer and inner portions. The seed and skin were removed and weighed, care being taken to free the skin from adhering to the pulp.

Extraction of avocado oil by soxhlet apparatus
The oil was extracted by organic solvent of the dried pulp (Weman and Neeman, 1987).

\[
\text{% oil} = \frac{\text{wt of sample} - \text{wt of residue after extraction}}{\text{Wt of sample}} \times 100
\]

Determination of moisture content
10g of the ground avocado sample was weighed out into the crucible, after the crucible has been heated and weighed. Moisture content was determined by oven drying at 100°C (Pearson, 1980). This was removed and cooled in a desiccator and then weighed. The moisture content was calculated by the formula:

\[
\text{% moisture content} = \frac{\text{Wt of sample before drying} - \text{Wt of after drying}}{\text{Wt of sample before drying}} \times 100
\]
Determinations of crude fibre

Material and reagent
Conical flask, glass stirring rod, funnel, filter paper are the materials used while the reagents used include distilled water, ethanol, boiling water, acetic acid, trichloroacetic acid.

Procedure
5g of the sample was digested into trichloroacetic acid by refluxing for 40 minutes and then filtered. The residue was washed with boiling distilled water and then with acetone. The washed residue was dry-heated at 105°C in oven and the dried residue was scraped into porcelain crucible, weighed and then placed in muffle furnace for ashing at 550°C for 2 hours, after which it was removed and cooled in desiccators and weighed.

\[
\text{The } \% \text{ fibre content} = \frac{\text{wt of crucible + residue} - \text{wt of crucible + ash}}{\text{Initial Wt of sample}} \times 100
\]

Determination of crude protein (Kjeldahl Method)
The sample was digested by adding 10g of anhydrous sodium; 0.9g hydrated copper sulphate and 50mls of sulphuric acid to 2g of avocado sample. After light green color was observed the digest solution was cooled and transferred into 100mls volumetric flask which was made up to mark with distilled water. Micro Kjeldahl distillation apparatus was used to distil 25mls of the prepared digest by the addition of 10mls 40% sodium hydroxide. The blue color changed to dark brown as distillation proceeded. The released ammonia was condensed and collected into a receiver containing 10mls of boric acid with indicator solution. The condensed ammonia is then back titrated with 0.01M HCl to pink color end point.

\[
\frac{\text{% Nitrogen by weight}}{\text{N}} = \frac{\text{titre value } (A) \times 1.4 \times 10^{-4} \times \text{volume made} \times 100}{\text{Aliquot taken} \times \text{wt of sample digest}}
\]

Determination of Ash Content
2g of the sample was weighed into porcelain crucible and was placed in a temperature controlled furnace at 600°C for about 6 hours for proper ashing. The crucible was then cooled in a desiccator and immediately weighed.

Determination of mineral constituent of avocado by AAS
Sample preparation: Finely cut samples of fresh material (100g) were used for the determination of mineral constituent. The ripe avocado pear was dried in an oven (Plus 11 Sanyo Gallenkamp Plc, England) at 105°C for 6hrs. The dried sample lots were ground using the mortar.

RESULTS AND DISCUSSION

Proximate Composition
The moisture content of avocado was found to be 64.73%. This result therefore shows that avocado has high moisture content, hence cannot be preserved for a long time.

This investigation revealed that the oil content of avocado from Gembu, Nigeria is 36.4%, which is relatively low in comparison to the value reported from South Africa (40.0%) (Pearson, 1980) but higher than the data reported from Moroco (23.4%); Brazil (25.5%) and Texas (20.1%) (Rouse and Knight, 1991).The ash content of avocado was 12.36%. Ash content signifies the level of mineral present in the sample. The protein content was 1.65% in avocado. The dietary allowance for protein is 56g for a 70kg man (National Research Council, 1989). For the fact that the protein content for avocado is high, it could be used as a dietary supplement for people who need a lot of protein, and most importantly for those who require plant protein e.g people suffering from hypertension. The fibre content of avocado was 4.03%. The high fibre content can act better on the digestive system without giving much problem of constipation. Avocado has a lipid content of 36.40%.
## Table 1: Proximate Analysis

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Composition (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td>64.73</td>
</tr>
<tr>
<td>Ash</td>
<td>12.36</td>
</tr>
<tr>
<td>Lipid</td>
<td>36.40</td>
</tr>
<tr>
<td>Crude Protein</td>
<td>1.65</td>
</tr>
<tr>
<td>Crude Fibre</td>
<td>4.03</td>
</tr>
</tbody>
</table>

### Mineral Elements

The concentration of sodium in avocado was 0.230 mg/kg. The dietary allowance for sodium is 110mg - 3300mg for adults, (National Research Council, 1989). The concentration of potassium on the other hand was found to be 2.040 mg/kg; which is not far from the dietary allowance for potassium (1875 mg - 5625 mg) for adults (National Research Council, 1989). The magnesium content was found to be 0.103 mg/kg. Calcium content in avocado was 0.064 mg/kg. The dietary allowance for calcium is 800mg for 70kg man (National Research Council, 1989). The value of 0.069 mg/kg was obtained for Iron. The dietary allowance for iron is 10g for 70kg (National Research Council, 1989); therefore, avocado could be recommended as a dietary supplement for people who need iron.

### Table 2: Mineral Element Composition

<table>
<thead>
<tr>
<th>Element</th>
<th>Composition (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium</td>
<td>0.230 ± 0.01</td>
</tr>
<tr>
<td>Potassium</td>
<td>2.040 ± 0.03</td>
</tr>
<tr>
<td>Iron</td>
<td>0.069 ± 0.02</td>
</tr>
<tr>
<td>Magnesium</td>
<td>0.103 ± 0.04</td>
</tr>
<tr>
<td>Calcium</td>
<td>0.064±0.01</td>
</tr>
</tbody>
</table>

### Oil (lipid) Characteristics

The saponification value of avocado oil was 0.1860. This value is low; Low saponification value is ideal for soap making (Akpaebio et al., 2011).

### Table 3: Oil Characteristics

<table>
<thead>
<tr>
<th>Lipid characteristics</th>
<th>Composition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saponification (mg KOH/g)</td>
<td>0.186</td>
</tr>
<tr>
<td>Free fatty acid (mgKOH/g)</td>
<td>0.180</td>
</tr>
<tr>
<td>Iodine value (g I₂/100g)</td>
<td>0.82</td>
</tr>
<tr>
<td>Specific gravity (25°C)</td>
<td>0.915</td>
</tr>
</tbody>
</table>

The free fatty acid value of the oil obtained was 0.180. According to Olge, et al., 1984, for soap making, oil with 2% to 5% free fatty acid value could be used. Thus the oil from avocado would not perform very well in soap making with regard to the free fatty acid values. The iodine value of avocado oil was found to be 0.82. The higher the iodine value the softer the soap made from the oil and hence the more conditioning effects. Oils with iodine value less than 1.30 are non drying oil and are not suitable for paint making (Hilditch & Seavell, 1950). Hence avocado oil is not suitable for paint making.

### Acidity of the edible avocado pulp

The pH values shown in Table 4.4 were determined by means of quinhydrone electrode.

### Table 4: pH value of different portions of mature ripe avocado pulp

<table>
<thead>
<tr>
<th>Portion of fruit used</th>
<th>pH value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stem half, inner portion</td>
<td>6.74</td>
</tr>
<tr>
<td>Stem half, outer portion</td>
<td>6.60</td>
</tr>
<tr>
<td>Tip half, inner portion</td>
<td>6.52</td>
</tr>
<tr>
<td>Tip half, outer portion</td>
<td>6.32</td>
</tr>
</tbody>
</table>
It is clear from the result of the pH test that the actual acidity increases outward toward the skin and also increases from the stem to the tip. This indicates that the outer tissues are better aerated and that the carbon dioxide which tends to make it alkaline is readily removed.

CONCLUSION
The present investigation revealed that the has avocado cultivated in Gembu, Sardauna L.G.A Taraba State has different composition as compared to those produced in other geographical location. This variation may be attributed to the climate and soil conditions in which it grows. From the results of the study, it can be concluded that avocado fruit has a higher level of most of the chemical components. Also it would serve as useful dietary supplements. The chemical properties of the avocado oil showed that the oil contain high saponification value with low iodine value, low saponification value is ideal for soap making, hence the oil is not recommended for soap industry. Avocado oil can also be considered as non drying oil, hence it is not good for paint making, but it is a very promising raw material for cosmetics industries.

REFERENCES