Original Research Article

DETERMINATION OF THE PROXIMATE, SUGAR AND VITAMIN PRESENT IN PEELS, FRUIT AND SEED OF AVOCADO PEARS AND GREEN MANGO

Proximate Analysis of Avocado Pear and Green Mango: Evaluation of Macro and Micro-nutrient Content of Peels, Fruit and Seed.

ABSTRACT

Abstract

The main aim of this study is comparative analysis of proximate, sugar and vitamin contents in peels, seed and fruits of avocado pear and green mangoes from Awka metropolies. The proximate compositions (moisture, ash, fat, fiber, protein and carbohydrate) were determined using AOAC method while amounts of reducing sugar, non-reducing sugar and total sugar were determined using AOAC method. The concentration of vitamin A and C was determined by titration technique in the aqueous extract using EDTA/TCA solution and titrating with $CUSO_4$. The result showed that Moisture ranges from 10.10% in avocado peels to 47.50% in mango fruit, ash (3.87-7.35%), fiber (3.22-7.85%), protein (0.62-3.11%), fats (2.27-17.50 and carbohydrates (37.70-65.32%). In terms of the total sugar content ranges from 2.1mg/100g in mango seed to 16.80 in avocado fruit. Vitamin A ranges from 0.11mg/100g in avocado peels to 1.80mg/100g in avocado fruits, vitamin C (10.30-26.40MG/100g), vitamin D (0.83-3.10mg/100g) and vitamin E (4.18-12.74MG/100g).The result showed that peels, seed and fruits of avocado pear and green mangoes contain enough vitamin C which is an antioxidant vitamin essential for human health and thus there is need to increase the consumption of these fruits by all household and also industrial utilization of peels of avocado pear and green mangoes in the production of food and drug products are recommended.

INTRODUCTION

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Proximate Analysis of Avocado Pear and Green Mango: Evaluation of Macro and Micro-nutrient Content of Peels, Fruit and Seed

Authors:
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Background of the study

Fruits and vegetables form an indispensable constituent of diet in Africa generally and Nigeria in particular. Tomato fruits are the major fruits consumed in our locality. Their nutritive significance is their richness in minerals and vitamins which is essential is the maintenance of human health. The importance and awareness of nutrition is public health issues has resulted in the increase demand of knowledge of the biochemical nutrients of foods. They are good sources of carotene, ascorbic acid, riboflavin, folic acid and minerals like calcium, iron, and phosphorous. The fruits also contain phytochemical which are nutritionally and medicinally useful but times reduce the bioavailability of nutrients in human system (Obiozoba, 2008).

Mangoes (*Mangifera indica L.*) are one of the most popular fruits in many countries among millions of peoples in the world. According to Soong *et al*. (2008), it contains 75 to 82% water, 8.7 to 20% sugar, 0.14 to 0.71% citric acid, 0.38 to 0.63% ash and 8.5 to 50 mg Vit-C per 100 gm of mango. The extracts from the bark of Mangifera indica has been proven effective in the treatment of toothaches (Afam-ezeaku *et al*., 2022).

The avocado pear (*Persea americana* Mill.) is a polymorphic tree species that originated in a broad geographical area from the Eastern and central highlands of Mexico through Guatemala to the Pacific (Athar and Nasir, 2005). Currently, avocado is a fruit that has been cultivated in many parts of the world, especially tropical countries. Avocado are existed in different shape, size, color depending on their variety. Avocado fruit can be consumed directly as a high energy food source because of its high content of lipids. that significantly higher than in other fruit. Besides, avocado fruit is also a good source of oil (Quinones-Islas *et al*., 2019).

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Peels are basic wastes or byproducts when fruits are peeled during processing for consumption and other purposes. They are largely sourced from fruit processing centers, commercial eateries, markets and are fed to animals such as goats and sheep (Ekenyem and Madubuike, 2006), and are also used as feed for snails (Omole *et al*., 2013), Broiler Chicks (Ekenyem and Madubuike, 2006) and Weaner rabbits (Akinmutimi *et al*., 2006). The chemical composition of cassava peels when influenced by isolates will release reducing sugar and increase its protein content which shows the feasibility of bioconversion of cassava peels to value added products (Nwakoby *et al*., 2022). Peels of avocado pear and green also possess biosorptive capacity for the removal of dye from aqueous solutions (Hilary *et al*., 2013). The peels avocado pear constitute about 10% of the fruit (Ijaiya and Awonusi, 2005), and have been reported to contain 2 to 6% of crude protein depending on the varieties, the crude fibre ranges between 9 to 15% (Akinmutimi *et al*., 2006).

However, peels of avocado pear and green utilization is sometimes limited as a result of poor understanding of their nutritional, antinutritional and economic values as well as proper use in livestock diets. They constitute environmental hazard where it is not properly utilized.

A vitamin is an organic compound and a vital nutrient that an organism requires in limited amounts. An organic chemical compound (or related set of compounds) is called a vitamin when the organism cannot synthesize the compound in sufficient quantities, and must be obtained through the diet; thus, the term "vitamin" is conditional upon the circumstances and the particular organism. For example, ascorbic acid (vitamin C) is a vitamin for humans, but not for most other animal organisms. Supplementation is important for the treatment of certain health problems, but there is little

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evidence of nutritional benefit when used by otherwise healthy people (Fennema, 2006).

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Vitamins have been reported to be vital for the maintenance of normal life and that deficiencies are associated with clinical symptoms that can be cured by their dietary addition they are also said to be active in the metabolism of all nutrients Toxicity due to overdose of some vitamins have also been reported (Muller, *et al.*, 2006). Vitamins are essential nutrients found in foods. They perform specific and vital functions in a variety of body systems, and are crucial for maintaining optimal health.

Chemically, sugar is one of carbohydrates and is a source of energy in human diet. Sucrose or table sugar has the chemical formula $C_{12}H_{22}O_{11}$ and is a disaccharide of fructose and glucose. It has a white crystalline appearing; it is the most popular of the various sugar for flavouring, exhibiting properties such as sweetening, preservation and texture in food and beverages. Sugars, especially sucrose are obtainable from sources such as sugar cane, beet sugar, honey etc.

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High consumption of sugar sweetened beverages increases the risk of overweight, obesity, heart diseases as well as tooth decay (Olsen and Heitmann, 2009). They contain high amounts of energy due to high sugar contents in the form of fluid which often do not give satiety in the same way as solid foods do (Barminas and Charles (2008). Therefore, there is need to monitor and control all sugar containing fruits to enhance food security.

Statement of the problem

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Many scientific researchers have made a tremendous effort towards the provision of empirical proofs to back up the use of the peels of avocado pear and green mangoes in food and medicinal practice in recent years

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(Martinez *et al*., 2018). Scientific validations are being made globally to get evidences for traditionally reputed herbal plants. However there still exists myriads number of plants with much medicinal potential that awaits realization. Beside, Sugar-sweetened beverages have been shown to contribute to weight gain in both adults and youth and are associated with chronic health consequences including risk for obesity, diabetes, cardiovascular disease, and fatty liver disease. Due to the lack of knowledge of actual sugar content in foods, there are needs for researchers to conduct detailed dietary analyses examining the sugar level in most consumed fruits and beverages produced from them.

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Aim and objectives.

The main aim of this study is comparative analysis of proximate, sugar and vitamin contents in peels, fruit and seed of avocado pear and green mangoes from Awka metropolies.

The specific objectives of the study are:

1. To determine the sugar contents in peels, fruit and seed of avocado pear and green mangoes from Awka metropolies.
2. To determine the nutritional contents in peels, fruits and seeds of avocado pear and green mangoes from Awka metropolies.
3. To determine the vitamins A and C contents in peels, fruits and seeds of avocado pear and green mangoes from Awka metropolies.

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1.4 Significance of the Study

The result of this study will be significant in the following areas;

The result of the study will be beneficial to the following:

a. **Humans.** The result of the study will enhance the utilization of sugar, vitamin A and C contents in peels of avocado pear and green mangoes owing to their phytochemical constituents..

b. **Pharmaceutical Company.** This study will encourage pharmaceutical companies to manufacture herbal products that would be inexpensive because of the locally available avocado seed raw material.

c. **Department of Health.** This study will help the ministry of Health to find a cheaper and effective natural treatment for infection.

d. **Future Researchers.** This study will help future researchers to further develop treatments from natural resources.

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Scope of the Study

The scope of the study is to determine the proximate, sugar, vitamin A and C contents in peels, fruit and seed of avocado pear and green mangoes from Awka metropolies using Association of Analytical Chemist 2010 method.

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LITERATURE REVIEW

2.1 General 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 (Swennen and Ortiz, 1997).

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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 (Taylor 2013). 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 a polyunsaturated 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 (Taylor 2013).

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a. Nutritional value avocado seed

According to USDA report in 2004, each 100g (3.5oz) of avocado seed 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 (Musdja, *et al*., 2017).

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General description of mango

Mango is known as the 'King of fruit' throughout the world and cultivated as a fruit tree in frost-free tropical and warmer subtropical climates like that of the India which accounts for 23 lakh hectare cultivation with more than half of the total world's total area under mango cultivation (Talcott, *et al*., 2005). Mango processing yields about 40-50% of by-products which can be used to feed livestock (Sundararaju, 2017). After consumption or industrial processing of the fruits, considerable amounts of mango seeds are discarded as waste. The seed represents from 10% to 25 % of the whole fruit weight (Calvo *et al*., 2001). The kernel inside the seed represents from 45% to 75% of the seed and about 20% of the whole fruit. Amina (2014), proposed the possibility of utilization of mango kernel as antimicrobial agent against food borne pathogenic bacteria after the extracting with ethanol and also studied the possibility of utilization mango kernel powder (MKP) as antioxidant agent to determine their content of phenolics to identify the polyphenol which protect the ghee from oxidation.

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Ascorbic Acid

Vitamins are substances that play an essential part in animal metabolic processes, which the animals cannot synthesis. In their absence the animal develops certain deficiency diseases or other abnormal conditions. Vitamins are chemicals other than proteins, carbohydrates, fats and mineral salts that are essential constituents of the food of animals (Kang *et al*., 2007).

Ascorbic acid is familiar and known as Vitamin C which is a water-soluble vitamin that has a number of biological functions. Ascorbic acid is the common name for Synthetic Vitamin C which is used by most

vitamin companies. Other forms include; Calcium Ascorbate or Buffered Vitamin C and Sodium Ascorbate or Buffered Vitamin C.

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Ascorbic acid (2,3-endiol-L-gulonic acid-_-lactone) also called vitamin C or L-ascorbic acid, is a strongly reducing the dibasic acid with a Pk1 of 4.1 and pK2 of 11.8. It is easily oxidized by several agents, especially in aqueous solutions, to form dehydroascorbic acid (DHA) via a semidehydroascorbic acid which can be reduced to ascorbic acid, for instance by sulfur containing agents like glutathione.

Ascorbic acid has been reported to reduce activity of the enzyme, aldose reductase, Vincent TE. Aldose reductase is the enzyme responsible for accumulation of sorbitol in eyes, nerves, and kidneys of people with diabetes. This accumulation is believed to be responsible for deterioration of these parts of the body associated with diabetes. Therefore, interference with the activity of aldose reductase theoretically helps protect people with diabetes (Ryall, 2007).

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Ascorbic acid is found in berries, citrus fruits like strawberry, orange, pineapple and green vegetables. Ascorbic acid is also found in herbs such as alfalfa, burdock root, cayenne, chickweed, eyebright, fennel seed, fenugreek, hops, horsetail, kelp, peppermint, mullein, nettle, oat straw, paprika, parsley, pine needle, plantain, raspberry leaf, red clover, rose hips, skullcap, violet leaves, yarrow and yellow dock(Sheng *et al.*, 2005). Ascorbic acid may help protect the body against accumulation or retention of the toxic mineral, lead. In one preliminary study, people with higher blood levels of vitamin C had much lower risk of having excessive blood levels of lead. Ascorbic acid is synthesized from vegetable starch which is then converted to glucose by enzymatic treatment. The glucose is then converted to sorbitol by catalytic hydrogenation. The sorbitol is

then fermented forming sorbose. Sorbose is then reacted with acetone and sulfuric acid. This is then oxidized with sodium hydroxide and a catalyst (Heilberg 2000).

Vitamin C or Ascorbic Acid is the enolic form of 3-oxo-L-gulofuranolactone. It can be prepared by synthesis from glucose or extracted from plant sources such as rose hips, blackcurrants or citrus fruits. It is easily oxidized in air. It is essential for the formation of collagen and intercellular material, bone and teeth and for the healing of wounds. It helps maintain elasticity of the skin aids the absorption or iron and improves resistance to infection. It is used in the treatment or scurvy. It may prevent the occurrence and development of cancer (Meschi *et al.*, 2004). Ascorbic acid is widely biosynthesized in nature, particularly by chlorophyll containing plants and by animals with the exception of a few mammalian and avian species.

MATERIALS AND METHOD

3.1 Materials to be used

- Beakers
- Spatula
- Electronic weighing balance
- Filter paper
- Water bath
- Refractometer

Reagents

- Petroleum ether
- Anhydrous sodium sulphate (Na_2SO_4)
- Calcium carbonate ($CaCO_3$)
- Alcoholic potassium hydroxide 12% (KOH-OH)

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3.2 Collection of sample

The avocado pear and green mangoes were collected from sellers in open markets in Awka. The samples collected were transported in a sterile polyethylene bag to the laboratory for analysis within 24 hours.

3.3 Procedure

Preparation of sample

The peels of avocado pear and green mangoes were removed using knife, the peels, fruit and seed (100 g) were blended separately and use for the analysis.

Moisture content determination

Moisture content was determined according to the standard method of AOAC (2010). A petri-dish was washed and dried in the oven. Exactly 2 g of the sample was weighed into petri dish. The weight of the petri dish and sample is noted before drying. The petri-dish and sample was put in the oven and heated at 100 ^{0}C for 1 hour, the result noted and heated another 1 hour until a steady result was obtained and the weight was noted. The drying procedure is continued until a constant weight is obtained.

$$\% \text{ moisture content} = \frac{W1 - W2}{\text{Wt of sample}} \times 100$$

Where: W1 = weight of petri dish and sample before drying

W2 = weight of petri dish

Ash content determination

Ash content was determined according to the standard method of AOAC (2010). Empty platinum crucible was washed, dried and the weight was noted, exactly 2 g of wet sample was weighed into the platinum crucible and placed in a muffle furnace at 500°C for 3 hours. The sample was cooled in desiccators after burning and weighed.

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$$\% \text{ Ash content} = \frac{W3 - W1}{W2 - W1} \times \frac{100}{1}$$

Where; W1 = weight of empty platinum crucible

W2 = weight of platinum crucible and sample before burning

W3 = weight of platinum and ash

Fiber content determination

Fiber content was determined according to the standard method of AOAC (2010). Defat about 2 g of material with petroleum ether (if the fat content is more than 10%). Boil under reflux for 30 minutes with 100 ml of a solution containing 1.25% of H_2SO_4 per 100 ml of solution. Filter the solution through linen or several layers of cheese cloth on a fluted funnel, wash with boiling water until the washings are no longer acid. Transfer the residue to a beaker and boil for 30 minutes with 100 ml of a solution containing 1.25 NaOH per 100 ml. Filter the final residue through a thin but close pad of washed and ignited asbestos in a Gooch crucible, dry in an electric oven and weigh. Incinerate, cool and weigh.

The loss in weight after incineration x 100 is the percentage of crude fiber

$$\% \text{ crude fiber} = \frac{\text{weight of fiber}}{\text{Weight of sample}} \times 100$$

Protein content determination

Protein content was determined according to the standard method of AOAC (2010). Exactly 0.5 g of sample was weighed into a 30 ml kjehdal flask (gently to prevent the sample from touching the walls of the side of each and then the flasks was stoppered and shaken). Then 0.5 g of the kjedahl catalyst mixture was added. The mixture was heated cautiously in a digestion rack under fire until a clear solution appeared. The clear solution was then allowed to stand for 30 minutes and allowed

to cool. After cooling about 100 ml of distilled water is added to avoid caking and then 50 ml was transferred to the kjedahl distillation apparatus. A 100 ml receiver flask containing 5 ml of 2 % boric acid and indicator mixture containing 5 drops of Bromocresol blue and 1 drop of methylene blue is placed under a condenser of the distillation apparatus so that the tap was about 2o cm inside the solution. The 5 ml of 40 % sodium hydroxide was added to the digested sample in the apparatus and distillation commenced immediately until 50 drops gets into the receiver flask, after which it was titrated to pink colour using 0.01 N Hydrochloric acid.

Calculations:

$$\% \text{ Nitrogen} = \frac{\text{Titre value} \times 0.01 \times 14 \times 100}{\text{Weight of sample}}$$

% Protein = % Nitrogen x 6.25

Fat content determination

Fat content determination was determined according to the standard method of AOAC (2010). Dry 250 ml clean flasks in oven at 105 to 110 ^{0}C for about 30 minutes. Transfer into a desiccator and allowed to cool. Weigh correspondingly labeled, cooled flasks. Fill the flasks with about 300 ml of petroleum ether (boiling point 60 ^{0}C), plug the extraction thimble lightly with cotton wool and assemble the soxhlet apparatus and allow to reflux for about 6 hours. Remove thimble with care and collect petroleum ether in the top container of the set – up and drain into a container for re-use. When flask was almost free of petroleum ether, remove and dry at 105 to 110 ^{0}C for 1 hour. Transfer from the oven into a desiccator and allow cooling and weighing.

$$\% \text{ fat} = \frac{\text{weight of fat} \times 100}{\text{Weight of sample}}$$

Carbohydrate content determination

Carbohydrate content was determined according to the standard method of AOAC (2010).

% Carbohydrate = 100 – (% Protein + % Moisture + % Ash + % Fat + % Fibre)

Determination of Vitamin A

Vitamin A content will be determined according to AOAC (2005) procedure. Then, 5 ml sample will be first saponified using an alcoholic solution of potassium hydroxide in the presence of pyrogallol. This freed the vitamins from the food matrix and converted any retinyl ester to retinol. The unsaponified matter containing vitamin A will be extracted using a mixture of diethyl ether and petroleum spirit. The extract will be evaporated under nitrogen and the residue will be dissolved in methanol. The extract will be chromatographed using a reverse phase octadecyl silane (ODS) column with the mobile phase consisting of 95% acetonitrile with 5% water. The separated retinol will be then quantified using a UV absorbance detector at 328 nm Calculate the content of vitamin A in International Units per gram from the expression:

$$\frac{A \times V \times X1900}{100 \times m}$$

Determination of Vitamin C

The ascorbic acid will be determined using the method of AOAC (2005). Then, two millilitres (2ml) of the sample will be weighed and 100 ml of distilled water will be added to it. It will be then filtered to get a clear solution. Also, 10 ml of the clear solution will be pipette into small flask in which 2.5 ml acetone will be added. It will be then titrated with indophenols solution (2, 6-dicholorophenolindophenol) to a faint pink

colour which persists for 15 seconds. The vitamin C content will be calculated as: Vitamin C (mg/ 100ml of sample) = 20 x V x C Where: V= indophenols solution in titration (ml); C= mg Vitamin C/ml indophenols.

Vitamin C mg/100 = $\frac{20 \times (V1-V2) \times C}{\text{Weight of sample}}$

DETERMINATION OF SUGAR LEVEL

Principle: In the juice industry this is a measure of the total soluble solids in the juice. These soluble solids are primarily sugars; sucrose, fructose, and glucose. Citric acid and minerals in the juice also contribute to the soluble solids. Brix is reported as "degrees Brix" and is equivalent to percentage. For example, a juice which is 12 degrees Brix has 12% total soluble solids. The National standards state the minimum brix sugar/ acid ratio for navel drink is 7.8.

Procedure

1. The refractometer will be used for the determination
2. Ensure the refractometer prism surface is clean and dry.
3. Place a small amount of fresh juice (a couple of drops is sufficient) onto the prism of the refractometer.
4. Look through the eyepiece while pointing the prism in the direction of good light (not directly at the sun).
5. Focus and take the reading of where the base of the blue colour sits on the scale and record the % percentage sugar (°Brix).
6. Clean the refractometer immediately with a damp tissue, and dry thoroughly.

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RESULT

The result for the proximate compositions, vitamin and sugar contents in peels, seed and fruits of mango and avocado pears are shown in table 1 to 3. Table 1 showed the proximate compositions and from the results, Moisture ranges from 10.10% in avocado peels to 47.50% in mango fruit, ash (3.87-7.35%), fiber (3.22-7.85%), protein (0.62-3.11%), fats (2.27-17.50 and carbohydrates (37.70-65.32%).

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Table 1: Proximate composition of peels, seed and fruits of mango and avocado pears (%)

SAMPLE	MOISTURE	ASH	FIBER	PROTEIN	FATS	CARBOHYDRATE
MANGO FRUIT	47.50± 0.10	6.80± 0.10	3.22± 1.00	2.51± 0.10	2.27± 0.20	37.70± 2.00
MANGO SEED	16.33± 1.20	4.77± 0.12	3.55± 0.30	1.05± 1.01	9.60± 1.10	64.70± 1.00
MANGO PEELS	13.50± 0.00	3.87± 1.10	5.41± 1.05	0.62± 0.31	3.25± 0.60	73.35± 2.10
AVOCADO FRUIT	37.50± 0.10	4.43± 0.15	2.22± 1.20	3.11± 0.15	5.17± 1.10	47.57± 1.00
AVOCADO SEED	11.30± 0.22	7.35± 0.11	4.80± 0.20	2.35± 0.11	17.50± 0.50	56.70± 1.00
AVOCADO PEELS	10.10± 0.20	5.33± 0.00	7.85± 1.00	1.60± 0.10	9.80± 0.10	65.32± 1.00

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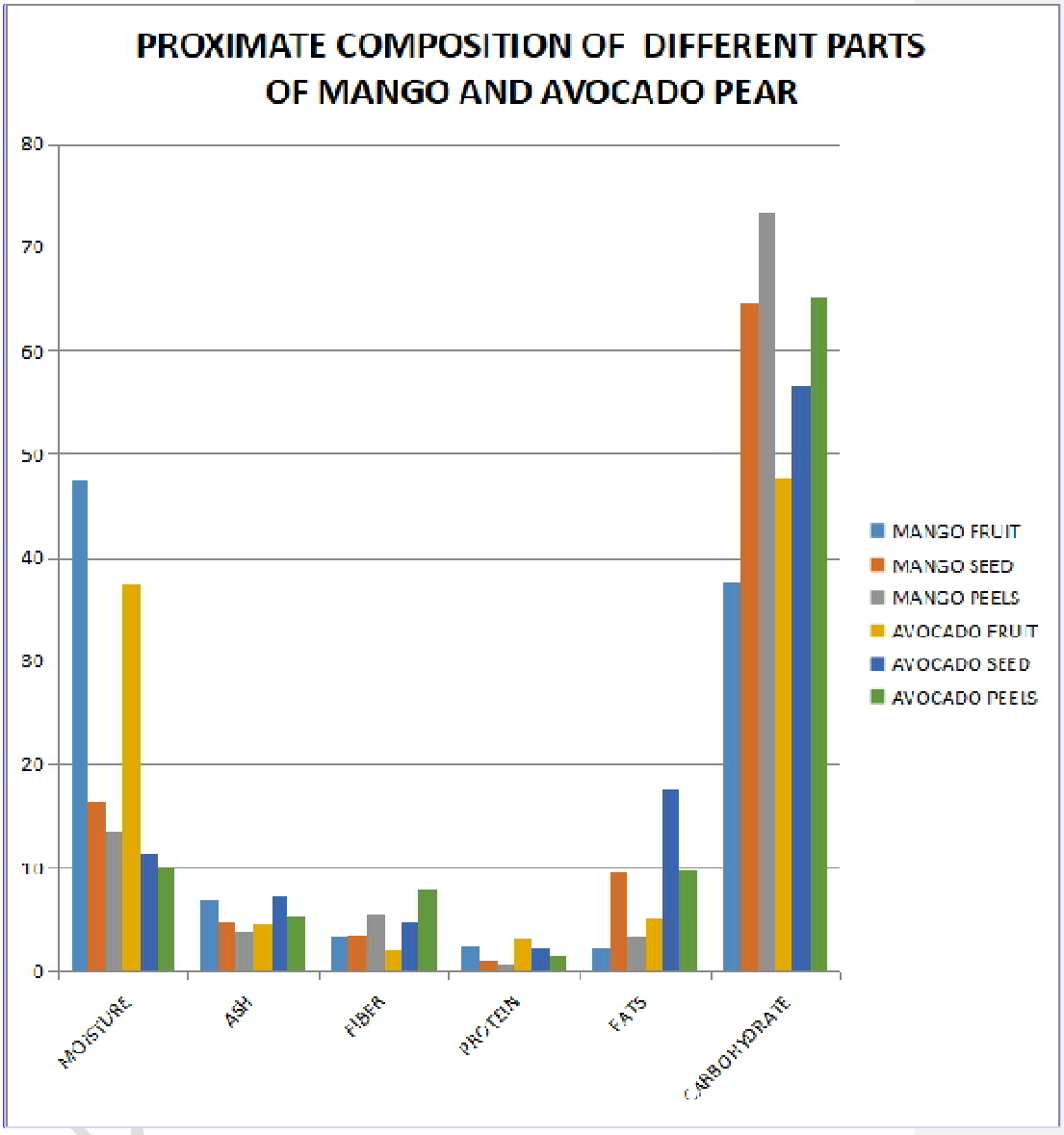

Figure 1: Proximate Composition of different parts of Mango and Avocado Pear

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SUGAR COMPOSITION (Mg/100g)

The result of the comparative sugar contents in peels, seed and fruits of avocado pear and green mangoes in Awka metropolies is presented in table 3. In terms of the total sugar content ranges from 2.1mg/100g in mango seed to 16.80 in avocado fruit

Table 2: sugar composition of peels, seed and fruits of mango and avocado pears (mg/100g)

SAMPLE	REDUCING SUGAR	NON REDUCING SUGAR	TOTAL SUGAR
MANGO FRUIT	3.783± 0.15	6.212± 0.13	10.00± 1.00
MANGO SEED	1.043± 0.21	1.139± 0.00	2.182± 0.00
MANGO PEELS	1.57± 0.13	3.45± 0.10	5.03± 0.10
AVOCADO FRUIT	5.78± 0.10	11.22± 0.10	16.80± 0.01
AVOCADO SEED	3.05± 0.11	5.11± 0.13	8.61± 0.20
AVOCADO PEELS	3.00± 0.00	2.19± 0.21	5.20± 0.11

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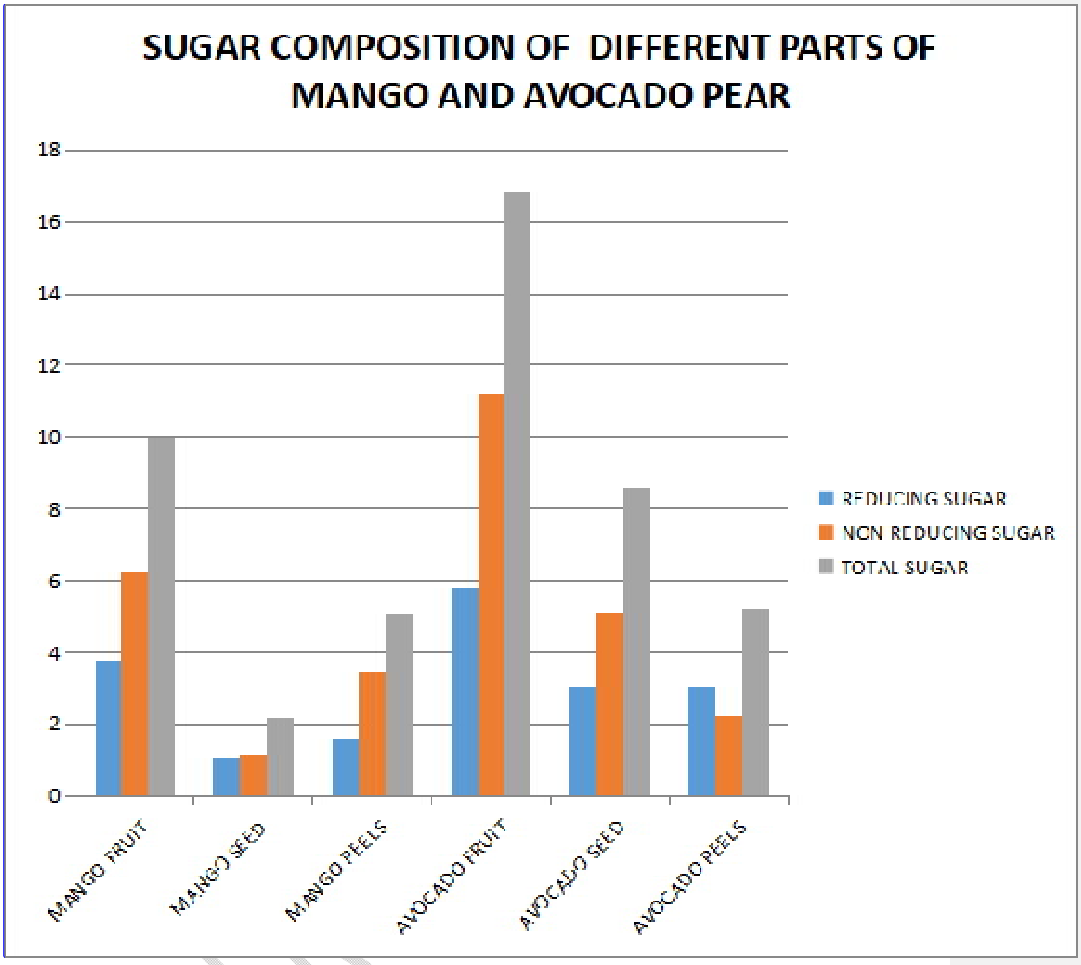

Figure 2: Sugar Composition of Different Parts of Mango and Avocado Pear

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VITAMIN COMPOSITION

The result obtained for the vitamin A and C vitamins in peels, seed and fruits of avocado pear and green mangoes are presented in table 3. Vitamin A ranges from 0.11mg/100g in avocado peels to 1.80mg/100g in avocado fruits, vitamin C (10.30-26.40MG/100g), vitamin D (0.83-3.10mg/100g) and vitamin E (4.18-12.74MG/100g).

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Table 3: Vitamin composition of peels, seed and fruits of mango and avocado pears (Mg/100g)

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SAMPLE	VITAMIN A	VITAMIN C	VITAMIN D	VITAMIN E
MANGO FRUIT	0.16± 0.21	26.40± 0.11	1.03± 0.51	7.45± 0.11
MANGO SEED	0.33± 0.30	10.30± 0.20	3.10± 0.01	7.37± 0.25
MANGO PEELS	1.58± 0.11	11.45± 0.22	2.55± 0.30	10.55± 1.11
AVOCADO FRUIT	1.80± 0.10	31.68± 0.20	1.97± 1.11	4.18± 1.00
AVOCADO SEED	0.48± 0.11	10.13± 0.25	0.83± 0.01	12.74± 0.22
AVOCADO PEELS	0.11± 0.20	17.09± 0.50	1.22± 0.20	9.77± 0.01

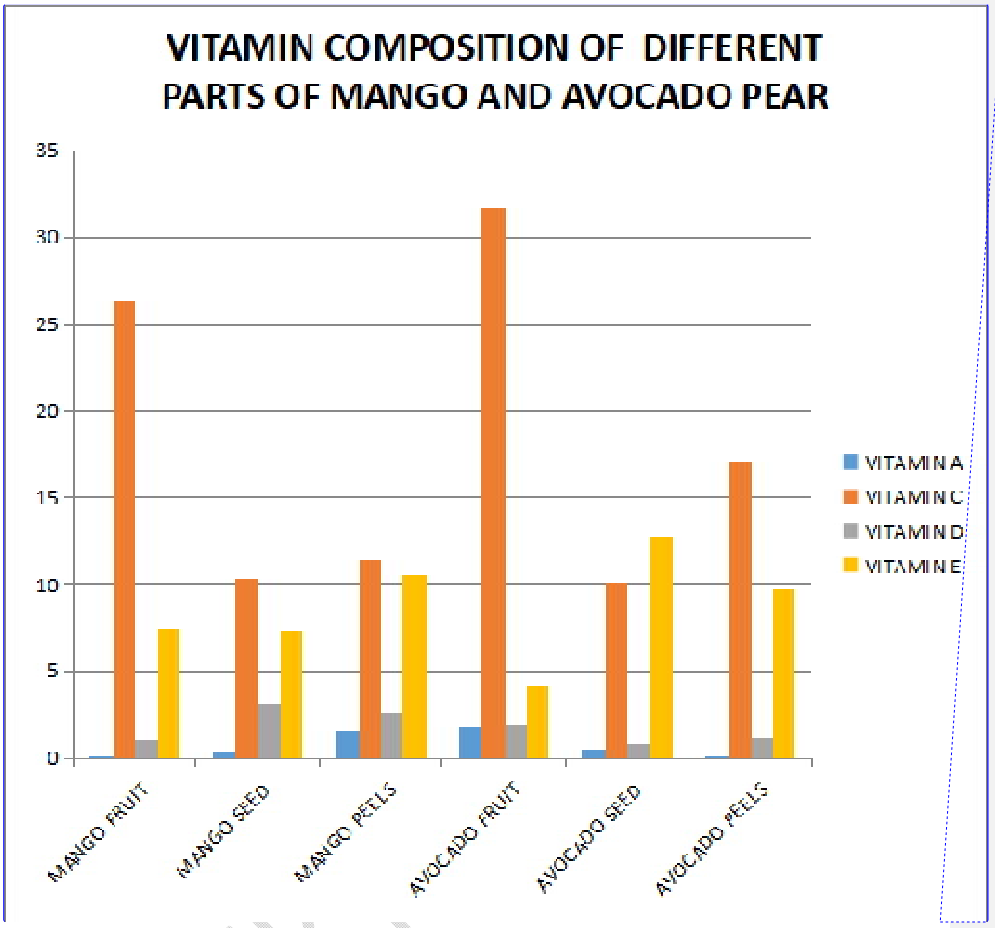

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Figure 3: Vitamin Composition of different parts of mango and avocado pear

DISCUSSION

The result from table 1 showed that peels, seed and fruits of avocado pear and green mangoes contain enough vitamin C which is an antioxidant vitamin essential for human health. Generally, vitamins are

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essential, but in small amounts, for the regulation of normal metabolism and as an antioxidant (Barminas and Charles, 2008). The mango fruits had higher composition value for Vitamin C than avocado fruits reported in the study. These imply higher quantity of antioxidant vitamins in and possibly higher supply from, the tomato samples than green pepper. The vitamin c composition in the fruit sample compared with the value reported for *Sterculia africana* but lower than the values reported by Okwu and Josiah (2006) for *Aspilia africana* and *Bryophylum pinnatum* .

According to Kadar (2010), vitamin C contents of fruits are influenced by a number of factors and prominent among them include varietal differences and pre-harvest environmental conditions. Any of these factors may have contributed to the variations in the ascorbic acid contents of the samples from that of the stated reports.

Vitamins C in foods has been associated with antioxidant activity and therapeutic effects including maintenance and protection of skin and teeth as well as the prevention of scurvy (Shofian *et al*., 2011). However, vitamins, must be supplied daily with a recommended allowance of 60 mg. Although Tosun and Yücecan (2007) suggested it is present in appreciable quantities in other food sources such as green vegetables and potatoes, Kadar (2002) reported it is easily deactivated by heat and exposure to the atmosphere, because of its strong reducing properties. Thus, their presence in fruits and vegetables that do not require heating is preferred.

Typical sugar content concentrations in peels, seed and fruits of avocado pear and green mangoes sold within Awka metropolies are shown in Table 2 to serve as a point of reference for the consumers. Fruits are valuable sources of the essential minerals and vitamins. Around sixty

Comment [H84]: This is discussion of experimental result not historical review. Remove

Comment [H85]: Reconstruct this statement

Comment [H86]: On what basis are you making this comparison. Reconstruct this statement

Comment [H87]: Take this to historical review. Remove

Comment [H88]: Remove

different kinds of fruits are available in Awka metropolies. Every human being requires food for their living as well as for the production of necessary energy like all other animals. Different food contains different proportion of carbohydrates. Most of the people are suffering from malnutrition because they are in need of adequate nutritious food.

Comment [H89]: Reconstruct and include this in....Conclusion

Fruit is occupying a larger proportion of daily food item of modern civilized nation certainly due to their great food values. Most of the people like fruits very much but in some cases a few of them don't like that of unknown cause. The findings indicate that the values for the sugar concentration of sugar in mango was quite high when compared with avocado fruit and seed. This result confirmed the use of mango pulp in wine production when compared with other fruits.

Comment [H90]: Take this to ....Conclusion

This suggests that the sugar concentration of fruit juices appears to represent the true sugar content of the corresponding fresh fruit, in its liquid form. It is relevant to note other beneficial ingredients or nutrients that are found in freshly-extracted fruit juice. The comparison between freshly-extracted and commercial fruit juices has been reported in prior studies.

Comment [H91]: Reconstruct and take ti .....Conclusion

CONCLUSION

The result showed that the peels, seed and fruits of avocado pear and green mangoes used in this study were better sources for the antioxidant vitamins. The preponderance of these nutrients in the samples, may be of nutritional and physiological importance. They may thus be incorporated

into diets as cheaper and/or more accessible source of nutrients to curtail some nutritional deficiencies.

Moreover, the relatively high antioxidant activities of fruits of avocado pear and green mangoes due to presence of vitamin C indicate the potential health benefits of the fruits. This study rather reports the presence of inherent health beneficial constituents, most of which are associated with the treatment of some chronic diseases.

Also, the peels of avocado pear and green mangoes can significantly supplement the dietary fibre needs of the populace (especially that of urban-dwellers) when incorporated into diets as raw-eaten snacks. The fruit mesocarps may also be used as alternative vitamin A and C sources in solving the challenges associated with the monotony of the traditional commercial ones. In view of the experimental results of the analysis of fruit products it could be concluded that the investigated peels of avocado pear and green mangoes showed high content of vitamin A and C and moderate sugar level.

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5.2 Recommendations:

In view of the results obtained from this study, the following recommendations are hereby forwarded.

a. It is recommended that, people should be eating fruit in order to meet up the recommended daily intake of vitamins.

b. It is also recommended that, consumption of fresh fruit should be strongly encourage because cooking of fruit leads to a considerable loss in ascorbic acid contents.

c. Then, people should avoid drying of fruits completely as a means of preserving them because it also leads to a considerable loss in antioxidant vitamin.

d. Freezing of fruits should be strongly encouraged than drying.

e. Further studies are required to investigate the total antioxidant vitamin contents of more of our local fruits and vegetables.

Comment [H93]: Not necessary. Remove

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Page 1: [1] Comment [H2] **HP** **4/7/2023 5:32:00 PM**

Use this Template to present your Title, Authors and Affiliations

Title:

Proximate Analysis of Avocado Pear and Green Mango: Evaluation of Macro and Micro-nutrient Content of Peels, Fruit and Seed

Authors:

[1]Eeeeee E. E. ., [2]Fffff F. F., [3]Gggggg G. G. and [4]Hhhhhh H. H.

Affiliations:

Present your Affiliations

Page 1: [2] Comment [H3] **HP** **4/7/2023 5:55:00 PM**

This research study is aimed at making a comparative assessment of the proximate composition (moisture, ash, fat, fiber, protein and carbohydrate), micro and micro-nutrient content of Peels, Fruit and Seed of Avocado Pear and Green Mango

Page 1: [3] Comment [H5] **HP** **4/7/2023 6:10:00 PM**

The proximate compositions (moisture, ash, fat, fiber, protein and carbohydrate)

Page 1: [4] Comment [H8] **HP** **4/7/2023 6:12:00 PM**

The proximate compositions (moisture, ash, fat, fiber, protein and carbohydrate), reducing, non-reducing and total sugar were determined using AOAC

Page 1: [5] Comment [H12] **HP** **4/7/2023 11:48:00 PM**

The result show that moisture content of 10.10% was recorded for avocado peels and 47.50% for mango fruit

Page 1: [6] Comment [H13] **HP** **4/7/2023 11:54:00 PM**

....while the proximate analysis carried out recorded ash (3.87-7.35%), fiber (3.22-7.85%), protein (0.62-3.11%), fats (2.27-17.50 and carbohydrates (37.70-65.32%).

Page 1: [7] Comment [H15] **HP** **4/7/2023 6:25:00 PM**

Total sugar content ranges from 2.1mg/100g in mango seed to 16.80 in avocado fruit.

Page 1: [8] Comment [H16] **HP** **4/7/2023 6:25:00 PM**

Total sugar content range from 2.1mg/100g in mango seed to 16.80 in avocado fruit.

Page 1: [9] Comment [H17] **HP** **4/7/2023 6:27:00 PM**

Vitamin A ranged from 0.11mg/100g in avocado peels to 1.80mg/100g in avocado fruits, while vitamin C ranged (10.30-26.40MG/100g), vitamin D (0.83-3.10mg/100g) and vitamin E (4.18-12.74MG/100g).

Page 1: [10] Comment [H20] **HP** **4/8/2023 12:00:00 AM**

...contain enough vitamin C, an antioxidant essential for human health hence the need to increase the consumption of these fruits.

Page 1: [11] Comment [H24] **HP** **4/8/2023 12:08:00 AM**

The industrial utilization of peels of avocado pear and green mangoes in the production of food and drug products are also recommended.