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Effect of preparation and cooking methods on the nutrient compositions of melon soups consumed in cross river state, Nigeria

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Abstract
Food choice and consumption is affected by inadequate food preparation, cooking methods and porosity of data on their nutrient composition etc. This study therefore assessed the proximate, mineral, fatty acids (FA), amino acids (AC), Vitamin A and carotenoid compositions of melon soups prepared using different indigenous methods.
Purchased melon seeds from Calabar Cross River State Nigeria was prepared and cooked using standard methods. Nutrient compositions of the two soups (Method-1: melon + water leaf + bitter leaf and Method-2: melon + water leaf + pumpkin leaf) were analysed using standard methods. Nutrient compositions of the soups (Method 1 and method 2) varied as follows. Protein 10.27±0.14% and 11.21±0.10%; fats 9.58±0.15 and 11.15±0.15%; carbohydrate 71.85±0.35 and 69.40±0.35% respectively. Leucine was the most abundant amino acid in the two soups (0.99 ±0.00 and 1.16 ±0.00 respectively), followed by arginine (0.64 ± 0.00 and 0.76 ±0.00 respectively). Methionine and tryptophan were found in the least amount. Method-2 had more amounts of phosphorus (47.53± 0.32), magnesium (17.83± 1.01), calcium (50.52± 4.10), sodium (15.86± 2.30) and zinc (0.47± 0.01) compared to Method-1. Method-1 had higher amounts of potassium (148.12± 0.14), copper (0.68±1.01) and iron (1.04± 0.91). The soups were also rich in oleic, linoleic and palmitic acids. The α-carotenoids, β-carotenoids, β-cryptoxanthin and vitamin A contents of the Method-2 were significantly ($p<0.05$) higher compared with the method-1. The soups are rich in essential nutrients although in variable amounts. Consumers should leverage on the information on their nutrient compositions for better food choice and nutritional outcome.

Keywords: melon, vitamins, amino acids, fatty acids, proximate and mineral analysis

Introduction

Soup is a tasty, popular food that is nutritious, wholesome, and stimulates the appetite. It is in the centre of the peoples' daily food as almost all carbohydrate diet is accompanied with one form of soup or another. Thus, pounded yam, processed cassava (garri and fufu), rice, and so on are taken with soup on daily basis [1].

Citrullus lunatus (melon) is among the popular seeds used for soup preparation as condiments and thickeners in most part of Nigeria, others are groundnut (*Arachis hypogaea*), and *Irvingia gabonesis* (ogbono) [2].

Melon also known as Egusi by the people of Southern Nigeria is used as a common component of daily meals in West Africa. It is edible, somehow bitter, nutty-flavoured, and rich in fat and protein. The seed could be eaten whole or used as an oil seed [3]. Melon seed is a good source of lipid and protein [4, 5]**.** It contains edible oil, 56% of which is linoleic acids and 25% oleic acids [6]**.**

Despite the nutritional benefits attributed to various plant parts, there is prevalence of malnutrition and food insecurity in developing countries due to under-utilization of plant parts by many people, high cost of animal protein sources and increasing population [7-9]. To curtail this, researches have been prompted into nutritional status of various plants with the aim of introducing more plant food especially the under-utilized plant seeds required to control the increasing food shortages and malnutrition [10-13]. Processing methods also affect bioavailability of some vital nutrients [14].

Knowledge of the nutrient values of melon soup is necessary in order to encourage increased cultivation and consumption of these nutritive seed utilized commonly for the preparation of soups among the indigenous people of Cross River State. The result from this study will help improve the database of the nutrient composition of these soups for better food choice.

Methodology

A. Sample collection

Raw melon seed, pumpkin leaf, bitter leaf and water leaf and other ingredients were purchased from Watt market in Calabar South, Local Government Area of Cross River State, Nigeria in the month of October.

B. Preparation of melon (egusi) soup.

1. Method 1

Melon was milled into powder, the beef and stock fish were washed separately, dry fish was washed and deboned and added to the beef and stock fish. Water, salt, pepper, onion and bouillon cube were added and the mixture was allowed to boil for 20 minutes. Crayfish was added to the stock and allowed to simmer for two minutes. Milled melon powder was added and allowed to simmer for 5 minutes. Palm oil was added and the mixture allowed to simmer for another five minutes. Water leaf and bitter leaf were added and allowed to simmer for two minutes and cooking was terminated, see Table 1.

2. Method-2
Melon seeds were sorted and blended. Fish was deboned and washed, stock fish and beef were also washed. Water, salt, pepper, onion, bouillon cube were added to the beef, stock fish and fish; they were boiled for 20 minutes. Melon powder was soaked in 200ml of water for 10 minutes Palm oil was heated slightly in a different pot, diced onion was added to the oil and heated slightly. The soaked melon was added to the oil and fried till dry for 5 minutes, the mixture was stirred continuously to avoid getting burnt. The stock was added to the mixture, water leaves were also added and simmered for 15 minutes. Crayfish and pumpkin leaves were added and allowed to simmer for 2 minutes and cooking was terminated, see Table 1.

Table 1: List of soup ingredients and quantity for melon (egusi) soup using method 1 and 2

Ingredients	Quantity	
	Method 1	Method 2
Melons	245g	245g
Meat	500g	500g
Dry fish	350g	350g
Stock fish	380g	380g
Crayfish	50g	50g
Salt	7.5g	7.5g
Pepper	5g	5g
Bouillon cube	16g	16g
Onion	65g	65g
palm oil	75ml	75ml
Water	1500ml	1500ml
Bitter leaf	100g	-
Water leaf	100g	100g
Pumpkin leaf	-	100g

C. Preparing sample for analysis
Samples were dried in an electric water dehydrator 50°C, after drying the sample were homogenized with the aid of an electric blender into paste then the samples were stored in a refrigerator before taken for analysis.

D. Proximate Analysis
Protein, moisture, fat, ash, dietary fibre and minerals (were determined according to standard method [15]. Moisture was determined using the air oven method. Crude protein and fat were determined by Kjeldahl procedure and Soxhlet solvent extraction method, respectively. Total dietary fibre was determined by enzyme gravimetric method of Prosky *et al*. Ash was determined by incineration of samples in a muffle furnace at 550°C for six hours. Available carbohydrate was calculated by difference 100−(moisture + protein + fat + ash + dietary fibre).

E. Analysis of Amino Acids
Ground samples were first dried at 100 degrees and homogenized after which the samples were prepared for amino acid determination by acid hydrolysis with 6 N HCl for 24 hours at 110°C in vial under vacuum and N2 atmosphere. Sample solution was evaporated and dissolved in sodium citrate buffer (pH 2.2). The hydrolysates were analyzed by a post-column derivative method using a HPLC, which was combined with a Pickering PCX5200 derivatizer (Pickering Laboratories, Inc., USA) and ion exchange column (3.0 × 250 mm, 8μm). The identification of amino acids was spectrometrically performed by measuring at 570 nm [16].

F. Mineral analysis
The phosphomolybdate method was used determine Phosphorus [17]. Potassium and Sodium were determined by flame photometer (Jenway, PF 7, Essex UK) while calcium, magnesium, iron and zinc were determined by Atomic absorption spectrophotometer (Unicam Analytical system, Model 919, Cambridge, UK.

G. Vitamin A (Retinol) analysis
The spectrophotometric method was employed in the determination of vitamins content. Three different test tubes were prepared into which 0.2ml of alcoholic potassium hydroxide was added to sample, standard, and blank test tubes. Distilled water of 0.2ml volume was added to blank test tube alone. The mixture formed was mixed on the vortex for 10-20 sec with the tubes stoppered. The test tubes were then placed on a water bath at approximately 55-60°C for 20min. A prepared 0.2ml 1:1mixture of xylene: kerosene was added after 20min of cooling the samples to room temperature and mixed. Retinol was extracted by vigorous mixing of each tube on the vortex for at least 30 sec, and the tubes were centrifuged for 5 min at 600-1000rpm. The xylene-kerosene supernatant formed was carefully withdrawn from the test tubes by a means of Pasteur's pipette, and the extracted samples read at 328nm with the aid of a spectrophotometer.

H. Carotenoid Determination
Two grams of the powdered sample was weighed and transferred into a 250ml round bottomed flask where 50ml of 20% ethanol solution was added. The mixture was kept under reflux for about 30min and was filtered into a 250ml conical flask. Two test tubes were prepared, 2.5ml of the filtrate was placed, and 0.5ml of concentrated nitric acid (HNO_2) was added to each. The mixtures were allowed to stand over a hot water bath f or 3min after which the test tubes were cooled and allowed to stand in dark for 15min. The volume of the solution was brought to 5ml with absolute ethanol, shaken and the absorbance measured at 470nm wavelength with the aid of a spectrophotometer. A standard and blank solution was also prepared and read off at the same wavelength [18].

I. Determination of Fatty Acids Content
The fatty acids profiles were determined by Gas Chromatography-Mass Spectrometry (GC-MS). Fatty acid methyl esters were prepared using BF3 methanolic solution and extracted with hexane. Gas Chromatography coupled with Mass Spectrometry Analysis. A 2 µl volume of each sample was injected in a HP6890 Series Gas Chromatograph coupled with a Hewlett Packard 5973 Mass Selective Detector. The gas chromatograph was equipped with a split-splitless injector and a Factor Four TM Capillary Column VF- 35ms fused silica column of 5% phenylmethylpolysiloxane, 30m x 0.25 mm, film thickness 0.25µm.
The GC oven was set to a temperature range of 100 to 3000C with 60C/min, and a solvent delay of 7 min. The injector temperature was maintained at 230 0C. The carrier gas of the sample was helium at 1.0 mL/min and the sample was injected in the splitless mode. The MS conditions were the followings: ionization energy, 70 eV; electronic impact ion source temperature, 200^0C; quadrupole temperature, 100^0C; scan rate 1.6 scan/s; mass, 40-500 Amu. For the

identification of the compounds the mass spectra of the samples were compared with those of the NIST/EPA/NIH Mass Spectral Library 2.0 [19].

J. Statistical analysis

The results obtained were summarized in a tabular form and statistically analysed using independent sample t-test with the aid of SPSS version 25.0 for windows (Microsoft Company, USA). Data were presented as mean ± standard error of mean. P-value of less than 0.05 was accepted as significant.

Result and discussion

A. Proximate composition of melon soups prepared using two different methods of preparation

Table 2: Proximate composition of melon soups prepared from two different Efik methods of preparation. (% composition)

Parameters	Method-1	Method-2
Protein	10.27±0.14	11.21±0.10*
Fat	9.58±0.15	11.15±0.15*
Ash	2.76±0.11	2.25±0.15*
Available carbohydrate	71.85±0.35	69.40±0.35*
Moisture	75.81±0.69	72.28±0.45*
Dietary Fibre	5.54±0.01	5.99±0.01*
Energy(kcal/KJ)	425.78/50616.6	434.78/5681.96

Values presented mean of triplicate values ± SD (Standard Deviation) * = significantly different from melon Efik -1 at p<0.05

Table 2 showed the mean values of proximate composition of melon soups prepared from two different methods. Protein (11.21 ±0.10%), fat (11.15 ±0.15%), and Dietary fibre (5.99 ±0.01%) were significantly (p<0.05) higher in melon soup prepared using Method-2 when compared with the melon soup prepared using method-1 method, while ash (2.25 ±0.15%), available carbohydrate (69.40 ±0.35%), and moisture (72.28 ±0.45%) were significantly (P<0.05) lower in melon soup prepared using Method-2. There is a no significant difference in the mean values of the energy values of the soups.

Crude proteins, crude fats and crude fibre content of the melon soup prepared using method 2 were higher compared to method-1, while ash, moisture and total carbohydrate were higher in method-1 compared to method-2. Some scholars [20] have presented proximate composition of melon seed as follows: moisture (4.60 ±0.30%), ash (3.70 ±0.10%), crude protein (23.40 ±0.20%), crude fibre (12d.00 ±0.10%), and total carbohydrate (10.60 ±0.20%), similar to report by Umar and colleagues [21]. Their results indicated higher moisture, ash, proteins and fiber contents compared to our present study. The fiber contents of the two melon soups also met the recommended crude fiber content of 5.0 to 6.0%. Protein deficiency causes growth retardation, muscle wasting, oedema, abnormal swelling of the belly [22]. Protein is needed for growth and overall survival of animals and humans [23].

B. Essential amino acids composition of melon soups prepared from two different methods of preparation

Table 3: Essential amino acids composition of melon soups prepared from two different Efik methods of preparation. (%composition as consumed)

Parameters	Method-1	Method-2
Isoleucine	0.48±0.00	0.65±0.00*
Leucine	0.99±0.00	1.16±0.00*
Lysine	0.42±0.00	0.67±0.00*
Arginine	0.64±0.00	0.76±0.00*
Methionine	0.061±0.00	0.071±0.00*
Phenylalanine	0.36±0.00	0.38±0.00*
Threonine	0.21±0.00	0.20±0.00*
Tryptophan	0.093±0.00	0.097±0.00*
Valine	0.31±0.00	0.32±0.00*
Histidine	0.15±0.00	0.14±0.00*

Result presented as mean ± SD (Standard Deviation) *significant at p<0.05 confidence level, n = 3.

As shown in Table 3, melon soup prepared with water leaf (method 2) had greater amount of isoleucine (0.65±0.00), leucine (1.16±0.00), lysine (0.67±0.00), tryptophan (0.097±0.00), arginine (0.76±0.00), valine (0.32±0.00) and methionine (0.071±0.00) compared with melon soup prepared with water leaf and bitter leafs (method 1). However, threonine and histidine were more in melon soup prepared using method 1 compared with method 2.

The protein quality of plant food is determined by the amino acid composition of the plant. Most essential amino acids cannot be synthesized by the body and are derived solely from plant sources which are altered by the processing method [24]. Amino acids are very important to the overall functions of the cells of the body. Some of them (Phenylalanine and tryptophan) are precursors of many vital biological compounds such as neurotransmitters and hormones [25], in the synthesis of melanin pigment in hair, eye and skin [26]. Aspartate is a precursor for the synthesis of other amino acids like methionine, threonine, and lysine. Arginine on the other hand is the precursor for the synthesis of nitric oxide (NO), NO is a potent vasodilator in the cardiovascular system, especially during exercise for enhanced performance [27].

Results obtained for leucine appeared and arginine corroborates reports of other scholars [28-33], that leucine is most abundant essential amino acid in Nigerian plant foods. Leucine is found in high concentration in the muscle tissue where they help muscle performance during extreme exertions [34-37]. Tryptophan and methionine appeared in the lowest concentration in both method-I and method-II respectively. Although, results obtained from this present study are lower compared to other research work [38] on the amino acid contents of melon soup that used ogiri (a good source of protein) to prepare the melon soup. Other scholars also presented higher amino acid composition of melon in their study [39-41] observed that arginine, glutamic acid and aspartic acid were most common amino acids in melon seed, this results contract our present finding. Possibly due to other ingredients used in melon soup preparation.

C. Mineral composition of melon soups prepared from two different methods of preparation

Table 4: Mineral composition of melon soups prepared from two different efik methods of preparation. (%composition as consumed)

Mineral	Method-1	Method-2
P	44.49 ± 0.01	47.53 ± 0.32*
K	148.12 ± 0.14	144.93 ± 1.21*
Mg	17.15 ± 0.10	17.83 ± 1.01*
Ca	39.37 ± 2.10	50.52 ± 4.10*
Na	12.88 ±0.14	15.86 ± 2.30*
Cu	0.68 ± 1.01	0.19 ± 0.00*
Fe	1.04 ± 0.91	0.98 ± 0.00*
Zn	0.38 ± 0.04	0.47 ± 0.01*

Values are expressed as mean ±SEM, n = 3.
*significant at $p<0.05$ confidence level, n = 3.

As shown in Table 4, melon soup prepared with water leaf (method 2) was richer in phosphorus (47.53± 0.32), magnesium (17.83± 1.01), calcium (50.52±0.41), sodium (15.86±2.30), and zinc (0.47±0.01) compared with melon soup prepared with water leaf and bitter leafs (method 1). But, melon soup prepared using method 1 had higher amount of potassium (148.12±0.14), copper (0.68±1.01) and iron (1.04±0.91) compared with method 2 (144.93±1.21; 0.91±0.00 and 0.98±0.00 respectively).

Mineral are important for vital body function such as acid-base and water balance. Calcium and phosphorus are the minerals present in the large quantity in the structure of the body and in the bones. Iron is an important constituent of heamoglobin. Vegetables provide needed minerals and enhance the availability in daily life [42].

The result of the study showed great variation in the concentration of the minerals in the two soups, except in the case of iron (Fe) and Zinc (Zn) that showed no significant difference between the two soups [42].

Recommended daily intake of phosphorus ranges from (7.8 to 20.1mg)/g protein. Phosphorus just like calcium play crucial role in bone and teeth development. It is important to note that phosphorus from food sources are relatively bioavailable with the exception of plant seeds (beans, peas, cereals, nuts) that contain a special courage form of phosphate called phytic acid. Deficiencies in phosphorus are rear because of the prevalence of the phosphorus in food and are generally observed only in cases of starvation [43]. Method-2 of melon soup preparation had more phosphorus than method-1.

The estimated average daily intake of potassium in adult is about 2,320mg for men and 3,016mg for women. Low potassium is associated with a risk of high blood pressure, heart disease, stroke, arthritis, cancer, digestive disorders, and infertility. For people with low potassium, improved diets or potassium supplements to prevent or treat some of these conditions may be recommended. Potassium was below the recommended levels in the analyzed food sample [44]. Potassium content of soup prepared using method-1 was higher than method-2. However, Nigerian soil is rich in potassium, most Nigerian food are rich in potassium [21].

Average intake of magnesium for Men 350mg and 267mg for women Magnesium content was observed to be appreciable amount in soup prepared using method 2 when compared to that prepared using method 1. Magnesium helps in blood pressure reduction and helps to prevent sudden heart attack, cardiac arrest and stroke. Like calcium, magnesium is an important component of bone and contributes to its structural development.

While calcium contracts muscles, magnesium relaxes the muscles [45]. Green leaf, legumes, nuts, seeds and whole grains are good sources of magnesium. Magnesium deficiency results in uncontrolled twisting of muscles leading to convulsion, which may eventually leads to death and it is common in people with chronic alcoholism [46].

For adult recommended calcium allowance is based on estimate of 200 to 250mg/day, Calcium concentration was found to low in soup-1 compared to soup-2. Calcium content of the two soups in our present study agrees with the work of other researchers [47]. Calcium is a constituent of bones and helps the muscle to contract correctly, blood to clot and the nerves to convey messages. When the calcium supply to the body becomes insufficient, the body gets its own needed calcium from the bones. If the body continues to tear down more calcium than it replaces over a period of years the bones will become weak and break easily [48]. The Ca/P ratio of all the soup type is more than the standard of 0.5. Higher Ca/K level in food is required for favourable calcium absorption in the intestine for bone [49]. The Ca/P ratio in this study indicates that all the soup type would help calcium absorption in the body.

Adults should consume less than 2,000mg of sodium or 5 grams per day of salt [50]. Also, sodium level higher in soup-2 (Efik method 2 = melon + water leaf and pumpkin leaf) than in soup-1 (method 1 = melon + water leaf and bitter leaf). This result contradicts that of previous report [47], who reported a low sodium level in melon soup using pumpkin leaf. Na/K plays a very importance role in diet as it controls high blood pressure in the body. Studies had showed that lower sodium and higher potassium intake helps to reduce high blood pressure in hypertensive patients. The recommended Na/K ratio should be less than one. The report of this investigation revealed that regular consumption of the melon soup prepared with water leaf and bitter leaf or pumpkin leaf would help to prevent hypertension and might lower blood pressure in hypertensive patients. This result agrees with the finding of other scholars [43], who reported that Nigerian underutilized legumes are good sources of diet for lowering blood pressure.

The median intake of copper from food is approximately 1.0 to 1.6mg/day for adult men and women. Also, copper level was found to be above normal range in soup 1(Efik method 1 = melon + water leaf and bitter leaf) when soup 2 (Efik method 2 = melon + water leaf and pumpkin leaf). This supports report showing moderate content of copper in melon soup [51]. Copper is an essential micronutrient for man and a constituent of specific cupero-enzymes (cytoplasmic superoxide dismutase, cytochrome c oxidase, dopamine-B-monoxygenase and tyrosinase). It is involved in lipid metabolism, bones development, and maturation of connective tissue. Dietary deficiency is rarely reported; it clinical manifestations include depigmentation of skin and hair, neurologic disturbances, leukopenia, hypochromic microcytic anemia, and skeletal abnormalities. People living in many developing countries lack adequate copper even in the absence of an apparent sign of deficiency [52]. However, this work had shown that melon soup prepared in Cross River State has the ability to supply enough copper needed by the body. Iron (Fe) content was observed to be normal range in soup 1 (Efik method 1 = melon + water leaf and bitter leaf) and soup 2 (Efik method 2 = melon + water leaf and pumpkin leaf). The result again contradicts the earlier study [52], who reported high content of iron in some Nigerian traditional soups. The reason for the difference in iron content might have been due to the method of preparation of the soup, as well as the recipe used. Iron is the most common micronutrient deficiency in the world. Women of childbearing age are the highest-risk group because of menstrual blood losses, pregnancy, and lactation. Iron conveys the capacity to participate in redox reactions to a number of metalloproteins such as haemoglobin, myoglobin, cytochrome enzymes, and many oxidases and oxygenases. It is required for many proteins and enzymes, notably haemoglobin to prevent anaemia [53]. All the soups analyzed contain inadequate proportion of iron when compared with RDA of 18 mg. To meet the daily requirement of iron, other sources of iron should be supplemented with melon soup.

Dietary intake of zinc range from 4-25mg / day has been recommended. Zinc was the third least present element and was found small amounts in the two soups and agrees with other reports [54], positing most Nigerian soup are not good source of zinc. Zinc boosts the health of our hairs, plays a role in the proper function of sense organs such as, ability to taste and smell, helps in carbohydrate and protein metabolism and also assists in metabolism of vitamin A from its storage site in the liver and facilitate the synthesis of DNA and RNA necessary for cell reproduction [55].

D. Fatty acid composition of melon soups prepared from two different methods of preparation

Table 5: Fatty acids composition of melon soups prepared from two different Efik methods of preparation (% composition as consumed)

Parameters	Method-1	Method-2
Palmitic %	0.98±0.00	0.85±0.00*
Stearic %	1.04±0.00	0.80±0.00 *
Lauric %	0.02±0.00	0.04±0.00 *
Behenic %	0.002±0.00	0.00±0.00*
*L-O %	0.002±0.00	0.00±0.00*
Oleic %	3.84±0.00	7.00±0.00*
Linoleic %	1.50±0.00	1.90±0.00*
Linolenic%	0.04±0.00	0.04±0.00

Result presented as mean ± SD (Standard Deviation)
*significant at p<0.05 confidence level, n = 3.

Table 5 shows the fatty acid composition of the melon seed soups. The fatty acids in soup prepared using method 1 were: Palmitic acid (0.98±0.00), Stearic acid (1.04±0.00), Lauric acid (0.002±0.00), Behenic acid (0.002±0.00), Lign-oceric (L-O) acid (0.002±0.00), Oleic acid (3.84±0.00), Linoleic acid (1.50±0.00) and Linolenic acid (0.04±0.00).

Palmitic acid, Stearic acid, Behenic acid and Lign-oceric (L-O) were significantly higher in melon soup prepared by Efik Method-1 of melon preparation when compared to melon soup prepared by Efik method-2 of melon soup preparation (p<0.05), while Lauric acid, Oleic and Linoleic acid were significantly lower in melon soup prepared by Efik Method-2 method of melon preparation when compared to melon soup prepared by Efik method-1 (p<0.05). There was no significant difference in the mean values of Linolenic acid when compared between the two different methods of melon soup preparation (p>0.05).

The fatty acid composition of melon soup prepared using method 1 (melon + waterleaf and bitter leaf) and method 2 (melon + waterleaf and pumpkin leaf) Efik-2 methods of preparation. The saturated fatty acids present were Palmitic, Stearic, Behenic, Lauric and Lign-Oceric acid; the monounsaturated fatty acid was oleic while the polyunsaturated were linoleic and linolenic acids. Other reports showed that palmitic acid as the most common fatty acid in melon soups (melon + spinach), which may be attributed to the high amount of palm oil used in preparation of the soups [56]. In our present study oleic and linoleic acids were preponderant.

The result obtained for stearic acid in this study agrees with previous report that the stearic acid value of melon soup at 1.60% [56]. Lauric, Behenic and Lign-oceri acids were in trace amount in the four soups. With this value obtained melon soups have lower amount of saturated fatty acid. Linolenic acid compositions of the two soups were in trace amount ranging from 0.37% to 0.39% in melon soup 1 and 2. This result is in agreement with report by other scholars [56].

E. Comparison of vitamin composition of melon soups prepared from two different Efik methods of preparation.

Table 6: Carotenoid and Vitamin A composition of melon soups prepared from two different Efik methods of preparation (mcg/100g)

Parameters	Method-1	Method-2
α -Carotenoid	156±0.01	195±0.01*
β-Carotenoid	185±0.04	284±0.01*
β-Cryptoxanthin	203±0.03	309±0.01*
Vitamin A	30.72±0.03	47.29±0.07*
Total vitamin A (RAE)	210.60	278.84

Values presented mean of triplicate values ± SD (Standard Deviation) * = significantly different from melon Efik-1 at P<0.05

The mean value of α-Carotenoid (195±0.01ug/100g), β-Carotenoid (284±0.01ug/100g), β-Cryptoxanthin (309±0.01 ug/100g) and Vitamin A (47.29±0.07mcg/100g) were significantly (p<0.05) higher in melon soup prepared using method-2 method of melon soup preparation when compared to the one prepared using method 1.

Conclusion

It can therefore be concluded that melon soups are good sources of proteins, fats, essential nutrients - vitamins (carotenoids), amino acids (especially leucine and arginine), monounsaturated and polyunsaturated fatty acid (especially Oleic acid) and micronutrients (potassium, calcium and phosphorus etc.). The consumption of these melon soups should be encouraged especially in combination with water leaf and pumpkin leaf.

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