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COMPARISON OF PROXIMATE, MINERAL AND VITAMIN COMPOSITION OF SELECTED FRUITS AND VEGETABLES

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ABSTRACT

Proximate, mineral and vitamin composition of some selected fruits and vegetables gotten from Local markets in Lokoja, Kogi state, Nigeria were investigated. The fruits were Carrot (*Daucus carota*), Pawpaw (*Carica papaya*) and Apple (*Malus domestica*) and the Vegetables were Ugu (*Telfairai occidentalis*) Scent leaf (*Ocimum gratissimum*) and Bitter leaf (*Vernonia amygdalina*). The fruits and vegetables were analyzed for proximate content (Moisture, Fat, Ash, Protein Crude fiber and Carbohydrate), Mineral elements (Mg, Ca, Fe, K and Na) and Vitamins (A and C). The fresh fruits and vegetables were air dried, pulverized, and analyzed. The proximate analysis of the selected fruits and vegetables indicated that both the fruits and vegetables were high in Crude fiber and Carbohydrate content. The Crude fiber content ranged from 18.33-46.32% in Carrot and Ugu leaf respectively and Carbohydrate content ranged from 16.40-64.09% in Ugu leaf and Apple respectively. Vegetable samples were slightly higher in their protein content with Scent leaf 22.84% highest and Ugu leaf having 15.91% lowest, as compared to the fruit samples with Carrot having 8.92% highest and Apple having 3.15% lowest. The Mineral elements analysis indicated that all the samples contained low levels of mineral elements. Fe (Iron) is predominant element, with highest level of 885.0 ± 0.12 mg/kg in Bitter leaf and as low as 221.5 ± 0.07 mg/kg in Carrot. All the samples were poor sources of Magnesium and Sodium, except Calcium which was relatively high in Scent leaf 6.92 ± 0.08% but lowest in Bitter leaf 0.03 ± 0.01%. Samples analyzed showed they were all good sources of the Vitamins with Scent leaf having highest Vitamin A and Vitamin C content of 0.36% and 0.385% respectively in vegetables. All selected fruits and vegetables are of high nutritional value based on the minerals analyzed and should be consumed more often for maintenance of good health.

Key words: Vitamin, Proximate, Minerals, Fruits, Vegetables

INTRODUCTION

Fruits are generally acceptable as good source of nutrients and supplement for food in a world faced with problem of food scarcity. They are known to be excellent source of nutrients such as minerals and vitamins; and also contain carbohydrates in form of soluble sugars, cellulose and starch (Nahar *et al*., 1990; Oladejo, 2009). Fruits are very vital portion of an adequate diet and they serve as food supplement, and an appetizer.

The contribution of fruits and their constituent to human nutrition cannot be overstated. In Africa, fruits are on high demand. This is because they are complemented with food to ensure balanced diet, and some serve as raw materials to industries. Fruits serve as sources of vitamins and minerals

hence, they play important role in the body. Also, some of these fruits are used in folk medicine to salvage some diseases. The ability of these fruits to remedy diseases could be as a result of bioactive constituents, which are generally present in plants (Udeme *et al.*, 2013).

Vegetables are generally succulent parts of plants grown in gardens and consumed as a side dish with starchy staples (Guarino, 1995; Emebu and Anyika, 2011). Several vegetable species abound in the world. Fresh vegetables are important foods both from an economic and nutritional point of view and vegetable of all types are valuable part of our diet. They play an important part in maintaining general good health owing to the presence of mineral element and vitamin

Vegetables are available in many varieties and can be classified into biological groups including:

Leafy green: lettuce, spinach and silver beet, Marrow: pumpkin, cucumber and zucchini Edible plant stem:
Common types of fruits that are readily available in clude: Apples and pears. Citrus: oranges, grapefruits, mandarins and limes.
Stone fruit: nectarines, apricots, peaches and plums celery and asparagus. Cruciferous: cabbage, cauliflower, Brussels sprouts and broccoli (Emebu and Anyika, 2011).

Fruits and Vegetables are low in fats and sugar. They are good sources of dietary fiber. As part of a well- balanced, regular diet and a healthy, active lifestyle, a high intake of fruits and vegetables can help reduce obesity and maintain a healthy weight, Lower cholesterol and blood pressure.

This research work determined and compared the proximate, mineral and vitamin composition of selected fruits and vegetables.

MATERIALS AND METHODS

Collection of samples

Fruits including, Carrot (*Daucus carota*), Pawpaw (*Carica papaya*), Apple (*Malus domestica),* were obtained from the local markets in Lokoja, Kogi State.

Vegetable samples for this research includes, Bitter leaf (*Vernonia amygdalina*), Scent leaf (*Ocimum gratissimum*), and Ugu leaf *(Telfairai occidentalis*), were also gotten from the local market Lokoja, Kogi State. The fruits and vegetable were identified and authenticated by a taxonomist in the Botany Unit, Salem University Lokoja, Kogi State Nigeria.

Preparation of Samples

The selected fruits and vegetables to be used in this study were harvested fresh. The leaves were destalked, washed with clean tap water and air dried. Also, the fruits were washed with clean water, chopped into small pieces and were air dried. Samples were ground using an electric blender and were packaged into polythene bags and then analyzed.

Proximate Analysis

The moisture, crude protein, crude fat, total ash and crude fibre contents of each sample were determined using Standard methods of the Association of Official Analytical Chemists (AOAC, 2005). Moisture content was determined by heating 2.0g of each fresh sample to a constant weight in a crucible placed in an oven maintained at 105^0C. The dry matter was used in the determination of the other parameters. Crude protein (% total nitrogen x 6.25) was determined by the Kjeldahl method, using 2.0g of the samples; crude fat was obtained by exhaustively extracting 5.0g of each sample in a Soxhlet apparatus using petroleum ether (boiling point range 40-60^{o}C) as the extractant. Ash was determined by the incineration of 10.0g samples placed in a muffle furnace maintained at 550^{o}C for 5h. Crude fibre was obtained by digesting 2.0g of sample with H_2SO_4 and NaOH and incinerating the residue in a

muffle furnace maintained at 550^{o}C for 5h. Each analysis was carried out in duplicates

Mineral Analysis

Mineral composition of sample was determined using the official method of the Association of official Analytical Chemists A.O.A.C (2005).

Two grams (2g) of the sample was dry ashed with a porcelain crucible in a muffle furnace at 500ºC for 24 hours. The resulting ash was cooled in a desiccator and weighed. The ash was treated with 10ml of 50% HCl. The quantification was carried out using 5 series atomic absorption spectrophotometer.

Vitamin Analysis

Determination of Vitamin A

One gram (1g), of the sample each was weighed and macerated with 20mls of n-hexane in a test tube for 10 minutes. Then 3mls of the upper hexane extract was transferred into a dry test tube in duplicates and evaporated to dryness. Following this, 0.2ml of acetic anhydride chloroform reagent was added and 2ml of 50%trichloroacetic acid (TCA) in chloroform was also added. The absorbance was taken at 620nm (AOAC, 2005).

Determination of Vitamin C

The procedure of Revansiddappa and Veena (2008) for sensitive spectrophotometric determination of vitamin C was carried out. One ml for each of the standard solutions was pipetted into 50ml flask. 0.8ml of (10ppm) $K_2CR_2O_7$) solution was added to it, and 1ml of 1M H_2SO_4 was also added and allowed to sit for 10mins. Then, 1ml of 0.25% DPC was added and made to the mark with distilled water. The UV/VIS spectrophotometer was then blanked using distilled water. The solution was measured at 550nm and blank was read and other standard subtracted from it.

RESULTS

The proximate composition of selected fruits and vegetables is shown in figure 1. Parameter of the fruits and vegetable samples analyzed included Moisture content, Fat, Crude fiber, Ash contents, Protein and Carbohydrate. Moisture content was highest in Carrot (10.40%) and lowest in bitter leaf (3.20%), Fat content was highest in Scent leaf (8.84%) and lowest in carrot (0.67%), and Crude fiber was generally high in all samples but Ugu leaf had the highest value (46.32%) as carrot had the lowest value (18.33%), Ash content was relatively high in all the fruits and vegetables having highest value in Scent Leaf (10.60%) and lowest value in apple fruits (2.53%). Protein content was also relatively high in all samples with highest value seen in Scent leaf (22.85%) and lowest value in Apple (3.15%). Carbohydrate content was generally high as the lowest value was in Ugu leaf (16.40%) and Apple having the highest value of 64.09%.

Table 1 shows the result for the Mineral composition for Calcium, Magnesium, Potassium, Sodium and Iron of some selected fruits and vegetables.

The calcium content of the samples ranges from 0.03 ± 0.08 to 6.92 ± 0.01 in Scent leaf and Bitter leaf respectively. The Magnesium content range from 0.07 ± 0.01 to 0.93 ± 0.01 in Bitter leaf and Ugu leaf respectively, while the Potassium content range from 0.08 ± 0.01 to 2.28 ± 0.01 in Scent leaf and Bitter leaf respectively. The sodium content ranges from 0.08 ± 0.01 to 0.92 ± 0.00 in Carrot and Apple respectively. And the Iron content which was relatively high in all the samples range from ± 0.212 to ± 0.07 in Bitter leaf and Carrot respectively. Results of Vitamins A and C analyzed showed they were all good sources of the vitamins. Scent leaf had the highest Vitamin A and Vitamin C content 1.036% and 0.385% respectively in selected vegetables while Pawpaw was lowest in Vitamin A 0.058% and Apple was lowest in Vitamin C 0.167% (Figure 2 and 3).

Table 1: Mineral composition of some selected fruits and vegetables.

S/N	Common name	Scientific name	%Ca	%Mg	%K	%Na	mg/kg Fe
1	Ugu leaf	*Telfairai occidentalis*	6.39 ± 0.01	0.93 ± 0.01	1.71 ± 0.02	0.11 ± 0.01	510.5 ± 0.14
2	Scent leaf	*Ocimum gratissimum*	*6.92* ± 0.08	*0.86* ± 0.01	*2.28* ± 0.01	*0.11* ± 0.01	*282.0* ± 0.01
3	Bitter leaf	*Veronia amygdalina*	0.03 ± 0.01	0.07 ± 0.01	0.08 ± 0.01	0.30 ± 0.07	885.0 ± 0.12
4	Apple	*Malus domestica*	5.45 ± 0.02	*0.22* ± 0.01	*0.78* ± 0.04	*0.08* ± 0.00	*282.5* ± 0.28
5	Pawpaw	*Carica papaya*	5.26 ± 0.02	0.31 ± 0.01	1.99 ± 0.02	0.11 ± 0.01	521.0 ± 0.35
6	Carrot	*Daucus carota*	5.98 ± 0.01	0.28 ± 0.01	1.96 ± 0.01	0.92 ± 0.01	221.5 ± 0.07

Data are % mean ± STDEV (standard Deviation) of double determinations.

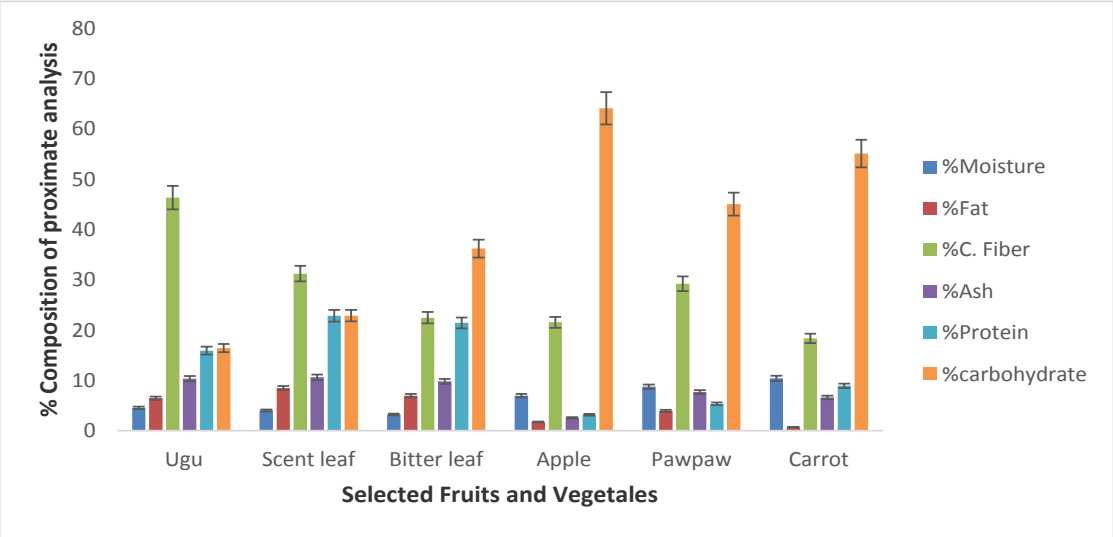

Figure 1 Proximate composition of some selected fruits and Vegetables.

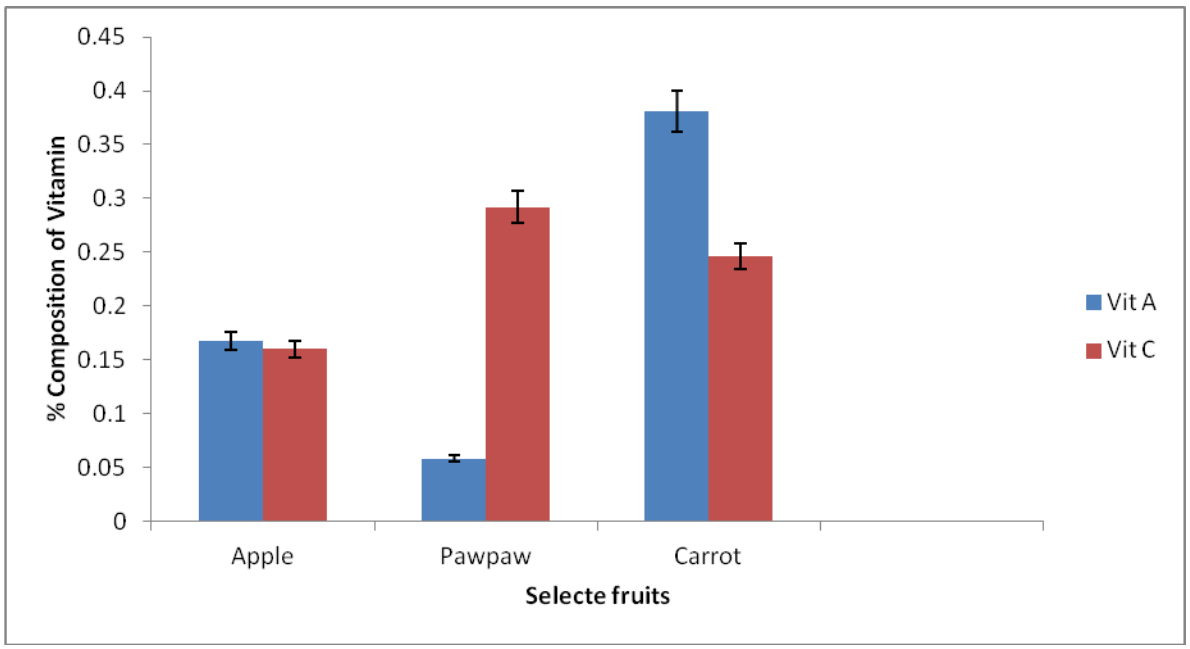

Figure 2: Vitamin A and Vitamin C Composition of some selected fruits

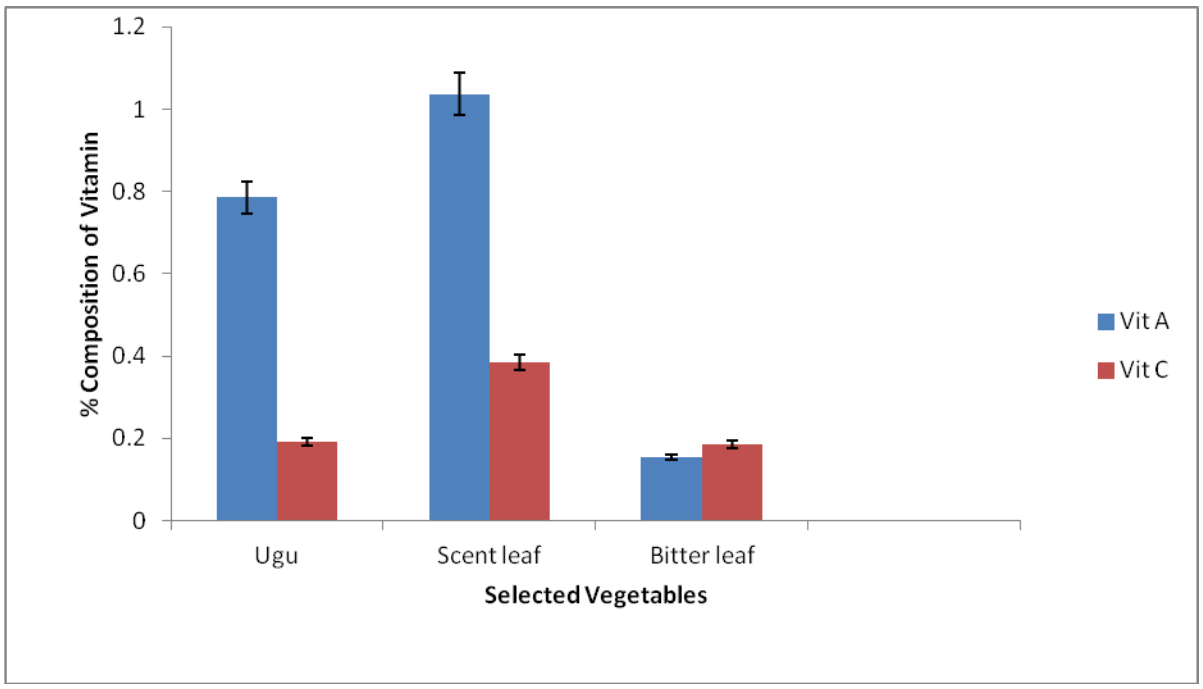

Figure 3: Vitamin A and Vitamin C composition of some selected Vegetables.

DISCUSSION

The moisture content was higher in Ugu (4.57%) than Scent leaf (4.02%) and Bitter leaf (3.2%) while carrot had the highest moisture content of (10.4%) compared to Pawpaw (8.75%) and Apple (6.97%). Moisture or water is a universal solvent. It dissolves other substances, carries nutrients and other materials round the body, making it possible for every organ to perform its functions effectively. The high water content in fruits and vegetables can help enhance food digestion and peristaltic movement on consumption. This also mean that these vegetables have low storage capacities or are easily perishable, highlighting the problem of conservation in warm climatic condition. The high moisture content seen in carrot, pawpaw and apple makes all take a longer time to dry, with the later lasting for 1-2 months.

The fat content as seen from the results shows it is higher in Scent leaf (8.48%) as compared to Ugu leaf (6.46%) and bitter leaf (6.95%) and highest in pawpaw (3.96%)compared to Apple (1.72%) and carrot (0.67%). Lipids are one of the major constituents of foods, and are important in our diet for a number of reasons. They are a major source of energy and provide essential lipid nutrients. Nevertheless, over-consumption of certain lipid components can be detrimental to our health, *e.g.* cholesterol and saturated fats. In many foods the lipid component plays a major role in determining the overall physical characteristics, such as flavour, texture, mouth feel and appearance. For this reason, it is difficult to develop low-fat alternatives of many foods; because once the fat is removed some of the most important physical characteristics are lost.

Crude fibre was seen highest in Ugu leaf (46.32%) followed by Scent leaf (31.21%) then bitter leaf (22.45%). Carrot had the lowest (18.33%) as compared to pawpaw and apple with 29.23 % and 21.54% respectively. The moderately high crude fibre content seen in the fruits and vegetables is indicative of its high soluble fibre (pectin) content Soluble dietary fibres have health-promoting properties as they have been implicated in lowering plasma and liver cholesterol concentration , diarrhoea treatment and detoxification of poisonous metals (Oladejo, 2009).

The Ash contents as observed for the vegetables Ugu, Scent and Bitter leaf were 10.34%, 10.6% and 9.8% respectively. Apple had the lowest Ash content of 2.25% as compared to pawpaw and carrot with value 7.7% and 6.59% respectively. Ash content of a plant based food is the function of the mineral elements present. However, it plays an important role in determining starch digestibility in food.

Protein content of all vegetables were high as Scent leaf had a value of 22.89%, Ugu leaf 15.91% and Bitter leaf 21.41%. This is reason for the frequent recommendations of vegetable for protein. Apple had the least protein content of 3.15% followed by Pawpaw 5.32% and Carrot 8.92%.

The carbohydrate content of selected fruits and vegetables were relatively high, with Apple having the highest value at 64.09% and Ugu leaf being the least with 16.40%.

The mineral analysis of the selected fruits and vegetables powder revealed the presence of Ca, Mg, K, Na and Fe; although these minerals occur in higher amounts in the seed coat powder. Na and K have been implicated in the regulation of acid-base balance as well as conduction of nerve impulse and is the principal cation in intracellular fluid and functions in acid base balance, regulation of osmotic pressure , muscle contraction and Na^+/ K^+ ATPase (Murray *et al*., 2000 ; Soetan *et al.*, 2010). Ca and Mg function as enzyme activator (ATPase, lipase etc) and enzyme cofactor respectively. They are also vital constituents of bones and teeth. In this regard therefore, Ugu leaf is seen with the highest calcium and Magnesium content with (6.39% and 0.93%) respectively and bitter leaf had the lowest content of both calcium and magnesium with values (0.03% and 0.07%) respectively. Carrot had Sodium content of 0.92% and Apple had Sodium content of 0.08%. Iron content was seen

highest in Bitter leaf (885.0%) and compared to Carrot content (221.5%). The nutrient analysis of fruits and vegetables compared favourably with the summary report of the food composition and diet team, public health directorate UK (FSA, 2010).

Vitamins are associated with energy production in the body, as well as essential for breakdown of fat and protein and keeping the mucus membrane healthy. Vitamin A is important for normal vision, gene expression, growth and immune function by its maintenance of epithelial cell functions while vitamin C is a potent antioxidant that facilitates the transport and uptake of non-heme iron at the mucosa, the reduction of folic acid intermediates and synthesis of cortisol (Lukaski, 2004). Vitamin A and Vitamin C is highest in Scent leaf with values 1.036% and 0.385% respectively. This is attributed to the medical applications of this plant, i.e. it is effective at reducing blood glucose hence in a useful tool in the management of diabetes. Vitamin A content of Pawpaw was 0.058% and that of Apple for Vitamin C was 0.160%.

CONCLUSION

The present study showed that the selected fruits and vegetables had enormous nutritional potentials and thus can favourably be used as a supplement and for consumption. Ugu Leaf has been recognized as a good source of vegetable fibre which helps to reduce high cholesterol levels thus helping in the prevention of atherosclerosis. It can also help in keeping blood sugar levels under control and is an excellent vegetable for people with diabetes as it is also low in carbohydrate. Scent leaf which is rich in vitamin A and vitamin C is very important medically as it also reduces blood glucose level and a good management for diabetes in humans. All selected fruits and vegetables are of high nutritional value based on the minerals analyzed and showed relevance in medical health if consumed for maintenance of good health.

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