

Comparative Determination of Vitamin C and Iron in Ten (10) Locally Consumed Fruits in Gombe State, Nigeria

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Abstract: *Fresh fruits are a good source of Vitamin C and iron. Vitamin C is known for its antioxidant and immune-enhancing effect while iron transportations oxygen through the body. The ascorbic acid and iron content of regularly consumed fruits were determined using spectro photometric method. A freshly prepared metaphosphoric acid was used to homogenized the sample for the determination of ascorbic acid while 1, 10-phenanthroline was used for the spectro photometric iron determination. The research revealed that pawpaw, water melon and sweet melon have high content of vitamin C of 68.204, 68.204 and 65.7360mg/100g respectively whereas balanite aegyptiaca has the least (1.648mg/100g). Pawpaw, water melon and sweet melon have high iron content of 0.3490, 0.3080 and 0.2310mg/100g respectively whereas baobab has the least iron content of 0.0100mg/100g. It could be concluded that pawpaw, water melon and sweet melon are both rich in vitamin C and iron content and should be consumed especially by both pregnant women and children.*

Keywords: *Ascorbic Acid, Iron, Fruits, Recommended Dietary Intake, Spectrophotometer.*

1. INTRODUCTION

The work is about comparative determination of vitamin C (Ascorbic acid), and Iron in ten (10) locally consumed fruits which are: Orange, palmyra, baobab, sweet melon, Water melon, *Balanite aegyptica*, *Garckeana azanza*, pawpaw, locust bean, and tamarind.

Fruits are amongst the first food items known to human beings, in fact, they have been in existence since the inception of mankind (even Adam and Eve ate apple the forbidden fruit). Fruits normally means the fleshy seed-associated structures of a plant that are sweet and edible in the raw state such as apples, oranges, grapes, strawberries and bananas. The botanical sense of fruits includes many structures that are not commonly called fruits such as bean pods, corn, kernels, wheat, grains and tomato [1].

Plant scientists have grouped fruits into three main groups, simple fruits, aggregate fruits and composite or multiple fruits [2]. The groupings reflect how the flower organs are rearranged and how the fruits develop.

Eating fruits provide health benefits; people who eat more fruits as part of an overall healthy diet are likely to have a reduced risk of some chronic diseases. All fruits contain carbohydrates mainly in the form of sugar dextrin and acids. Fruits whether taken as a whole or in the form of juice have a hydrating effect when eaten by an individual. They replenish water, apart from numerous nutrients in the body. In fact the water absorbed by a person in the form of fruit juice has additional benefits of providing sugar and essential minerals. Low fruits intake has the potential to result in nutrient deficiencies for potassium, vitamin C, foliate or dietary fiber. Lack of fruits in the body may increased risks of bone lose, diabetes, cancer, stroke, heart diseases or kidney stones, because fruits, help reduce the risks of those conditions. Nutritional deficiencies and imbalanced diets can also cause mental and physical effects, such as a lack of energy, trouble with focus and woodiness.

1.1. Vitamin C (Ascorbic Acid)

Ascorbic acid, commonly known as Vitamin C, is a water-soluble vitamin naturally present in some foods, added to others, and available as a dietary supplement [3]. Humans are unable to synthesize vitamin C endogenously, and as such, it is consumed as essential dietary component [4]. Ascorbic

acid is an important physiological antioxidant [5] and also regenerates other antioxidants within the body, including alpha-tocopherol (vitamin E) [6]. Ascorbic acid is equally important in immune function [6] and improves the absorption of non heme iron [7] this is the form of iron present in plant-based foods. Deficiency of Ascorbic acid causes scurvy, the symptoms of which are; fatigue or lassitude, widespread connective tissue weakness, and capillary fragility [4]; [8]; [6] and [9]. Recommended dietary intake for Ascorbic acid in the Dietary Reference Intakes (DRIs) developed by the Food and Nutrition Board (FNB) at the Institute of Medicine (IOM) of the National Academies (formerly National Academy of Sciences) IOM, 2000. High intakes of ascorbic acid have no severe adverse effects and also have low toxicity [10].

1.2. Iron

Iron (Fe) is a chemical element with atomic number 26. It is the most common element (by mass) forming the planet earth as a whole, forming much of earth's outer and inner core. Iron is a component of the red blood cells and the muscles that assist in the transportation of oxygen throughout the body, formation of hemoglobin and certain enzymes Immune activity etc. High intake of iron results into; low blood pressure, weak pulse, and shock, black or woody face, diarrhea, liver problem, vomiting, convulsion, fever and headache.

Due to the fact that some of those selected fruits are rich in vitamin C and iron, consumers tends to neglect it to other sources which might not be rich in these minerals. The study is significant because the consumers of those fruits will be able to know the nutritional value of what they are consuming and also to compare these levels to the recommended dietary intake (RDI) of ascorbic acid.

There are several studies that were carried out on the amount of vitamin C (ascorbic acid), calcium and iron in some indigenous fruits. Due to the fact that these fruits are on different geographical location and hence have different conditions for growth and as such different values will be obtained.

1.3. Sample

The samples of palmyra and Azanza garckeana fruits were collected from Kaltungo Local Government Area whereas the other eight fruits were bought from Gombe Main market, Gombe Local Government Area.

2. METHODS

2.1. Procedure

1.00, 2.00, 5.00, 10.00 and 25.00ml of the standard iron solution were placed into a set of 100ml volumetric flasks. The unknown sample was pipetted into another 100ml volumetric flask. 50ml of distilled water was placed in another volumetric flask to serve as a blank. To each of the flask 10ml of hydroxylamine solution and 5ml of 1, 10 - phenanthroline solution was added, each solution is buffered by the addition of 8.0ml sodium acetate solution which produced red colour of ferrous 1,10 - phenanthroline. The sodium acetate neutralized the acid present and adjusts the pH. After the addition of the reagents, the samples were kept for 15 minutes before making the absorbance measurement so that the colour of the complex can fully develop; the standard was diluted to exactly 100ml, which corresponds to 0.1, 0.2, 0.5, 1 and 25 ppm iron respectively.

Ferrous iron form coloured complex with 1, 10- phenanthroline when the pH of the solution is between 3 & 8. Any Fe (III) must be reduced to Fe (II) using hydroxylamine and that Fe (III) solutions are unstable (hydrolyze) if the pH is above 3. After reduction and addition of the 1, 10- phenanthroline, sodium acetate is used to buffer the acid present to about pH = 4.

3. ASCORBIC ACID STANDARD

Stock solution of oxalic acid was prepared freshly by dissolving 50mg in 100ml volumetric flask and 100ml of 6% metaphosphoric acid was added to the mark. Serial dilutions were made from the stock solution (50mg ascorbic acid/100 cm³) to give working solutions of 0.10, 0.40, 0.80, 1.20, 2.00, 3.00 and 4.00 mg/l [11].

3.1. Procedure

Extracted fruit samples were homogenized with freshly prepared 6% metaphosphoric acid and centrifuge for ten (10) minutes it was then filtered. Using 25ml volumetric flask the following

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working calibrators were prepared 0.10, 0.4, 0.80, 1.20, 2.00, 3.00 and 4.00mg/l. Triplicate samples of 1.2ml of both working calibrators and clear supernatant extract were measured and placed in test tubes. A 0.4ml of dinitophelhydrazine-thiourea-copper sulphate reagent was added to all test tubes it was then placed in water both at 37°C for 3 hours.

The test tubes were removed and allowed to chill for ten minutes in ice bath while mixing 2.0ml to cold sulfuric acid (12ml) was added. The spectrophotometer was adjusted to read zero blank at 520nm and the calibrators and unknown were read.

4. RESULT AND DISCUSSION

4.1. Results

The results for vitamin C content and iron content of the samples were recorded in mg/100g. The results for vitamin C are on Table 1 and those for iron content are presented on Table 2.

Table1. Vitamin C content

FRUITS	SPECTROPHOTOMETRIC VALUE mg/100g
Palmyra	1.6468
Tamarind	11.4300
Pawpaw (<i>Carica papaya</i>)	68.204
Water melon (<i>Citrullus lanatus</i>)	68.2040
Sweet melon (<i>Cucumis melo</i>)	65.7360
<i>Balanite egyptica</i>	13.6740
Baobab (<i>A. digitata</i>)	29.198
Locust beans	15.918
<i>Azanza garckeana</i>	23.664
Orange	25.794

Table2. Iron Content

FRUITS	SPECTROPHOTOMETRIC VALUE mg/100g
Palmyra	0.0360
Tamarind	0.0214
Pawpaw (<i>Carica papaya</i>)	0.3490
Water melon (<i>Citrullus lanatus</i>)	0.3080
Sweet melon (<i>Cucumis melo</i>)	0.2310
<i>Balanite egyptica</i>	0.0360
Baobab (<i>A. digitata</i>)	0.0100
Locust beans	0.0360
<i>Azanza garckeana</i>	0.0410
Orange	0.0601

4.2. Discussion

The Recommended Daily Allowance (RDA) by National Research Council (NRC) (1989) for vitamin C in adult is 60mg. The vitamin C content of palmyra obtained in this research is 1.6468mg/100g which is lower compared to the value reported by [12]. However one would have to consume more of Palmyra fruits in order to meet the RDA if one would depend on only Palmyra fruits for vitamin C. The vitamin C content of papaya obtained in this work is 68.20 mg/100g which is also lower to the value reported by another researcher elsewhere [3].

In Azanza G. the vitamin C content obtained is 29.198mg/100g which is higher than the value reported by [13].

The value for Locust bean is 18.898mg/100g which is lower than the one gotten by [14]. [3] also reported vitamin C content in orange as 67.37 mg/100g which is higher than the one obtained in this research 31.776mg/100g. The vitamin C content of *balanite egyptiaca* obtained in this present work is 13.674 mg/100g and is lower than the value reported by [15]. Vitamin C content obtained in sweet

melon is 65.736mg/100ml as compared to 26.42 mg/100g [11], the vitamin C value for water melon reported by [11] as 7.77 mg/100g is low in comparison with the value obtained in the present work which is 68.20 mg/100g. Tamarind and baobab contained 11.4300mg/100g and 29.198mg/100g vitamin C respectively. C. Papaya, C. lanatus and C. melo are having the highest content of vitamin C where as B. egyptiaca is having the least concentration.

The variation between the above results with those of other investigators for many of the fruit samples analyzed may be explain on the basis of factors that affects ascorbic acid levels in fruits. Climatic conditions as light and temperature have been reported to affect the chemical composition of horticultural crops [16]. Ascorbic acid content of a fruit is also determined by the level of nitrogen fertilizer used in growing the plant [17].

The recommended daily allowance of iron is 10mg. The iron content obtained in orange is 0.21mg/100g which is close to 0.2mg/100g as reported by [18]. Another researcher [12] obtained 0.4 mg/100g for Palmyra which is higher than the value obtained 0.0360 mg/100g. The iron content in tamarind was found to be 2.80 mg/100g and 0.17 mg/100g for C. lanatus. Garckean A., C. papaya, locust beans, C. melo, B. egyptiaca and A. digitata all have appreciable amount of iron. The recommended daily allowance is 15mg.

5. CONCLUSION

From the analysis it can be seen that all the fruits contained vitamin C and iron in various concentrations. Papaya, C. lanatus and C. melo have highest concentration of vitamin C and iron whereas b. egyptiaca is having the least concentration of vitamin C and A. digitata with the least concentration of iron.

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