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Determination of Variation of Vitamin 'C' Content of Some Fruits and Vegetables Consumed in Ugbokolo After Prolonged Storage.

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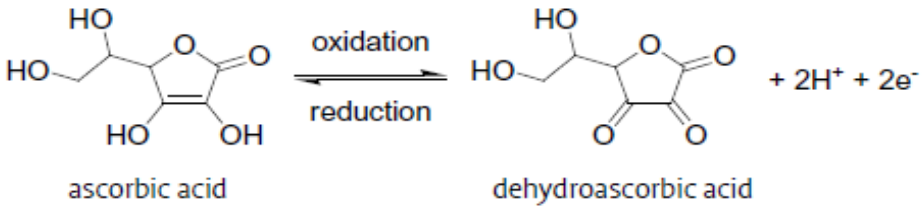
Abstract: *This research work investigates the variation of vitamin C in some fruits: guava, (psidium guajava), orange (citrus sinensis) pineapple, (ananas comosus) and apple (malus pumila), and vegetables: tomato (lycopersicum esculentum), okra (abelmoschus esculentus), red pepper (capsicum annuum) and green pepper (capsicum annuum) at prolonged storage by titrimetric method using dichlorophenolindophenol (DCPIP) titrant. The vitamin C content of orange was found to be (74.67 and 51.79mg/100g sample), guava (69.6 and 52.8mg), pineapple (53.42 and 27.93mg), apple (27.3 and 7.29mg), tomato (27.93 and 9.93mg), okra (11.41 and 5.77mg), red pepper (81.53 and 28.26mg) and green pepper (27.62 and 10.65mg). The amount of vitamin C in fresh red pepper, orange and guava was found to be the highest and that of fresh okra was found to be lowest. It was observed that content of vitamin C decreased at prolonged storage. In conclusion, red pepper, orange and guava prove useful for vitamin C deficiency.*

Keywords: *Vitamin C, Fruits, Vegetables, Fresh, Prolonged Storage, DCPIP*

I. Introduction

Vitamin C (Ascorbic Acid) is the most important vitamin in fruits and vegetables [1]. Except human and other primates, most of the phylogenetically higher animals can synthesize vitamin C (*L*-ascorbate). More than 90% of the vitamin c in human diets is supplied by fruits and vegetables [1]. Vitamin C is defined as the generic term for all compounds exhibiting the biological activity of *L*-ascorbic acid [1]. Vitamin C or ascorbic acid is a water-soluble vitamin, well recognized as an anti-scorbutic food factor [2, 3]. Chemically, it is a six carbon sugar, with a diol grouping at carbons 2 and 3 which is readily oxidized to a diketo group to form dehydroascorbic acid (DHAA) [3]. Its ready oxidation to DHAA is the most prominent chemical property of the vitamin.



(1)

While ascorbic acid (vitamin C) is a familiar molecule because of its dietary significance, most aspects of its metabolism and some aspects of its function in plants are very poorly understood. For example, its biosynthetic pathway has not been firmly established even though it reaches millimolar concentrations in most tissues [4]. Ascorbate is best known for its function as an antioxidant and for its role in collagen synthesis. Collagen deficiency results in the symptoms of scurvy, a form of avitaminosis that is characterized by: loose teeth, superficial bleeding, fragility of blood vessels, poor healing, compromised immunity, mild anaemia [2, 4]. Vitamin C is also required for synthesis of dopamine, noradrenaline and adrenaline in the nervous system or in the adrenal glands. It is a strong antioxidant [2].

As a potent antioxidant, AA has the capacity to eliminate several different reactive oxygen species, keeps the membrane-bound antioxidant α-tocopherol in the reduced state, acts as a cofactor maintaining the activity of a number of enzymes (by keeping metal ions in the reduced state), appears to be the substrate for oxalate and tartrate biosynthesis and has a role in stress resistance [5, 6, 7].

It is to be noted that the requirement of vitamin C increases during pregnancy, lactation, adolescence, hyperthyroidism, infection and after surgery [1]. Maintenance of daily dietary intake of Vitamin C leads to the prevention of scurvy which is the deficiency disease state of vitamin C. This disease state has been shown to be

high in children and the elderly [1]. It also has a reputation for being useful in the treatment of colds and flu. The evidence to support this idea, however, is ambiguous [8]. Ascorbic acid helps protect against cancers, heart disease, stress, it is part of the cellular chemistry that provides energy, it is essential for sperm production, and for making the collagen protein involved in the building and health of cartilage, joints, skin, and blood vessels. vitamin C helps in maintaining a healthy immune system, it aids in neutralizing pollutants, is needed for antibody production, acts to increase the absorption of nutrients (including iron) in the gut, and thins the blood. Just to mention it's most important functions [2].

The dietary amounts recommended by various authorities are 50-150 mg of ascorbic acid per day. High doses (thousands of mg) are used but may result in diarrhea. Any excess of vitamin C is generally excreted in the urine. The amount of vitamin C in fruit depends on the precise variety of the fruit, the soil and climate in which it grew, and the length of time since it was picked [2]. The aim of the present study is to determine the variation of ascorbic acid in some fruits: guava (*psidium guajava),* sweet orange (*citrus sinensis),* apple (*malus pumila),* pineapple (*ananas comosus*) and vegetables: tomato *(lycopersicum esculentum),* okra *(abelmoschus esculentus),* red pepper *(capsicum annuum)* and green pepper *(capsicum annuum)* after a prolonged storage.

II. Study Area

The Ugbokolo Community is located in Okpokwu Local Government Area in the southern part of Benue State. It lies approximately between latitudes $7^{o}08'00"$ and $7^{o}13'48"$ N and longitudes $7^{o}41'42"$E and $7^{o}49'30"$ E. The area is bounded in the north by Ohimini LGA, in the northwest by Kogi State, and southwest by Ogbadibo LGA, and southeast by Okonobo Ward and east by Amejo Ward in Edumoga, Benue State, Nigeria [9].

III. Principle

The principle of this method is a titration with dichlorophenolindophenol also known as DCPIP. Ascorbic acid reacts with DCPIP, changing the colour from blue to colourless. They react in a 1:1 fashion, so if a known quantity of DCPIP solution reacts with the plant tissue extract, the quantity of DCPIP used gives a direct measure of the quantity of ascorbic acid present. It has been established that $1cm^3$ of 0.1% DCPIP solution is equivalent to 6.071×10^{-4}g ascorbic acid [10].

IV. Material And Methods

The fruits samples used in this study were purchased from Ugbokolo main market; these samples were thoroughly cleaned using deionised water to remove adhering contaminants. The fruits samples were then divided into four groups and prepared for the determination of vitamin C. For the analysis of vitamin C in the samples, determinations were done on the same day of purchase for fresh samples and after one week to study the effect of prolonged storage. 10g each of the fruits samples were pounded separately using mortar and pestle, 50ml of water was then added separately into the already pounded samples in the extract beakers. The resulting solutions were centrifuged at one thousand revolutions per minutes. The supernatant was carefully decanted and filtered using filter papers to obtain the vitamin C extract [1].

The burette was filled with 0.1% dichlorophenolindophenol and adjusted to zero mark. $5cm^3$ of the extract was added into a respective beaker for each sample. The dichlorophenolindophenol was then added drop wise, after which the blue colour quickly disappeared. The dichlorophenolindophenol was added until the blue colour does not disappear and volume used was noted. The procedure was repeated for second and third titrations noting the volume of dichlorophenolindophenol used each time [10].

V. Results And Discussion

The contents of L-ascorbic acid in different fruits were determined by titrimetric method and the results are given in table 1 for fruits and in table 2 for vegetables. The result of analysis of fresh samples shows that for fruits: sweet orange has maximum vitamin C content and apple has low vitamin C content and for vegetables: red pepper has maximum and okra has low vitamin C content. Analysis of stored samples shows that for fruits: guava has maximum vitamin C content and apple has lowest. For vegetables: red pepper has highest vitamin C content and okra has the lowest. Result of analysis also revealed that some quantities of ascorbic acid (vitamin C) were lost as a result of prolonged storage. This is attributed to the fact that ascorbic acid is susceptible to oxidation by atmospheric oxygen over time [11]. This result is also in agreement with facts in literature which rated red pepper ahead of most citrus fruits in terms of ascorbic acid content [12].

Table 1: Vitamin C Content (mg/100g Sample) of Some Fruits

Fruit	Fresh	1 Week Storage
Guava	69.60	52.80
Apple	27.30	7.29
Sweet Orange	74.67	51.79
Pineapple	53.42	27.93

Table 2: Vitamin C Content (mg/100g Sample) of Some Vegetables

Vegetable	Fresh	1 Week Storage
Tomato	27.93	9.93
Okra	11.41	5.77
Red Pepper	81.53	28.26
Green Pepper	27.62	10.65

VI. Conclusion

Analysis showed that red pepper, orange and guava, are the best among tested fruits and vegetables for vitamin C. Where storing of fruit become necessary, then guava proves better. Since these fruits and vegetables are always available in local markets and they are also not expensive, the considerable amount of vitamin C presents in these fruits and vegetables showed that when they are consumed in relative large amount, they will certainly contribute to the daily human dietary intake of the vitamin. Fruits and vegetables are best consumed fresh than when stored, owing to the reduction in the content of ascorbic acid (vitamin C) at prolonged storage.

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