Plant Archives Volume 20 No. 1, 2020 pp 1944-1946 **e-ISSN:2581-6063 (online), ISSN:0972-5210**

COMPARATIVE ANALYSIS OF VITAMIN-C CONTENT FROM LOCALLY AVAILABLE FRUITS AND VEGETABLES.

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Abstract

The present research paper deals with the study of comparative analysis of vitamin C content, in locally available fruits and vegetables. The quantity of vitamin-C were analysed by simple iodometric titration method. From the results obtained, it is found that fresh Amala (*Emblica officinalis*) fruit is the richest source of vitamin c among all samples. Storage of fruit and vegetables in refrigerator for longer duration as well as cooking of fruit and vegetables for longer time also reduce the contents of vitamin c. So it is concluded that we have to eat fruits fresh and raw to get more vitamin c.

Key words: Vitamin C, Ascorbic acid, Iodometric Titration Method.

Introduction

Vitamin-C is also known as ascorbic acid. Vitamin C is easily oxidized and carried out the majority of functions. It plays a key role in the synthesis of collagen and nor epinephrine by keeping the enzymes responsible for these processes in their active reduced form. Vitamin C may also play a role in detoxifying the by-products of respiration. Occasionally during respiration O_2 is incompletely reduced to superoxide ion (O_{2-}) instead of being reduced completely to its -2 oxidation state (as in H_2O). Normally an enzyme called superoxide dismutase converts O_{2-} to H_2O_2 and O_2, but in the presence of Fe_2+ the hydrogen peroxide may be converted into the highly-reactive hydroxyl radical (•OH). The hydroxyl radical can initiate unwanted and deleterious chemistry within a cell when it removes a hydrogen atom (H•) from an organic compound to form H_2O and a new, potential more reactive free radical. Ascorbic acid can donate a hydrogen atom to a free radical and thus stop these reactions from occurring. The human body cannot produce ascorbic acid and so it must be obtained entirely through one's diet (Brody, T., 1994).

A vitamin C deficiency in human's results in the disease called scurvy, whose symptoms include haemorrhage (especially in the gums), joint pain and exhaustion. In its final stages scurvy is characterized by a profound exhaustion, diarrhoea and then pulmonary and kidney failure, which result in death (Pauling, L., 1981). A very small daily intake of vitamin C (10-15 mg/day for an adult) is required to avoid deficiency and stave off scurvy. (Kallner, A., 1986). Ascorbic acid is an antioxidant helps in various functions like Iron Absorption, Bone Building, Wound Healing, Healthy Skin, lowering of blood pressure, Eyesight, Immune Function etc.

Many fruits & vegetables contain vitamin C, but while cooking and also while storage the concentration of vitamin C lowers down or destroys, therefore keeping these views in mind, the present research paper deals with the study of comparative analysis of vitamin C content, in Fresh, Frozen and Cooked Plant material of locally available fruits and vegetables separately.

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Material and Methods

There are various modes of estimation of vitamin C some of them are:

1. An enzymatic method for the estimation of true vitamin c by Kallner, A., (1986).
2. Colorimetric estimation of vitamin C using folin phenol reagent (Jagota, S.K., 1982).
3. Estimation of vitamin C by titration by Cheftel, H., (1936).
4. Estimation of vitamin C in presence of iron salts using dichlorophenol indophenol by Gawron, O. *et al.*, (1944).

5. Estimation of vitamin C by titration with standard alkali.
6. Redox titration
7. Iodometric titration

In this present work the quantity of vitamin-C was analysed by simple iodometric titration method. Iodine is relatively insoluble, but this can be improved by complexing the iodine with iodide to form tri iodide, Tri iodide oxidizes vitamin C to form dehydroascorbic acid,

As long as vitamin C is present in the solution, the tri iodide is converted to the iodine ion very quickly. However when all the vitamin C is oxidized, iodine & tri iodide will be present. Then to detect titration endpoint standard indicator starch is used. it forms a black complex. The blue-black colour is the end point of the titration.

Reaction taking place during titration:

$$C_6H_8O_6 + I_2 \longrightarrow C_6H_6O_6 + 2I^- + 2H^+$$

Where $C_6H_8O_6$ is (Ascorbic Acid) and $C_6H_6O_6$ is dehydroascorbic acid

This titration procedure is appropriate for testing the amount of vitamin C in vitamin C tablets, juices and fresh, frozen, packaged, or cooked fruits and vegetables. The titration can be performed using just iodine solution of 0.05 M concentration and indicator starch

Estimation Of vitamin-C by Iodometric method

In the experimental part, Following steps were followed:

1. Three different sets of samples 1st set with 10 samples of fresh fruits and vegetables 2nd set with frozen 10 samples of fruits and vegetable for 10 days in refrigerator at 4°C. 3rd set with 10 samples of cooked fruits and vegetable for 10 minutes.
2. A known weight of fruits and vegetables in 100 grams was taken separately (without seeds). Then they were crushed well separately in mortar with pastel and then filtrate each juice with muslin cloth and taken in 100 ml volumetric flask. The crushed fruits are further crushed with some water for 4-5 times and the washings are collected to the flask. The solution is diluted to 100 ml.
3. Standardisation of I_2 solution (0.05M) was done.
4. Determination of vitamin C was done separately from three different sets of samples of fresh, frozen and cooked fruit and vegetable juice.
5. The quantity of vitamin C was obtained by the relation 1 N 1000 ml ascorbic acid= 176 gm of vitamin C.
6. Finally all the values were calculated (1 mole of ascorbic acid reacts with 1 mole of iodine and this ratio is used for titration result calculations) and represented in the form of table.

Table 1: The quantity of vitamin C in different fresh, frozen, cooked fruits and vegetables were determined separately and represented in the form of following table.

Sr. No.	Name of the Plant Material	Vitamin C content in mg/100g of Fresh plant Material	Vitamin C content in mg/100g of Frozen plant Material	Vitamin C content in mg/100g of Cooked plant Material
1	Lemon	77	68	62
2	Orange	53	48	41
3	Amala	380	352	340
4	Papaya	62	48	39
5	Guava	228	212	206
6	Black currants	181	176	168
7	Strawberries	59	52	48
8	Tomato	13	10	7
9	Green chilli pepper	142	121	111
10	Sweet Yellow pepper	112	100	86

Result and Discussion

Amongst the studied fruits and vegetables vitamin C content was found maximum in amala (380mg/100g of fresh material) and minimum in tomato (13 mg/100g of fresh plant material). When we compare the results between fresh, frozen and cooked plant materials then it is observed that the fresh fruit and vegetable juice show maximum content of vitamin C than frozen and cooked plant material. (Igwemmar *et al.*, 2013) also studied effect of heating on vitamin C content in different vegetables and found that due to cooking there was decrease in the content of vitamin C. (Gilani *et al.*, 2017) also showed that Storage of fruits and vegetables in refregirator increases their phenolic acids but decreases the total phenolics, Anthocyanins and vitamin C with subsequent loss of their antioxidant capacity. After comparison between the results obtained in different fruits, the fruit juice of Amala, Guava, Black current show maximum content of vitamin C and Lemon, Papaya, Orange, Strawberry with minimum content of vitamin C. After that the comparison between the results obtained in different vegetables Green chilli pepper show maximum content of vitamin C than sweet yellow pepper and tomato.

Conclusion

From the results obtained it is concluded

that fresh Amala (*Emblica officinalis*) fruit is the richest source of vitamin c among all. Storage of fruit and vegetables in refrigerator for longer duration as well as cooking of fruit and vegetables for longer time also reduces the contents of vitamin c. So it is concluded that we have to eat fruits fresh and raw to get more vitamin c.

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