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COMPARATIVE ANALYSIS OF ASCOBIC ACID CONCENTRATION OF SELECTED FRUITS AND VEGETABLES CONSUMED IN WUKARI TARABA STATE BY IODOMETRIC TITRATION

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ABSTRACT

Ascorbic acid commercially known as Vitamin C is water-soluble organic acid that Prevents many diseases and enhances the Immune system. Fruits and Vegetables are Natural and rich source of Ascorbic acid. The fruits and vegetables were washed with distilled water and then cut and grinded the edible part of it, 10ml of distilled water added while grinding the sample decanting off the liquid extract using muslin cloth into 100ml Volumetric flask. Starch indicator (1%) was prepared by adding 0.50g of starch powder to 50ml of *distilled water. Iodine solution was prepared by mixing 5.20g of Potassium iodide and 0.27g of Potassium iodate into 500ml beaker and dissolved it with 200ml of distilled water; 25ml of 3molar Sulphuric acid were added into the beaker and then diluted it with distilled water to 500ml solution*. The result obtained in this analysis has revealed that the Ascorbic acid concentration in Vegetable samples were in decreasing order as follows; Cucumber > Ogwu > Maringa > Pepper > Tomato > Cabbage > Carrot > Spinach > Bitter leaf > Onion. A similar trend is observed in the fruit samples: Orange > Watermelon > Pear > Pineapple > Pawpaw > Mango > Guava > Cashew. The highest Ascorbic acid concentration in Vegetable samples were observed in Cucumber 1.62 g/L and the lowest ascorbic acid concentration was observed in Onion 0.53g/L while the variation of Ascorbic acid in Fruit samples shown that Orange has the highest concentration 1.46g/L and the lowest concentration ascorbic acid was observed in Cashew 0.61g/L.

KEYWORDS: Ascorbic acid, vitamin C, Fruit, Vegetable, Iodometric titration.

1.0 INTRODUCTION

Ascorbic acid, commercially known as vitamin C, is water-soluble organic acid which inhibits radical and enhances immunity due to its anti-oxidant properties. Inadequacy of ascorbic acid in body causes diseases such as scurvy, depression, poor gum, bad wound healing and other free radical ill health.[1] Humans are biologically unable to produce ascorbic acid.[2] Fruits and vegetables are the natural and rich source of ascorbic acid. It essentially prevents many sickness including common cold, cancer, anemia, diabetes, blood pressure, cardiovascular disease and other free radical caused illness.[3,10] It plays vital role in protective resistance against infection, biosynthesis of collagen, absorption of Iron and lowering of cholesterol level.[3,4,9]

Many analytical methods have been used for the quantitative analysis of ascorbic acid including titrimetric method.[2,5,6,7] Spectrophotometric method.[6,13] High Performance Liquid chromatographic method,[6,8,9] Voltametric method.[11,14] The easiest, quickest and low-cost technique to quantify Ascorbic concentration is titration method which provides comparable results to spectrophotometric method and High performance liquid chromatographic method.[14] Iodometric titration is based on reduction-oxidation reaction where Iodine is reduced to iodide and ascorbic acid is oxidized to dehydroascorbic acid (in 1 :1 mole ratio as shown in Titration-reaction equation (Figure.1).

This study was aimed to investigate the concentration of some selected fruits and vegetables consumed in Wukari local government local Taraba state, Nigeria by iodometric titration.

2.0 MATERIAL AND METHOD

2.1Sample collection

All the samples were obtained from new market wukari local government Area in Taraba state, Nigeria.

2.2 Extraction of sample

100g edible part of fruit and vegetable was grinded; 20ml of distilled water was and filtrated with muslin cloth. The

filtrate was diluted with distilled to 100ml solution of sample. Redox titration was carried immediately.

2.3 Reagent preparation

Iodine solution was prepared by mixing 5.20g of potassium iodide and 0.27g potassium iodate was dissolved was dissolved into 500ml beaker with 200ml of distilled water. 25ml of 3molar sulphuric acid was added into the beaker and then diluted with distilled water to prepare 500ml iodine solution. 0.34g of ascorbic acid standard was dissolved with 100ml of distilled water. Starch indicator was prepared by adding 0.50g of starch to 50ml of distilled water.

2.4 Standardization of iodine solution and sample analysis

20ml of ascorbic acid standard was titrated against iodine solution in the presence of 10 drops starch indicator until blue black colour was observed, the titration was carried six times and three closest values were recorded, the concentration of iodine solution was found to be 0.0164M which was used as standard solution in the analysis of sane using the mentioned procedure above. The concentration of ascorbic acid was calculated by the formula shown in equation (2)

$$C_6H_8O_{6\,(aq)} + I_{2\,(g)} \rightarrow C_6H_6O_{6\,(aq)} + 2I^-_{(aq)} + 2H^+_{(aq)} \quad (1)$$

$$\text{Concentration of sample (g/L)} = \frac{M_I V_I}{V_A} \times W \quad (2)$$

M_I = Molar concentration of standard solution
V_I = Average of titre value of standard of solution
V_A = volume of unknown concentration solution
W= Molar mass of ascorbic acid (176.12 g/mole)

Table 1: Average titre value and concentration of Ascorbic acid in Vegetables.

Vegetable	Average titre value (mL)	Concentration of Ascorbic acid (g/L)
Cucumber	11.22	1.62
Ogwu	9.81	1.42
Moringa	9.51	1.37
Pepper	8.10	1.17
Tomato	7.91	1.14
Cabbage	7.71	1.11
Carrot	7.60	1.10
Spinach	6.70	0.97
Bitter leaf	4.92	0.71
Onion	3.70	0.53

Table 2: Average titre value and concentration of Ascorbic acid in Fruits.

Fruit	Average titre value (mL)	Concentration of Ascorbic acid (g/L)
Orange	10.12	1.46
Watermelon	9.71	1.40
Pear	8.11	1.17
Pineapple	7.20	1.04
Pawpaw	6.62	0.96
Mango	5.61	0.81
Guava	5.10	0.74
Cashew	4.21	0.61

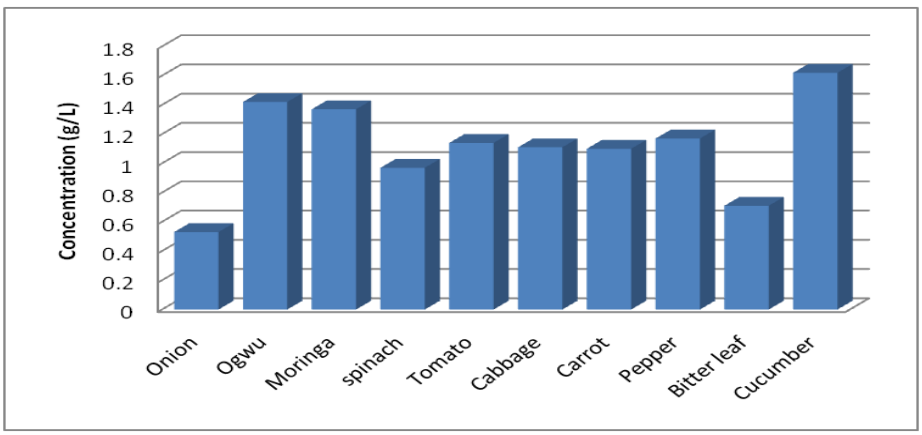

Figure 3: Concentration of Ascorbic acid in fruit samples.

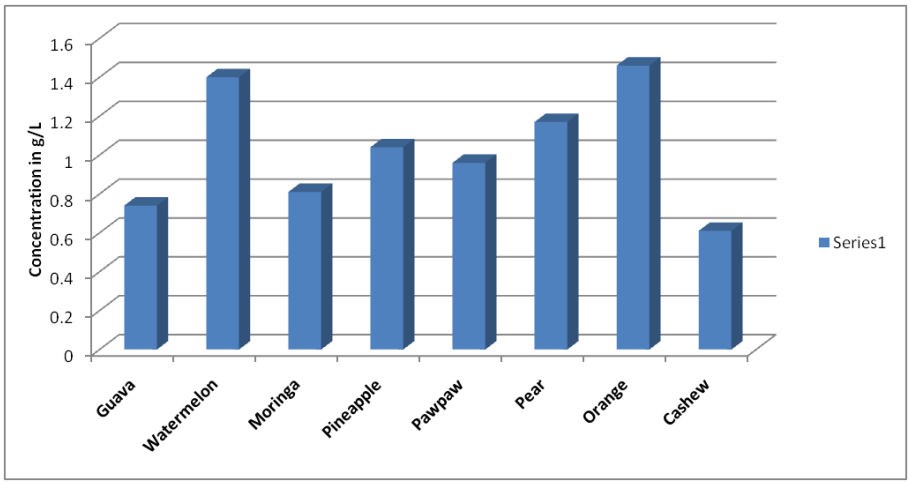

Figure 4: Concentration of Ascorbic acid in fruit samples.

3.0 RESULT AND DISCUSSION

Table 1 and table 2 show concentration of Ascorbic acid in Vegetable and fruit samples respectively. The result obtained in this analysis has revealed that the Ascorbic acid concentration in Vegetable samples were in decreasing order as follows; Cucumber > Ogwu > Maringa > Pepper > Tomato > Cabbage > Carrot > Spinach > Bitter leaf > Onion. A similar trend is observed in the fruit samples: Orange > Watermelon > Pear > Pineapple > Pawpaw > Mango > Guava > Cashew. The highest Ascorbic acid concentration in Vegetable samples was observed in Cucumber 1.62 g/L and the lowest ascorbic acid concentration was observed in Onion 0.53g/L while the variation of Ascorbic acid in Fruit samples shown that Orange has the highest concentration 1.46g/L and the lowest concentration ascorbic acid was observed in Cashew 0.61g/L. The concentration of ascorbic acid in the sample is directly proportional to the average titre value; this is to say the high quantity of Ascorbic in the sample solution the more iodine solution will be used up in reaction. A similar study conducted by.[5] has revealed that Orange has highest concentration (600mg/L) with highest average titre value (15.20ml). The variation in Ascorbic acid concentration depends on nature of soil, Climatic factors, Species and Size.[14]

CONCLUSION

Ascorbic acid or vitamin c is essential to for life and required in the diet.

The study has comparably shown the concentration of Ascorbic acid in fruits and Vegetables using low-cost, simple, and suitable method.

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