

*Research Paper*

**COMPARATIVE DETERMINATION OF ASCORBIC ACID IN SOME  
SELECTED FRUITS AND VEGETABLES COMMONLY CONSUMED IN  
NORTHERN NIGERIA**

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**Abstract**

Ascorbic acid content of some fruits and vegetables commonly consumed in Northern Nigeria was measured using titrimetric method with Indophenol solution. The concentration of ascorbic acid in fruits: pineapple, banana, grape, orange and papaya were 78.92, 19.32, 41.13, 67.37 and 86.51mg/100g respectively, and that of non-leafy vegetables: tomato, red hot pepper, sweet red pepper, green pepper and ginger were 36.46, 139.48, 141.37, 117.03 and 16.46mg/100g respectively. While that of leafy vegetables: spinach, bitter leaf, cabbage leaves, lettuce leaves, and Roselle Calyx were 59.51, 41.16, 27.33, 24.31 and 39.67 mg/100g respectively. Ascorbic acid content of fruits was found to be highest in papaya and lowest in banana; and in non-leafy vegetables, it was highest in sweet red pepper and lowest in ginger. However, in leafy vegetables, it was highest in spinach and lowest in lettuce. The result of this work further enlarge the database of ascorbic acid content in fruits and vegetables commonly consumed in Northern Nigeria and will serve as a useful guide in the selection of plant product which are rich in ascorbic acid, in line with the recommended dietary intake of ascorbic acid.

Key words: Ascorbic acid, Fruits, Vegetables, Northern Nigeria, Recommended Dietary Intake.

**INTRODUCTION**

Vegetables and fruits are major constituents of the human diet. Soup preparation using green leafy vegetables is common to different cultures in Northern Nigeria. Vegetables serve as source of minerals, vitamins, certain hormone precursors as well as proteins and energy [1]. The consumption of vegetables and fruits in diets protects the body from degenerative diseases [1].

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. Humans are unable to synthesize vitamin C endogenously, and as such, it is consumed as essential dietary component [2].

Ascorbic acid is required in the Biosynthesis of collagen, L-carnitine, and certain neurotransmitters requires Ascorbic acid and in protein metabolism [2,3]. Ascorbic acid is an important physiological antioxidant [4] and also regenerates other antioxidants within the body, including alpha-tocopherol (vitamin E) [5]. Ascorbic acid is equally important in immune function [5] and improves the absorption of non heme iron [6], 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 [2,3,5,7].

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) [8].

High intakes of ascorbic acid have no severe adverse effects and also have low toxicity [8].

The objective of this work is to determine and compare the ascorbic acid content in some commonly consumed vegetables and fruits in Northern Nigeria and also to compare these levels to the recommended dietary intake (RDI) of ascorbic acid.

## MATERIALS AND METHODS

### Purchase of samples

Samples for the study were purchased in a local market in Kaduna state, Northern Nigeria. All the samples were thoroughly cleaned using deionised water to remove adhering contaminants. The samples were analyzed on the same day of purchase to prevent any change in the contents of vitamin C.

### Extraction and Titration

Concentration of ascorbic acid in the samples were determined using the procedure outlined by [9] with the exception of fruits were accurately weighed and ground using mortar and pestle with an additional of 20 milliliters of metaphosphoric acid-acetic acid. The mixture of sample and metaphosphoric acid was further ground and strained through muslin and the extract was made up to 100 milliliters with the metaphosphoric-acetic acid mixture. 5 milliliters of the metaphosphoric acid-acetic acid solution was pipetted into three of the 50 milliliters Erlenmeyer flask followed by 2 ml of the samples extract. The samples were titrated separately with the indophenol dye solution until a light rose pink persisted for 5 seconds. The amount of dye used in the titration were determined and used in the calculation of vitamin C content. Determination of vitamin C in fruits was done by extracting the juice using juice extractor and 2 milliliters of the muslin-filtered juice was used in titration for the determination of vitamin C [9].

## RESULTS

**Table 1: Ascorbic Acid content of some selected fruits**

| Sample    | Ascorbic Acid(mg/100g) |
|-----------|------------------------|
| Pineapple | 78.92                  |
| Banana    | 19.32                  |
| Grape     | 41.13                  |
| Orange    | 67.37                  |
| Papaya    | 86.51                  |

**Table 2: Ascorbic Acid content of some selected non leafy vegetables**

| Sample           | Ascorbic Acid(mg/100g) |
|------------------|------------------------|
| Tomato           | 36.46                  |
| Red Hot Pepper   | 139.48                 |
| Sweet Red Pepper | 141.31                 |
| Green Pepper     | 117.03                 |
| Ginger           | 16.46                  |

**Table 3: Ascorbic Acid content of some selected leafy vegetables**

| Sample         | Ascorbic Acid(mg/100g) |
|----------------|------------------------|
| Spinach        | 59.51                  |
| Bitter Leaf    | 41.16                  |
| Cabbage leaves | 27.33                  |
| Lettuce leaves | 24.31                  |
| Roselle Calyx  | 39.67                  |

## DISCUSSION

Table 1 shows the ascorbic acid content in fruits selected for this work, while Table 2 and 3 shows the ascorbic acid content in non-leafy and leafy vegetables, respectively. The result in Table 1 shows that papaya has the highest content of ascorbic acid (86.51mg/100g) while banana has the lowest ascorbic acid content (19.32mg/100g) of the fruits analyzed.

The results obtained in the current study on fruits are in agreement with [10, 11] who reported similar range of values in fruits analyzed. The result indicated shows that these selected fruits contain substantial amount of ascorbic acid and can serve as reliable source of vitamin C in both humans and animals.

The result in Table 2 shows that sweet red pepper has the highest content of ascorbic acid (141.37mg/100g) while ginger has the lowest content of ascorbic acid (16.46mg/100g) of the vegetables analyzed in this work.

The result obtained is in agreement with the work of [1] that carried out similar work on vegetables and reported similar range of values; (15-126mg/100g) of ascorbic acid in some of the non leafy vegetables analysed in this work. The result [1] obtained may be as a result of comparing two different methods of determining ascorbic acid. However, the result obtained in leafy vegetables differs from similar work carried out by [12], who reported lower values (4-89mg/100g) than the one obtained in this work. The difference may be as a result of different Processing methods employed in his work, which may alter the concentration of ascorbic acid in vegetables and fruits. The different processing methods employed in his work resulted in temperature variation which greatly affects the concentration of ascorbic acid in vegetables and fruits. The variation could also be as a result of difference in geographical location of the samples analyzed, which might be responsible for the differences in the range of values. Also, pollution and contamination either from farmlands or markets where these vegetables are sold might be responsible for the variation in ascorbic acid contents. The loss of ascorbic acid in green leafy vegetables is a function of the processing method employed in its preparation [12].

The result of this work shows that leafy vegetables contain low content of ascorbic acid compared to the non-leafy vegetables. This work will serve as guide in selection of plant produce with suitable source of ascorbic acid.

## CONCLUSION

The fruits and vegetables analyzed in this work contain appreciable amount of ascorbic acid, this work has further enlarge the database of ascorbic acid contents in fruits and vegetables commonly consumed in northern Nigeria and will serve as a useful guide in the selection of plants which are rich in ascorbic acid, in line with the recommended dietary intake of ascorbic acid.

### ACKNOWLEDGEMENT

We would like to acknowledge Kamaludeen Hussaini, a student of Department of Chemistry, Federal University of Technology, Minna, Nigeria. And also Aliyu Mohammed, also a student of Department of Chemistry, Bayero University, Kano, Nigeria for their support.

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