International Journal of Pharmacy and Medical Sciences 5 (1): 01-03, 2015
ISSN 2222-5854

DOI: 10.5829/idosi.ijpms.2015.5.1.1105

Determination of Ascorbic Acid Contents of Fruits and Vegetables

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Abstract: Ascorbic acid contents of some fruits and vegetables in Abakaliki were analyzed through titrimetric methods. The results recorded the concentrations (mg/100g) of ascorbic acids in various fruits as orange (15.47 ± 0.23), lemon (12.87 ± 0.45), grape (2.00 ± 0.10), paw-paw (46.40 ± 1.65), apple (2.20 ± 0.10), banana (1.87 ± 0.06), carrot (1.80 ± 0.04), pineapple (2.80 ± 0.10), water melon (2.27 ± 0.12), cucumber (1.20 ± 0.02) and mango (10.40 ± 0.20) while the concentrations (mg/100g) of ascorbic acids in vegetables recorded pepper (13.27 ± 2.01), cabbage (4.40 ± 0.16), water leaf (1.53 ± 0.03), green amaranthus (11.73 ± 0.46) and pumpkin (4.93 ± 0.31). Paw-paw contained the highest concentration among the tested fruits while orange, lemon and mango showed relatively moderate contents of ascorbic acid. Pepper and green amaranthus recorded higher levels of ascorbic acids in vegetables with water leaf having the least concentrations in those vegetables.

Key words: Ascorbic Acid · Fruits and vegetables

INTRODUCTION

A vitamin is an organic compound required by an organism as a vital nutrient in limited amount [1]. An organic chemical compound is called a vitamin when it cannot be synthesized by an organism and must be obtained from diet. Thus, the term is conditional both on the circumstances and on the particular organism. For example, ascorbic acid is a vitamin for humans, but not for most other animals. Supplementation is important for the treatment of certain health problems [2].

Vitamin C, also known as ascorbic acid or ascorbate is essential for human health. It is a water soluble vitamin having the structure of monosaccharides. As a reducing agent, ascorbic acid readily loses two hydrogen atoms to become L-dehydroascorbic acid, which also has vitamin C activity [3]. Vitamin C cannot be synthesized by human and must be obtained from dietary source, primarily vegetables and fresh fruits. In human beings deprived of vitamin C, the life threatening nutritional deficiency disease scurvy develops [4]. The early story of ascorbic acid is associated with aetiology, treatment and preventions of the disease. Before the association of scurvy with diet was recognized, it was believed to be a veneral disease and was treated as such with disastrous result. Today incidents of scurvy surface in ascorbic acid deficiency [5].

Nevertheless, the main biochemical role that ascorbic acid plays is undoubtedly related to its function as a good reducing agent [6-7]. It is involved in several enzymatic reactions. Ascorbic acid plays some roles in collagen synthesis. Collagen is the principal component of skin and connective tissue, the organic substance of bones and teeth and the ground substance between cells. Deficiency of ascorbic acid causes impaired collagen synthesis. Thus, synthesis involves the enzymatic hydroxylation of protein to form a stable extracellular matrix and of lysine for glycosylation and formation of cross links in the fibers. However, ascorbic acid reduces the Fe^{3+} [8].

Ascorbic acid functions as a chelating agent. It interacts with some metal ions resulting in their enhanced absorption from the diet and their mobilization and distribution throughout the body. Ascorbic acid deficiency interferes with iron mobilization from the spleen but not from the liver. Supplementary ascorbic acid increases its mobilization from the body stores during the treatment of iron over load. This property is important in the treatment of anaemia [9].

An important biological function of ascorbic acid is the destruction of free radicals derived from oxygen (O_2) such as hydroxyl, Singlet oxygen and superoxide [10]. These free radical scavenging reactions are important in the eyes in the extracellular fluid of the lungs where they

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provide protection against other oxidizing agents such as ozone. The metabolism of L- tyrosine involves mixed function oxidase that is dependent on the presence of L-ascorbic acid [11].

Ascorbic acid plays very important role in the maintenance of the body system, hence it is imperative to analyze the ascorbic acid levels of some common fruits and vegetables to compare their various concentrations.

MATERIALS AND METHODS

Materials: Fruit and vegetable samples (orange, carrot, banana, water melon, cucumber, mango, apple, cabbage, water leaf, paw-paw, grape, green amaranthus, pumpkin and pepper) used for this research were collected from Abakaliki in the month of May.

Method

Determination of Ascorbic Acid: Ascorbic acid was determined by the method of Pascal [12].

RESULTS AND DISCUSSION AND CONCLUSION

The results showed that ascorbic acid concentrations in fruits were on the average higher than that of the vegetables (Figs. 1 and 2). There was higher concentration of ascorbic acid in paw-paw, orange, lemon and mango and low concentration is found in pineapple, water-melon, apple, banana, carrot, grape and cucumber while in vegetable, high concentrations of ascorbic acid were found in pepper and green amaranthus while moderate concentration was found in cabbage and pumpkin and low concentration was found in water – leaf. Pepper, green amaranthus, orange and lemon were reported to have high ascorbic acid concentrations [12]. It was reported that analysis of ascorbic acid contents of fruits and vegetables showed that there is high concentration of ascorbic acid in orange, lemon, green and pepper [13], while this work also reported high ascorbic acid concentrations on the same fruits and vegetables. Low concentration is also reported in Pakistan on carrot, cucumber, apple, pumpkin and onions [13] while

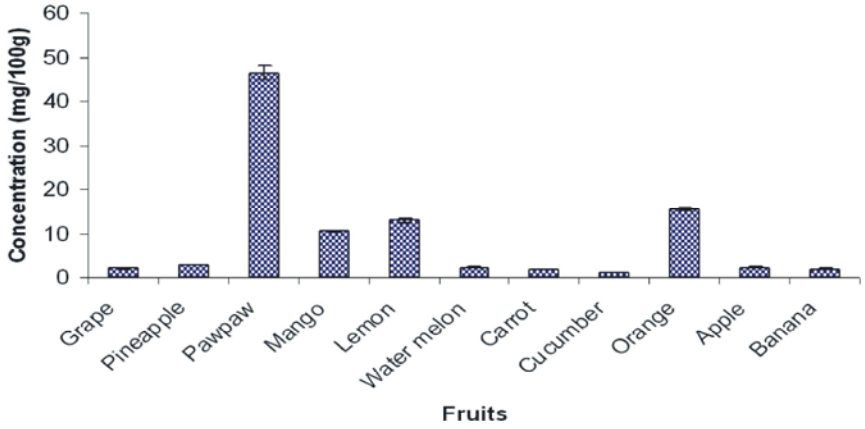

Fig. 1: Ascorbic acid concentrations (mg/100g) in fruits.

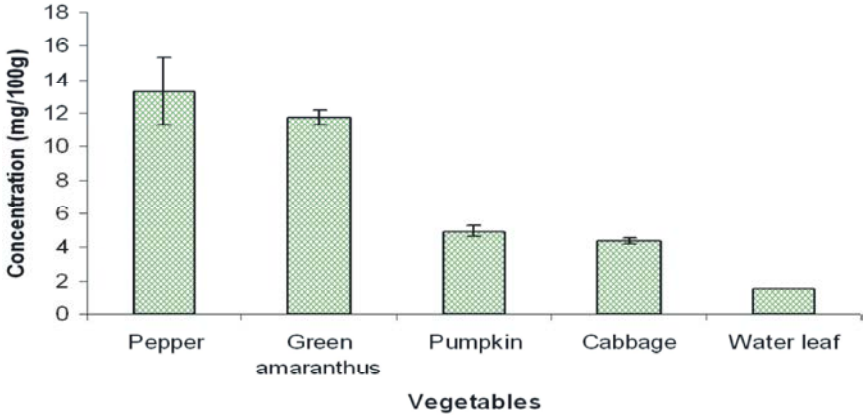

Fig. 2: Ascorbic acid concentrations (mg/100g) in vegetables.

this work also reported low concentrations of ascorbic acid in the same fruits and vegetables.

There were also variations in the concentrations of vitamin C the fruits and vegetables from these two countries. These differences are most probably due to different regional varieties of fruits and vegetables [5]. It has been reported that the amounts of vitamin could even vary between different samples of the same species [5].

In conclusion, there are variations in the ascorbic acid concentrations of fruits and vegetables. Orange, paw-paw, pepper, lemon, green amaranthus and mango appeared to be reasonable sources of vitamin C.

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