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Determination of Vitamin C content in Citrus Fruits and in Non-Citrus Fruits by Titrimetric method, with special reference to their nutritional importance in Human diet

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ABSTRACT: The objective of this study was to determine the Vitamin C content in citrus fruits (orange, grape fruit, lemon) and non-citrus fruits (mango and papaya) purchased randomly from local market found at Saryab road of Quetta city in province Balochistan of Pakistan in order to analyzed their Vitamin C content by titrimetrically. During the present study, method used for the determination of Vitamin C content was cheap, accurate and can also be used for routine analysis. The results of present study indicated that the concentration of vitamin C in each fruit was found to be i.e., Orange (12.78mg/100ml), Grapefruit (10.9mg/100ml), Lemon (12.68mg/100ml), Mango (7.84mg/100ml) and Papaya (9.31mg/100ml). From the results, it can be concluded that among non-citrus fruits, papaya contain higher concentration of vitamin C than in mango; while among citrus fruits, orange was proved to be have high content of vitamin C. thus, it had been proved that present work is valuable for providing information to the nutritionists as well as for diet conscious peoples for removing the deficiency of the vitamin C in their diet.

Keywords: Vitamin C, Titrimetric method, citrus and non-citrus fruits.

INTRODUCTION

Citrus fruits are one of the most important sources of food and medicine. Fruits are divided into two classes climacteric and non-climacteric based on their pattern through ripening. In climacteric category are the bananas, pears and avocados while in non-climacteric category are the grapefruit, lemon, orange, melon, pineapple and the strawberry (Thurlor. and Lumley, 1989).

Vitamin C is defined as hexuronic acid, cevitamin acid or xiloascorbic acid. The term vitamin C is commonly used to describe all these compounds even though the representative of which is ascorbic acid (Jose and María-Del, 2013). Ascorbic acid is the most abundant vitamin in orange, lemon and grapefruit (Ralph and Bender, 2000). Ascorbic acid is also known as Vitamin C or L-ascorbic acid or antiscorbutic vitamin. More than 90% of the vitamin C in Human diets is supplied by fruits and vegetables. It is synthesized by most organisms from glucose but man and other primates and various other species must obtain it from their diet (Alibone, 2000). Vitamin C is an essential nutrient that plays a vital role in protecting the body from infection and disease. It is necessary in the synthesis of collagen in connective tissues, neurotransmitters, steroid hormones, carnitine, and conversion of cholesterol to bile acid and enhances iron bio-availability (Robert *et al.,* 2000). It also has found to have anti-inflammatory, antioxidant, anti-tumor, anti-fungal and blood clot inhibition activities (Abeysinghe *et al.,* 2007). A lack of vitamin C in the diet causes the deficiency disease scurvy (Levine 1986). It may also result in hemorrhages under the skin, poor wound healing, edema and weakness (Enloe *et al.,* 1985).

Ascorbic acid content of citrus fruits is never stable but varies with some factors which include maturity state and position on the tree, climatic/environmental conditions, ripening stage, specie and variety of the citrus fruit as well as temperature (Holcombe 1992). Therefore, the present study was conducted to determine the vitamin C in citrus fruits (orange, grapefruit, lemon) and non-citrus fruits (mango and papaya) by titrimetric methods.

MATERIALS AND METHODS

A. Chemicals

The chemicals used for the experimental purpose in the present study includes distilled water, potassium iodide-5grams, potassium iodate-0.268grams, conc. sulphuric acid- 30ml, starch solution- 10 drops, standard ascorbic acid- 0.25grams.

B. Sample collection and preparation

The commercial fruits such as Orange, Grapefruit, Lemon, Mango and papaya were purchased from local market found in Saryab road Quetta in Balochistanon dated 12 March 2015 and brought to Laboratory of Chemistry department of Sardar Bahadur Khan Women University, Quetta. The fruit juices were extracted by fruit pressing and was filtered using a muslin cloth and made up to 100ml with distilled water and Vitamin C content of the fresh fruit juices was determined by the methods adopted from Nweze *et al.* (2010).

RESULTS AND DISCUSSION

A total of five fruits were used in the present study. The results of Vitamin C content obtained for the five different types of fruits are tabulated in the Table 1. From the obtained results of the present study, It was clear that among non-citrus fruits, papaya shows higher concentration of vitamin C as compared to the mango, while among citrus fruits, orange also possessed high content of vitamin C. One of the study conducted in Ethiopia reported that the ascorbic acid content of freshly prepared Orange juice and old Orange juice were 41.4mg/100 mL and 32.4mg/100 mL, respectively (Tiruwork and Ghirma, 2012). While the other study conducted in Valencia indicating that vitamin C content of orange juice ranged from 33 to 50 mg/100 ml was obtained by squeezing the fruits (Aydogmus *et al.*, 2002). Wall (2006) used HPLC technique to analyze the vitamin C content of Banana and Papaya. The average ascorbic acid was highest in lemon juice followed by sweet orange juice, sweetie and white grapefruit (Nour *et al.*,2010).

Table 1: Shows the concentration of Vitamin C (mg/100ml) content in the five different fresh fruits.

Juice Samples	Vitamin C (mg/100ml)
Citrus fruits	
Orange	12.78[a]
Grapefruit	10.9[c]
Lemon	12.68[b]
Non-citrus fruits	
Mango	7.84[e]
Papaya	9.31[d]

Tee *et al.* (1988) determined the vitamin C content of 19 types of fresh fruits and vegetables by dye titration and microfluorometry. The values obtained by latter method estimated that ascorbic acid plusdehydroascorbic acid (DHAA) were higher than those found by titration method, which determined only ascorbic acid. Melo *et al.* (2006) reported the value 37.34mg/100g for orange and141.97mg/100g for papaya 'Hawaii' by using 2,6 dichlorophenolindophenol (DCIP) in the titrimetric method. Aurelia *et al.* (2011) reported ascorbic acid content of Lemon juice 54.74 mg/100ml and Orange juice 39.25 mg/ 100 ml by using Voltammetry Performed at Carbon Paste Electrodes.

Okiei *et al.* (2009) reported that the ascorbic acid content of freshly prepared lemon juice is 48.61 mg/100 ml, respectively.

Conversely, there are considerable differences in the values of vitamin C obtained in the present study with those reported by several other studies for some fruit juice samples. All such differences in the contents of vitamin C in the present study and previous studies might be as a result of variations in maturity stage and regional varieties of fruits. Different techniques of measuring and squeezing process may also affect the vitamin C content of fruit juices. The amount of vitamin C could even vary between the different fruit samples of the same species.

Factors including climate, temperature and amount of nitrogen fertilizers used in growing the plant and various climatic conditions such as light can also affect the concentration of vitamin C in fruits. The amount of vitamin C content in fruit juices can also be affected by the type of storage. Therefore, it is necessary that fruit juices must be stored at cool temperature because its vitamin C content will not be decrease.

CONCLUSIONS

From the obtained results, it can be concluded that among five different fruits used in the present study, papaya and orange was proved to contain high content of vitamin C determined by titrimetric method. Vitamin C or ascorbic acid is important for the human body, since these fruits are always available in local markets and they are also not expensive. So, the considerable amount of vitamin C presents in these fruits showed that when they are consumed in relative large amount, they will certainly contribute to the daily human dietary intake of the vitamin. Hence, it had been proved that that fresh fruits and their fresh juices contain more vitamin C content as compared to artificial juices and drinks because fruit is pickled fresh, not stored, preserved or exposed to air, So they are valuable in Human diet for getting Vitamin C in their diet.

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