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Estimation of ascorbic acid, sodium, potassium and sugar contents in different stages of guava from Malir, Karachi, Pakistan

Kashif Ahmed*, Naveed Hassan

Department of Chemistry, NED University of Engineering and Technology, Karachi, Pakistan

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Abstract

The study shows Quantitative analysis for Ascorbic Acid (Vitamin C), Sugar contents and Minerals (Sodium and Potassium) at different stages of guava (*Psidium guajava*) ripening period. Results showed that 100g of guava fruit give 228 mg average weight of vitamin C, the value larger than three times that of DRI (daily recommended intake). External thick skin of guava fruit have exceptionally higher levels of Ascorbic Acid i.e. vitamin C than the central pulp. It was found that all of these components increases with the passage of time then remain constant after its ripening period (three to four weeks). The work will serve baseline information for other studies.

* **Corresponding Author:** Kashif Ahmed ✉ kashif25473@yahoo.com

Introduction

Guava is tropical fruit that is very rich with nutrients. It has peculiar flavor, alone taste, as well as health promoting character. This fruit vary widely in taste, pulp color, texture as well as in seediness. The fruit becomes balmy when ripe and mature with sugariness taste. Internally, guava fruit varies with color depending upon the type of cultivar (a variety of plant produces by selective breeding) and may be in white color, pink color, yellow color, and/or in red color. Each guava fruit have numerous tiny, semi hard (in some cases very hard cannot be broken by teeth) edible seeds, concentrated especially at its center (Bashir and Abu-Goukh 2003).

Mostly Guava fruits are pear-shaped, round, having the length from 2 to 4 inches, and 4 or 5 sepals or protruding floral remnants are connected with the apex. Varieties of guava fruit or tree are widely different in seediness, texture, and flavor of the fruit. The better and good varieties of guava have soft pulp when ripe with creamy texture and soft natural external covering of fruit i.e. fully edible. The sweet and musky odor of fruit is pungent. Seeds of guava fruit are numerous, slightly hard, small in size but fully edible. Quality of the guava fruit which are grown in cold regions is disappointing (El-Zoghbi 1994).

Ascorbic acid is essential for the synthesis of a protein collagen, it is a protein that is important in wound healing process and also in formation of connective tissue. It is an antioxidant compound, and protecting against the harms by reactive molecules i.e. called as free radicals. The Federal Food and Drug Administration have accepted the recommended dietary allowance (RDA) as 60mg/day. Daily minimum intake of vitamin C should be 10-15mg/day for an adult, to prevent scurvy disease as well as to avoid the deficiency of vitamin C. (Tiitinen *et al.* 2006).

Potassium and sodium in a human body are to regulate the various types of body processes, such as acid-base balance, maintenance of osmotic pressure, nerve conduction, muscle contraction and control of heart beat (Deb, 1998). The basic aim of the present work is to study the compositional changes (Ascorbic Acid, Sugar contents and Minerals) during various stages of guava fruit ripening and to provide baseline information to assist in development of sound programmes for this sweet fruit.

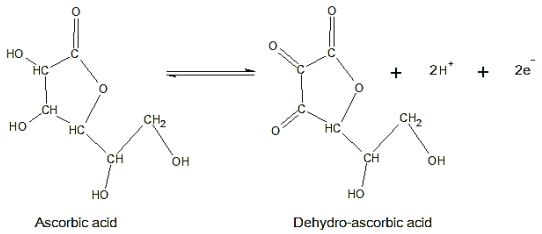
Materials and methods

Description of Samples

The entire sample was taken after 30 days (four weeks) of its ripening period. Sample was marked as A-1, B-1, C-1, to differentiate it from its color and texture. The entire samples was taken again after 60 days (eight weeks) of its ripening period and samples were named as A-2, B-2, C-2 to differentiate them between their color and texture.

Determination of ascorbic acid

The amount or concentration of vitamin C (Ascorbic Acid) can be analyzed with the help of redox titration. A standardized solution of iodine is used in this process. The ascorbic acid reduces iodine to form its iodide form. It can be seen in the following redox equation.



Chemical Reaction: $I_2 + 2\ e^- \rightarrow 2\ I^-$

The end point of this titration comes when a slight excess solution of iodine is added to the sample or solution of ascorbic acid. Iodine I_2 is not a standard solution; therefore it may be standardized with the solution of thio-sulphate. (Sauberlich Howerde *et al.* 1982).

Determination of refractive index & sugars

Refractive index and sugars of guava sample was measured by Refractometer DR-6000. (Wilson *et al.* 1982).

Determination of Na^+ and K^+

Standard solutions of Na^+ (40, 60, 80 and 100 ppm) were prepared in the laboratory. First the blank solution was run in the flame photometer. The blank was distilled water in which all of standard solutions were prepared.

The blank reading is adjusted to zero. After running of 4 standards of sodium in the flame, three samples of guava solution were run in the flame photometer. Graph of display readings were plotted against the concentration of standard solutions. (Premuzic *et al.* 1998). Similarly, standard solutions of K^+ (20, 40, 60, and 80 ppm) were prepared and same procedure was applied to analyze the concentration of potassium in guava samples.

Results and discussion

Ascorbic acid contents

When various samples of Guava from Malir, Karachi were analyzed for ascorbic acid contents then it was noticed that (Table 2) guava of 60 days (eight weeks) of ripening period contain high amount than those guava which have 30 days (four weeks) of ripening period. So, with the passage of time the concentration of Vitamin C (ascorbic acid) increases it is obvious ripened fruits have more ascorbic acid content than unripen fruits. Similar types of results for Ascorbic acid were also reported by Haquea *et. al. (*2009).

Sugar contents

Fruits are an important source of sugar supply to human beings. When sugar contents were analyzed in Guava of Malir, Karachi then it was observed (Table 3) that the concentration of glucose increases with the passage of ripening period from four weeks to eight weeks. That's why the guava fruit's sweetness increases with the passage of time. Same trends are observed in fructose and sucrose like glucose. Haquea *et. al.* (2009) also reported such type of increasing trend in this fruit.

Table 1. Guava's Sample Description.

Parameters	Sample A-1	Sample B-1	Sample C-1	Sample A-2	Sample B-2	Sample C-2
Color	Green	Greenish-yellow	Yellow	Light green	Greenish-yellow	Yellowish-green
Texture	Hard	Semi-hard	Semi-hard	Semi-hard	Semi-hard	Very Soft
Weight	60.18 g	80.64 g	49.92 g	76.359 g	62.71 g	63.46 g
Diameter	45 mm	52 mm	45 mm	47.3 mm	44.0 mm	42.1 mm
Status	Fresh	Fresh	Fresh	Fresh	Fresh	Fresh

Table 2. Ascorbic Acid content in various samples of Guava rom Malir, Karachi.

Four Weeks		Eight Weeks	
Sample	Ascorbic acid in mg/100g	Sample	Ascorbic acid in mg/100g
A-1	121.7	A-2	205
B-1	146.3	B-2	250
C-1	132.8	C-2	248

Table 3. Sugar content in various samples of Guava from Malir, Karachi.

Four Weeks		Eight Weeks	
Sample	Glucose %	Sample	Glucose %
A-1	4.01	A-2	4.24
B-1	4.28	B-2	4.59
C-1	3.86	C-2	4.92
Sample	Fructose %	Sample	Fructose %
A-1	4.88	A-2	4.95
B-1	5.11	B-2	5.09
C-1	5.07	C-2	5.07
Sample	sucrose %	Sample	Sucrose %
A-1	4.74	A-2	4.89
B-1	4.99	B-2	4.99
C-1	4.38	C-2	4.99

Table 4. Mineral contents (Na^+ & K^+) in various samples of Guava rom Malir, Karachi.

Samples	Concentration of Na^+	Concentration of K^+
A1	71.0 ppm	63.0 ppm
B1	93.0 ppm	71.2 ppm
C1	85.0 ppm	67.2 ppm
A2	177.5 ppm	157.5 ppm
B2	231.5 ppm	178.0 ppm
C2	212.6 ppm	168.0 ppm

Mineral Contents

Guavas are also important source of various minerals. Mineral content (Na^+ and K^+) are reported in Table 4. Samples A-1, B-1 and C-1 contain 177.5 ppm, 232.5 ppm and 212.6 ppm of sodium per 10 gram of guava fruit. The data shows that concentration of Sodium electrolyte increases when the fruit is going to complete its ripening period. And sodium concentration in guava fruit also depends upon the color, texture and size of guava fruit. It is also observed that sodium in guava fruit of Karachi Pakistan is very high because the soil of Malir Karachi contain high amount of sodium minerals. Sample A-1, B-1 and C-1 contain 157.5 ppm, 178 ppm and 168 ppm of potassium per 10 gram of guava fruit. The data shows that concentration of potassium electrolyte increases when the fruit is going to complete its ripening period. And potassium concentration in guava fruit also depends upon the color, texture and size of guava fruit. Mineral content in this fruit varies from place to place which is due to land conditions. In literature, (El-Zoghbi, 1994; Bashir and Abu-Goukh, 2003; Haquea *et al.,* 2009) varying quantities of mineral contents Have been reported.

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