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Determination of the rate of change of the concentrations of oxalate ion and ascorbic acid in ripening guava with respect to the number of days

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Abstract

The oxalate ion and ascorbic acid concentrations of the matured guava fruit at different stages of ripening were determined using reported procedures. The oxalic acid content was found to increase and the ascorbic acid content was found to decrease with number of days. The rate of change of concentrations of oxalate ion and ascorbic acid with number of ripening days were studied by plotting their concentrations with respect to number of days.

Introduction

Guava *(Psidium guajava)* being a climacteric fruit is widely present in all most all homes of India. It is rich in ascorbic acid (Vitamin C), Vitamin B and other minerals and is considered as a healthy food. But being an oxalate rich fruit the over intake of it may cause the formation of Kidney stone in people. The potential antioxidant property of Guava is reported various groups (Yan *et al*., 2006 and Gull *et al*.,2012). It is already reported by several studies that the oxalate content in guava increases as it get ripens with a corresponding decrease in the ascorbic acid (Vitamin C) content (Muhammed *et al*., 2014, Navis *et al*., 2017). Various mechanisms are suggested for the increase of oxalate content in Guava. Some of the various reasons are the chance of the incomplete oxidation of glucose to oxalate ion, or in the respiratory Krebs cycle the oxaloacetic acid formed may be converted to oxalate ion, or the ascorbic acid present in Guava is converted to oxalate ion (Prasad *et al*.,2017 and Curtin *et al*.,1995). But the kinetics of this variation has not studied much. So in this paper we have done preliminary studies on the kinetics of the variation of oxalate ion and ascorbic acid of guava at its various ripening stages. For this purpose, we have determined the oxalate ion concentration and ascorbic acid concentration at various ripening stages of matured guava by reported procedures. We have observed that the oxalate ion content increases and ascorbic acid content decreases with ripening of Guava. From the concentrations oxalate ion and ascorbic acid against the age of the guava, approximate rates of variation of oxalate ion and ascorbic acid were measured.

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Materials & Methods

The matured guava for the study was collected from nearby localities. All chemicals were purchased from Merck and used after purification.

Estimation of oxalate ion and ascorbic acid

The amount of oxalic was determined by titrating a known amount of guava extract with standard potassium permanganate and ascorbic acid was found by titrating against standard iodine solution.

Results and Discussion

The oxalate ion concentrations of the matured guava fruits at different stages are summarized in Table 1. Both oxalate ion concentration and ascorbic acid content was found to be slightly higher than the reported value because these values depend on the variety of the fruit. The oxalate content increased from 5-9 g/litre and ascorbic acid concentration decreased from 71 to 36 g/lire as the guava get ripened.

From the data it is seen that the oxalate ion concentration increases while the ascorbic acid concentration decreases as the fruit get ripens. In order to study the rate of change of concentrations of oxalate ion and ascorbic acid concentration with no of days, graphs are plotted by taking the concentration values on the y-axis and no of days on the x-axis. Graph 1 is the plot obtained for oxalate ion concentration change and Graph 2 that for the ascorbic acid concentration change. Both plots obey linear fit.

In graph 1 is a straight line with equation $y= 0.456 x + 3.989$. The slope is negative, $dy/dx = 0.456$g/litre/ day indicating the oxalate ion concentration increases with time. i.e. the oxalate ion concentration increases by 0.456 g/litre/day. The intercept 3.989 g/lire gives an idea about the amount of oxalate ion when the matured guava plucked from the plant.

While in graph 2 is a straight line with equation $y= -0.006 x + 0.104$. So the slope is $dy/dx = 0.006$g/day. i.e. the Ascorbic acid concentration decreases by 6 mg/day. The intercept 104mg/50 g gives an idea about the amount of ascorbic acid present when the matured guava plucked from the plant.

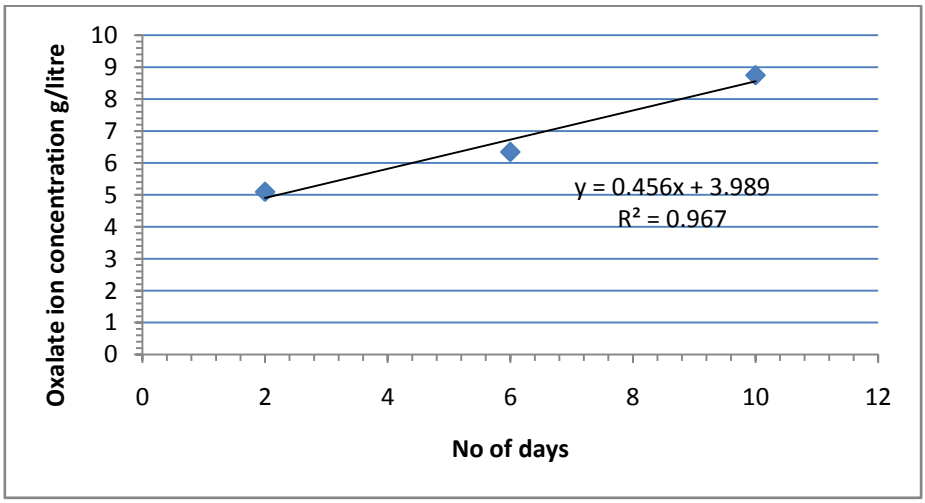
Conclusion

The ascorbic acid concentration in the matured guava at different stages it's ripening was determined using the oxalate ion concentration was determined by permanganometric titrations and the ascorbic acid concentration was determined by iodometric titration and it is found that and oxalate ion concentration increases with a rate 0.456g/litre/day and the ascorbic acid concentration decreases with a rate 6mg/50g/day. The decrease in the concentration in ascorbic acid may due to its conversion into oxalate ion.

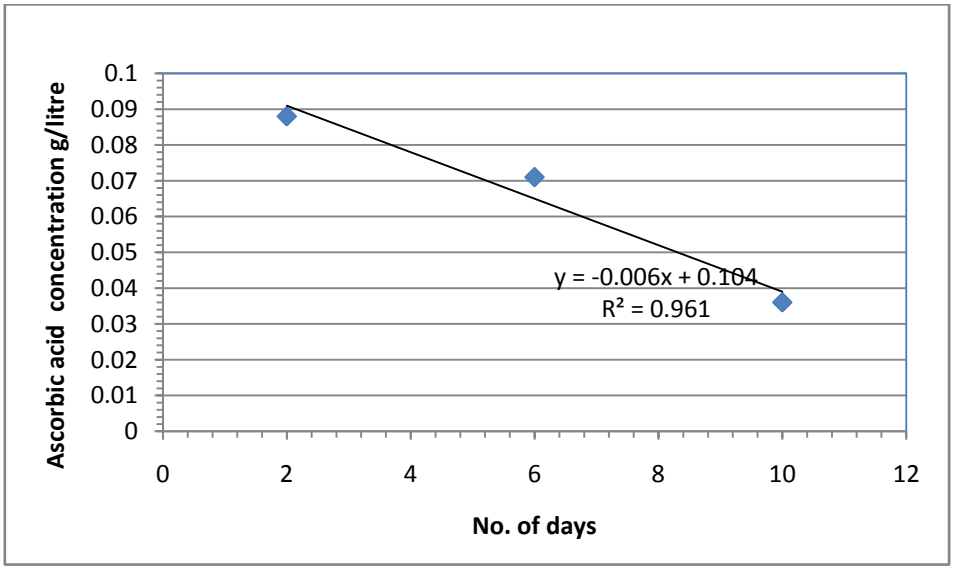
Table 1: The amount of ascorbic acid and oxalate ion concentrations of matured guava at different ripening stages.

Guava	Oxalate ion (g/litre)	Ascorbic acid (mg/50 g)
2 days old	5.095	88
6 days old	6.345	71
10 days old	8.747	36

Graph 1. Variation of oxalate ion concentration in ripening guava with no of days



Graph 2. Variation of ascorbic acid concentration in ripening guava with no of days.



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