Effect of Postharvest Treatments of Calcium Chloride and Gibberellic acid on storage Behaviour and Quality of Guava (*Psidium Guajava L.*) Cv. Lucknow-49

M. Rajkumar, Yearly Base Heart Najiar, R. Suresh Kumar, R. Sendhilnathan
Department of Horticulture,
Annmalai University, Annmalai Nagar-608 002.

ABSTRACT

An experiment was conducted at department of Horticulture, Annamalai University, Chidambaram to find out the effect of post -harvest treatments of Calcium chloride and gibberellic acid on storage behaviour and quality of guava (*Psidium guajava*) cv. Lucknow -49. The fruits were given post-harvest treatments of $Cacl_2$ (1%,2%,3%,4%) and GA_3 (25,100,150 and 200 ppm) each for 5 minutes. The fruits were dried in air and stored in ambient temperature. Among these treatment post-harvest dipping of fruits in Calcium chloride (2%) extended shelf life successfully for about 12 days. The post-harvest treatment of guava fruits in GA_3 @100 ppm recorded significantly the lowest level of loss in fruit weight, ripening percentage and rate of decay and have registered high firmness, high TSS, high ascorbic acid content, titrable acidity. The study suggests that both GA_3 @ 100 ppm and $Cacl_2$ at 2% as physiological changes and improve the shelf-life upto to 12 days and the quality in guava.

INTRODUCTION

Guava (*Psidium guajava* L.) belong to myrtaceae family is an evergreen tree and one of the major fruit of India. It is extensively grown in wide variety of soil and climatic conditions. A side from being eaten fresh. The unripe fruit can also be processed into jelly, dried fruit, canned slices in syrup. In India, guava is cultivated in area of 1.82 million hectares with an annual production of 18.23 million tonnes. If occupies fifth position in terms of production among fruits of India (N.H.B. production profile, 2008). The characteristic of different varieties of guava very considerably fruit shape ranges from round to pear shape. The skin colour of mature ripe fruit can be various shades of green or yellow. The flesh colour can barge from white to yellow to pink and red. Texture and taste of different guava as well as the seed content also vary (Brown and Paxton 1983).

A report of food and agricultural integrated Development Action (FAIDA) by Confederation of Indian Industry (CII) showed that the oral loss of fruits and vegetables has been estimated at 50% of their current production. In order to reduce loss on farm and procurement chain and prevent loss in value destruction. Packaging and storage system will play an important role. Various chemicals have been used to hasten or delay the ripening to reduce losses and to improve and maintain the colour and quality. Post-harvest application with Calcium chloride have been used to delay aging or ripening, consequently reducing postharvest decay and controlling many diseases in fruits and vegetables. (Cheour *et al.*,1990; El-Gamal *et al.*, 2007). Further calcium has been shown to inhibit ethylene production and thus delay ripening (Al-Ani and Richardson). It was observed that the fruits that are rich in calcium are more resistant to mechanical injury and post-harvest losses. In addition to this, there are few growth regulators believed to promote shelf-life of guava fruits.

Mehta *et al* suggest that GA_3 @100 ppm significantly suppress the succinate activities of malate –dehydrogenase during post-harvest ripening of guava and thus retard ripening.

Singh and Singh observed minimum physiological loss in weight for mango fruits treated with GA_3 @50 ppm under ambient conditions. Therefore, an experiment was conducted to find out with the following objectives:

To assess the physical, physiological and biochemical changes of guava fruits during storage.

To find out the effect of $cacl_2$ and GA3 on the quality of Guava.

MATERIALS AND METHODS

The uniform sized, firm and good looking guava cv. Lucknow 49 which were harvested at proper physiological maturity from healthy plants from a commercial orchard, Annamalai Nagar and were used to study. The fruits were washed, graded by the density gradation method to select fruits having uniform maturity and only water sinkers were used for storage studies. The fruits were treated in different compounds, which consist four levels of each $CaCl_2$ (1%,2%,3% and 4%) and GA_3 (50,100,150,200 ppm) along with a control. The total number of treatments were nine replicated three times in completely randomized block design (CRBD). The fully developed, mature, unripe, healthy, good looking and uniform medium sized fruit subjected to post-harvest treatments and the observations on quality parameters were periodically recorded on 3^{rd},6^{th},9^{th} and 12^{th} day of storage. Fruits were analysed for physiological loss in weight (PLW), fruit weight, firmness, Total soluble solids (TSS), Total sugars, Titratable acidity, and ascorbic acid.

T_1 - Dipping fruits in $CaCl_2$ @ 1 %

T_2 – Dipping fruits in $CaCl_2$ @ 2%

T_3 – Dipping fruits in $CaCl_2$ @ 3%

T_4 – Dipping fruits in $CaCl_2$ @ 4%

T_5 – Dipping fruits in GA_3 @ 50ppm

T_6 – Dipping fruits in GA_3 @ 100 ppm

T_7 – Dipping fruits in GA_3 @ 150 ppm

T_8 - Dipping fruits in GA_3 @ 200 ppm

T_9 – Dipping fruits in control

RESULT AND DISCUSSION

The data revealed that there was a significant difference in the physiological loss in weight (PLW) of fruits under different treatments and storage levels. The PLW of fruits gradually increased from 3rd day to 12th day of storage may be due to moisture loss through respiration and transpiration of fruit. The decline in fruit weight during storage primarily attributed to the losses in moisture through physiological processes such as evaporation and transpiration (Roy and Pandey,12). Among these, the least PLW of 0.32 percent, 1.12 percent, 2.01 percent, 2.80 percent on 3rd, 6th,9th and 12th days of storage were observed in T_2 (2% $CaCl_2$). The highest PLW recorded in Control T_9 of 0.96 percent, 2.23 percent, 4.49 percent and 5.14 percent on 3rd,6th,9th and 12th days of storage.

The firmness of fruit was gradually declined with proceeding of storage period from 3rd day to 12th days may be due to breakdown of pectin substances and cell wall softening. Softening of fruits is caused either by breakdown, of insoluble protopectins into soluble pectin or by hydrolysis of starch (Matto *et al*.,1975). The firmness range from The firmness range from 5.92 to 11.15 lb/force on the 12th day of storage. Among the various treatment the highest firmness was observed in T_2 (11.15 lb/ force) and followed by T_5 (10.68 lb/force). The lowest firmness was observed in T_{10} (5.92 lb/force) control.

$Cacl_2$ has merit in reducing spoilage in guava fruits which may be due to their positive role in delaying the senescence of fruits by maintaining cell wall integrity and thus lowering the spoilage. This are in conformity with the finding of Mahajan *et al.,* (2011) in guava, Sabry (1998) in apple, Cheour et al., (1990) in Strawberry.

The spoilage of fruits on the 12th day of storage ranged from 8.71 percent to 29.20 percent. Among the various treatments the T_2 was found to be the best with a value of (8.71 per cent) followed by T_5 (9.48 per cent). The highest spoilage is in the T_{10} (29.20 per cent) control.

The treatment exhibited wide variation for TSS on the 12th day of storage which ranged from 7.02° Brix to 10.71° Brix. During the period of evaluation (12 days) the total soluble solids (TSS) content of fruits enhanced with the progress of ripening as a consequence of conversion of starch into sugars, which is in line with the report made by Thumbhar and Desai (1986). The performance of T_2 was found to be the best with the value of (10.71° brix). The treatment T_{10} have exhibited the least performance with the value of

(7.02° Brix) in control.

The accumulation of total sugars during the process of ripening is a consequence of starch hydrolysis. The activity of α-amylase and β-amylase and starch phosphorylase leads to conversion of starch into sugars (Chundawat and Raghava Rao, 1981).

In the present study, the total sugar and reducing sugar of guava fruits increased slowly and steadily upto 6 days of storage and thereafter a sharp decline was noticed due to rapid metabolic breakdown in these fruits. The highest total sugar percentage was observed in the treatment of T_2 (6.20 percent). The lowest total sugar percentage was observed in T_{10} (4.80 percent) control. The highest reducing sugar was observed in T_2 (3.68 percent) and the lowest reducing sugar was in T_{10} (2.77 per cent) control.

Upsurge in ethylene biosynthesis in the intercellular spaces proceeds climacteric rise in respiration leading to ripening of the fruit and the acidity level decreased (Singh, 1989).

The fruits acidity on the 12^{th} day of storage varied from 0.19 percent to 0.40 per cent. The highest values for this trait is (0.40 percent) T_2. The lowest value is in T_{10} (0.19 percent).

The decrease in ascorbic acid may be due to utilization of lesser amount of organic acids in metabolic activities which reduce the level of acidity with the progress in storage period. This are in conformity with the finding of Lal *et al.*, (2015) in citrus, Ismail et al., (2010) in guava, Jain and Dashora, (2011) in guava, Yadav et al., (2001) in guava fruits.

The ascorbic acid content ranged from 103.02mg/100g to 119.70 mg / 100g on the 12^{th} day of storage. Among the various treatments the performance of T_2 was found to be the best with a value of 119.70 mg/100g. The least performance with a value of (103.02 mg/100g) T_{10} control.

Effect of post-harvest treatments on physiological loss in weight (%) and firmness in fruit of Guava Cv. Lucknow- 49.

Treatments	Physiological loss in weight (%)				Firmness (lb force)			
	3rd	**6th**	**9th**	**12th**	**3rd**	**6th**	**9th**	**12th**
T_1-$CaCl_2$ 1%	0.56	1.50	2.70	3.50	16.51	15.78	13.18	10.22
T_2-$CaCl_2$ 2%	0.32	1.12	2.01	2.80	17.49	16.58	14.09	11.15
T_3- $CaCl_2$ 3%	0.63	1.58	2.81	3.63	16.12	15.25	12.52	8.89
T_4- $CaCl_2$ 4 %	0.72	1.66	2.92	3.76	15.69	14.79	12.06	8.47
T_5- GA_3 50 ppm	0.59	1.55	2.73	3.55	16.60	15.65	12.75	9.84
T_6- GA_3 100 ppm	0.64	1.56	2.83	3.63	16.76	15.56	12.81	9.95
T_7- GA_3 150 ppm	0.73	1.65	2.93	3.77	15.52	14.52	12.19	8.32
T_8- GA_3 200 ppm	0.96	2.67	4.45	8.56	15.25	9.87	6.98	4.56
T_9- Control	0.96	2.23	4.99	5.14	14.70	12.05	8.60	5.92

Effect of postharvest treatments on total sugars (%) and titratable acidity (%) of guava fruits during storage.

Treatments	Total sugars (%)				Titratable acidity (%)			
	3rd	6th	9th	12th	3rd	6th	9th	12th
T_1	5.54	6.04	5.87	5.72	0.40	0.37	0.33	0.31
T_2	5.85	6.36	6.26	6.20	0.46	0.42	0.42	0.40
T_3	5.56	5.96	5.81	5.67	0.39	0.33	0.32	0.30
T_4	5.45	5.67	5.79	5.87	0.35	0.33	0.30	0.27
T_5	5.40	5.77	5.57	5.52	0.41	0.36	0.29	0.24
T_6	5.51	5.91	5.77	5.62	0.39	0.38	0.34	0.32
T_7	6.40	6.76	6.56	6..51	0.37	0.33	0.26	0.22
T_8	6.42	6.77	6.57	6.52	0.41	0.36	0.29	0.24
T_9	5.36	5.70	5.23	4.80	0.33	0.26	0.23	0.19

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