Madras Agric. J. 89 (4-6) : 221-224 April-June 2002

https://doi.org/10.29321/MAJ.10.A00204

Effect of post harvest application of calcium and virosil on ripening and shelf life of guava var. Allahabad Safeda

A. GOPI KRISHNA AND K. HARI BABU
Department of Horticulture, S.V. Agricultural College, Tirupati - 517 502

Abstract: Effect of calcium ($CaCl_2$ at 1, 2 or 4% and Ca $(NO_3)_2$ at 1, 2 or 4%) and Virosil (1, 2 or 4%) as post harvest treatments on storage life of guava var Allahabad Safeda at room temperatures was studied. It revealed that the treatment *viz.* 4% Ca $(NO_3)_2$ and 5% virosil (contains silver in cationic form) have extended shelf life of guava fruits by 5 days. The fruits treated with 4% $Ca(NO_3)_2$ have retained higher TSS, higher ascorbic acid, higher total titrable acidity and higher total sugars than other treatments. The fruits treated with Ca $(NO_3)_2$ at 4% and 2% and virosil at 5% were exhibited reduced loss in physiological weight, slower increase in TSS percent and total sugar contents and slower decrease in ascorbic acid and total acidity of fruits.

Key words: Guava, Calcium, Silver, Post harvest storage life.

Introduction

Guava (*Psidium guajava* L.) is one of the important fruits in India and considered to be "poor man's apple" because of its high nutritive value and low price. Being highly perishable in nature, guava fruit should be marketed immediately after harvest. Otherwise the continued physiological changes that take place in the fruits make them unfit for consumption. Application of mineral to fruits after harvest is gaining importance in recent days in delaying ripening and fruit senescence (Poovaiah *et al.* 1988). Hence the present study was therefore undertaken to evaluate the effect of calcium and silver in extending shelf life of guava fruit Cv Allahabad Safeda.

Materials and Methods

The fruits of guava Cv Allahabad Safeda were harvested at fully matured green stage and dipped in 1%, 2% or 4% calcium chloride, 1%, 2% or 4% calcium nitrate and 1%, 2.5% or 5% virosil. Then fruits were air dried and packed in perforated wooden crates. Then fruits were analysed on 2,4,6,8,10 and 12 days after harvest for the parameters *viz.* physiological loss in weight, TSS, total titrable acidity, ascorbic acid, total sugars and shelf life.

TSS was determined by using hand refractometer. Total titrable acidity, ascorbic acid and total sugars of fruits were estimated adopting the procedure described by Ranganna (1977). Shelf life of the fruits was recorded as the No. of days taken by the fruits from harvest to the point of 50% shriveling.

Results and Discussion

As the storage period extended the PLW (Percent Loss in Weight) of guava fruits of cultivar Allahabad Safeda increased in all the treatments (Table 1). The lowest PLW was noticed in fruits treated with 4% Ca $(NO_3)_2$. This less loss in weight is due to the fact that calcium is known to retard the rate of respiration, decay and checks cellular disintegration by maintaining protein and nucleic acid synthesis (Faust and Sheer, 1971).

Storage period influenced significantly the content of the total soluble solids in fruits. In general TSS increased up to 8 days of storage and there after in declined subsequently (Table 2). Maximum TSS content was recorded in control as compared to the fruits treated with 4% Ca $(NO_3)_2$. It was also noticed that the rate of increase in TSS was faster in untreated fruits while slower in fruits treated with Ca $(NO_3)_2$, $CaCl_2$ and virosil. These results were in conformity with those reported by Kumar and Chauhan (1989) in kinnow mandarins where TSS increased faster in control when compared to calcium treated fruits.

A progressive decrease in ascorbic acid content of guava in all the treatments with the progress in the storage period is evident from the data (Table 3). Mapson (1970) reported that this decrease in ascorbic acid content may be due to higher rate of respiration and oxidation. Similar decrease in ascorbic acid with various treatments along with storage period was reported by Khedkhar *et al.* (1982).

It was observed that total titrable acidity decreased gradually in fruits treated with Ca $(NO_3)_2$

Table 1. Effect of post harvest applications of calcium and silver on PLW% of guava during storage

Treatment	Days after harvest						Mean
	2	4	6	8	10	12	
1 % $CaCl_2$	5.61	9.52	12.88	16.89	18.51	22.38	14.29
2 % $CaCl_2$	5.20	9.30	12.38	15.23	17.76	21.90	13.62
4 % $CaCl_2$	3.12	8.62	11.93	15.14	17.14	20.73	12.78
1 % Ca $(NO_3)_2$	5.03	8.80	10.57	12.50	15.38	17.30	11.59
2 % Ca $(NO_3)_2$	4.26	6.95	9.44	11.33	13.04	15.11	10.02
4 % Ca $(NO_3)_2$	2.80	6.36	8.69	10.43	13.04	13.91	9.20
1 % Virosil	4.16	7.02	10.90	14.66	16.84	21.25	12.47
2.5 % Virosil	4.06	6.58	11.00	13.10	15.83	18.33	11.48
5 % Virosil	3.84	6.73	8.73	12.72	15.45	16.36	10.63
Control	9.45	14.64	19.00	22.32	24.69	27.12	19.53
Mean	4.84	8.39	11.45	14.38	16.67	19.43	

CD (P=0.05); Treatment (T) : 1.09; Days after harvest (D) : 0.99; T x D : 1.21

Table 2. Effect of post harvest applications of calcium and silver on TSS (%) of guava during storage

Treatment	Days after harvest						Mean
	2	4	6	8	10	12	
1 % $CaCl_2$	10.77	13.38	14.04	14.82	13.73	8.50	12.54
2 % $CaCl_2$	10.33	13.25	13.68	14.13	12.73	8.23	12.05
4 % $CaCl_2$	10.32	12.95	13.54	14.05	11.58	7.95	11.73
1 % Ca $(NO_3)_2$	10.45	12.63	13.38	14.14	11.19	8.02	11.63
2 % Ca $(NO_3)_2$	9.92	12.24	12.93	13.62	11.18	7.72	11.26
4 % Ca $(NO_3)_2$	9.65	12.30	12.41	12.62	10.51	7.56	10.82
1 % Virosil	10.42	13.22	13.81	14.45	11.93	8.73	12.09
2.5 % Virosil	10.17	12.76	13.40	14.05	11.23	8.34	11.65
5 % Virosil	10.01	12.39	12.92	13.55	10.93	8.25	11.34
Control	11.56	13.91	14.25	14.40	12.09	9.67	12.64
Mean	10.36	12.89	13.43	13.98	11.71	8.29	

Initial value : 10.52
CD (P=0.05); Treatments (T) : 0.30; Days after harvest (D) : 0.39; T x D : 0.34

while a faster decline in acidity of fruits was exhibited in control (Table 4). The mean total titrable acidity was maximum in fruits treated with 4% Ca $(NO_3)_2$ and minimum in control. Singh *et al.* (1987) reported a similar pattern of changes in titrable acidity due to calcium treatment either as pre harvest spray or post harvest dipping of Amrapali mangoes.

The effect of post harvest application of calcium and virosil on changes in total sugars is presented in Table 5. With the advancement of storage period, a gradual hike in total sugars was observed and at later stages a decline was observed. The maximum mean percentage of sugars was observed in fruits treated with 4% Ca $(NO_3)_2$.

The effect of post harvest application of calcium and silver on shelf life of guava fruits is presented in Table 6. It was observed that the shelf life of guava fruits was maximum in

Table 3. Effect of post harvest applications of calcium and silver on ascorbic acid content of guava during storage

Treatment	Days after harvest						Mean
	2	4	6	8	10	12	
1 % $CaCl_2$	222.50	185.28	164.64	143.56	106.56	84.55	150.84
2 % $CaCl_2$	225.17	193.50	168.36	148.33	111.32	89.77	156.07
4 % $CaCl_2$	235.60	205.66	175.77	166.38	131.56	109.20	170.70
1 % Ca $(NO_3)_2$	248.80	218.30	190.20	159.45	114.02	99.12	171.65
2 % Ca $(NO_3)_2$	261.00	222.74	180.25	164.85	121.31	103.24	178.56
4 % Ca $(NO_3)_2$	270.60	226.12	219.08	177.65	142.15	120.87	192.91
1 % Virosil	234.95	209.28	174.80	160.72	115.32	94.05	164.85
2.5 % Virosil	247.70	215.51	183.03	163.92	121.98	98.65	171.19
5 % Virosil	253.00	217.30	187.75	172.64	131.58	114.45	179.43
Control	95.68	165.00	139.00	131.50	100.58	75.02	134.45
Mean	239.30	205.86	180.09	158.89	119.72	98.89	

Initial value : 272.54
CD (P=0.05); Treatments (T): 5.95; Days after harvest (D) : 7.68; T x D : 6.23

Table 4. Effect of post harvest applications of calcium and silver on total titrable acidity of guava during storage

Treatment	Days after harvest						Mean
	2	4	6	8	10	12	
1 % $CaCl_2$	0.70	0.66	0.62	0.59	0.50	0.40	0.57
2 % $CaCl_2$	0.74	0.67	0.64	0.61	0.54	0.48	0.61
4 % $CaCl_2$	0.80	0.72	0.69	0.64	0.58	0.50	0.65
1 % $Ca(NO_3)_2$	0.72	0.70	0.68	0.61	0.55	0.46	0.62
2 % $Ca(NO_3)_2$	0.76	0.73	0.69	0.64	0.56	0.47	0.64
4 % $Ca(NO_3)_2$	0.80	0.74	0.72	0.70	0.58	0.49	0.65
1 % Virosil	0.72	0.69	0.66	0.60	0.48	0.43	0.59
2.5 % Virosil	0.73	0.70	0.67	0.63	0.50	0.44	0.61
5 % Virosil	0.77	0.72	0.70	0.66	0.53	0.50	0.64
Control	0.65	0.71	0.58	0.55	0.46	0.38	0.53
Mean	0.73	0.69	0.66	0.62	0.52	0.45	

Initial value : 0.80
CD (P=0.05); Treatments (T): 0.018; Days after harvest (D) : 0.024; T x D : 0.021

fruits treated with 4% Ca $(NO_3)_2$ followed by fruits treated with 5% virosil whereas minimum shelf life was observed in control. Pathmanabhan *et al.* (1995) reported that the shelf life of guava fruits was extended to 10-12 days when they were treated with 4% $CaCl_2$.

This increase in shelf life is due to increased content of calcium in fruits which results in reduced rate of ripening. The fruits treated with virosil which contains silver also enhanced the shelf life of guava fruits. This might be due to the effect of silver in inhibiting ethelene production (Saltveit *et al.* 1978). These results have indicated that calcium and silver (in the form of $CaCl_2$, Ca $(NO_3)_2$ and Virosil) extended the shelf life besides improving the quality parameters of guava.

Table 5. Effect of post harvest applications of calcium and silver on total sugar of guava during storage

Treatment	Days after harvest						Mean
	2	4	6	8	10	12	
1 % $CaCl_2$	7.20	7.61	8.13	8.51	8.02	6.58	7.72
2 % $CaCl_2$	7.21	7.31	8.03	8.50	7.23	5.54	7.27
4 % $CaCl_2$	6.48	7.01	7.75	8.21	6.95	5.51	6.98
1 % Ca $(NO_3)_2$	7.15	7.28	7.43	7.87	6.84	6.07	7.10
2 % Ca $(NO_3)_2$	6.76	6.86	7.22	7.65	6.39	5.52	6.73
4 % Ca $(NO_3)_2$	6.18	6.54	6.91	7.32	5.99	4.14	6.18
1 % Virosil	7.21	7.68	8.13	8.58	7.23	5.54	7.39
2.5 % Virosil	7.20	7.29	7.51	7.96	6.52	4.72	6.86
5 % Virosil	6.92	7.08	7.45	7.89	6.08	4.22	6.60
Control	7.29	7.81	8.23	8.61	8.12	6.98	7.84
Mean	6.94	7.24	7.67	8.11	6.93	5.51	

Initial value : 6.12
CD (P=0.05); Treatments (T): 0.31; Days after harvest (D): 0.40; T x D: 0.36

Table 6. Effect of post harvest applications of calcium and silver on shelf life (days) of guava during storage

Treatment	Shelf life (days)
1 % $CaCl_2$	4.33
2 % $CaCl_2$	5.33
4 % $CaCl_2$	6.33
1 % Ca $(NO_3)_2$	5.00
2 % Ca $(NO_3)_2$	7.00
4 % Ca $(NO_3)_2$	8.33
1 % Virosil	5.00
2.5 % Virosil	7.33
5 % Virosil	7.66
Control	3.66
Mean	5.99

References

Faust and Sheer, C.B. (1971). The effect of calcium on respiration of apples. *J. Am. Soc. Hort. Sci.* 97: 437-439.

Khedkar, D.M., Asarwadkar, K.W., Dabhade, R.S. and Ballal, A.L. (1982). Extension of storage life of guava. Var. Lucknow-49. *Ind. Fd. Packer* 36: 49-52

Kumar, S. and Chauhan, K.S. (1989). Effect of certain fungicides and calcium compounds on post harvest behaviour of kinnow mandarins. *J. Hort. Sci.* 18: 167-176.

Mapson, L.W. (1970). *Vitamins in fruits, (In) Biochemistry of fruits and their products.* Vol.1, Chapter XIII, pp, 376-377. Hulme, AC (Ed.), Academic Press, London.

Pathmanabhan, G., Nagarajan, M., Manian, K. and Annamalainathan, K. (1995). Effect of fused calcium salts on post harvest preservation in fruits. *Madras Agric. J.* 82: 47-50

Poovaiah, B.W., Gleen, G.M., and Reddy, A.S.N. (1988). Calcium and fruit softening, physiology and biochemistry. *Hort. Rev.* 10: 107-152

Ranganna, S. (1977) *Manual of analysis of fruit and vegetable products*, Tata Me. Graw Hill Publishing Company Limited, New Delhi, India.

Saltveit Mikal, E Jr., Kent J., Bradford and Dravi, R. Dilley (1978). Silver ion inhibits ethylene synthesis and action in ripening fruits. *J. Am. Soc. Hort. Sci.* 103: 472-475.

Singh, R.N., Gorak Singh, Mishra, J.S. and Rao, O.P. (1987). Studies on the effect pre and post harvest treatment of calcium nitrate and calcium chloride on storage life of Amrapali mango *Prog. Hort.* 19: 1-9.

(Received: November 2001; Revised: March 2002).