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Effect of post: Harvest treatments on physico-chemical properties and quality of guava (*Psidium guajava* L.)

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Abstract
The experiment was conducted at Laboratory of the Department of Horticulture, Babasaheb Bhimrao Ambedkar University (A central university), Vidya-Vihar, Rai Bareli Road, Lucknow -226 025 (U.P.), during 2017-18. In the experiment "Effect of post-harvest treatments on physico-chemical properties and quality of guava" contain one level of variety and 7 level of chemicals treatment used. The experimental details are Distilled water (control), Calcium chloride @ 1%, Calcium chloride @ 2%, Calcium Nitrate @ 0.5%, Calcium Nitrate @ 1%, Aloe Vera Gel @ 15%, Aloe Vera Gel @ 25% were followed in Completely Randomized Design with three replications. In the treatment physiological loss in weight and chemical parameters like TSS, acidity, ascorbic acid, total sugar, reducing sugar and non-reducing sugar of fruit were positively influenced by treatment calcium nitrate 1% up to 9 days of storage.

Keywords: Guava (*Psidiun guajava* L.), calcium chloride, calcium nitrate and aloe vera gel, TSS, Ascorbic acid

Introduction
Guava (*Psidium guajava* L.) is one of the most well-known edible tree fruits grown widely in the tropical and sub-tropical regions in the world and belongs to the family of Myrtaceae. Guava 'The apple of the tropics' is one of the most delicious and nutritious fruit crops grown in India. Guava fruit is often referred to as 'apple of tropics' probably due to its high nutritive value similar as commercially important temperate fruit of apple. Guava is considered to be superior to several other fruits by virtue of its commercial and nutritional value (Menzel, 1985) [9]. 671478

The fruits are delicious, rich in vitamin 'C', pectin and iron, fair source of minerals like phosphorus (23.37 mg/100 g), calcium (14-30 mg/ 100 g) as well as vitamin like niacin, thiamine, riboflavin and vitamin 'A'. Guava fruits are normally consumed as fresh or processed into several products like jam, jelly, cheese, nectar, paste etc. (Boora, 2012).

The medicinal use of guava plant is fresh leaf extract is used to treat digestive disorders like Diarrhoea and vomiting. Guava is considered most useful for eyes due to richness in vitamin A, good for nourishment of skin because of availability of vitamin C, vitamin E, and antioxidants etc. Guava leaf tea is commonly used as a medicine against dysentery.

There is a great demand of guava fruits in both domestic and international markets for fresh and processing purposes. The share of guava in fresh fruit export from

India is mere 0.65 per cent which can be further boosted, if fruit is properly handled after harvest to earn more foreign exchange (Mitra *et al.*, 2008) [10].

Guava has a short post-harvest shelf life of 5-8 days so under ambient condition fruits ripen rapidly after harvest, and are highly perishable. The fruit ripening in guava is characterized by loss of green colour, softening, shrinkage, loss of brightness and rot development (Ali and Lazan 1997).

Guava is fifth most important fruit crop in production after banana, mango, citrus and papaya. Allahabad has the distinct reputation of growing best quality guavas in the world. This fruit is a native of tropical America and extensively grown in South Asian countries. In India, this crop has been confined to the states of Utter Pradesh, Bihar, Madhya Pradesh, Gujarat and Maharashtra. In India it occupies 265 thousand ha area with a total production of 4054 thousand metric tonnes and productivity 16.27 tones/ha NHB (2018).

Materials and Methods

An investigation entitled "Effect of post-harvest treatments on physic chemical properties and quality of guava" was conducted at Laboratory of Department of Horticulture, Babasaheb Bhimrao Ambedkar University, Lucknow, Uttar Pradesh, during 2018-19. Geographically, Lucknow is the capital city of Uttar Pradesh, India, subtropical, semiarid zone falling in between latitude and longitude of 26.8467° N, 80.9462° E with an elevation of 123 meters from the sea level. The average annual rainfall is 896.2 millimetres from the south-west monsoon winds and relative humidity ranged during these conditions approximately ranging 60-70%. In winter, the maximum and minimum temperature is around 25 °C and 3 to 7 °C respectively. Summers are extremely hot with temperature ranges between 40 °C to 45°C.

The guava fruits of winter season were harvested at 80% maturity (colour break stage) and collected in plastic crates covered with a thick layer of guava leaves and brought to laboratory. Fruits with uniform size and colour were selected whereas blemished and diseased fruit were discarded. Prior to the post- harvest treatment, the fruits were washed in potable water. The fruits were then allowed to dry in shade prior to imposition of treatments. A lab experiment to investigate the effect of post-harvest treatments on the physico-chemical and quality of guava (*Psidium guajava* L.) was carried out in Completely Randomized Design with three replications at Laboratory of Department of Horticulture, Babasaheb Bhimrao Ambedkar University, Lucknow, Uttar Pradesh, during 2018-19. The experimental material comprised of fruits of cultivar Sardar obtained from Fruit Research Station, CISH Lucknow.

For different treatment combinations, one level of variety and 7 level of chemicals treatment used. Thus in the present investigation, 7 treatments combinations on storage were made. The experimental details and various treatment combinations are Distilled water (control), Calcium chloride @ 1%, Calcium chloride @ 2%, Calcium Nitrate @ 0.5%, Calcium Nitrate @ 1%, Aloe Vera Gel @ 15%, Aloe Vera Gel @ 25% were followed in Completely Randomized Design with three replications. The physical, chemicals observations to be recorded Total soluble solids (°Brix), Acidity (%), Ascorbic acid (mg/100gm), Total sugars (%), Non-reducing sugar (%), Reducing sugar (%).

Physiological loss in weight (PLW) of fruit was calculated as loss of weight in grams to the initial weight and expressed in percentage. The TSS content of fruits was measured by using Erma Hand refractometer of 0-32° Brix range, following the procedure described in A.O.A.C. (1980). Total sugar reducing sugar and non-reducing sugar determination by Rangana (1986). Acidity was estimated by simple acid-alkaline titration method as described in A.O.A.C and ascorbic acid contents of fruits were estimated by adopting the procedure described by Ranganna (1986) [13]. The shelf life was determined by recording the number of days the fruits remained in good condition without spoilage in each replication during storage. When the spoilage (over-ripening, skin browning and rotting) of fruits under different treatments exceeded 50 per cent, it was considered as the end of storage period, which was judged by visual scoring.

Results and Discussion

Physiological loss in weight during storage is characterized by reduction in fruit weight by the way of loss of moisture through evaporation and transpiration. As far as the effect of individual chemical treatment is concerned, the minimum Physiological loss in weight in control 3rd, 6th, 9th days is 11.38, 12.39, 15.11 respectively and the maximum loss was observed in the 3rd, 6th, 9th days in the treatment of Calcium Nitrate @ 1% (15.34, 15.89, 18.89). These results are in conformity with Kumar *et al.* (2001) [8].

TSS content of fruit was significantly affected as a result of different chemical treatments during entire period of storage. However, the maximum (13.50, 14.45 and 14.64^{0}Brix) was recorded from treatment T_4 (Calcium Nitrate @ 1%) followed by treatment T2 and T6 (Calcium chloride @ 2% and Aloe Vera Gel @ 25%) and minimum (11.30, 12.23 and 12.56^{0}Brix) total soluble solids was recorded from treatment T_0 (control) at 3, 6 and 9 days after harvesting respectively. These similar results found in guava Rajput *et al.* 2008

The maximum ascorbic acid content of fruit was significantly recorded (165.56, 164.67 and 169.56 mg) in the treatment T4 (Calcium Nitrate @ 1%) followed by treatment T3 and T5 (Calcium Nitrate @ 0.5% and Aloe Vera Gel @ 15%) and minimum (157.47, 155.41and 159.67 mg) ascorbic acid was recorded from treatment T0 (control) at 3, 6 and 9 days after harvesting respectively. These results are in conformity with Jagdeesh and Rokhade 1998, in guava. He reported that ascorbic acid content of fruits decreased with the advancement of storage period.

Acidity is an important parameter of fruit quality. The acidity content of fruits decreased with the advancement of storage period. However, various chemical and packaging material treatments significantly affected the rate of decrease in acidity content of fruits. The data show that among different chemical treatments, Calcium nitrate resulted the minimum decrease in acidity of fruits during storage. Acidity content of fruit was significantly affected as a result of different chemical treatments during entire period of storage. However, the maximum (0.39, 0.40 & 0.33%) was recorded from treatment T_2 (Calcium chloride @ 2%) followed by treatment T_4 and T_5 (Calcium Nitrate @ 1% and Aloe Vera Gel @ 15%) and minimum (0.33, 0.31 and 0.23) acidity was recorded from treatment T_0 (control) at 3, 6 and 9 days after harvesting respectively. The effect of Calcium nitrate on lower reduction in acidity of guava cv. 'Sardar' fruits could be due to the fact that the physiological changes in these treatments are slow. In other words, chemical treatments curtailed the acidity of those enzymes, which could convert acidity into another by-product. Also, lesser loss of moisture from the fruit, slowing down the rate of respiration which may be responsible for less conversion of acidity into other by- products. Similar results were also obtained by Kumar *et al*, (2001) [8] in guava; Jagdish and Rokhade, (1998) [7] in guava; Rajput *et al.* (2008) [12] in guava.

Total sugar content of fruit was significantly affected as a result of different chemical treatments during entire period of storage. However, the maximum (7.59, 8.65 and 7.66) was recorded from treatment T_4 (Calcium Nitrate @ 1%) followed by treatment T_3 and T_2 (- Calcium Nitrate @ 0.5% and Calcium chloride @ 2%) and minimum (6.61, 7.35 and 6.62) total sugar was recorded from treatment T_0 (control) at 3, 6 and 9 days after harvesting respectively. The increase in total sugar during initial storage period might be due to the hydrolysis of starch into sugar as on complete hydrolysis of starch, no further increase occurs and subsequently a decline in total sugar is predictable. The present investigation is in conformity with the results reported by Bisen *et al.* (2014) [4] in guava.

The significantly maximum reducing sugar (4.25, 4.39, 4.50, 3.82 and 3.58) was observed with T4 ($CaNO_3$ 1%) at 3, 6 and

9 day of storage period, and minimum (3.60, 4.16 and 4.19) reducing sugar was recorded from treatment T_0 (control) at 3, 6 and 9 days respectively. The increase of reducing sugar content by calcium application might be due to the less utilization of sugar in respiration and conversion of starch into sugar, while the subsequent decline was perhaps due to consumption of sugar for respiration during storage. Similar findings have been reported by Bhalerao *et al*. (2010) [3] and Desai (2016) [6] in sapota.

Non-reducing sugar was found maximum with Calcium Nitrate @ 1% i.e. 3.35, 3.46, 3.95 at 0, 3, 6 and 9 day of storage period and minimum (3.03, 3.17 and 3.28) non-reducing sugar was recorded from treatment T_0 (control) at 3, 6 and 9 days respectively. The increase in non-reducing sugar during storage was due to the conversion of starch into sugar. While, decrease in sugar is may be due to the consumption of sugar for respiration during storage period. The findings obtained in the present investigation can be compared to those obtained by Bisen *et al.* (2014) [4] in guava.

Table 1: Effect of chemicals treatment on Physiological loss in weight, TSS, Ascorbic acid and acidity (%) of guava cv. L-49 during storage

Treatments	Physiological loss in weight (%)			TSS			Ascorbic acid (mg)			Acidity (%)		
	Storage Days			Storage Days			Storage Days			Storage Days		
	3rd Day	6th Day	9th Day	3rd Day	6th Day	9th Day	3rd Day	6th Day	9th Day	3rd Day	6th Day	9th Day
T0 – Distilled water (control)	15.34	15.89	18.89	11.30	12.23	12.56	157.47	155.41	159.67	0.33	0.31	0.23
T1 - Calcium chloride @1%	14.18	15.73	18.85	12.43	13.37	13.96	161.47	163.34	165.09	0.37	0.39	0.32
T2- Calcium chloride @ 2%	12.85	12.65	16.78	12.70	13.66	13.51	159.23	159.90	161.45	0.39	0.40	0.33
T3 -Calcium Nitrate @ 0.5%	12.36	12.56	16.58	13.26	13.34	13.85	163.55	163.89	167.89	0.34	0.37	0.26
T4 - Calcium Nitrate @ 1%	11.38	12.39	15.11	13.50	14.45	14.64	165.56	164.67	169.56	0.38	0.39	0.33
T5 – Aloe Vera Gel @ 15%	13.22	13.78	18.65	12.95	12.91	13.29	162.29	163.52	161.23	0.36	0.36	0.31
T6 – Aloe Vera Gel @ 25%	13.00	13.65	16.90	13.35	13.30	13.49	161.00	161.23	163.45	0.35	0.37	0.33
S.Em±	1.90	0.55	0.79	1.88	0.60	0.51	15.20	0.75	0.76	0.001	0.01	0.01
CD at 5%	7.81	1.67	2.39	2.40	1.82	1.54	6.82	2.26	2.29	0.07	0.03	0.03

Table 2: Effect of chemicals treatment on total sugars (%), reducing sugar (%) and non-reducing sugar (%) of guava cv. L-49 during storage

Treatments	Total sugars (%)			Reducing Sugar (%)			Non-Reducing Sugar (%)		
	Storage Days			Storage Days			Storage Days		
	3rd Day	6th Day	9th Day	3rd Day	6th Day	9th Day	3rd Day	6th Day	9th Day
T0 – Distilled water (control)	6.61	7.35	6.62	3.60	4.16	3.19	3.03	3.17	3.28
T1 - Calcium chloride @1%	7.03	7.54	6.50	3.79	4.37	3.23	3.13	3.23	3.39
T2- Calcium chloride @ 2%	7.18	7.82	6.69	3.81	4.29	3.45	3.21	3.18	3.54
T3 -Calcium Nitrate @ 0.5%	7.26	8.05	7.10	3.97	4.64	3.68	3.29	3.45	3.58
T4 - Calcium Nitrate @ 1%	7.59	8.65	7.66	4.23	5.08	4.24	3.35	3.46	3.95
T5 – Aloe Vera Gel @ 15%	6.81	6.98	6.67	3.92	4.79	3.60	3.26	3.37	3.71
T6 – Aloe Vera Gel @ 25%	6.93	7.52	6.73	3.64	4.41	3.46	3.17	3.18	3.46
S.Em±	0.47	0.41	0.33	0.35	0.28	0.08	0.37	0.04	0.19
CD at 5%	1.20	1.25	0.93	1.04	0.84	0.23	0.04	0.13	0.58

Conclusion

On the basis of present investigation, it is concluded that fruits treated with calcium salt (calcium nitrate and calcium chloride) specially calcium nitrate 1% retained excellent firmness of fruits and were in good state of edibility and marketable. Most of physiological loss in weight and chemical parameters like TSS, acidity, ascorbic acid, total sugar, reducing sugar and non-reducing sugar of fruit were positively influenced by treatment calcium nitrate 1% up to 9 days of storage. The treatment was found effective in increasing the post-harvest life of guava fruits up to 9 days over control without adversely affecting the fruit quality.

References

1. Ali ZM, Lazan H. Post-harvest physiology and storage of tropical and subtropical fruits. In: Mitra SK (Ed), Cab International, Wallingford, UK, 1997, 145-165.
2. AOAC. Official methods of analysis. Association of the Official Analytical chemists, Washington DC. 13th Edn, 1980, 187-198.
3. Bhalerao RR, Parmar BR, Padhiar BV, Bhalerao PP. Pre harvest spray of different sources of calcium to improve the bio chemical qualities of sapota fruits [Manilkara achras (Mill.) Forsberg] cv. Kalipatti. The Asian Journal of Horticulture. 2010; 5(1):93-95.
4. Bisen S, Thakur RS, Tembhare D. Effect of pre-harvest spray of calcium nitrate and gibberellic acid alone and in combination on growth, yield and post-harvest behavior of guava fruits. An International Quarterly Journal of Environmental Sciences2014; 5:56-62.
5. Boora RS. Improvement in guava (*Psidium guajava* L.) A review. Agric. Rev. 2012; 33(4):341-349.
6. Desai VN. Influence of pre-harvest spraying treatments of chemicals and plant growth regulators on quality parameters and shelf life of sapota [Manilkara achras (Mill.) Forsberg] fruits cv. Kalipatti M.Sc. Thesis Submitted to Anand Agricultural University. Anand (Gujarat), 2016, 109-111.
7. Jagadeesh SL, Rokhade AK. Effect of postharvest treatments on keeping quality of guava (Psidium guajava L.) fruits cv. Sardar-I. Karnataka. J. Agric. Sci. 1998; 11(4):1003-1008.
8. Kumar N, Singh R, Kumar R. Effect of grading on specific gravity basis on the shelf-life of guava (*Psidium guajava* L.) cv.L-49 during storage. Haryana Journal of Horticultural Sciences. 2001; 30(1/2):39-40.
9. Menzel GM. Guava: An exotic fruit with potential in Queenssland. Queensland Agricultural Journal. 1985; 3(2):93-98.
10. Mitra SK, Gurung MR, Pathak PK. Guava production and improvement in India: An overview. Acta Hort. 2008; 787:59-65.
11. NHB Data base, 2017, 185.

12. Rajput BS, Lekhe R, Sharma GK, Singh L. Effect of pre and postharvest treatments on shelf life and quality of guava fruits. (*Psidium guajava* L.) cv. Gwalior-27. The Asian Journal of Horticulture. 2008; 3(2):368-371.
13. Ranganna S. Handbook of analysis and quality control for fruit and vegetable products. Second edition, Tata Mac Graw Hill publication co. Ltd. New Delhi, India, 1986.