Plant Archives Vol. 17 No. 2, 2017 pp. 1411-1414 *ISSN 0972-5210*

IMPACT OF PRE AND POST HARVEST TREATMENTS ON THE SHELF LIFE OF GUAVA *cv.* PANT PRABHAT UNDER VALLEY CONDITION OF GARHWAL HIMALAYA

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Abstract

The present investigation entitled "Impact of pre and post harvest treatments on the shelf life of guava *cv.* Pant Prabhat, under valley condition of Garhwal Himalaya" was carried out under the field and laboratory conditions of Horticultural Research Centre and Department of Horticulture, Chauras Campus, H.N.B. Garhwal University, Srinagar (Garhwal), Uttarakhand, India. The experiment was designed in RBD with three replications and thirteen treatments. The fruits were treated with pre harvest spray of $ZnSO_4$ (2000, 3000, 4000ppm), Boric acid (3000, 4000, 5000ppm), GA_3 (50, 100, 150ppm), and post harvest treatments like Aloe vera juice, $Cacl_2$ (2%), and tissue paper, respectively. The maximum weight of fruit (124.86g), volume of fruit (123.33cm^3), diameter of fruit (5.80cm), gravity of fruit (1.05ml), ascorbic acid in fruit (243.3mg) and acidity in fruit (0.29%) was observed at harvest and 7th day after harvest under T_8 (GA_3@150ppm) treatment. At harvest, maximum T.S.S in fruit (8.61%) was estimated under the treatment $\mathbf{T_1}$ ($ZnSO_4$@2000ppm) and after 7th day of harvesting, the maximum T.S.S. (12.00%) was recorded under treatment $\mathbf{T_8}$ (GA_3@150ppm). The minimum physiological loss in weight of fruit (2.30%) was noted under $\mathbf{T_8}$ (GA_3@150ppm) treatment. A critical study of above findings indicated that shelf life of guava goes on decreasing with the prolong periods of storage. Treatment of GA_3 @150ppm was found to be most effective in retaining the quality of guava.

Key words : Guava, shelf life, pre harvest, post harvest.

Introduction

Guava is widely grown in Indian tropics and subtropics. It is a very common fruit popular among the rich and the poor alike due to its moderate price, nourishing value, excellent flavour and delicious taste. The fruit is rich in vitamin 'C'. Uttar Pradesh, the largest grower produces best quality of fruits. But the fruits are blemished being highly delicate in nature besides the biochemical post harvest changes soften it leading to spoilage. However, the storage life of fresh fruits can be effectively increased and spoilage can be reduced. In recent years, plant growth regulators like auxins, gibberellins and growth retardants like cycocel are being used for improving the fruit quality, delaying deterioration in storage and increasing the shelf life (Rao, 2001 and Tondon *et al.,*1989). Zinc is the important constitute of several enzymes systems which regulate various metabolic reactions in the plant. Zinc is essential for auxin and protein synthesis, seed production and proper maturity. Boron is a constituent of cell membrane and essential for cell division. It acts as a regulator of potassium /calcium ratio in the plant, helps in nitrogen absorption and translocation of sugar in plant. The application of GA_3 improves the size, shape and weight of the fruits. GA_3 increases fruit set and fruit retention of the tree. By the application of NAA, T.S.S. and ascorbic- acid content of fruits are increased and acidity is reduced (Shukla *et al.,* 2008). The quality of guava fruit is greatly affected by temperature and humidity, because of these facts the fruit quality of winter season is far better than rainy season. The foliar application of nutrients and growth regulators play vital role in improving the quality and comparatively more effective for rapid recovery of plants. The foliar feeding of fruit tree has gained much importance in recent years, as nutrients applied through soil are needed in higher quantity because some amount leaches down and some become unavailable to the plant due to complex soil reactions. The yield parameter like average fruit weight, number of fruits per tree and yield per tree are increased by the spray with micronutrients. Under ambient conditions, fruit keeps well for only 2 to 3 days after harvest. Because of high moisture content and thin and soft skin, guava fruits are subjected to higher rate of

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transpiration, respiration, ripening and other biological activities even after harvest which deteriorate the quality of the fruits in a short period and finally make them unmarketable. Guava is susceptible to chilling injury so low temperature storage is also ruled out. Hence it is necessary to reduce these physio-chemical changes in order to enhance the shelf-life of guava fruits as the post harvest technology is highly commodity specific and location specific. Therefore, in order to achieve our largest goal of feeding the population as well as meet the requirements of the processing industry and export trade, only increasing the production and productivity of fruits will not be enough. We must strengthen the post harvest facilities of our country. It becomes necessary to explore suitable methods to extend the shelf life of this popular fruit. To minimize the losses, pre and post harvest spray of various chemicals could be an effective way. Through the application of plant growth regulators the physical (size, diameter and shape), chemical (T.S.S. and ascorbic acid) and the reproductive (fruit set and fruit retention) parameters are improved. Plant growth regulators play important role in fruit set, fruit production, fruit weight and fruit size without causing any adverse effect in fruit quality. Among them, NAA induces more fruiting, promotes flowering, whereas, GA_3 increases fruit retention. Nitrogen is essential for plant growth, zinc for growth and development, boron for effective fruit set and potassium is necessary for photosynthetic activities and translocation of photosynthates influencing the quality attributes (Sharma *et al.,* 2005).

Materials and Methods

The present investigation was carried out under the field and laboratory conditions of Horticultural Research Centre and Department of Horticulture, Chauras Campus, H.N.B. Garhwal University, Srinagar (Garhwal), Uttarakhand, India. The experiment was designed in RBD with three replications and thirteen treatments. The fruits were treated with pre harvest spray of $ZnSO_4$, Boric acid, GA_3, and post harvest treatments of Aloe vera juice, $Cacl_2$ and tissue paper. The experiment comprising of thirteen treatments having different concentrations of pre and post harvest treatments *viz.*, $ZnSO_4$ @ 2000 ppm ($\mathbf{T_1}$), 3000 ppm ($\mathbf{T_2}$), and 4000 ppm ($\mathbf{T_3}$), Boric acid @ 3000 ppm ($\mathbf{T_4}$), 4000 ppm ($\mathbf{T_5}$), and 5000 ppm ($\mathbf{T_6}$), GA_3 @ 100 ppm ($\mathbf{T_7}$), 150 ppm ($\mathbf{T_8}$), and 200 ppm ($\mathbf{T_9}$), $Cacl_2$ @ 2% ($\mathbf{T_{10}}$), Tissue paper ($\mathbf{T_{11}}$), Aloe vera juice ($\mathbf{T_{11}}$) and Control with tap water ($\mathbf{T_{12}}$). Geographically, the Horticultural Research Centre, Chauras Campus, H.N.B. Garhwal University, Srinagar (Garhwal), Uttarakhand, is situated at Alaknanda Valley between 780 46' 56" E longitude and 300 13' 7" N latitude, right in the heart of Garhwal region 132 km away from Haridwar on Haridwar-Badarinath Dham Highway at an elevation of 540 m above MSL, in the lesser Himalayan region. The experimental site exhibits a semiarid subtropical climate with occasional dense fog in the morning up to 10 AM from October to with not only dry summer and rigorous winter mid February. Except during rainy season, rests of the months are usually dry, with exception of occasional showers during winter or early spring. Ten fruits from each treatment were randomly selected and tagged for recording the following observations *viz.,* Fruit volume (ml), Specific gravity (ml), Fruit diameter (cm), Weight of fruit (g), Physiological loss in weight (%), Total soluble solids (%), Titrable acidity (%), Vitamin C (mg). The data were analyzed according to the procedure of analysis for randomized block design (RBD) given by Cochran and Cox (1992). The significance of variation among the treatments was observed by applying ANOVA and least significant differences (LSD) test at 1% and 5% level was calculated to compare the mean values of treatments for all the characters.

Result and Discussion

Results in table 1 and table 2 showed that pre and post harvest treatments on the shelf life of guava were significantly influence by various pre and post harvest treatments. The effects of various treatments on the weight of fruit were found significant. The maximum weight of fruit (124.86g) was recorded under $\mathbf{T_8}$ (150 ppm GA_3) treatment. This may be due to spraying with GA_3 seems to stimulate both cell division and cell enlargement which by their turn are reflected on fruit weight increase. After 7 days of storage the maximum weight of fruit (112.06g) was also recorded under $\mathbf{T_8}$ (150 ppm GA_3) treatment. These findings are in close conformity with the results reported by Tuan and Ruey (2012). They reported that GA_3 spray in Apple at 30 ppm gave the faster rate of fruit growth than the other treatments. Fruit size as well as fruit weight markedly improved by spraying 30 ppm GA_3, compared to untreated control.

The maximum diameter of fruit (5.80cm) was recorded under $\mathbf{T_8}$ (150 ppm GA_3) and $\mathbf{T_4}$ (3000ppm boric acid) treatment. The maximum diameter of fruit (5.17cm) was recorded under both $\mathbf{T_8}$ (150 ppm GA_3) and $\mathbf{T_6}$ (5000ppm boric acid) treatments after 7 days of storage.

The highest volume of fruit (123.33ml) was recorded under $\mathbf{T_8}$ (150 ppm GA_3) treatment followed by $\mathbf{T_5}$ (4000ppm boric acid) treatment. This may be due to spraying with GA_3 seem stimulate both cell division and cell enlargement by which their turn are reflected on fruit volume increase. After 7 days of storage the maximum volume of fruit (113ml) was recorded under $\mathbf{T_8}$ (150 ppm GA_3). Tuan and Ruey (2012) reported that GA_3 spray in apple at 30 ppm gave the faster rate of fruit growth than the other treatments. Fruit size as well as fruit volume

Table 1: Impact of pre and post harvest treatments on quantitative characters of guava *cv.* Pant Prabhat.

Treatments	Weight of fruits (g)		Diameter of fruits (cm)		Volume of fruits (ml)		Specific gravity of fruits (ml)		Physiological lossin weight (g)	
	At harvest	7th day after harvest	At harvest	7th day after harvest	At harvest	7th day after harvest	At harvest	7th day after harvest	At harvest	7th day after harvest
T_1	100.97	90.13	5.37	5.22	103.56	95.00	0.97	0.89	0.00	4.60
T_2	83.43	69.58	5.09	4.87	85.85	76.00	0.97	0.88	0.00	6.57
T_3	84.80	74.89	5.03	4.60	93.56	85.33	0.90	0.81	0.00	4.20
T_4	99.69	89.67	5.80	5.43	107.33	99.00	0.93	0.85	0.00	3.90
T_5	114.60	104.82	5.60	5.43	113.57	103.42	1.01	0.93	0.00	3.23
T_6	105.05	94.57	5.50	5.17	105.36	94.67	0.99	0.92	0.00	3.30
T_7	113.67	98.34	5.75	5.13	108.33	99.00	1.01	0.92	0.00	3.83
T_8	124.86	112.06	5.80	5.17	123.33	113.33	1.05	0.98	0.00	3.10
T_9	106.07	94.85	5.33	4.80	106.19	96.00	1.00	0.92	0.00	4.23
T_{10}	92.28	77.46	5.43	5.30	93.23	84.00	0.97	0.90	0.00	4.87
T_{11}	90.44	78.72	5.37	5.03	88.64	78.00	1.01	0.94	0.00	3.90
T_{12}	101.02	88.65	5.43	5.17	100.33	90.33	1.01	0.94	0.00	4.37
T_0	81.58	71.04	5.37	4.93	83.28	71.67	0.95	0.88	0.00	5.03
Mean	99.88	88.06	5.40	5.09	100.96	91.21	0.98	0.91	0.00	4.24
Sem±	6.06	5.95	0.13	0.16	6.06	5.75	0.02	0.02	0.00	0.47
C.D. 5%	17.69	17.37	0.40	0.47	17.69	16.79	0.06	0.06	0.00	1.40

Table 2: Impact of pre and post harvest treatments on qualitative characters of guava *cv.* Pant Prabhat.

Treatments	Vitamin C (mg)		Acidity (%)		TSS (%)	
	At harvest	7th day after harvest	At harvest	7th day after harvest	At harvest	7th day after harvest
T_1	225.5	203.9	0.26	0.09	7.90	11.30
T_2	236.2	215.1	0.29	0.07	8.53	11.67
T_3	234.6	204.7	0.27	0.11	8.07	10.90
T_4	219.9	192.5	0.26	0.12	7.23	11.20
T_5	228.1	200.3	0.26	0.11	7.20	11.13
T_6	228.5	190.2	0.27	0.10	7.87	11.60
T_7	219.0	189.8	0.25	0.10	7.13	11.57
T_8	243.3	223.4	0.29	0.13	8.67	12.00
T_9	235.3	208.6	0.27	0.13	7.43	11.63
T_{10}	228.0	203.5	0.26	0.10	7.67	11.57
T_{11}	232.9	206.0	0.26	0.12	7.37	11.67
T_{12}	228.4	198.1	0.25	0.13	7.33	11.10
T_0	216.2	185.4	0.23	0.08	7.00	10.13
Mean	228.3	201.7	0.26	0.10	7.60	11.34
Sem±	1.7	1.7	0.01	0.01	0.14	0.20
C.D. 5%	5.0	4.9	0.02	0.03	0.43	0.60

markedly improved by spraying 30 ppm GA_3, compared to untreated control.

The maximum gravity of fruit (1.05ml) was recorded under T_8 (150 ppm GA_3) treatment followed by T_5 treatments. After 7 days of storage the maximum specific gravity of fruit (0.98ml) was recorded under T_8 (150 ppm GA_3). Ravi and Shanoo (2005) observed maximum specific gravity in Guava with 90ppm GA_3 as compared to control.

The minimum PLW of fruit (3.23%) was recorded under T_5 (4000 ppm boric acid) treatment followed by T_9 (200ppm GA_3) treatment. After 7 days of storage the minimum PLW of fruits (3.1) was recorded under T_8 (150 ppm GA_3). Similar results were also reported by Rajput *et al.,* (1992) in guava fruit

The maximum ascorbic acid in fruit (243.%) was recorded under T_8 (150 ppm GA_3) treatment followed by T_2 (4000 ppm boric acid) treatment. After 7 days of storage the maximum ascorbic acid in fruit (223.0%) was recorded under T_8 (150 ppm GA_3). The above results are also corroborated with the findings of Rachna and Singh (2013) that the GA_3 50 ppm dose resulted in maximum expression of ascorbic acid at final harvest of ber.

The maximum acidity in fruit (0.29%) was recorded under T_8 (150 ppm GA_3) and T_2 (3000 ppm $ZnSo_4$) treatment. Rachna and Singh (2013) reported that the GA_3 50 ppm dose resulted in maximum expression of acidity in Ber. After 7 days of storage the maximum acidity of fruits

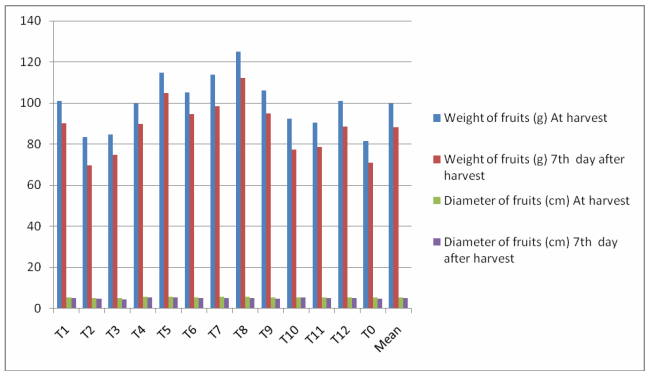

Fig 1a: Impact of pre and post harvest treatments on quantitative characters of guava *cv.* Pant Prabhat.

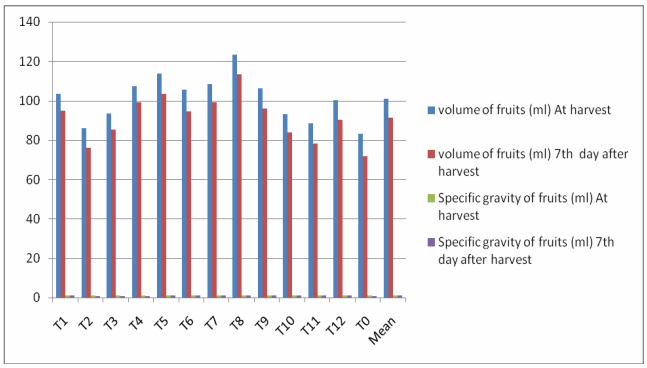

Fig1 b: Impact of pre and post harvest treatments on quantitative characters of guava *cv.* Pant Prabhat

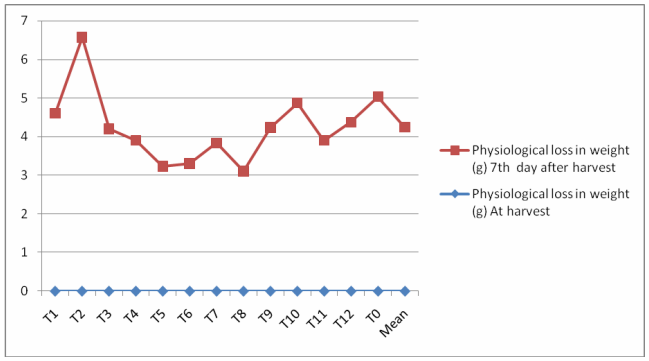

Fig1c: Impactt of pre and post harvest treatments on quantitative characters of guava *cv.* Pant Prabhat.

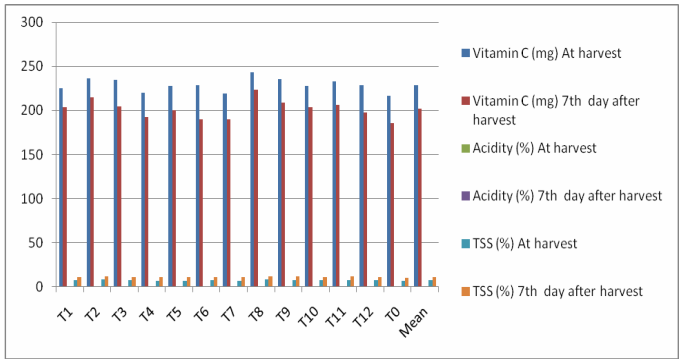

Fig 2a: Impactt of pre and post harvest treatments on qualitative characters of guava *cv.* Pant Prabhat.

(0.13%) was recorded under $\mathbf{T_8}$ (150 ppm GA_3).

The maximum T.S.S in fruit (8.676%) was recorded under $\mathbf{T_8}$ (150 ppm GA_3) treatment followed by $\mathbf{T_2}$ (3000ppm $ZnSO_4$) treatment. After 7 days of storage the maximum TSS of fruits (12.0) was recorded under $\mathbf{T_8}$ (150 ppm GA_3) treatment. Similar results were also reported by Rajput *et al.,* (1992) in guava fruit under same concentration of GA_3.

Conclusion

A critical study of above findings indicated that shelf life of guava goes on decreasing with the prolong periods of storage. Treatment of GA_3 @150 ppm was found to be most effective in retaining the quality of guava.

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