Plant Archives Vol. 17 No. 1, 2017 pp. 597-600 ***ISSN 0972-5210***

EFFECT OF PRE-HARVEST NUTRIENTS SPRAYING ON PHYSICO-CHEMICAL QUALITY AND STORAGE BEHAVIOUR OF RAINY SEASON GUAVA (*PSIDIUM GUAJAVA* L.) FRUITS CV. L-49

Krishna Kumar Mishra*, Sanjay Pathak, Nitish Sharma[1] and Nikita Nehal[1]

Departmrnt of P.H.T., N. D. U. A. T., Kumarganj, Faizabad - 224 229 (Uttar Pradesh), India.
[1]Department of Crop Physiology, N. D. U. A. T., Kumarganj, Faizabad - 224 229 (Uttar Pradesh), India.

Abrstract

The present investigation was carried out to study the effect of pre-harvest nutrients of calcium chloride, potassium sulphate and zinc sulphate on the physico-chemical quality and storage behavior of rainy season guava (*Psidium guajava* L.) fruits cultivar L-49 at Department of Horticulture, Narendra Dev University of Agriculture and Technology, Kumarganj, Faizabad (U.P.), India. Experiment was laid out in a randomized block design with eight treatments consisting of $\mathbf{T_0}$ control, $\mathbf{T_1}$ (K_2So_4 1%), $\mathbf{T_2}$ (K_2So_4 0.2%), $\mathbf{T_3}$ (K_2So_4 0.4%), $\mathbf{T_4}$ (K_2SO_4 0.6%), $\mathbf{T_5}$ ($CaCl_2$ 1.5%), $\mathbf{T_6}$ ($CaCl_2$ 2%), $\mathbf{T_7}$ ($CaCl_2$ 0.2%), $\mathbf{T_8}$ ($Cacl_2$ 1%) and all the treatment three replication. In this experiment, it was observed that the fruit length, and width were maximum under potassium sulphate 1 per cent. The maximum weight was observed under potassium sulphate 1 per cent calcium chloride 0.2 percent and it was at par with potassium sulphate 0.2 per cent. The potassium sulphate 1 per cent significantly improves the physicochemical quality, *viz*., total soluble solids, acidity, ascorbic acid, reducing, non-reducing and total sugar at harvest. The physiological loss in weight after harvest was minimum under calcium chloride 1 per cent closely followed by calcium chloride 1.5 per cent. Maximum fruit firmness was also observed with the application of potassium sulphate 0.6 percent and minimum found in calcium chloride 1 per cent.

Key words : *Psidium guajava*, nutrients spraying, quality, storage.

Introduction

Guava (*Psidium guajava* L.) belonging to family Myrtaceae, is the fifth most important fruit crop of India. It is a delicious and nutritious fruit rich in vitamin C (200-300 mg 100 g^{-1} of pulp), calcium, mineral and phosphorus (Mitra and Sanyal, 2004). India shares 4% of the world production of guava producing 3.668 mt from 0.268 mha area with the productivity of 13.7 t ha^{-1} (Anonymous, 2014). Guava is one of the most important highly productive fruit crops and grown commercially throughout sub-tropical and tropical regions of the world. Uttar Pradesh, Bihar, Rajasthan, Madhya Pradesh and Maharashtra are the major guava growing states in the country. However, Allahabad of Uttar Pradesh has the reputation of growing best quality guava fruits in the world (Maji, 2010). Guava is a climacteric fruit and excellent source of ascorbic acid *i.e.* vitamin C, dietary fiber, pectin and minerals. Guava fruits are used as fresh fruit as well as making jam, jelly, paste, toffees, candy etc. Guava fruits, leaves and roots are used for curing diarrhea, dysentery and other traditional medicines (Patel *et al*., 2015). In north Indian agro-climate conditions guava flowers twice in a year-first in April-May for rainy season crop and then, September-October for winter season crop. Generally, fruit yield is more in rainy season crop as compared to winter season but fruits quality of rainy season guava crops are insipid in taste and poor in quality and more infestation of pests and diseases like fruit flies in comparison to winter season. The maximum growth of any plants needs an optimum availability of all macro and micro – nutrients. If the nutritional balance is disturbed due to insufficient or excess of essential elements during the active growth period, disorder of growth manifestations will occur and special symptoms will developed on sooner. Guava generally cultivated in poor soil due to which it suffers from different nutrients deficiency resulting the loss in quality and storage life of this important fruit crop. To improve the quality of fruit at

***Author for correspondence :** E-mail: kkmishrababbu@gmail.com

harvest and to enhance the storage life by influencing the after harvest changes, several research workers have used certain pre-harvest treatments. The application of mineral nutrients like calcium chloride and potassium sulphate are known to play a crucial role in growth, development, quality and storage of fruits. The present study will contribute in understanding the physical and biochemical status of guava fruits at harvest as effect by pre harvest spray of nutrients, which may help in increasing the physico-chemical quality and storage life of guava fruits.

Materials and Methods

The present investigation was conducted on 7 years old plants of uniform, healthy and young bearing tree of guava (*Psidium guajava* L.) cv. L-49 during the year 2015-16 at Main Experiment Station, Department of Horticulture, N. D. University of Agriculture and Technology, Kumarganj, Faizabad. U.P., India with eight treatments (**T_0** – control, **T_1** (K_2SO_4 1%), **T_2** (K_2SO_4 0.2%), **T_3** (K_2SO_4 0.4%), **T_4** (K_2SO_4 0.6%), **T_5** ($CaCl_2$ 1.5%), **T_6** ($CaCl_2$ 2%), **T_7** ($CaCl_2$ 0.2%), **T_8** ($CaCl_2$ 1%) which were three replication in a randomized block design. Observations was taken on at the time of harvest for length and diameter of fruit, weight and volume of fruit, total soluble solids, acid content of fruit, sugar content and ascorbic acid (mg/100 g of fruit). The data were analysed statistically as per method given by Panse and Sukhatme (1985) and results were evaluated at 5% level of significance.

Results and Discussion

It has been observed that application of different treatments proved beneficial in increasing the length and width of guava fruit as compared to control (table 1). The maximum fruit length (4.80 cm) and width (5.93 cm) were recorded with K_2SO_4 1 per cent and it was significantly superior to all other treatments followed by $CaCl_2$ 1.5 per cent (4.80cm) for length and $CaCl_2$ 1.5 per cent for width of fruit (4.86 cm). Mrinalini *et al.* (1998) also found that pre-harvest spray of borax (0.6-1%) twice, improved the quality of guava in terms of size and weight of fruit. Singh and Brahmachari (1997) also observed that size and weight of fruit was greatly increased by the spraying of borax and potassium chloride. The similar finding was observed by Singh *et al.* (2004) in guava by using zinc sulphate and boric acid at 0.4 per cent. The weight and volume of guava fruits were also significantly affected by the application of mineral nutrients as compared to control (table 1). The maximum weight (159.00 g) was observed under K_2SO_4 1 per cent

Table 1 : Effect of nutrients on the fruit length, width, weight, TSS, acidity, reducing sugar, non- reducing sugar, total sugar, ascorbic acid, PLW and fruit firmness on rainy season guava fruit cv. L-49.

Treatmnts	Average fruit wt. (g.)	Length of fruit (cm)	Fruit width (cm)	TSS (^{0}Brix)	Fruit acidity (%)	Reducing sugar (%)	Non-reducing sugar (%)	Total sugars (%)	Ascabic acid (mg/ 100g)	PLW (%)	Fruit firmness (Kg/cm^2)
T_0	109.39	3.20	4.333	12.12	0.40	4.89	4.39	9.28	178.20	6.79	7.23
T_1	159.00	4.80	5.933	15.02	0.42	6.34	5.20	11.54	217.57	3.26	8.25
T_2	134.80	4.80	4.267	14.12	0.38	5.68	5.10	10.78	188.21	5.28	9.11
T_3	107.40	3.90	3.167	11.20	0.41	4.53	3.80	8.33	169.46	7.30	9.03
T_4	146.20	4.20	4.733	12.07	0.40	5.21	4.46	9.67	204.13	6.39	9.73
T_5	143.76	4.80	4.867	11.93	0.38	4.93	4.20	9.13	157.74	6.20	8.90
T_6	116.66	4.53	4.333	12.18	0.39	4.97	4.33	9.30	145.35	6.44	9.84
T_7	108.26	3.20	4.667	11.03	0.34	5.75	3.88	9.63	140.59	7.66	10.20
T_8	101.46	3.93	3.233	9.10	0.26	3.88	3.10	6.98	119.53	13.52	8.67
SEm±	**1.31**	**0.05**	**0.09**	**0.23**	**0.01**	**0.11**	**0.08**	**0.17**	**0.74**	**0.16**	**0.20**
CD at 5 %	**3.93**	**0.15**	**0.26**	**0.69**	**0.02**	**0.34**	**0.23**	**0.52**	**2.22**	**0.48**	**0.61**

and it proved superior to all the treatments. This was followed by K_2SO_4 0.6 per cent (146.20 g), $CaCl_2$ 1.5% (143.76 g) and K_2SO_4 0.4 per cent (134.80 g). The minimum weight of fruits (101.46 g) were observed under $CaCl_2$ 2%. It has been observed that higher concentration of potassium sulphate and calcium chloride increased weight of guava fruit. Das *et al.* (2000) also observed that spraying of zinc sulphate increased the weight, and size of guava fruit. Singh *et al.* (2004) also found out that zinc sulphate 0.4 per cent and boric acid 0.4 per cent increased the size and weight of guava fruit. The increase in length and width of guava fruit may be due to the fact that mineral nutrients (calcium and potassium) appear to have indirect role in hastening the process of cell division and cell elongation due to which the size of fruit may have improved. The possible reason for increase in fruit weight by Ca, might be due to faster mobilization of metabolites into fruits and involvement in cell division and cell expansion as well as increased intercellular space in mesocarpic cells (Brahmachari *et al*., 1997). The maximum accumulation of total soluble solids content (15.02 ^{0}Brix) in guava fruits was found with the pre-harvest spray of 1 per cent potassium sulphate followed by potassium sulphate 0.4 per cent (14.12 ^{0}Brix) and calcium choloride 2 per cent (12.18 ^{0}Brix) (table 1). These results are in conformity with the findings of Singh *et al.* (2004), who noted that TSS, sugar and acid content enhanced by application of potassium and calcium in guava fruits. Increase in TSS content with these micronutrients may be attributed to the quick metabolic transformations of polysaccharides and pectin into soluble compounds and rapid translocation from leaves to the developing fruits due to improved source- sink relationship. The present study indicates that acidity content of guava fruits decreased significantly under different treatments. The minimum acidity (0.26 per cent) was observed in control followed by calcium choloride 0.2 per cent (0.34 per cent) treated fruits. The maximum acidity content (0.42 per cent) was found in potassium sulphate. This is in accordance with the finding of Hason and Jana (2000) in litchi fruit. The reduction in acid content may be based on the fact that mineral compounds reduced the acidity in fruits, since it is neutralized in parts during metabolic pathways and/ or used in respiratory process as a substrate. The reducing sugars content in fruit was estimated maximum (6.34 per cent) with the pre-harvest application of potassium sulphate 1% followed by 5.75 per cent calcium choloride. The potassium sulphate and calcim choloride both recorded significantly higher reducing sugars over control. The increase in reducing sugars was also observed by the application of potassium sulphate in guava fruits (Das *et al*., 2000; El-Sherif *et al*., 2000). The total sugar contents in fruits were found to be increased by all the treatments over control. However, it was maximum (11.54 per cent) with the spray of 1 per cent potassiumsulphate followed by potassium sulphate 0.2 per cent (10.78 per cent). The similar finding were observed by Singh *et al.* (2004) who also reported that pre-harvest spray of potassium sulphate enhanced the total sugars content of guava fruits. The increase in total sugars can be attributed to the accumulation of oligosaccharides and polysaccharides in higher amount in almost all treatments. It was reported that these micronutrients in association with growth retardant might have increased the activity of hydrolyzing enzyme, which convert complex polysaccharides into simple sugars (Brahmachari and Rani, 2001).

References

Ali, Wahid, R. A. Pathak and A. L. Yadav (1993). Effect of foliar application of nutrients on guava (*Psidium guajava* L.) cv. Allahabad Safeda. *Prog. Hort.,* **23(1-4)** : 18-21.

Annonymous (2014). NHB Horticulture Database 2014.

Brahmachari, V. S. and R. Rani (2001). Effect of growth substances on productivity, cracking, ripening and quality of fruits of litchi. *Orissa J. Hort.*, **29** : 44-45.

Brahmachari, V. S., G. S. Yadav and N. Kumar (1997). Effect of foliar feeding of calcium, zinc and boron on yield and quality attribute of litchi (*Litchi chinensis* Sonn.). *Orissa J. Hort.*, **25(1)** : 49.

Chandel, S. K. (1987). Effect of some pre-harvest factors on the cracking yield and post-harvest changes in quality of litchi (*Litchi chinensis*) cv. Rose Scented. M.Sc. (Ag.) thesis submitted to G.B. Pant Agri. Univ., Pant Nagar-263 145

Das. A., K. Majumdar and B. C. Mazumdar (2000). Zinc sulphate induced higher sweetness of rainy season guava fruits. *Indian Agri.*, **44(3-4)** : 199–201.

Dixit, C. K., J. N. Singh and Akath Singh (2004). Studies on storage of square (*Psidium guajava* L.) cv Allahabad Safeda. International seminar on Recent Trend in Hitech Hort & P.H.T. Kanpur, Feb 4-6, 2004, pp. 270.

El-sherif, A. A., W. T. Saeed and V. F. Nouman (2000). Effect of foliar application of potassium and zinc on behaviour of Mantakhab El-kanater guava trees. *Bulletin faculty Ag*., *Univ. Cario.*, **51(1)** : 73-84.

Hasam, M. D. A. and A. Jana (2000). Foliar feeding of potassium, calcium, zinc and copper in improving the chemical composition of fruits in litchi cv Bombai. *Environment and Ecology*, **28(2)** : 497-499.

Jayachandra, K. S., D. Srihari and Y. N. Reddy (2005). Preharvest spray of different source of calcium to improve the shelf life of guava. *Indian J. Hort.,* **62(1)** : 68–70.

Maji, S. (2010). Studies on organic nutrition, intercropping and crop regulation in guava (*Psidium guajava* L.) cv. L-49. *Ph.D Thesis*, 3.

Mansour, N. M. and Z. A. H. EI-Sied (1985). Effect of zinc sulphate on set and yield of guava trees. *Agri. Res. Review*, **59(3)** : 119-135.

Mitra, S. K. and D. Sanyal (2004). *Guava*: ICAR Publication, Pusa, New Delhi, 13–18.

Mrinalini, Raghava and J. P. Tiwari (1998). Effect of boron on growth, quality and shelf-life of fruits of guava (*Psidium guajava* L.) cv. Sardar. *Prog. Hort*., **30(1/2)** : 68–72.

Pandey, D. K., R. A. Pathak and R. K. Pathak (1988). Studies on the foliar application of nutrients amd plant growth regulator in Sardar guava (*Psidium guajava* L.). Effect on yield and fruit quality. *Indian J. Hort.*, **45(3-4)** : 197-202

Panse, V. C. and P. V. Sukhatme (1985). *Statistical methods for Agricultural workers*, I.C.A.R., New Delhi.

Patel, R. K., C. S. Maiti, B. C. Deka, N. A. Deshmukh, V. K. Verma and A. Nath (2015). Physical and biochemical changes in guava (*Psidium Guajava* L.) during various stages of fruit growth and development. *International Journal of Agriculture, Environment and Biotechnology*, **8(1)** : 75–82.

Singh, Ramendra, O. P. Chaturvedi and Raghwendra Singh (2004). Effect of pre harvest spray of zinc, boron and calcium on the physico chemical quality of guava fruits (*Psidium guajava* L.). International seminar on recent Trend on Hi-tech Hort. and P.H.T. Kanpur, Feb 4-6 2004, 204.

Singh, Ramendra, O. P. Chaturvedi and Raghwendra Singh (2004). Effect of pre harvest spray of zinc, boron and calcium on the physico chemical quality of guava fruits (*Psidium guajava* L.) International seminar on recent Trend on Hi-tech Hort. and P.H.T. Kanpur, Feb 4-6 2004, 204.

Singh, U. P. and V. S. Brahmachari (1999). Effect of potassium, zinc, boron and molybdenum on the physicochemical composition of guava (*Psidium guajava* L.) cv. Allahabad Safeda. *Orrisa J. Hort.,* **27(2)** : 62–65.