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EFFECT OF PRE-HARVEST APPLICATION OF MICRO-NUTRIENTS ON QUALITY OF GUAVA (*Psidium guajava* L.) CV. SARDAR

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ABSTRACT: The present investigation was conducted on uniform, healthy, nine year old budded trees of guava (*Psidium guajava* L.) cv. Sardar. Various doses of calcium nitrate, boric acid and zinc sulphate were sprayed twice i.e. 45 and 25 days before harvesting and compared with untreated ones. Each treatment was applied on two trees and replicated thrice in a randomized block design. It was observed that the size of fruit comprises length, diameter, volume were maximum in fruits collected from trees sprayed with zinc sulphate (0.4 per cent). The maximum weight was observed under 0.4 per cent boric acid and it was at par with zinc sulphate at 0.4 per cent. The zinc sulphate 0.4 per cent also improves the physico-chemical parameters at harvest. Among the different treatments pre harvest spray of zinc sulphate at 0.4 per cent wasfound most effective for improving the physico-chemical parameters at harvest and prolonged the shelf-life of fruits exhibiting lower degree of post-harvest losses.

Keywords : *Guava, pre-harvest, micro nutrients, quality, shelf life.*

Guava (*Psidium guajava* L.), a member of the family Myrtaceae, is a well recognized edible fruit of tropical and subtropical climate. It is a native to tropical America stretching from Mexico to Peru and gradually become a crop of commercial significance in several countries because of its hardy nature, prolific bearing, high vitamin C content, pleasant aroma and its good flavour. In recent years guava cultivation is getting popularity due to increasing international trade, nutritional contents and value added products. The crop is being grown on an acreage 2.04 lac ha. with a production 22.70 lakh MT (Anonymous, 2). Uttar Pradesh having largest share in area and production followed by Maharashtra. Since the demand of fruit is increasing in the market, thereby to achieve higher yield of good quality fruit with longer storage life become the priority. To improve the quality of fruit at 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 nitrate, boric acid and zinc sulphate are known to play a crucial role in growth, development, quality and storage of fruits (Dixit *et al.,* 6; Jayachandra *et al.,* 8 Singh *et al.,* 11). The present study will contribute in understanding the physical and biochemical status of guava fruits at harvest as influenced by pre-harvest spray of mineral nutrients, which may help in increasing the physico-chemical quality of guava fruits.

MATERIALS AND METHODS

The present investigation was conducted on nine year old budded plants of uniform, healthy and young bearing tree of guava (*Psidium guajava* L.) cv. Sardar, at Horticulture garden of C.S.A. University of Agriculture and Technology, Kanpur, India with ten treatments (T_0 – control, T_1 – 1% calcium nitrate, T_2 – 1.5% calcium nitrate, T_3 – 2% calcium nitrate, T_4 – 0.2% boric acid, T_5 – 0.4 % boric acid, T_6 – 0.6% boric acid, T_7 – 0.2 % zinc sulphate, T_8 – 0.4 % zinc sulphate and T_9 – 0.6% zinc sulphate) which were replicated thrice in a randomized block design. Observations recorded at the time of harvest were weight of fruit, Total soluble solids (TSS), acidity content (A.O.A.C., 1), total sugar content (by 'Fehling solution method' and expressed in percentage), ascorbic acid (mg/100 g of fruit) and for Physiological loss in

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weight (PLW %), the weight of whole fruit was recorded and the cumulative loss at every storage period was worked out in percentage. The data were analysed statistically as per method given by Panse and Sukhatme (10) and results were evaluated at 5% level of significance.

RESULTS AND DISCUSSION

The observations regarding length, diameter and volume of the fruits were significantly affected by application of nutrients. The maximum length (6.18 cm), diameter (5.46 cm) and volume (120.28 cc) recorded in T8 followed by T_5. However fruit weight was maximum in T_5 followed by T_8. The possible reason for increase in these parameters by foliar spray of calcium, boron and zinc might be due to faster mobilization of metabolites into fruits and involvement in cell division and cell expansion as well as increased volume of intercellular space in mesocarpic cells (Brahmachari *et al.*, 4).The maximum accumulation of total soluble solids content (11.8°Brix) in guava fruits was found with the pre-harvest spray of 0.4 per cent zinc sulphate followed by boric acid 0.4 per cent (11.2°Brix) and zinc sulphate 0.2 per cent (11.2°Brix) (Table 1). The T.S.S. of control was found at par with applications of calcium. The present study indicates that acidity content of guava fruits decreased significantly under different treatments. The minimum acidity (0.34 per cent) was observed in zinc sulphate at 0.4 per cent followed by boric acid at 0.4 per cent (0.36 per cent) and maximum acidity content (0.44 per cent) were found in control. The reduction in acid content may be based on the fact that mineral compounds reduced the acidity in fruits, since it is neutralized in plant parts during metabolic pathways and/or used in respiratory process as a substrate.

The total sugar contents in fruits were found to be increased by all the treatments over control. However, it was maximum (9.22 per cent) with the spray of 0.4 per cent zinc sulphate followed by boric acid 0.4 per cent (8.72 per cent). The similar finding were observed by Singh *et al.* (11) who also reported that pre-harvest spray of zinc sulphate and boric acid 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 micro-nutrients increased the activity of hydrolyzing enzyme, which convert complex polysaccharides into simple sugars (Brahmachari and Rani, 3). All the treatments were significantly effective in increasing the ascorbic acid content of fruits as compared to control. It was found maximum (230.24 mg/100 g) with the pre-harvest application of 0.4 per cent zinc sulphate followed by 0.4 per cent boric acid (210.18 mg/100 g). The Pre-harvest spray of zinc sulphate at 0.5 per cent or 1 per cent enhanced the ascorbic acid content in the fruits of guava (El-Sherifet *et al.*, 7; Mansour and Sied, 9).

In the present study, it has been observed that the per cent physiological loss in weight (PLW %) increased with the progress of storage period under different treatments. There was no spoilage of fruits upto 6 days of storage in all the treatments including control. The spoilage of fruit gradually increased with increasing storage period. The minimum P.L.W. (2.28 per cent) was observed under 0.4 per cent zinc sulphate treatment followed by boric acid at 0.4 per cent (2.42 per cent). All the treatments decreased the per cent cumulative physiological loss in weight as compared to control. The effect of storage period as well as the effect of the interaction (treatments x storages period) was also found significant. The reduced per cent of spoilage in fruits with foliar application of 0.3 per cent zinc sulphate has also been observed in guava by Chaitanya *et al.* (5).

The application of mineral nutrients has favourably influenced the metabolic activities possibly due to their increased endogenous level following external application. These may have enhanced the process of synthesis, translocation and accumulation of quality constituents like TSS, sugars and ascorbic acid following strong source sink relationship. So according to the present findings, the pre harvest spray of zinc sulphate at

Table 1: Effect of mineral nutrients on the length, diameter, weight, volume, TSS, acidity, reducing sugar content, total sugar content and ascorbic acid of guava fruit at harvest.

Treatment	Length of fruit (cm)	Diameter of fruit (cm)	Weight of fruit (g)	Volume of fruit (cc)	TSS of fruit (°Brix)	Acidity of fruit (%)	Reducing sugar content (%)	Total sugar content (%)	Ascorbic acid (mg/100 g)
T_0	4.50	4.56	98.10	96.05	9.6	0.44	3.56	6.68	158.38
T_1	4.58	4.86	106.14	108.12	10.4	0.43	3.78	7.24	178.14
T_2	4.61	4.90	104.12	102.10	10.0	0.41	3.84	7.56	190.32
T_3	4.65	4.78	110.06	108.12	9.8	0.43	3.81	7.30	187.16
T_4	4.78	5.12	112.72	114.14	10.6	0.40	4.16	7.94	196.05
T_5	5.20	5.30	120.87	118.87	11.2	0.36	4.42	8.72	210.18
T_6	4.92	5.00	116.11	114.78	10.8	0.42	4.00	8.04	189.82
T_7	5.28	5.10	114.34	112.37	11.2	0.39	4.30	8.42	208.47
T_8	6.18	5.46	118.78	120.28	11.8	0.34	4.94	9.22	230.24
T_9	5.38	5.24	110.32	112.04	10.8	0.41	3.98	7.76	196.18
C.D. (P=0.05)	0.39	0.39	3.30	4.40	0.91	0.05	0.33	0.96	4.87

Table 2: Effect of mineral nutrients on the physiological losses in weight (%) of guava fruits during storage.

Treatment x Period (TP)	P_0	P_1	P_2	P_3	P_4	P_5	P_6	Mean excluding P_0
T_0	-	2.48	3.90	4.64	5.06	6.36	7.02	4.91
T_1	-	1.92	2.34	3.18	4.28	5.08	5.88	3.78
T_2	-	1.77	2.52	3.83	4.18	5.44	5.93	3.88
T_3	-	1.92	2.68	3.94	5.00	5.67	6.12	4.22
T_4	-	1.58	2.04	2.94	3.69	4.50	5.04	3.30
T_5	-	0.38	1.12	2.98	3.38	4.16	4.94	2.83
T_6	-	1.33	1.76	2.70	3.56	4.44	4.98	3.13
T_7	-	1.18	1.88	2.89	3.62	4.06	4.98	3.10
T_8	-	0.34	1.10	2.45	3.04	4.18	4.85	2.28
T_9	-	1.08	1.62	1.98	3.28	4.20	4.91	2.85
Mean	-	1.39	2.09	3.15	3.90	4.80	5.46	
C.D. (P=0.05)	Tr-0.045			P - 0.03759		T x P-0.119		

T= Treatments P=Periods

0.4 per cent found more effective among the different treatments tried for improving the physico-chemical quality at harvest and prolonged the shelf-life of fruits during storage.

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