Annals of Plant and Soil Research 16(4): 327-329 (2014)

EFFECT OF PRE-HARVEST SPRAY OF NUTRIENTS ON DELAYED RIPENING AND PROLONGED STROREABILITY OF GUAVA FRUITS

VIPIN PATEL AND RAJESH TIWARI*

Department of Fruit Science, RVSKVV, Campus, College of Horticulture, Mandsaur-458 001 (M.P)

Received: August, 2013; Revised accepted: October, 2014

ABSTRACT

An experiment was conducted at Mandsaur (M.P.) to study the effect of pre harvest spray of nutrients on delayed ripening and prolonged stroreability of guava during 2012-13. Results revealed that guava fruits treated with 0.4% zinc sulphate increased the post-harvest life of guava fruits by 9 days over control (25.0 %) and proved superior to maintain the considerable physico-chemical composition of guava fruits as compared to control and different doses of other chemicals. Calcium nitrate spray proved inferior to zinc sulphate with respect to physic-chemical composition of fruits. The lower values of physico-chemical composition of guava fruit were recorded in control.

Keywords: Guava, pre-harvest sprays, micronutrients, delayed ripening, shelf life

INTRODUCTION

Guava (Psidium guajava L.) the apple of the tropics, is one of the most popular fruit grown in tropical, sub-tropical and some parts of arid regions of India, that belongs to the family Myrtaceae. Guava is one of the choicest fruits due to its delicacy and nutritive value. It exceeds most other fruits in productivity and is highly remunerative. The fruit is an excellent source of vitamin C containing 2-5 times more than oranges and 10 times more than tomatoes. Under agro climatic conditions of Madhya Pradesh, guava bears two crops in a year. Winter season crop, though good in quality needs prolong stroreability. However, large quantity of fruit is lost after harvest due to inherent bio-chemical changes. In recent years, Plant growth regulators have been used for improving the quality, delaying deterioration in storage and thereby increasing shelf life of various fruit crops including guava. However, due to the high cost of plant growth regulators, it is imperative to find out some other cheaper chemical/chemicals which can be used to improve the shelf life and fruit quality. Calcium compounds extend the shelf life of several fruit by maintaining firmness, minimizing the rate of respiration, protein breakdown and disease incidence (Gupta *et al.*, 1980). Calcium compounds have shown promise in the quality retention of fruit also (Huber, 1983). Boron is most effective when applied as a foliar spray. Boron is important for ovule development, pollen tube growth and fruit set. Boron is a constituent of cell membrane and essential for cell division. It acts as a regulator of potassium/calcium ratio in the plant and helps in nitrogen absorption and translocation of sugar in plant. Zinc is an essential trace element for plants, being involved in many enzymatic reactions and is necessary for their good growth and development. Zinc is also involved in regulating the protein and carbohydrate metabolism. Foliar application of zinc sulphate also increases the vegetative growth of trees. The role of Borax and zinc sulphate is also reported by Jayachandran *et al.*, 2005. Therefore, an attempt has been made in the present study to prolong the shelf life of guava fruit with calcium nitrate, zinc sulphate and borax.

MATERIALS AND METHOD

The experiment was conducted to see the effect of different doses of chemicals on shelf life of guava fruits on seven year old guava plants cv. L-49 of Instructional cum Research Fruit Orchard in the Department of Fruit Science, K.N.K. College of Horticulture, Mandsaur during 2012-13. The experiment was laid out in randomized block design (RBD) with three replications. The treatments were imposed on guava fruit plants by pre-harvest spray of water (control), 1.0, 1.5 and 2.0% of calcium nitrate solution, 0.2, 0.4 and 0.6% of zinc sulphate solution and 0.2%, 0.4% and 0.6% of borax solution during December, 2012. Two sprays were done at 15 days interval before harvesting. The Twelve fresh, good looking, fully mature and uniform fruits of guava cv. L-49 were taken for each treatment in each replication. The physiological weight loss, decay loss, fruit length and diameter, physico-chemical composition and organoleptic values of guava fruits were taken on 3, 6 and 9 days of storage in ambient temperature (maximum and minimum temperature during storage were 28.1 and 14.40C, respectively). The TSS of fruits were measured with the help of Hand Refractometer of 0-320 Brix range. The acidity content was determined as per AOAC (1970). The appearance, taste, flavour and texture of each sample were evaluated organoleptically by the panel of judges by giving marks as per method of 9 point Hedonic scale given by Larmond (1977).

*Corresponding authors email: rt_jnkvv@yahoo.com

RESULTS AND DISCUSSION

The ripening of guava fruits (Table 1) was delayed under 0.4% zinc sulphate by retention of 77.8 and 44.4 % marketable fruits after 6 and 9 days of storage, respectively, followed by 0.4% borax (75.0 and 38.9 % marketable fruits retained), while 58.4 and 19.4 % marketable fruits were retained under control after 6 and 9 days of storage, respectively.

Table 1: Effect of different doses of chemicals on shelf life of guava fruits

Treatment	Physiological weight loss (%)			Marketable fruits retained (%)		Unmarketable fruits (Decay loss) (%)		Marketable fruits retained over control (%)		Decrement in fruit length (%)			Decrement in fruit diameter (%)		
	Days After Storage														
	3	6	9	6	9	6	9	6	9	3	6	9	3	6	9
Water spray	4.6	6.4	6.6	58.4	19.4	41.6	80.5	--	--	13.7	20.7	21.7	8.9	17.5	18.4
CN (1.0%)	4.4	5.9	6.3	69.4	22.2	30.5	77.7	11.0	2.7	11.6	19.7	21.4	6.7	11.4	13.3
CN (1.5%)	4.3	5.9	5.9	72.2	25.0	27.7	72.2	13.7	5.5	7.6	15.1	18.0	6.2	9.1	11.6
CN (2.0%)	4.3	5.5	5.8	72.2	27.7	27.7	75.0	13.7	8.3	4.4	10.8	14.5	6.0	8.4	11.4
ZS (0.2%)	3.9	5.0	5.3	72.2	27.7	27.7	72.2	13.7	8.3	4.0	8.0	11.4	4.5	8.0	10.9
ZS (0.4%)	3.0	3.7	4.5	77.7	44.4	22.2	55.5	19.3	25.0	0.3	5.3	9.2	0.5	6.4	08.8
ZS (0.6%)	3.9	4.8	5.1	72.2	30.5	27.7	69.4	13.7	11.1	2.7	8.0	10.9	3.9	7.2	10.1
Borax (0.2%)	4.3	5.1	5.5	72.2	27.7	27.7	72.2	13.7	8.3	4.4	9.1	12.0	5.1	8.4	10.9
Borax (0.4%)	3.1	4.1	4.5	75.0	38.8	25.0	61.1	16.5	19.4	0.7	7.6	9.6	2.9	6.4	9.0
Borax (0.6%)	3.8	4.5	4.8	75.0	30.5	25.0	69.4	16.5	11.1	2.6	7.7	10.4	3.2	6.6	9.5
CD (P=0.05)	1.41	0.001	2.10	-------	-------	-------	------	-------	------	-	-	-	-	-	-

CN- Calcium nitrate, ZS- Zinc sulphate

The lowest decrement in fruit length (9.20%) and fruit diameter (8.83%) were also recorded in fruits treated with 0.4% zinc sulphate. Maximum retention of marketable fruits under 0.4% zinc sulphate might be due to slow degradation of chlorophyll and decreased enzymatic activities, which are responsible for delay ripening. Delay in ripening of guava by such chemicals was also reported by Goswami *et al.* (2012) and Rajput *et al.* (2008). In case of physiological weight loss of fruits, 0.4% zinc sulphate was found the best and only 4.54 % weight loss was found under this treatment on 9 days of storage followed by 0.4% borax (4.56 %), which showed its effectiveness in controlling the physiological weight loss right from the beginning of the storage. The less increase in weight loss under storage conditions plays a crucial role in quality and storage of fruits (Agrawal, 2012; Bhowmick *et al.*, 2012 and Jayachandran *et al.*, 2005). The data on the quality rating (Table 2) show that the maximum consumer acceptability of fruits on the basis of appearance, taste, flavour and texture was found under 0.4% borax up to 9 days of storage. But under control it was found maximum up to 3 days of storage only, while 0.4% zinc sulphate doses decreased the consumer acceptability of guava fruits as well as physico-chemical composition of fruits. Goswami *et al.* (2012) and Wali *et al.* (2006) have also reported similar findings.

As regards, the effects of different doses of chemicals on fruits (Table 3), none of the parameters was influenced significantly. But 0.4% zinc sulphate

Table 2: Effect of different doses of chemicals on sensory score of guava fruits

Treatment	Appearance			Taste			Flavour			Texture		
	Days After Storage											
	3	6	9	3	6	9	3	6	9	3	6	9
Water spray	5.9	4.0	3.1	5.4	2.9	2.0	5.4	3.2	2.9	5.8	4.2	1.2
CN (1.0%)	6.5	4.5	3.9	5.8	3.5	3.2	5.6	4.0	3.1	6.3	4.8	2.6
CN (1.5%)	6.8	5.8	4.5	6.1	4.8	3.8	6.5	4.2	3.3	6.4	5.1	2.7
CN (2.0%)	6.9	6.0	4.7	6.5	5.3	4.8	6.4	4.5	3.3	6.4	5.2	2.8
ZS (0.2%)	7.2	6.3	5.2	6.2	5.0	4.3	6.3	4.6	3.7	6.6	5.6	3.3
ZS (0.4%)	8.8	8.0	7.2	8.0	7.0	6.5	7.0	5.2	4.4	7.4	7.1	4.8
ZS (0.6%)	8.0	7.5	6.7	7.1	6.0	5.0	6.5	5.2	4.2	7.3	6.9	4.6
Borax (0.2%)	7.4	6.7	5.7	6.7	5.7	4.5	6.5	5.1	4.0	6.9	5.9	3.7
Borax (0.4%)	9.0	8.6	7.7	8.1	7.6	6.8	7.3	5.8	4.7	7.8	7.2	5.2
Borax (0.6%)	7.6	7.0	6.2	6.8	6.5	5.5	6.4	5.1	4.1	7.1	6.7	4.3
CD (p=0.05)	0.03	0.09	0.03	0.06	0.10	0.98	0.076	0.163	0.075	0.125	0.07	0.16

CN- Calcium nitrate, ZS- Zinc sulphate

was found best for retaining of maximum TSS and total sugars in 6 and 9 days of storage, while under control maximum TSS and total sugar was retained only on 3 days of storage. Initial rise in sugar content of fruits might be due to conversion of starch into sugar, while decreasing trend of sugar under higher doses of chemicals might be due to consumption of more sugar for respiration during storage. The higher percentage of total sugar, reducing sugar and non–reducing sugar might be due to efficient translocation photosynthates to the fruits by regulation of zinc substances.

Table 3: Effect of different doses of chemicals on chemical constituents of guava fruits

Treatment	TSS (%)			Acidity (%)			Sugars (%)					
							Reducing			Non reducing		
	Days After Storage											
	3	6	9	3	6	9	3	6	9	3	6	9
Water spray	10.33	9.03	7.80	0.64	0.50	0.44	3.03	2.62	2.50	3.31	3.11	2.75
CN (1.0%)	11.53	10.27	8.83	0.55	0.44	0.40	3.67	3.43	3.00	3.06	2.69	2.78
CN (1.5%)	11.57	10.33	8.87	0.51	0.44	0.40	3.74	3.49	3.11	3.12	2.82	2.98
CN (2.0%)	11.60	10.57	9.17	0.48	0.43	0.36	3.86	3.56	3.17	3.04	2.84	2.95
ZS (0.2%)	11.67	10.87	9.73	0.44	0.38	0.33	3.89	3.59	3.23	3.21	3.16	3.14
ZS (0.4%)	12.03	12.63	10.03	0.36	0.33	0.29	3.97	3.98	3.59	3.89	3.68	3.59
ZS (0.6%)	11.83	11.17	9.80	0.42	0.38	0.33	3.90	3.61	3.30	3.49	3.23	3.28
Borax (0.2%)	11.60	10.70	9.27	0.46	0.40	0.35	3.89	3.56	3.17	3.05	3.17	2.98
Borax (0.4%)	11.97	12.40	9.97	0.40	0.33	0.31	3.94	3.86	3.43	3.63	3.53	3.59
Borax (0.6%)	11.87	12.37	9.87	0.40	0.35	0.33	3.92	3.76	3.39	3.64	3.56	3.44
CD (p=.05)	0.42	0.47	0.20	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.003	0.003

CN- Calcium nitrate, ZS- Zinc sulphate

These results are in agreement with the findings of Goswami *et al.* (2012) in guava and Samant *et al.* (2008) in ber. The minimum acidity on 3, 6 and 9 days of storage was recorded under 0.4% zinc sulphate. The decrease in acidity under 0.4% zinc sulphate might be due to rapid utilization of organic acid in respiration at senescence stage of fruits or delay ripening might have been responsible for minimizing the titrable acidity (Goswami *et al.*, 2012).

REFERENCES

A.O.A.C. (1970) Official Method of Analysis, 14th Edn. Association of Analytical Official Chemists. Washington, D.C.

Agrawal, V. (2012) Effect of pre-harvest sprays and post-harvest dip of different chemicals on shelf-life of guava. *International Journal of Agricultural Science* **8** (1): 247-249.

Bhowmick, N.; Banik, B.C.; Hasan, M.A. and Ghosh, B. (2012) Response of pre-harvest foliar application of zinc and boron on mango cv. Amrapali under new alluvial zone of west Bengal. *Indian Journal of Horticulture* ***69*** (3): 428-431.

Gupta, O.P.; Jindal, P.C. and Singh, B.P. (1980) Effect of pre-harvest spray of calcium nitrate on the storage behavior of grapes cv. Perlette. *Journal of Research Haryana Agriculture University* **10**: 204-206.

Goswami, A.K.; Shukla, H.S.; Kumar, P. and Mishra, D.S. (2012) Effect of pre harvest application of micro-nutrients on quality of guava cv. Sardar. *Horticulture FloraResearch Spectrum* **1**(1): 60-63.

Huber, D.J. (1983) Role of cell wall hydrolases in fruit softening. *Horticulture Review* **5**: 169-171.

Jayachandran, K.S.; Srihari, D. and Reddy, Y.N. (2005) Pre-harvest sprays of different sources of calcium to improve the shelf life of guava. *Indian Journal of Horticulture* **62** (1): 68-70.

Larmond, E. (1977) Laboratory methods for sensory evaluation of food. Canada. Deptt. Agril. Publication No. 1637, Ontario: 57-59.

Rajput, B.S.; Lekhe, R.; Sharma, G.K. and Singh, L. (2008) Effect of pre and post-harvest treatments on shelf life and quality of guava fruits (*Psidium guajava* L.) cv. Gwalior-27. *The Asian Journal of Horticulture* **3** (2): 368-371.

Samant, D.; Mishra, N.K.; Singh, A.K. and Lal, R.L. (2008) Effect of micronutrient sprays on fruit yield and quality during storage in ber cv. Umran under ambient conditions. *Indian Journal of Horticulture* **65** (4): 399-404.

Wali, V.K. and Kumar, Sermesh (2006) Effect of pre-harvest sprays of calcium, zinc and silver on physico-chemical characteristics of guava *(Psidium guajava L.)* cv. Sardar during storage. *Journal of Research SKUAST-J* **5** (1): 89-99.