

Original Research Article

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Effect of Foliar Application of Different Chemicals on Quality of Guava (*Psidium guajava* L.) Var. Sardar

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ABSTRACT

The present investigation entitled "Effect of foliar application of different chemicals on quality of guava (*Psidium guajava* L.)" Var. Sardar was conducted in a well-established guava orchard on 9 years old Sardar guava trees planted at 6×6 m having uniform growth and productivity at the Instructional-Cum-Research Farm, Department of Horticulture, College of Agriculture, Latur, during mrig bahar 2013-14. The experiment was laid out in Randomized Block Design (RBD) with ten treatments replicated thrice. The treatments comprised of 19:19:19 @ 1% (T₁), 12:61:0 @ 1% (T₂), 0:52:34 @ 1% (T₃), Calcium Nitrate @ 1% (T₄), Sulphate of Potash @ 1% (T₅), Calcium Nitrate @ 1% + Sulphate of Potash @ 1% (T₆), ZnSO₄ @ 0.5% + FeSO₄ @ 0.5% + Boric acid @ 0.3% (T₇), 19:19:19 @ 1% + ZnSO₄ @ 0.5% + FeSO₄ @ 0.5% + Boric acid @ 0.3% (T₈), Calcium Nitrate @ 1% + Sulphate Potash @ 1% + ZnSO₄ @ 0.5% + FeSO₄ @ 0.5% + Boric acid @ 0.3% (T₉) and Control (T₁₀). The results revealed that, the maximum values of diameter of fruit (9.17 cm), TSS (13.40 °Brix), TSS: acid ratio (34.36), acid: sugar (20.94) ratio were observed with the application of 0:52:34 @ 1% (T₃) and at par results were observed in Sulphate of Potash @ 1% (T₅) treatment. The minimum per cent weight loss (13.14%) at 8 days of storage and maximum shelf life of fruit (6.99 days) was observed in fruits obtained with the foliar application of calcium nitrate @ 1% + Sulphate of Potash @ 1% + ZnSO₄ @ 0.5% + FeSO₄ @ 0.5% + Boric acid @ 0.3% (T₉). The minimum values for most of the quality attributes studied were observed in control (T₁₀) treatment.

Keywords

Guava, Chemicals,
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Introduction

Guava (*Psidium guajava* L.) "Apple of the tropics" is an important fruit crop of country. Guava is one of the fourth most important fruit crop in India after Mango, Banana and Citrus. In India, it occupies nearly 2.36 lakh hectares of area with production of 31.98 lakh metric tonnes and average productivity of 13.6 metric tonnes per hectare. In Maharashtra, it is

cultivated in the area of 0.39 lakh hectare with production of 3.05 lakh metric tonnes and with an average productivity of 7.8 metric tonnes per hectare.

Low productivity of guava in Maharashtra state as compared to national, large scale use of chemical fertilizers causes the problem of ground water and environmental pollution through leaching, volatilization and

denitrification in addition to wastage of nutrients through costly fertilizers. The disproportionate use of chemical fertilizers has widened soil imbalance in terms of NPK ratio and lowered the organic carbon contents of the soil. The occurrence of multinutrient deficiencies and overall decline in productive capacity of soil has been widely reported due to non-judicious fertilizer use (Chhonkar, 2008).

The judicious supply of nutrients not only increases the productivity but it also improves the quality of the produce. As the foliar application is an effective method of nutrient management and required nutrients can be readily supplied when they are needed. It is an effective method for correcting the micronutrient deficiencies. Hence, in recent days it has been widely practiced in high valued fruit crops like grape, mango, banana, citrus and pomegranate etc. It has been reported that the guava plant can readily absorb mineral nutrients spray or painted on the foliage. Spraying method using the correct strength have been great merit of simplicity and requires about 1 or 2 weeks to produce clear effects. Foliar application experiments conducted in India showed that guava has given good response to foliar application of different chemicals. Use of different mixed fertilizers and chemicals like calcium nitrate, magnesium sulphate, sulphate of potash, zinc sulphate, ferrous sulphate and boric acid through foliar application was found beneficial and the recommendations which have been suggested by different workers for different chemicals appears to have profound influence on fruit quality through its influence on size, appearance, colour, soluble solids, sugar, acidity and vitamin contents. Foliar application of different chemicals has increased the yield and quality parameters in guava (Arora and Singh, 1970; Ahamad *et al.*, 1988; Ghosh, 1988; Yadav *et al.*, 2001; Priyaawasthi, 2009; and Trivedi *et al.*, 2012).

Materials and Methods

The present investigation entitled “Effect of foliar application of different chemicals on quality of guava (*Psidium guajava* L.)” Var. Sardar was carried out at College of Agriculture, Latur, during 2013-2014. The experimental site soil was medium black, slightly alkaline with uniform texture, colour and having good drainage. The experiment was conducted on well-established orchard of nine years old Sardar guava trees which are planted at 6.0 × 6.0 m spacing. The experiment was laid out in Randomized Block Design (RBD) with ten treatments replicated thrice. The treatments comprised of 19:19:19 @ 1% (T₁), 12:61:0 @ 1% (T₂), 0:52:34 @ 1% (T₃), Calcium Nitrate @ 1% (T₄), Sulphate of Potash @ 1% (T₅), Calcium Nitrate @ 1% + Sulphate of Potash @ 1% (T₆), ZnSO₄ @ 0.5% + FeSO₄ @ 0.5% + Boric acid @ 0.3% (T₇), 19:19:19 @ 1% + ZnSO₄ @ 0.5% + FeSO₄ @ 0.5% + Boric acid @ 0.3% (T₈), Calcium Nitrate @ 1% + Sulphate Potash + @ 1% + ZnSO₄ @ 0.5% + FeSO₄ @ 0.5% + Boric acid @ 0.3% (T₉) and Control (T₁₀). Recommendations for RDF were used as 800 g N, 400 g P₂O₅, and 400 g K₂O/tree (Anon, 2012). After preparation of basins, FYM @ 20 Kg/plant was given to all trees.

Results and Discussion

An appraisal of the data presented in Table1 revealed that in the present studies, significant variation in the fruit quality parameters like length, diameter, weight of pulp, weight of seed, number of seeds and pulp: seed ratio were observed due to application of different chemicals. The data clearly showed that the treatment 12:61:0 @ 1% (T₂) recorded maximum fruit length (8.74 cm) which was statistically at par with the treatment of 0:52:34 @ 1% (T₃), whereas, minimum fruit length (7.06 cm) was observed in control (T₁₀).

The data revealed that the maximum diameter of the fruit (9.17 cm) was recorded in the treatment of 0:52:34 @ 1% (T₃) which was statistically at par with 19:19:19 @ 1% (T₁) and calcium nitrate @ 1% (T₄), the minimum (7.07 cm) diameter of fruit was observed in control (T₁₀).

It is clear from the data that, the maximum weight of pulp (254 g) was recorded in the treatment of 12:61:0 @ 1% (T₂) and the minimum (152.46 g) weight of pulp was observed in control (T₁₀).

It is evident from the data that, the minimum number of seeds (251.50) per fruit was recorded with the foliar application of 19:19:19 @ 1% (T₁) and it was statistically at par with the application of sulphate of potash @ 1% (T₅), whereas the maximum number of seeds (346.00) per fruit were recorded in 0:52:34 @ 1% (T₃) treatment.

It is evident from the data that, the minimum (3.70 g) weight of seeds per fruit was recorded in the treatment of sulphate of potash @ 1% (T₅) and it was statistically at par with the treatments of ZnSO₄ @ 0.5%+ FeSO₄ @ 0.5%+ boric acid @ 0.3% (T₇), calcium nitrate @ 1% (T₄), calcium nitrate @ 1%+ sulphate of potash @ 1% (T₆) and 19:19:19 @ 1% (T₁)

The maximum weight of seeds (6.30 g) was recorded in the treatments of 12:61:0 @ 1% (T₂). The highest pulp: seed ratio (57.89) was observed with the application of sulphate of potash @ 1% (T₅). The lowest pulp: seed ratio (33.21) was observed with the application of in treatment of 19:19:19 @ 1%+ ZnSO₄ @ 0.5%+ FeSO₄ @ 0.5%+ boric acid @ 0.3% (T₈).

The quality improvement in terms of physical attributes of fruits with foliar application of urea has also reported by Arora and Singh (1970a). Similar findings were also reported

by Rajput *et al.*, (1986), Singh *et al.*, (1994), Dubey *et al.*, (2001) and Pal *et al.*, (2008) and due to combined application of N and P by Sharma and Sharma (1992), which supports the present findings.

Biochemical attributes

The data pertaining to TSS, ascorbic acid, reducing sugar, non- reducing sugar, total sugars, acidity, TSS: acid ratio and sugar: acid ratio of guava fruits as influenced due to foliar application of different chemicals are presented in Table 2.

The maximum TSS (13.40 °Brix) was observed with the application of 0:52:34 @ 1% (T₃) which was statistically at par with the application of sulphate of potash @ 1% (T₅), Whereas, minimum (10.45 °Brix) TSS was observed in control (T₁₀) treatment. The maximum (34.36) TSS: acid ratio was observed in the treatment of 0:52:34 @ 1% (T₃). The minimum TSS: acid ratio (19.90) was observed in ZnSO₄ @ 0.5% + FeSO₄ @ 0.5% + boric acid @ 0.3% (T₇) treatment.

The maximum ascorbic acid content (268.00 mg/100g) was recorded with the application of 12:61:0 @ 1% (T₂), which was statistically at par with the application 19:19:19 @ 1% (T₁) and sulphate of potash @ 1% (T₅). Whereas, the minimum (146.30 mg/100g pulp) ascorbic acid content was observed in control (T₁₀) treatment. Higher concentration of urea, however, had adverse effect on ascorbic acid content of fruit Dubey *et al.*, (2001). Similar findings were also reported by Doraipandian and Shanmugrvelu (1972), Meena (2005), Rajput *et al.*, (1986).

The maximum reducing sugars (5.18%) was recorded with the application of sulphate of potash @ 1% (T₅), while the minimum (2.58%) reducing sugar was recorded in the control (T₁₀).

Table.1 Effect of foliar application of different chemicals on physical attributes of guava fruits

Treatment Details	Fruit length (cm)	Fruit diameter (cm)	Weight of pulp (g)	No. of seeds/fruit (g)	Weight of seed/fruit (g)	Pulp: seed ratio
T ₁ - 19:19:19 @ 1%	8.20	8.48	226.66	251.50	4.46	50.82
T ₂ - 12:61:0 @ 1%	8.74	8.19	254.00	332.16	6.30	40.32
T ₃ - 0:52:34 @ 1%	8.42	9.17	246.50	346.00	4.93	50.00
T ₄ - Calcium Nitrate @ 1%	8.37	8.35	203.00	314.60	4.40	46.13
T ₅ - Sulphate of Potash @ 1%	8.15	8.16	217.66	268.66	3.70	57.89
T ₆ - Calcium Nitrate @ 1% + Sulphate of Potash @ 1%	8.18	7.72	221.33	311.36	4.43	49.96
T ₇ - ZnSO ₄ @ 0.5% + FeSO ₄ @ 0.5% + Boric acid @ 0.3%	7.99	7.64	164.70	312.00	4.16	39.60
T ₈ - 19:19:19 @ 1% + ZnSO ₄ @ 0.5% + FeSO ₄ @ 0.5% + Boric acid @ 0.3%	8.04	7.66	179.36	348.13	5.40	33.21
T ₉ - Calcium Nitrate @ 1% + Sulphate of Potash @ 1% + ZnSO ₄ @ 0.5% + FeSO ₄ @ 0.5% + Boric acid @ 0.3%	8.13	7.74	200.66	314.33	4.77	42.06
T ₁₀ - Control.	7.06	7.07	152.46	264.16	3.76	41.20
S.E ±	0.11	0.29	14.11	16.03	0.36	
C.D at 5 %	0.33	0.85	41.40	47.02	1.064	

Table.2 Effect of foliar application of different chemicals on chemical composition of guava fruits

Treatment Details	TSS (° Brix)	Ascorbic acid (mg/100g fruit pulp)	Reducing sugar (%)	Non reducing sugar (%)	Total sugars (%)	Acidity (%)	TSS/ acid ratio	Sugar/ acid ratio
T ₁ - 19:19:19 @ 1%	10.9	248.66	3.43	4.26	7.70	0.37	29.46	20.81
T ₂ - 12:61:0 @ 1%	10.71	268.00	2.65	4.15	6.71	0.39	27.47	15.82
T ₃ - 0:52:34 @ 1%	13.40	166.13	4.49	3.52	8.17	0.39	34.36	20.94
T ₄ - Calcium Nitrate @ 1%	11.06	223.03	3.61	4.00	7.84	0.40	27.65	19.60
T ₅ - Sulphate of Potash @ 1%	13.00	233.70	5.18	4.26	9.25	0.49	26.53	18.88
T ₆ - Calcium Nitrate @ 1% + Sulphate of Potash @ 1%	10.53	153.00	4.53	2.55	7.08	0.47	22.40	15.06
T ₇ - ZnSO ₄ @ 0.5% + FeSO ₄ @ 0.5% + Boric acid @ 0.3%	10.94	176.33	4.39	4.19	7.98	0.55	19.90	14.50
T ₈ - 19 : 19 : 19 @ 1% + ZnSO ₄ @ 0.5% + FeSO ₄ @ 0.5% + Boric acid @ 0.3%	10.45	146.33	4.62	2.63	8.90	0.52	20.95	17.11
T ₉ - Calcium Nitrate @ 1% + Sulphate of Potash @ 1% + ZnSO ₄ @0.5% + FeSO ₄ @ 0.5% + Boric acid @ 0.3%	11.00	193.30	4.41	4.40	8.00	0.54	20.37	14.81
T ₁₀ - Control.	10.45	146.30	2.58	3.63	6.02	0.47	22.40	12.80
S.E ±	0.14	12.22	0.06	0.15	0.22	0.017		
C.D at 5 %	0.42	35.86	0.20	0.45	0.66	0.052		

Table.3 Effect of foliar application of different chemicals on physiological loss in weight (PLW) and shelf life of guava fruits

Treatments	Initial weight (g)	Physiological loss in weight (%)				Shelf life (days)
		After 2 days	After 4 days	After 6 days	After 8 days	
T ₁ - 19:19:19 @ 1%	993	4.28 (950)	8.31 (910)	13.18 (861)	16.30 (830)	5.37
T ₂ - 12:61:0 @ 1%	1315	2.36 (1283)	4.66 (1253)	7.23 (1220)	14.24 (1146)	6.66
T ₃ - 0:52:34 @ 1%	1225	3.10 (1186)	6.35 (1146)	9.89 (1103)	14.51 (1035)	6.33
T ₄ - Calcium Nitrate @ 1%	1033	3.58 (996)	9.03 (940)	12.92 (900)	16.19 (866)	5.66
T ₅ - Sulphate of Potash @ 1%	1056	4.53 (1008)	7.55 (976)	10.09 (950)	15.44 (893)	5.66
T ₆ - Calcium Nitrate @ 1% + Sulphate of Potash @ 1%	1135	5.92 (1065)	9.48 (1025)	12.00 (1006)	14.09 (973)	6.33
T ₇ - ZnSO ₄ @ 0.5% + FeSO ₄ @ 0.5% + Boric acid @ 0.3%	865	6.71 (805.33)	10.45 (773)	13.14 (750)	16.21 (723)	5.66
T ₈ - 19: 19: 19 @ 1% + ZnSO ₄ @ 0.5% + FeSO ₄ @ 0.5% + Boric acid @ 0.3%.	901	3.60 (868)	6.51 (84)	9.94 (810)	13.18 (780)	5.66
T ₉ - Calcium Nitrate @ 1% + Sulphate of Potash + @ 1% ZnSO ₄ @ 0.5% + FeSO ₄ @ 0.5% + Boric acid @ 0.3%	1053	4.04 (1010)	7.05 (976)	10.43 (940)	13.14 (910)	6.99
T ₁₀ - Control.	780	6.98 (723)	12.50 (683)	16.41 (650)	22.16 (603)	4.33
SE±	38.07	1.14	1.55	1.64	1.85	0.43
C.D at 5%	113.11	3.39	4.60	4.88	5.50	1.29

The maximum (4.40 %) non reducing sugar were recorded in the treatment of Calcium Nitrate @ 1% + Sulphate of Potash @ 1% + ZnSO₄ @ 0.5% + FeSO₄ @ 0.5% + Boric acid @ 0.3% (T₉). and it was statistically at par with the application of 19:19:19 @ 1% (T₁), Sulphate of Potash @ 1% (T₅), 12:61:0 @ 1% (T₂) and calcium nitrate @ 1% (T₄). The minimum (2.55 %) non reducing sugar contents were recorded with the application of calcium nitrate @ 1%+ sulphate of potash @ 1% (T₆).

The maximum (9.25 %) total sugar was recorded in the treatment of sulphate of potash @1% (T₅) which was statistically at par with 19:19:19 @ 1% + ZnSO₄ @ 0.5% + FeSO₄ @ 0.5% + Boric acid @ 0.3% (T₈) while, the minimum (6.537 %) total sugar content was observed in control (T₁₀) treatment.

The increased in non-reducing sugar and total sugar with potassium compounds alone or in combination with other nutrients may be due to increased rate of photosynthesis which accumulated more sugars in fruits.

Similar results with potassium application compound have also been reported by Singh *et al.*, (1981), which support the result of present investigation.

The data showed that, the minimum (0.37 %) acidity was recorded in the treatment of 19:19:19 @ 1% (T₁) and it was statistically at par with the 12:61:0 @ 1% (T₂), 0:52:34 @ 1% (T₃) and Calcium Nitrate @ 1% (T₄). Whereas, the maximum (0.55%) acidity was recorded in ZnSO₄ @ 0.5% + FeSO₄ @ 0.5% + Boric acid @ 0.3% (T₇) treatment.

The maximum sugar: acid ratio (20.94) was observed in the treatment of 0:52:34 @ 1% (T₃), while the minimum (12.80) TSS: acid ratio was observed in control (T₁₀) treatment

Post-harvest quality

The minimum physiological weight loss (13.14%) after 8 days storage and maximum

shelf life (6.99 days) was recorded in fruits produced from the foliar application of Calcium Nitrate @ 1% + Sulphate of Potash @ 1% + ZnSO₄ @ 0.5% + FeSO₄ @ 0.5% + Boric acid @ 0.3% (T₉). Similar findings were also reported by Kumar *et al.*, (2011) (Table 3).

He reported that the reduction in weight loss of guava fruits with foliar application of GA₃ and borax. Mandal *et al.*, (2010) also reported that the foliar application of 1% calcium nitrate in guava effectively reduced the spoilage, maintained higher firmness, TSS and ascorbic acid up to 2 days.

The minimum PLW (%) and prolonged shelf life of guava fruits was observed due to foliar application of 0.4% ZnSO₄ (Goswami *et al.*, 2012).

The Foliar application of different chemicals was found beneficial for increasing quality of guava. The application of potash alone (Sulphate of Potash) @ 1% or in combination with other nutrients like Calcium Nitrate (T₆) or micronutrients (T₉) produced beneficial effects on quality attributes of guava fruits. The overall performance of application of Calcium Nitrate + Sulphate of Potash each @ 1% (T₆) was found superior and it was closely followed with the application of 19 : 19 : 19 @ 1% + ZnSO₄ + FeSO₄ each @ 0.5% + Boric acid @ 0.3% (T₈) for improving quality from guava.

Thus, it can be concluded that two foliar sprays of Calcium Nitrate plus Sulphate of Potash each @ 1% or 19 : 19 : 19 @ 1% + ZnSO₄ + FeSO₄ each @ 0.5% + Boric acid @ 0.3% at 30 and 60 days after flowering will be beneficial for increasing the quality of guava under Marathwada conditions.

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