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Effect of foliar spray of urea and zinc on growth and flowering attributes of guava (*Psidium guajava*) cv. BHAVNAGAR RED

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ABSTRACT : Study was conducted in experimental farm of Junagadh Agricultural University, Gujarat India to find out the effect of foliar application of 1.0 per cent, 1.5 per cent or 2.0 per cent urea and zinc sulfate with concentration of 0.2, 04 and 0.6 per cent on guava crop, respectively, just before blooming significantly improved shoot growth, leaf number, area and weight. The best results were obtained with treatments of 1.0 and 1.5 per cent foliar spray of urea. In case of flowering, fruit set and fruit retention was better in treated plants with fertilizer. The size of fruits and yield per tree increased with increasing urea concentration and the significant variation in number of flowers per shoot was observed while non significant effect was observed under interaction effect of urea and zinc. The highest fruit weight and maximum fruit girth was registered with 0.6 per cent zinc. Thus, it is proved that 1.5 per cent urea solution and 0.6 per cent zinc sulphate were effective for the augmentation of growth and flowering attributes of guava.

Key **W**ords : Foliar spray, Urea, Zinc, Guava

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The guava is one of the most common and important fruit crop cultivated all over India. It is fourth most important fruit crop in area and production after mango, banana and citrus. Guava belongs to family Myrtaceae. It is classified under genus *Psidium*, which contains 150 species, but only *Psidium guajava* has been exploited commercially. In eastern and southern India, the guava tree flowers thrice in a year, *i.e.* February, June-July and October. The respective *bahars* are called "*Ambe*", "*Mrig*" and "*Hasta*" *bahar*. Thus, guava in this part seems to bear fruits almost throughout the year. Among all of these three bahars "Mrig bahar" crop gives fruits during winter *i.e.* November-January, which are better in quality, taste and higher vitamin C content. Foliar fertilization of micronutrients has advantage of low application rates, uniform distribution of fertilizer materials and quick responses to applied nutrients (Umer *et al*., 1999). Application of micro nutrients through foliage can be from 10 to 20 times as efficient as soil application (Zaman and Schumann, 2006). Zn deficiency symptoms such as little leaf or rosette was described for peach (*Prunus percia*). Kumar *et al*. (2013) studied on effect of drip fertigation on growth of guava (*Psidium guajava* L.) concluded that growth parameters were significantly influenced by varieties. Soil applications are not very effective because the roots of fruit crops occupy deep soil layers and zinc does not easily move in the soil therefore, foliar sprays are more effective (Chandler *et al.*, 1931). Many scientific evidence have been shown the effect of nutrient in on Guava tree. However, there is limited work has done on effect of nutrient spray on this culitivars of guava in this saurashtra region.

RESEARCH PROCEDURE

The study was conducted at Horticultural Department. Junagadh agricultural University Junagadh, India, during years 2012 and 2013 on old trees of guava. The plants having uniform vigour and size with the age of 18 years old were selected for the study. The NPK were supplied to the trees as per

recommendation given by recommended doses of university of 25 kg of FYM/plant and 500 : 250 : 250(g) N : P : K(g)/plant (N in two split doses first 50 per cent at first week of July and remaining 50 per cent at second week of October. Micro nutrients *i.e.*, zinc as $ZnSO_4$,$7H_2O$ and urea were sprayed combinations with two sprayed. First spray was done at the time of flowering and second was done three weeks afterfirst spray. The details of the treatment composition were as U_1= 1.0 per cent Urea, U_2= 1.0 per cent Urea, U_3= 1.0 per cent Urea, Z_1= 0.2 per cent $ZnSO_4$, $7H_2O$, Z_2= 0.4 per cent $ZnSO_4$, $7H_2O$, Z_3= 0.6 per cent $ZnSO_4$, $7H_2O$, Treatments were replicated thrice in a Randomized Block Design, each replicate consisted of two trees. The observations were recorded on size of fruit (fruit length and diameter) at different interval in the every year. The data on average fruit length, diameter, fruit volume, fruit firmness and fruit weight were taken from ten fruits per replication with the standard calibration unit and procedures. The statistical analyses of data were carried out as per the method prescribed by Panse and Sukhatme (1985).

RESEARCH ANALYSIS AND REASONING

A perusal of data in Table 1 clearly indicate flowering characteristics with growth parameter *viz.*, plant height, number of flowers per shoot, flower drop, fruit characteristics, fruits retention, fruits drop, fruit weight, volume of fruit, length of fruit and fruit girth size of fruit (on fruit length and diameter) was significantly influenced by the use of micronutrients spray treatments of urea and zinc are presented in Table 1.

Number of flowers per shoot :

The data revealed that application of different treatments significantly influenced the number of flowers per shoot. The maximum number of flowers per shoot (5.30) was observed in 0.6 per cent zinc (Z_3). The flower number per shoot increased with increasing concentrations of zinc, which is due to significant increase in shoot number that ultimately ended in an individual flower. Improvement in growth characters as a result of foliar application of zinc might be due to the enhanced photosynthetic and other metabolic activity which leads to an increase in various plant metabolites responsible for cell division and elongation. Increased number of flowers in present study is in agreement with the results obtained by Balakrishnan (2001).

Flower drop :

The result indicates that the percentage of flower drop was significantly reduced due to different levels of zinc. The minimum flower drop (58.18%) was observed in the treatment Z_3 (0.6% zinc). The zinc has helped in flower retention because zinc stimulates the synthesis of endogenous auxins and auxin prevents the abscission and facilitated the ovary to remain attached with the shoot, resulting in lower flower drop. Similar results were found by Supriya and Bhattacharyya (1993), Sharma and Bhattacharyya (1994) and Yadav *et al.* (2011).

Fruit characteristics :

The result indicates that the percentage of fruit set was significantly increased due to different level of zinc. The maximum percentage of fruit set (70.49%) was observed in the treatment Z_3 (0.6% zinc). More fruit set due to zinc spray was due to profuse flowering. It seems to have helped to increase the fruit set either by improving pollen germination or by helping the growth of pollen tubes and thus facilitate in timely fertilization before the stigma loses its receptivity or the style becomes non-functional. These findings are in agreement with Bhambota *et al.* (1962) and Sharma and Bhattacharyya (1994).

Fruits retention :

The percentage of fruit retention was significantly increased due to different level of zinc. The maximum percentage of fruit retention (62.86%) was observed in the treatment Z_3 (0.6% zinc). More fruit retention due to zinc spray was due to more fruit setting. It seems to have helped to increase the fruit retention either by improving pollen germination or by helping the fruit set. These findings are in agreement with Bhambota *et al.* (1962) and Dixit *et al.* (1977).

Fruits drop :

Percentage fruit drop was significantly reduced due to different levels of zinc. The minimum fruit drop (37.14%) was observed in the treatment Z_3 (0.6% zinc). The zinc has helped in fruit retention because zinc stimulates the synthesis of endogenous auxins and auxin prevents the abscission and facilitated the ovary to remain attached with the shoot, resulting in lower fruit drop. Similar results were found by Bhambota *et al.* (1962) and Dixit *et al.* (1977).

Fruit weight :

The fruit weight of guava was (153.89g) increased under 0.6 per cent zinc. An increase in fruit weight was due to accumulation of sugars and high pulp percentage in zinc sprayed fruits. Similar results were also obtained by Pandey *et al.* (1998) and Haque *et al.* (2000).

Volume of fruit :

The results indicated that the volume of fruit (125.44ml) increased under 0.6 per cent zinc. This is due to that the zinc regulates metabolic activities, which increased stored food material in the tissue. This caused increase in volume of fruit. Similar results were also obtained by Pandey *et al.* (1998) and Haque *et al.* (2000).

Length of fruit :

The fruit length of guava (7.95 cm) increased under 0.6 per cent zinc. The increase in length of fruit may be due to

Table 1 : Effect of Urea and zinc on growth attributes of guava (*Psidium guajava*)

Sr. No.	Treatments	Plant height (m)	Plant spread (cm) E-W	Number of leaves per shoot S-N	Number of flowers per shoot	Flower drop (%)	Fruit set (%)	Fruit retention (%)
U_1	1.0% Urea	2.40	404.67	404.84	10.86	4.67	67.74	61.03
U_2	1.5% Urea	2.62	427.00	427.17	11.18	5.33	58.49	70.80
U_3	2.0% Urea	2.52	417.22	417.67	11.08	5.08	62.88	67.48
	S.E. ±	0.09	9.41	9.27	0.15	0.09	1.13	1.39
	C.D. (P=0.05)	NS	NS	NS	NS	0.27	3.40	4.17
Z_1	0.2% Zinc sulphate	2.43	407.78	407.95	10.89	4.70	67.46	61.35
Z_2	0.4% Zinc sulphate	2.50	416.44	416.93	11.06	5.08	63.46	67.46
Z_3	0.6% Zinc sulphate	2.62	424.67	424.80	11.18	5.30	58.18	70.49
	S.E. ±	0.09	9.41	9.27	0.15	0.09	1.13	1.39
	C.D. (P=0.05)	NS	NS	NS	NS	0.27	3.40	4.17
	C.V. (%)	11.20	6.78	6.68	4.08	5.45	5.40	6.28
	Interaction urea x zinc	NS	NS	NS	NS	NS	NS	NS

Table 1 contd...

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Sr. No.	Treatments	Fruit drop (%)	Fruit weight (g)	Volume of fruit (ml)	Specific gravity of fruit (g/ml)	Fruit length (cm)	Fruit girth (cm)	Plant spread (cm)
U_1	1.0% Urea	53.24	46.76	140.86	112.40	1.24	7.18	6.95
U_2	1.5% Urea	63.17	36.83	155.47	127.12	1.22	7.98	7.75
U_3	2.0% Urea	59.85	40.15	150.41	122.06	1.23	7.78	7.55
	S.E. ±	1.43	1.44	2.52	2.49	0.01	0.13	0.14
	C.D. (P=0.05)	4.30	4.31	7.54	7.48	NS	0.40	0.41
Z_1	0.2% Zinc sulphate	53.57	46.43	141.93	113.58	1.23	7.22	6.98
Z_2	0.4% Zinc sulphate	59.83	40.17	150.90	122.55	1.23	7.77	7.54
Z_3	0.6% Zinc sulphate	62.86	37.14	153.89	125.44	1.23	7.95	7.72
	S.E. ±	1.43	1.44	2.52	2.49	0.01	0.13	0.14
	C.D. (P=0.05)	4.30	4.31	7.54	7.48	NS	0.40	0.41
	C.V. (%)	7.33	10.46	5.07	6.21	1.99	5.26	5.59
	Interaction urea x zinc	NS	NS	NS	NS	NS	NS	NS

NS = Non–significant

increase in either flesh or seeds or in both. This is primarily due to the stimulation in the growth of flesh. This is in agreement with the results of Pandey *et al.* (1998) and Haque *et al*. (2000).

Fruit girth :

The results indicated that the girth of fruit was significantly increased by foliar application of zinc. Maximum girth of fruit was recorded under treatment Z_3 (0.6% zinc). It might be due to cumulative effect of micronutrient. The enlargement of fruit size is caused by drawing of photosynthates to the fruit as a consequence of intensification of the sink. It is in conformity with the observations of Pandey *et al.* (1998) and Haque *et al*. (2000). Application of zinc could be promoted the auxin synthesis in the plant system which might delayed the formation of abscission layer during early stages of fruit development (Nason and McElroy, 1963). Zinc in growth promoting substances (Shivanandam *et al.*, 2007).

Conclusion :

This experiment on effect of foliar application of 1.0 per cent, 1.5 per cent or 2.0 per cent urea and zinc sulfate with concentration of 0.2, 0.4 and 0.6 per cent on guava crop, respectively, just before blooming. significantly improved in shoot growth, leaf number, area and weight as well as the

fruit set and fruit retention was better in treated plants. The size of fruits and yield per tree increased with increasing urea concentration The significant variation in fruit weight due to zinc was found. Thus, it is proved that 1.5 per cent urea solution and 0.6 per cent zinc sulphate were effective for the augmentation of growth and flowering attributes of guava.

LITERATURE CITED

Balakrishnan, K. (2001). Effect of foliar application of micronutrients on guava. *Madras Agri. J.*, **88** (4-6): 316-317.

Bhambota, J.R., Azad, K.C., Kanwar, J.S. and Dhingra, D.R. (1962). Study of the effect of sprays with micronutrients of the chlorosis of citrus. *Hort. Adv.*, **6**: 168-172.

Chandler, W.H., Hoagland, D.R. and Hibbard, P.L. (1931). Little leaf or rosette of fruit trees. *Proc. Amer. Soc. Hort. Sci*., **28**: 556-560.

Dixit, C.K., Yamdagni, R. and Jindal, P.C. (1977). A note on the effect of micronutrients sprays on quality of Kinnow – A Mandarin hybrid. *Haryana J. Hort. Sci.*, **6** (3-4): 153-154.

Haque, R., Roy, A. and Pramanick, M. (2000). Response of foliar application of Mg, Zn, Cu and B on improvement of growth, yield and quality of Mandarin orange in Darjeeling Hills of West Bengal. *Hort. J.*, **13** (2): 15-20.

Kumar, Harendra, Kotoky, U. and Devee, A. (2013). Effect of drip fertigation on growth of guava (*Psidium guajava* L.). *Asian J. Hort.*, **8** (2) : 534-536.

Nason, A. and McElroy, W.D. (1963). Modes of action of the essential mineral elements in plant physiology: A Treatise. F.C. Steward. (Ed.) Vo. III, Academic Press. NEW YORK (U.S.A.).

Pandey, D.K., Pathak, R.A. and Pathak, R.K. (1998). Studies on the foliar application of nutrients and plant growth regulators in Sardar Guava I- Effect on yield and fruit quality. *Indian J. Hort.*, **45** (3/4): 197-202.

Panse, V.G. and Sukhatme, P.V. (1985). *Statistical method for agricultural*. ICAR, NEW DELHI (INDIA).

Sharma, R. and Bhattachrya, R.K. (1994). Effect of foliar application zinc on vegetative growth and reproductive characters of guava. *South Indian Hort.*, **42** (3): 200-203.

Shivanandam, V.N., Pradeep, S.L., Rajanna, K.M. and Shivappa, (2007). Effect of zinc sulphate on growth and yield of mango varieties and hybrids. *J. Soil Crops*, **17** (2) : 225-229.

Supriya, L. and Bhattacharya, R.K. (1993). Effect of foliar application of chelated and non-chelated zinc on growth and yield of assam lemon. *Hort. J.*, **6** (1) : 35-38.

Umer, S., Bansal, S., Imas, K.P. and Magen, H. (1999). Effect of foliar fertilization of potassium on yield, nutrition. quality and nutrient uptake of groundnut. *J. Plant. Nutr.*, **22** (11) : 1785-1795.

Yadav, R.K., Rana, G.S., Ahlavat, V.P. and Kumar, Suresh (2007). Effect of zinc application on growth and fruit drop of sweet orange (*Citrus sinensis*) cv. JAFFA. *Haryana J. Hort. Sci*., **36** (3&4): 205-206.

Zaman, Q. and Schumann, A.W. (2006). Nutrient management zones for citrus based on variation in soil properties and tree performance. *Precision Agric*., **7** (1) : 45-63.