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Influence of Foliar Application of Nutrients on Growth, Flowering, Fruiting and Yield of Guava (*Psidium guajava*) cv. L-49

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ABSTRACT

In depth study focusing to ascertain the effect of foliar sprays of $ZnSO_4$ (0.50, 0.75 and 1.00%), $FeSO_4$ (0.2, 0.4 and 0.6%), K_2SO_4 (0.5, 1.0 and 1.5%) and Urea (1.0, 1.5 and 2.0%) along with control (water spray) before flowering and after fruit set, during rainy and winter seasons, in improving the growth, flowering, fruiting characteristics and yield of guava (Psidium guajava L.) cv. L-49 was carried out in the Experimental Orchard of Department of Horticulture, CCS Haryana Agricultural University, Hisar during 2016-17. The findings of the experiment revealed that the foliar application of various nutrients significantly increased the growth rate, flowering and fruiting characters of the plants over control. Maximum increase in plant growth in terms of plant height (11.57%), plant spread (8.33 and 8.63% N-S and E-W direction) and stem girth (5.82%) were recorded in the plants receiving $ZnSO_4$ @1.00 per cent, which was statistically at par with $ZnSO_4$ @0.75 per cent and Urea @2.0 per cent. Average shoot length was also recorded maximum (28.21 cm) in plants sprayed with $ZnSO_4$ @1.00 per cent closely followed by $ZnSO_4$ @0.75 per cent (28.14 cm) and Urea @1.5 per cent (27.67 cm). Maximum number of flowers per branch (19.66 and 14.74), fruit set (61.17 and 70.24%) and yield per plant (32.76 and 29.31 kg/tree) were recorded with minimum number of days for fruit set from flowering (18.00 days and 21.07), fruit drop (19.52 and 14.27%) and number of days for fruit maturity (94.90 and 119.2 days) under the treatment $ZnSO_4$ @1.00 per cent, during rainy and winter seasons, respectively. Application of $ZnSO_4$ @0.75 per cent was also found to be equally good, during both the seasons of investigation.

Key words: *Psidium guajava, $ZnSO_4$, Nutrients, Papaya*

INTRODUCTION

Guava (*Psidium guajava* L.), 'The Apple of the Tropics' and 'Poor Man's Apple' is an important fruit crop of country, not because of large area and production, but due to its wider edapho-climatic adaptability. In India, it is fifth most important fruit crop after Mango, Banana, Citrus and Papaya[8]. It comes under the family Myrtaceae. Guava is not only delicious and refreshing but is also the chief source of vitamins, minerals and proteins. Due to variation in environmental conditions, plants give fruiting almost throughout the year; therefore need continuous availability of nutrients.

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Generally, the micronutrients are not used in guava orchards and these orchards are declining in their growth, quality and commercial life. Hence there is essentiality to find out the optimum micro nutrient dose based practices on the performance of morphological and yield attributing characteristics. Foliar feeding of nutrients has acquired much importance in recent years which is utterly economical and obviously an ideal way of evading the problems of nutrients availability and supplementing the fertilizers to the soil. Application of micronutrients through foliage can be 10 to 20 times as efficient as soil application[12]. Nutrients like nitrogen, phosphorus and potash play a vital role in promoting the plant vigour and productivity, whereas micronutrients like zinc and iron perform a specific role in the growth and development of plant, quality produce and uptake of major nutrients[7] . Considering all the above facts and with a view to have better growth, flowering, fruiting and yield of fruits, a field experiment was carried out with the objective to study the influence of foliar application of nutrients on growth, flowering and fruiting attributes of guava (*Psidium guajava* L.) cv. L-49.

MATERIALS AND METHODS

The experiment comprising of foliar application of $ZnSO_4$ (0.50, 0.75 and 1.00%), $FeSO_4$ (0.2, 0.4 and 0.6%), K_2SO_4 (0.5, 1.0 and 1.5%) and Urea (1.0, 1.5 and 2.0%) along with control (water spray), before flowering and after fruit set, during rainy and winter seasons, was carried out in the Experimental Orchard of Department of Horticulture, CCS Haryana Agricultural University, Hisar during 2016-17 by following randomized block design on 4 year old guava plants cv. L-49 spaced at 6 x 6 m. All the treatments were replicated thrice. The observations on growth, flowering and fruiting parameters of guava plants were recorded as per standard procedures.

RESULTS AND DISCUSSION

A perusal of the data presented in following tables clearly indicates that flowering and fruiting characteristics with growth parameters were significantly influenced with the foliar application of different nutrients.

Growth parameters

It is quite apparent from the data presented in Table 1 that the effect of foliar application of different nutrients on growth parameters of guava cv. L-49 was found significant. Per cent increase in plant height was recorded to be maximum (11.57%) under $ZnSO_4$ @1.00 per cent, which was significantly higher than all other treatments except Urea @2.0 per cent (11.42%) and $ZnSO_4$ @0.75 per cent (11.39%) and the minimum (9.83%) was recorded under control. Maximum increase (5.82%) in stem girth was recorded in the trees receiving $ZnSO_4$ @1.00 per cent closely followed by $ZnSO_4$ @0.75 per cent (5.75%), while the minimum (5.17%) was recorded under control. Increase in plant spread was recorded to be maximum (8.33 and 8.63%) under $ZnSO_4$ @1.00 per cent, closely followed by Urea @2.0 per cent (8.17 and 8.31%) and $ZnSO_4$ @0.75 per cent (8.14 and 8.20%), whereas the minimum (6.17 and 6.21%) was recorded under control in North-South and East-West directions, respectively. Average shoot length was recorded to be maximum (28.21 cm) under the treatment $ZnSO_4$ @1.00 per cent, which was statistically at par with $ZnSO_4$ @0.75 per cent (28.14 cm) and Urea @1.5 per cent (27.67 cm). While, minimum average shoot length (21.65 cm) was recorded under control treatment.

Table 1: Effect of foliar application of different nutrients on growth parameters of guava (*Psidium guajava* L.) cv. L-49

Treatment	Increase in plant height (%)	Increase in stem girth (%)	Increase in plant spread (%)		Average shoot length (cm)
			North- South	East- West	
$ZnSO_4$ (0.50%)	10.53	5.50	7.00	7.17	24.41
$ZnSO_4$ (0.75%)	11.39	5.75	8.14	8.20	28.14
$ZnSO_4$ (1.00%)	11.57	5.82	8.33	8.63	28.21
$FeSO_4$ (0.2%)	10.63	5.40	7.34	6.73	24.91
$FeSO_4$ (0.4%)	10.93	5.67	6.93	7.67	22.59
$FeSO_4$ (0.6%)	10.73	5.60	7.47	7.40	25.42
K_2SO_4 (0.5%)	10.23	5.40	6.50	7.00	23.59
K_2SO_4 (1.0%)	10.60	5.60	6.85	6.77	26.30
K_2SO_4 (1.5%)	10.47	5.54	7.03	7.28	25.88
Urea (1.0%)	10.73	5.43	6.95	8.10	24.42
Urea (1.5%)	11.34	5.70	7.96	7.82	27.67
Urea (2.0%)	11.42	5.73	8.17	8.31	27.41
Control	9.83	5.17	6.17	6.21	21.65
C.D. at 5%	0.21	0.09	0.23	0.48	0.61

The possible reason for increased vegetative growth of plant by application of zinc might be because zinc is required for the synthesis of tryptohan, which is a precursor of auxin that might have resulted in increased apical growth and thus increased height and spread[3] . The increment in plant height and stem girth with the foliar application of zinc, is in conformity with the findings of Kumar *et al.*[3], who observed an increase of 12.23 per cent in plant height with $ZnSO_4$ @0.03 per cent sprayed at fruit set stage and an increase of 14.26 per cent in stem girth with $ZnSO_4$ @0.01 per cent sprayed two weeks after fruit set stage in guava. The increment in average shoot length with the application of zinc is in conformity with the findings of Waskela *et al.*[10] who observed that shoot length of guava cv. Dharidar was significantly increased to a maximum (13.44 cm) with the foliar application of $ZnSO_4$ @0.75 per cent at par with $ZnSO_4$ @0.5 per cent. The results are further supported by the findings of Hada *et al.*[1] and Yadav *et al.*[11] in guava

Flowering and fruiting parameters

Number of flowers per branch

Data presented in Table 2 reveals that the number of flowers per branch was significantly improved with the foliar application of different nutrients. Maximum number of flowers per branch (19.66 and 14.74) was recorded with the foliar application of $ZnSO_4$ @1.00 per cent, which was significantly higher than all other treatments but statistically at par with $ZnSO_4$ @0.75 per cent (19.62 and 14.72) and Urea @2.0 per cent (19.61 and 14.49), while the minimum (16.08 and 11.77) was recorded under control, during rainy and winter seasons, respectively. Improvement in the number of flowers per branch as a result of foliar application of zinc might be due to enhanced photosynthetic and other metabolic activity which leads to an increase in various plant metabolites responsible for cell division and elongation[6] . The results are in conformity with the findings of Jat and Kacha[2] who observed numbers of flowers to be increased upto 5.30 in the plants treated with $ZnSO_4$ @0.6 per cent among various doses of urea and zinc sprayed on guava cv. Bhavnagar Red.

Days taken for fruit setting from flowering

It is quite apparent from the data presented in Table 2 that the number of days taken for fruit set from flowering was significantly influenced with different treatments, during both the seasons. It was recorded to be minimum (18.00 and 21.07 days) with $ZnSO_4$ @1.00 per cent, which was significantly lower than all other treatments except Urea @2.0 per cent (18.27 and 21.24 days) and $ZnSO_4$ @0.75 per cent (18.34 and

21.31 days), while it was found maximum (20.58 and 23.50 days) under control, during rainy and winter seasons, respectively.

Days taken for fruit to ripen

The data regarding days taken for fruit ripening from fruit set have been presented in Table 2. It is indicated that during rainy season, minimum number of days (94.90 and 119.2 days) were recorded with $ZnSO_4$ @1.00 per cent, which was closely followed by the treatment $ZnSO_4$ @0.75 per cent (94.92 and 119.4 days), while maximum number of days (98.84 and 123.4 days) were recorded under control, during rainy and winter seasons, respectively. The results are in accordance with the findings of Lal and Sen[4], who recorded the earliest fruit maturity (131.33 days) with foliar spray of $ZnSO_4$ in guava cultivar Allahabad Safeda in a field experiment conducted in Rajasthan.

Fruit set

A perusal of Table 3 shows that the effect of foliar application of nutrients on the fruit set in guava cv. L-49 was found significant, during both the seasons of experimentation. Maximum fruit set (61.17%), during rainy season was recorded under $ZnSO_4$ @1.00 per cent, which was significantly higher than all other treatments but statistically at par with $ZnSO_4$ @0.75 per cent (61.09%) and Urea @2.0 per cent (61.03%) and the minimum (55.19%) was recorded under control. In winter season also, maximum fruit set (70.24%) was recorded under $ZnSO_4$ @1.00 per cent, closely followed by $ZnSO_4$ @0.75 per cent (70.13%) and Urea @1.5 per cent (70.06%), while minimum fruit set per cent (64.07%) was recorded under control. Zinc seems to have helped to increase the fruit set either by improving pollen germination or by helping the growth of pollen tubes that facilitate timely fertilization before the stigma loses its receptivity or the style become non-functional[6]. This increase in fruit set per cent is in accordance with the findings of Hada *et al.*[1] who obtained an increased fruit set (77.78%) with $ZnSO_4$ @0.8 per cent among various doses of urea and zinc sprayed on guava cv. L-49. Similar trend of increase in fruit set were also obtained by Parmar *et al.*[6] and Yadav *et al.*[11] in guava.

Table 2: Effect of foliar application of different nutrients on flowering characters of guava (*Psidium guajava* L.) cv. L-49

Treatment	Rainy season			Winter season		
	Number of flowers /branch	Days to fruit setting	Days to maturity	Number of flowers /branch	Days to fruit setting	Days to maturity
$ZnSO_4$ (0.50%)	18.00	19.00	95.64	13.93	22.00	120.7
$ZnSO_4$ (0.75%)	19.62	18.34	94.92	14.72	21.31	119.4
$ZnSO_4$ (1.00%)	19.66	18.00	94.90	14.74	21.07	119.2
$FeSO_4$ (0.2%)	17.56	19.06	96.70	13.56	21.82	121.7
$FeSO_4$ (0.4%)	18.37	19.72	96.04	14.12	22.66	120.8
$FeSO_4$ (0.6%)	18.23	19.11	95.82	13.96	22.00	121.0
K_2SO_4 (0.5%)	17.39	19.66	96.48	13.71	22.33	121.9
K_2SO_4 (1.0%)	17.94	19.02	96.71	13.57	22.04	121.1
K_2SO_4 (1.5%)	17.92	19.12	96.61	14.07	21.77	121.3
Urea (1.0%)	18.07	19.25	96.73	14.11	22.34	121.8
Urea (1.5%)	19.50	18.69	95.00	13.94	21.67	119.6
Urea (2.0%)	19.61	18.27	95.26	14.49	21.24	119.4
Control	16.08	20.58	98.84	11.77	23.50	123.4
C.D. at 5%	0.45	0.62	0.27	0.54	0.36	0.29

Fruit drop

It is quite apparent from the data presented in Table 3 that during both the seasons of investigation, all the treatments were significant in minimizing the fruit drop. Minimum fruit drop (19.52 and 14.27%) was observed with the spray of $ZnSO_4$ @1.00 per cent, which was statistically at par with $ZnSO_4$ @0.75 per cent (19.63 and 14.33%) and Urea @1.50 per cent (19.70 and 14.39%), while the maximum fruit drop (24.71 and 18.22%) was recorded under control, during rainy and

winter seasons, respectively. The decreased fruit drop and more fruit retention due to zinc, might be because of the reason that zinc stimulates the synthesis of endogenous auxins and auxin prevent the formation of abscission layer and facillitate the ovary to remain attached with the shoot, resulting in lower fruit drop[6] . Highest reduction in fruit drop in plants sprayed with zinc might be probably due to auxin metabolizing role of zinc which perhaps antagonized the effect of ethylene and delayed synthesis of abscission layer[3]. The results are in line with the findings of Hada *et al.*[1], who obtained an reduced fruit drop (44.27%) with $ZnSO_4$ @0.8 per cent among various doses of urea and zinc sprayed on guava cv. L-49. The findings are further supported by Yadav *et al.*[11] and Kumar *et al.*[3],in guava.

Table 3: Effect of foliar application of different nutrients on fruit set, fruit drop and days to fruit maturity of guava (*Psidium guajava* L.) cv. L-49

Treatment	Rainy season			Winter season		
	Fruit set (%)	Fruit drop (%)	Yield (kg/tree)	Fruit set (%)	Fruit drop (%)	Yield (kg/tree)
$ZnSO_4$ (0.50%)	60.57	19.81	29.46	69.91	14.47	27.99
$ZnSO_4$ (0.75%)	61.09	19.63	32.36	70.13	14.33	29.03
$ZnSO_4$ (1.00%)	61.17	19.52	32.76	70.24	14.27	29.31
$FeSO_4$ (0.2%)	57.15	21.49	28.96	66.62	15.93	26.68
$FeSO_4$ (0.4%)	58.70	21.69	30.12	67.64	15.21	27.36
$FeSO_4$ (0.6%)	58.63	22.33	29.88	67.46	15.33	27.44
K_2SO_4 (0.5%)	57.12	21.89	28.72	66.63	15.68	25.96
K_2SO_4 (1.0%)	57.67	20.87	31.04	67.86	15.48	27.85
K_2SO_4 (1.5%)	57.83	21.07	30.66	67.71	15.60	27.92
Urea (1.0%)	59.21	20.13	29.50	68.37	14.80	27.03
Urea (1.5%)	60.91	19.70	32.19	70.06	14.39	28.92
Urea (2.0%)	61.03	19.89	31.94	69.99	14.49	28.52
Control	55.19	24.71	26.26	64.07	18.22	24.20
C.D. at 5%	0.18	0.24	0.61	0.20	0.17	0.52

Yield (kg/tree)

It is clear from Table 3 that almost during both the seasons of investigation, yield per tree was significantly improved with the foliar application of different nutrients. Maximum fruit yield per tree (32.76 kg/tree), during rainy season was obtained from the trees receiving foliar application dose of $ZnSO_4$ @1.00 per cent. The treatments $ZnSO_4$ @0.75 per cent (32.36 kg/tree) and Urea @1.5 per cent (32.19 kg/tree) were also found equally good and yield obtained under rest of the treatments was also significantly higher than the minimum under control (26.26 kg/tree). In winter season also, all the treatments significantly improved the yield over control. The maximum yield per tree (29.31 kg/tree) was recorded with $ZnSO_4$ @1.00 per cent, which was significantly higher than all other treatments except $ZnSO_4$ @0.75 per cent (29.03 kg/tree) and Urea @1.5 per cent (28.92 kg/tree). While, minimum yield per tree (24.20 kg/tree) was recorded under control. The possible reason behind the increased fruit yield might be cumulative effect of zinc that has helped in improving yield attributing characters like increase in flowering, fruit set, number and weight of fruits and decrease in fruit drop[2]. The results are in conformity with the findings of Waskela *et al*[10], who observed significant improvement in yield per plant with the foliar spray of zinc on guava cv. Dharidar and the maximum fruit yield (30.90 kg/tree) was recorded with the application of $ZnSO_4$ @0.75 per cent followed $ZnSO_4$ @0.5 per cent (30.60 kg/tree). The results are further supported by the findings of Kumar *et al.*[3], Manivannan *et al.*[5],Suman *et al.*[9], in guava.

REFERENCES

1. Hada, T.S., Singh, B.K., Veer, K. and Singh, S.P., Effect of different levels of boron and zinc on flowering, fruiting and growth parameter of winter season guava (*Psidium guajava* L.) cv. L-49. *The Asian Journal of Horticulture,* **9(1):** 53-56 (2014).
2. Jat, G. and Kacha, H.L, Response of guava to foliar application of urea and zinc on fruit set, yield and quality. *Journal of AgriSearch,* **1(2):** 86-91 (2014).
3. Kumar, J., Kumar, R., Rai, R. and Mishra, D.S., Response of 'Pant Prabhat' guava trees to foliar sprays of zinc, boron, calcium and potassium at different plant growth stages. *The Bioscan,* **10(2):** 495-498 (2015).
4. Lal, G. and Sen, N. L., Flowering and fruiting of guava (*Psidium guajava* L.) cv. Allahabad Safeda as influenced by application of nitrogen, zinc and manganese. *Journal of Eco-Physiology*, **5(3-4):** 87-91 (2002).
5. Manivannan, M.I., Irulandi, S. and Thingalmaniyan, K.S., Studies on the effect of pre-harvest application of plant growth regulators and chemicals on yield and quality of guava (*Psidium guajava* L.) cv. L-49. *International Journal of Agricultural Sciences*, **11(1):** 138-140 (2015).
6. Parmar, J.M., Karetha, K.M. and Rathod, P.J., Effect of foliar spray of urea and zinc on growth and flowering attributes of guava (*Psidium guajava*) cv. Bhavanagar Red. *Advance Research Journal of Crop improvement,* **5(2):** 140-143 (2014).
7. Rawat, V., Tomar, Y.K. and Rawat, J.M.S.,Influence of foliar application of micro-nutrients on fruit quality of guava cv. Lucknow-49. *Journal of Hill Agriculture,* **1**(1): 63-66 (2010).
8. Saxena, M. and Gandhi, C.P., Indian Horticulture Database 2014. National Horticulture Board. Ministry of Agriculture. Government of India (2015).
9. Suman, M., Dubalgunde, S.V., Poobalan, O. and Sangma, P.D., Effect of foliar application of micronutrients on yield and economics of guava (*Psidium guajava* L.) cv. L-49. *International Journal of Agriculture, Environment and Biotechnology*, **9(2):** 221-224 (2016).
10. Waskela, R.S., Kanpure, R.N., Kumawat, B.R. and Kachouli, B.K., Effect of foliar spray of micronutrients on growth, yield and quality of guava (*Psidium guajava* L.) cv. Dharidar. *International Journal of Agricultural Sciences,* **9(2):** 551-556 (2013).
11. Yadav, R.K., Ram R.B., Kumar, V., Meena, M.L. and Singh, H.S., Impact of micronutrients on fruit set and fruit drop of winter season guava (*Psidium guajava* L.) cv. Allahabad Safeda. *Indian Journal of Science and Technology,* **7(9):** 1451-1453 (2014).
12. Zaman, Q. and Schumann, A. W., Nutrient management zones for citrus based on variation in soil properties and tree performance. *Precision Agriculture*, **7(1):** 45-63 (2006).