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Effect of Soil Application of Zinc Sulphate and Ferrous Sulphate on Flowering and Fruiting Parameters of Guava Plants cv. Hisar Safeda under High Density Planting

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Abstract

The present experiment was undertaken to evaluate the effect of soil application of zinc sulphate and ferrous sulphate on flowering and fruiting parameters of 8 years old guava plants. Uniform plants planted at 6m X 2m spacing at Research Orchard of Department of Horticulture, CCS Haryana Agricultural University, Hisar were selected for the investigation. Maximum number of flowers per branch, fruit set and minimum days to fruit set, fruit drop and days to maturity were observed with 90 g zinc sulphate application treatment. Number of flowers, fruit set, fruit drop in both seasons and days to maturity in rainy season obtained optimum results with 20 g ferrous sulphate, while minimum values of days to fruit set in both seasons and days to maturity in rainy season were resulted with application of 30 g ferrous sulphate.

Key words : *soil application, zinc sulphate, ferrous sulphate, guava, flowers, fruit set, fruit drop, maturity.*

Introduction

Guava (*Psidium guajava* L.), a member of family Myrtaceae, native to tropical America, the apple of the tropics, is one of the most common fruits in India. Being very hardy, it gives an assured crop even with very little care (1). It is well known that the nutrients are applied to the fruit trees for the improvement of vegetative growth, flowering, correction of deficiency symptoms and increasing the yield. Most of the farmers apply fertilizers containing only macronutrients like N, P and K. Now-a-days, problem regarding deficiency of micronutrients is also being faced which is affecting the yield and quality of guava. Among these micronutrients, zinc and iron are most important. Although soil application of zinc and iron is potentially very efficacious but it is very unpopular. Zinc deficiency can inhibit the growth of fruit trees by impeding photosynthesis, carbon metabolism and respiration, which reduces the yield and quality of fruit. Iron deficiency inhibits vegetative growth and the formation of flower buds, affecting the number of buds and fruit set.

Research Methodology

The present experiment was conducted at the Research Orchard of Department of Horticulture, CCS Haryana Agricultural University, Hisar to study the effect of different levels of zinc sulphate (zero, 30, 60 and 90g/plant) and ferrous sulphate (zero, 10, 20 and 30g/plant) on leaf nutrient status of guava cv. Hisar Safeda. Uniform guava plants of 8 years age planted at 6m X 2m spacing were selected for this study. Three branches were selected in different directions on each tree and were tagged. Number of flowers was counted on these tagged branches in both the seasons. Heed contemplation was kept after flowering to check the precise date of fruit set and the number of days in both seasons were calculated for fruit setting from flowering. Fruit set and fruit drop were calculated according to the method suggested by (2). Number of days taken for fruits to mature from setting was calculated at firm ripe stage which is appropriate for analysis of quality parameters.

Results and Discussion

Number of flowers per branch : It is amply clear from data presented in Table-1 that zinc sulphate had significant effect on number of flowers per branch in both seasons. Maximum number of flowers per branch in rainy (35.00) as well as winter season (25.33) were produced with 90 g zinc sulphate dose which was found to be at par with 60 g zinc sulphate treatment and significantly higher than all other treatments, while minimum number of flowers per branch (31.67 and 21.75) were produced in control treatment in rainy and winter season respectively. Increase in number of flowers with increasing concentration of zinc may be due to significant increase in shoot number that ultimately ended in individual flower. The results obtained are in conformity with the results of (3) who revealed that flower number per shoot increased from 4.70 to 5.30 when zinc application was increased from 0.2 to 0.6 per cent. Similar results were obtained by (4) in guava.

Regardless of zinc sulphate treatment, ferrous sulphate also resulted in significant effect on number of flowers per branch in rainy season. Maximum number of flowers per branch (34.67) were produced on the trees

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Table-1 : Effect of zinc sulphate and ferrous sulphate on number of flowers per branch of guava cv. Hisar Safeda under high density planting.

$ZnSO_4$ (g/plant)	$FeSO_4$ (g/plant)									
	Rainy season					Winter season				
	0	10	20	30	Mean	0	10	20	30	Mean
Zero	30.33	31.33	32.67	32.33	31.67	20.67	21.33	22.67	22.33	21.75
30	31.67	32.67	34.33	33.67	33.08	21.67	22.67	24.67	23.67	23.17
60	33.33	34.33	35.67	35.33	34.67	23.33	24.33	26.33	25.33	24.83
90	33.67	35.00	36.00	35.33	35.00	24.00	25.00	26.67	25.67	25.33
Mean	32.25	33.33	34.67	34.17		22.42	23.33	25.08	24.25	
CD at 5%	Zn= 0.55, Fe= 0.55, Zn × Fe= NS					Zn= 0.54, Fe= 0.54, Zn × Fe= NS				

Table-2 : Effect of zinc sulphate and ferrous sulphate on days to fruit set of guava cv. Hisar Safeda under high density planting.

$ZnSO_4$ (g/plant)	$FeSO_4$ (g/plant)									
	Rainy season					Winter season				
	0	10	20	30	Mean	0	10	20	30	Mean
Zero	20.33	18.33	19.33	17.67	18.92	30.00	29.00	29.67	28.67	29.33
30	18.33	16.33	17.00	15.67	16.83	28.33	26.00	27.33	25.33	26.75
60	17.67	15.33	16.67	14.67	16.08	26.00	23.67	25.00	23.33	24.50
90	17.00	15.00	16.33	14.33	15.67	27.67	25.67	26.33	24.67	26.08
Mean	18.33	16.25	17.33	15.58		28.00	26.08	27.08	25.50	
CD at 5%	Zn= 0.56, Fe= 0.56, Zn × Fe= NS					Zn= 0.55,Fe= 0.55, Zn × Fe= NS				

Table-3 : Effect of zinc sulphate and ferrous sulphate on fruit setting (%) of guava cv. Hisar Safeda under high density planting.

$ZnSO_4$ (g/plant)	$FeSO_4$ (g/plant)									
	Rainy season					Winter season				
	0	10	20	30	Mean	0	10	20	30	Mean
Zero	55.97	56.83	58.23	57.83	57.22	71.37	72.77	73.37	73.10	72.65
30	56.93	57.77	58.97	58.53	58.05	73.23	74.20	75.30	74.93	74.42
60	58.80	59.60	60.70	60.07	59.79	73.80	75.07	76.30	75.97	75.28
90	59.03	59.90	60.97	60.57	60.12	74.13	75.40	76.63	76.27	75.61
Mean	57.68	58.53	59.72	59.25		73.13	74.36	75.40	75.07	
CD at 5%	Zn= 0.86,Fe= 0.86,Zn × Fe= NS					Zn= 1.01,Fe= 1.01,Zn × Fe= NS				

supplied with 20 g ferrous sulphate, which was at par with 30 g ferrous sulphate and significantly higher than all other treatments, while minimum (32.25) were produced with the control treatment. Ferrous sulphate gave significant effect on number of flowers per branch in winter season as well. Application of 20 g ferrous sulphate resulted in maximum number of flowers per branch (25.08) which is significantly higher than all other treatments, while minimum (22.42) were produced with the control treatment. Number of flowers per branch did not vary significantly due to interaction effect between different doses of zinc sulphate and ferrous sulphate, during both seasons (rainy and winter).

Days taken for fruit setting : The results pertaining to days taken for fruit setting during rainy season, showed significant results with zinc sulphate application (Table-2). Plants supplied with 90 g zinc sulphate took minimum number of days for fruit setting (15.67), which was closely followed by 60 g zinc sulphate dose and significantly lower than all the other treatments, while maximum number of days for fruit setting (18.92) were recorded in control treatment. Days taken for fruit setting showed significant results during winter season as well with different zinc sulphate application. Minimum number of days (24.50) was taken with 60 g zinc sulphate application which was significantly lower than all the other treatments, while maximum number of days (29.33) was taken in control treatment. The reason may be the involvement of zinc in improving pollen germination and increasing pollen tube growth which leads to early fertilization and ultimately resulting in early fruit set.

Irrespective of zinc sulphate application, ferrous sulphate also gave significant results with respect to days taken for fruit setting in both seasons. Minimum number of days (15.58 and 25.50) were taken with 30 g ferrous sulphate per plant in rainy and winter season, which was significantly lower than all the other treatments, while maximum days were taken in control treatment during rainy (18.33) as well as winter (28.00) season.

Table-4 : Effect of zinc sulphate and ferrous sulphate on f ruit drop (%) of guava cv. Hisar Safeda under high density planting.

$ZnSO_4$ (g/plant)	$FeSO_4$ (g/plant)									
	Rainy season					Winter season				
	0	10	20	30	Mean	0	10	20	30	Mean
Zero	26.03	23.57	23.93	24.77	24.58	12.37	11.67	10.93	11.00	11.49
30	24.97	22.77	23.10	24.03	23.72	11.80	11.17	10.63	10.63	11.06
60	24.57	22.43	22.77	23.73	23.38	11.50	10.67	10.03	10.03	10.56
90	24.23	22.10	22.33	23.40	23.02	11.20	10.37	9.70	9.73	10.25
Mean	24.95	22.72	23.03	23.98		11.72	10.97	10.33	10.35	
CD at 5%	Zn= 0.41, Fe= 0.41, Zn × Fe= NS					Zn= 0.30, Fe= 0.30, Zn × Fe= NS				

Table-5 : Effect of zinc sulphate and ferrous sulphate on days to maturity of guava cv. Hisar Safeda under high density planting.

$ZnSO_4$ (g/plant)	$FeSO_4$ (g/plant)									
	Rainy season					Winter season				
	0	10	20	30	Mean	0	10	20	30	Mean
Zero	100.7	99.00	98.33	97.3	98.83	120.7	118.7	117.3	118.3	118.8
30	97.7	96.33	95.33	94.67	96.00	117.7	116.3	114.7	115.3	116.0
60	96.33	95.33	94.33	93.67	94.92	115.3	114.3	112.0	113.3	113.8
90	95.67	94.67	93.67	92.67	94.17	115.0	113.7	111.7	112.3	113.2
Mean	97.58	96.33	95.42	94.58		117.2	115.8	113.9	114.8	
CD at 5%	Zn= 1.30,Fe= 1.30,Zn × Fe= NS					Zn= 1.37,Fe= 1.37,Zn × Fe= NS				

No significant results for days taken for fruit setting wer e recorded with the interaction between zinc sulphate and ferrous sulphate treatments, during both seasons (rainy and winter).

Fruit setting (%) : Data given in Table-3 shows the significant differences in fruit setting per cent in both seasons as affected by different applications of zinc sulphate. Fruit setting was found to be maximum (60.12% and 75.61%) with the application of 90 g zinc sulphate per plant in both seasons (rainy and winter), which was significantly higher than all other treatments except 60 g zinc sulphate, while minimum fruit setting was found in the control treatment in rainy (57.22%) as well as winter season (72.65%). The increase in fruit set with zinc sulphate application might be due to more availability of photosynthates and increased synthesis of tryptophan which serves as precursor for auxin synthesis and auxin is directly related with fruit set. Likewise, (5) reported maximum fruit set in ber with application of 300 g zinc sulphate per plant. Similar results were obtained by (6, 7, 8, 9) in pomegranate.

Irrespective of the zinc sulphate, ferrous sulphate also gave significant results with respect to fruit setting per cent during both seasons. Maximum fruit setting was observed when the trees were supplied with 20 g ferrous sulphate per plant in both rainy (59.72%) and winter season (75.40%), which was found to be on par with 30 g zinc sulphate treatment and significantly higher than all other treatments, while minimum fruit setting (57.68% and 73.13%) was observed in the control treatment in rainy and winter season respectively.

Interaction effect between different doses of zinc sulphate and ferrous sulphate was found to be non-significant, during both seasons (rainy and winter), for fruit setting.

Fruit drop (%) : The data presented in Table-4 reveals that zinc sulphate gave significant results with respect to fruit drop per cent during both seasons. Minimum fruit drop (23.02% and 10.25%) was observed with the application of 90 g zinc sulphate in rainy and winter season respectively, which was closely followed by 60 g zinc sulphate and significantly lower than all the other treatments, while maximum (24.58% and 11.49%) was observed in control treatment during both seasons (rainy and winter). Zinc has helped in fruit retention because zinc stimulates the synthesis of endogenous auxin, which prevents the abscission and facilitate the ovary to remain attached with the shoot resulting in lower fruit drop. The results are in line with the findings of (4) in guava. Similar results were observed by Singh (10) in grapefruit, (11) in sweet orange cv. Jaffa, (5) in ber, (12, 13, 14) in guava.

Ferrous sulphate gave significant results with respect to fruit drop in rainy season, irrespective of zinc sulphate treatments. Minimum fruit drop (22.72%) was observed with the application of 10 g ferrous sulphate, which was at par with 20 g ferrous sulphate and significantly lower than all the other treatments, while maximum fruit drop (24.95%) was observed under control

treatment. In winter season, minimum fruit drop (10.33%) was observed with the application of 20 g ferrous sulphate, which was significantly lower than all the other treatments, while maximum fruit drop (11.72%) was observed under control treatment.

No significant results were obtained with the interaction between zinc sulphate and ferrous sulphate treatments, during both seasons (rainy and winter).

Days taken for maturity : The data given in Table-5 regarding days taken for maturity of fruits in rainy season differed significantly due to application of different doses of zinc sulphate. Minimum days (94.17 and 113.2) were taken for maturity with 90 g zinc sulphate per plant in both seasons (rainy & winter), which was at par with 60 g zinc sulphate and significantly lower than all the other treatments, while maximum days for maturity (98.83 and 118.8) were taken in control treatment in rainy and winter season respectively. This might be due to the reason that zinc is involved in photosynthesis which results in metabolites increment leading to early maturity.

Application of ferrous sulphate also gave significant results during rainy season. Minimum days (94.58) were taken by trees for maturity, when they were supplied with 30 g ferrous sulphate, which was at par with 20 g ferrous sulphate and significantly lower than all the other treatments, while maximum days (97.58) were recorded under control treatment. In winter season also, application of ferrous sulphate gave significant results. Minimum days (113.9) were taken by trees for maturity when they were supplied with 20 g ferrous sulphate, which was found to be on par with 30 g ferrous sulphate and significantly lower than all the other treatments, while maximum days (117.2) were recorded under control treatment.

There was no variation found due to interaction effect of zinc sulphate and ferrous sulphate for days to maturity, during both seasons (rainy and winter).

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