Journal of Pharmacognosy and Phytochemistry
Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2019; SP2: 937-941

Dinesh Singh Dhakar
Department of Horticulture, College of Agriculture, Rajmata Vijayaraje Scindia Krishi Vishwavidyalaya., Gwalior, Madhya Pradesh, India

AK Barholia
Department of Horticulture, College of Agriculture, Rajmata Vijayaraje Scindia Krishi Vishwavidyalaya., Gwalior, Madhya Pradesh, India

Rajesh Jatav
Department of Horticulture, College of Agriculture, Rajmata Vijayaraje Scindia Krishi Vishwavidyalaya., Gwalior, Madhya Pradesh, India

Narendra Vasure
Department of Horticulture, College of Agriculture, Rajmata Vijayaraje Scindia Krishi Vishwavidyalaya., Gwalior, Madhya Pradesh, India

Correspondence
Dinesh Singh Dhakar
Department of Horticulture, College of Agriculture, Rajmata Vijayaraje Scindia Krishi Vishwavidyalaya., Gwalior, Madhya Pradesh, India

Effect of phosphorus and zinc sulphate on yield attributes and quality of guava (*Psidium guajava* L.) cv. Gwalior 27

Dinesh Singh Dhakar, AK Barholia, Rajesh Jatav and Narendra Vasure

Abstract
An experiment was conducted during 2013 to find out the effect of phosphorus, zinc sulphate and their combined effect on yield and quality of Guava (*Psidium guajava* L.) cv. G-27. The experiment was laid out in Randomized Block Design (RBD) with thirteen number of treatments replicated thrice in well established 15 years old plant of guava. There were four levels of phosphorus i.e., 300 g, 400 g, 500 g and 600 g., three levels of spray of zinc sulphate i.e., 0.25%, 0.50% and 0.75%, while the control plants received no fertilizer and no spray. The study revealed that 600 g phosphorus per plant, spray of 0.75% zinc sulphate (P_4xZn_3), followed by P_3 X Zn_3 (P_2O_5 500 g/ plant & $ZnSO_4$ @ 0.75 %) were found to be the best treatments for almost all yield and quality parameters of guava plant, for getting maximum yield with quality fruits in northern Madhya Pradesh.

Keywords: Guava, Phosphorus, Zinc sulphate, Yield, Quality.

1. Introduction
Guava (*Psidium* guajava L.), the apple of the tropics, which belongs to the family Myrtaceae, is an evergreen tree is one of the major fruit crops of India and is extensively grown in wide area of tropical, sub-tropical and some parts of arid regions of India because of its low cost of cultivation, more tolerant to drought and semiarid conditions as well as salinity problems. It has wide adaptability to varying soil and climatic conditions. It is a cheap and very rich source of vitamin-C, carbohydrate, iron, fat and contains a fair amount of calcium and phosphorus. Guava fruits are also used for preparation of salad, chutney, jam, jelly, nector etc. These qualities make guava an important and one of the most popular fruits of India. India is the leading producer of guava in the world.
Gwalior is an important region in Madhya Pradesh, where guava is widely grown and several guava orchards are found in and around the Gwalior district. However, yield and quality of the guava tree is influenced by a large number of factors. One of the important factors is inadequate supply of plant nutrients. Nutrient requirement of guava vary with varieties and agroclimatic conditions. It gives good response to manuring and fertilization. Out of various major nutrients, phosphorus plays extremely important role in guava cultivation for optimum yield and performance. Uses of micronutrients also play an important role to avoid hidden nutrient hunger. Zinc is one of the important micronutrients required for flowering, fruiting, yield and quality of fruits. Gwalior-27 is a popular variety in northern Madhya Pradesh but nutritional requirement of this variety has not been standardized so for.

Material and Methods
The experiment was conducted at orchard of Department of horticulture, College of Agriculture, Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior during the year 2013-14. The experiment was laid out in randomized block design with thirteen treatments including control replicated three times. The phosphorus was applied as basal dose prior to start of flowering in end of june, while single foliar spray of zinc sulphate was done after fruitset. The details of treatments are T_0 (Control), T_1 (Phosphorus @ 300 g + Zinc sulphate @ 0.25 %), T_2 (Phosphorus @ 300 g + Zinc sulphate @ 0.50 %), T_3 (Phosphorus @ 300 g + Zinc sulphate @ 0.75 %), T_4 (Phosphorus @ 400 g + Zinc sulphate @ 0.25 %), T_5 (Phosphorus @ 400 g + Zinc sulphate @ 0.50 %), T_6 (Phosphorus @ 400 g + Zinc sulphate @ 0.75 %), T_7 (Phosphorus @ 500 g + Zinc sulphate @ 0.25 %), T_8 (Phosphorus @ 500 g + Zinc sulphate @ 0.50 %), T_9 (Phosphorus @ 500 g + Zinc sulphate @ 0.75 %) and T_{10} (Phosphorus @ 600 g + Zinc sulphate @ 0.25 %), T_{11} (Phosphorus @ 600 g + Zinc sulphate @ 0.50 %), T_{12} (Phosphorus @ 600 g + Zinc sulphate @ 0.75 %). The various observations recorded during

the investigation were number of fruits per plant, weight of fruit (g), yield of fruit per plant (kg), yield per hectare (q), total soluble solid (^{0}Brix), titrable acidity (%) and ascorbic acid (mg/100g).

Result and Discussion

The data pertaining to various yield and quality parameters of the guava plant viz. number of fruits per plant, weight of fruit (g), yield of fruit per plant (kg), yield per hectare (q), total soluble solid (^{0}Brix), titrable acidity (%) and ascorbic acid (mg/100g) are given in [Table 1 and 2].

Yield attributing characters

Number of fruits per plant

The data presented in table 1, revealed that the number of fruits per plant was significantly affected by the application of phosphorus over the other level of treatments. The mean maximum number of fruits per plant (205.11) was recorded under P_4 P_2O_5 600 g/ plant, which was at par with the treatment P_2O_5 500 g/ plant (204), while the minimum number of fruits per plant (194.66) was recorded under the treatment P_2O_5 300 g/ plant respectively. The number of fruits per plant was significantly affected due to the spray of zinc sulphate over the other level of treatments. The mean maximum number of fruits per plant (208.33) was recorded under Zn_3 ($ZnSO_4$ @ 0.75 %), which was significantly superior to the other levels of $ZnSO_4$, respectively, while the minimum number of fruits per plant (189.00) was recorded under the treatment ZnSo4 @ 0.25 %. The interaction effect of phosphorus and zinc sulphate on number of fruits per plant was significantly influenced by the different combinations. (Table 2). The maximum number of fruits per plant (211.00) was recorded under treatment combinations P_4 **x** Zn_3 (P_2O_5 @ 600 g/ plant & $ZnSO_4$ @ 0.75 %), while the minimum number of fruits per plant (176.67) under the treatment combination P_1 **x** Zn_1 (P2O5 @ 300 g/ plant & $ZnSO_4$ @ 0.25 %) respectively.

Weight of fruit (g)

Data on fruit weight (g) presented in table 1 revealed that the weight of fruit was significantly increased by the application of phosphorus over the other level of treatments. The mean maximum weight of fruit (198.46 g) was recorded under P_2O_5 600 g/ plant, the treatment P_3 and P_2 was also showed good result (195.60 and 192.81 g), while the minimum weight of fruit (188.13 g) was recorded under the treatment P_2O_5 300 g/ plant respectively. The weight of fruit was significantly affected due to the spray of zinc sulphate over the other level of treatments. The mean maximum weight of fruit (209.06 g) was recorded under Zn_3 ($ZnSO_4$ @ 0.75 %), which was significantly superior to the other levels of $ZnSO_4$, while the minimum weight of fruit (177.31 g) was recorded under the treatment ZnSo4 @ 0.25 %. The interaction effect of soil application of phosphorus and foliar application zinc sulphate on weight of fruit was significantly influenced by the different combinations. (Table 2). The maximum weight of fruit (211.66 g) was recorded under treatment combinations P_4 **x** Zn_3 (P_2O_5 @ 600 g/ plant & $ZnSO_4$ @ 0.75 %), which was at par with the treatment P_3 **x** Zn_3 (P_2O_5 @ 500 g/ plant & $ZnSO_4$ @ 0.75 %) and P_2 **x** Zn_3 (P_2O_5 @ 400 g/ plant & $ZnSO_4$ @ 0.75 %), (209.70 And 209.32 g, respectively), while the minimum weight of fruit (168.12 g) was recorded under the treatment combination P_1 **x** Zn_1 (P_2O_5 @ 300 g/ plant & $ZnSO_4$ @ 0.25 %).

Yield of fruit per plant (kg)

Fruit yield (kg) per plant data presented in table 1, shows that the yield of fruits per plant was significantly increased by the application of phosphorus over the other level of treatments. The mean maximum yield of fruits per plant (40.77 kg) was recorded under P_2O_5 600 g/ plant which was at par with the treatment P_3 (P_2O_5 500 g/ plant) (39.97 kg), while the minimum yield of fruits per plant (36.81 kg) was recorded under the treatment P_2O_5 300 g/ plant, respectively. The yield of fruits per plant was significantly affected due to the spray of zinc sulphate over the other level treatment. The mean maximum yield of fruits per plant (43.56 kg) was recorded under Zn_3 ($ZnSO_4$ @ 0.75 %), which was significantly superior to the other levels of $ZnSO_4$, respectively. The treatment Zn_2 ($ZnSO_4$ @ 0.50 %) was showed better result (39.74 kg), while the minimum yield of fruits per plant (33.57 kg) was recorded under the treatment ZnSo4 @ 0.25 %. The interaction effect of phosphorus and zinc sulphate on yield of fruits per plant was significantly influenced by the different combinations. (Table 2). The maximum yield of fruits per plant (44.69 kg) was recorded under treatment combinations P_4 **x** Zn_3 (P_2O_5 @ 600 g/ plant & $ZnSO_4$ @ 0.75 %), which was at par with the treatment combinations P_3 **x** Zn_3 (P_2O_5 @ 500 g/ plant & $ZnSO_4$ @ 0.75 %) and P_2 **x** Zn_3 (P_2O_5 @ 400 g/ plant & $ZnSO_4$ @ 0.75 %) (44.04 and 43.33 kg, respectively), while the minimum yield of fruits per plant (29.70 kg) was obtained under the treatment combination P_1 **x** Zn_1 (P_2O_5 @ 300 g/ plant & $ZnSO_4$ @ 0.25 %), respectively.

Yield per hectare (q)

Data shown in table 1, the yield per hectare was significantly influenced by the application of phosphorus over the other level of treatments. The mean maximum yield per hectare (113.33 q) was recorded under P_4 (P_2O_5 600 g/ plant). The treatment P_3 also showed better result (111.10 q), while the minimum yield per hectare (102.32 q) was recorded under the treatment P_2O_5 300 g/ plant, respectively. The yield per hectare was significantly affected due to the spray of zinc sulphate over the other treatments. The mean maximum yield per hectare (121.09 q) was recorded under Zn_3 ($ZnSO_4$ @ 0.75 %), which was significantly superior to the other levels of $ZnSO_4$, while the minimum yield per hectare (93.31 q) was recorded under the treatment ZnSo4 @ 0.25 %. The interaction effect of phosphorus and zinc sulphate on yield per hectare was significantly influenced by the different combinations. (Table 2). The maximum yield per hectare (124.25 q) was recorded under treatment combinations P_4 **x** Zn_3 (P_2O_5 @ 600 g/ plant & $ZnSO_4$ @ 0.75 %), which was at par with the treatment combination P_3 **x** Zn_3 (P_2O_5 @ 500 g/ plant & $ZnSO_4$ @ 0.75 %) 122.42 q respectively, while the minimum yield per hectare (82.57 q) under the treatment combination P_1 **x** Zn_1 (P_2O_5 @ 300 g/ plant & $ZnSO_4$ @ 0.25 %).

Quality parameters

Total soluble solid (^{0}Brix)

Data presented in table 1, revealed that the TSS was not significantly affected by the application of phosphorus over the other level of treatments. The mean maximum TSS (10.74 ^{0}Brix) was recorded under P_2O_5 600 g/ plant, while the minimum TSS (9.61 ^{0}Brix) was recorded under the treatment P_2O_5 300 g/ plant respectively. The TSS was significantly affected due to the spray of zinc sulphate over the other treatment. The mean maximum TSS (10.54 ^{0}Brix) was

recorded under Zn_3 ($ZnSO_4$ @ 0.75 %), which was significantly superior to the other levels of $ZnSO_4$ respectively, while the minimum TSS (9.65 ^{0}Brix) was recorded under the treatment ZnSo4 @ 0.25 %. The interaction effect of phosphorus and zinc sulphate on TSS was not significantly influenced by the different combinations. (Table 2). The maximum TSS (11.11 ^{0}Brix) was recorded under treatment combinations P_4 **x** Zn_3 (P_2O_5 @ 600 g/ plant & $ZnSO_4$ @ 0.75 %), while the minimum TSS (8.50 ^{0}Brix) under the treatment combination P_1 **x** Zn_1 (P_2O_5 @ 300 g/ plant & $ZnSO_4$ @ 0.25 %), respectively.

Titrable acidity (%)

The titrable acidity (table 1) was not significantly affected by the application of phosphorus over the other level of treatment. The mean maximum titrable acidity (0.69 %) was recorded under P_2O_5 400 g/ plant and P_2O_5 300 g/ plant while the minimum titrable acidity (0.68 %) was recorded under the treatment P_2O_5 600 g/ plant and P_2O_5 500 g/ plant, respectively. The titrable acidity was not significantly affected due to the spray of zinc sulphate over the other treatment. The mean maximum titrable acidity (0.69 %) was recorded under Zn_2 ($ZnSO_4$ @ 0.50 %) and Zn_1 ($ZnSO_4$ @ 0.25 %), while the minimum titrable acidity (0.68 %) was recorded under the treatment ZnSo4 @ 0.75 %, respectively. The interaction effect of phosphorus and zinc sulphate on titrable acidity was not significantly influenced by the different combinations. (Table 2). The minimum titrable acidity (0.67 %) was recorded under treatment combinations P_1 **x** Zn_3 (P_2O_5 @ 300 g/ plant & $ZnSO_4$ @ 0.75 %), P_4 **x** Zn_2 (P_2O_5 @ 600 gm/plant & $ZnSO_4$ @ 0.50 %) and P_4 **x** Zn_1 (P_2O_5 @ 600 g/ plant & $ZnSO_4$ @ 0.25 %), while the maximum titrable acidity (0.71 %) under the treatment combination P_1 **x** Zn_1 (P_2O_5 @ 300 g/ plant & $ZnSO_4$ @ 0.25 %), respectively.

Ascorbic acid (mg/100g)

Data on ascorbic acid (mg/100g) (table 1), presented that the ascorbic acid was not significantly increased by the application of phosphorus over the other level of treatments. The mean maximum ascorbic acid (152.60 mg/100 g) was recorded under P_2O_5 600 g / plant, while the minimum ascorbic acid (148.61 mg/100 g) was recorded under the treatment P_2O_5 300 g/ plant respectively. The ascorbic acid content was significantly affected due to the spray of zinc sulphate over the other treatments. The mean maximum ascorbic acid (156.85 mg/100 g) was recorded under Zn_3 ($ZnSO_4$ @ 0.75 %), while the minimum ascorbic acid (145.21 mg/100 g) was recorded under the treatment $ZnSo_4$ @ 0.25 % respectively. The interaction effect of phosphorus and zinc sulphate on ascorbic acid was not significantly influenced by the different combinations. (Table 2). The maximum ascorbic acid acidity (158.54 mg/100 g) was recorded under treatment combinations P_4 **x** Zn_3 (P_2O_5 @ 600 g/ plant) while the minimum ascorbic acid (144.54 mg/100 g) under the treatment combination P_1 **x** Zn_1 (P_2O_5 @ 300 g/ plant & $ZnSO_4$ @ 0.25 %), respectively.

Discussion

Effect of Phosphorus

Yield attributing parameters

The data pertaining various yield attributing parameters of the guava plant viz; number of fruits per plant, weight per fruit, yield of fruits per plant (kg) and yield per hactare were significantly improved by the soil application of phosphorus. The maximum number of fruits per plant (205.11), weight per fruit (198.46 g), yield per plant (40.77 kg) and yield per hectare (113.33 q) were recorded under the treatment P_4 (P_2O_5 600 g/ plant), which were significantly superior to other levels of P_3 (P_2O_5 500 g/ plant), P_2 (P_2O_5 400 g/ plant), P_1 (P_2O_5 300 g/ plant), while, the minimum number of fruits per plant (194.66), weight per fruit (188.13 g), yield per plant (36.81 kg) and yield per hectare (102.32 q) noted under P_1 (P_2O_5 300 g/ plant). These findings are in agreement with those reported by Chaplin and Westood, (1980) [5].

Quality characters

The chemical parameters of guava fruits were not significantly influenced by the soil application of phosphorus. The maximum TSS (10.54 ^{0}Brix), was recorded under P_4 (P_2O_5 600 g/ plant) and minimum P_1 (P_2O_5 300 g/ plant), titrable acidity (0.69 %) were recorded under the treatment P_2 (P_2O_5 400 g/ plant) and P_1 (P_2O_5 300 g/ plant) and ascorbic acid content (152.60 mg/ 100 g), whereas, minimum TSS (9.61 ^{0}Brix) was recorded under P_1 (P_2O_5 300 g/ plant). The minimum titrable acidity (0.68 %) were recorded under the treatment P_3 (P_2O_5 500 g/ plant) and P_4 (P_2O_5 600 g/ plant). These findings are in agreement with those reported by Shuman, (1998) [15] and Van den Driessche, (2002) [18].

Effect of zinc sulphate

Yield attributing parameters

The data pertaining to various yield attributing parameters of the guava plant viz; fruit length, fruit width, number of fruits per plant, weight of fruit, yield of fruit per plant and yield per hectare were significantly increased by the various sprays of zinc sulphate. The increased fruit length (6.90 cm), fruit width (6.89 cm) and maximum number of fruits per plant (208.33), weight of fruit (209.06 g), yield per plant (43.56 kg) and yield per hectare (121.09 q) were recorded under the treatment Zn_3 ($ZnSO_4$ @ 0.75 %), which were significantly superior to the other levels of Zn ($ZnSO_4$ @ 0.25 %, $ZnSO_4$ @ 0.50%) whereas, the minimum number of fruits per plant (189.00), weight of fruit (177.31 g), yield per plant (33.57 kg) and yield per hectare (93.31q) were recorded under Zn_1 ($ZnSO_4$ @ 0.25 %). The increase in fruit yield due to the increased growth and yield parameters may be due to the increased auxin production. Zinc acts as catalyst in the oxidation and reduction processes and is also of great importance in the sugar metabolism which might have improved the physical characters of guava fruit and thus increased the yield per tree. Heavier fruits under zinc treatment might be due to the high level of auxin in the various parts of the fruit maintained by zinc application. The role of Zn in production of auxins is well known. The increase in the fruit weight by zinc spray was due to the significant increase in the fruit width and length. The increase in the yield under the effect of zinc sprays might be due to the fact that zinc is universally claimed to be an essential micro nutrient and it is considered indispensable for the growth of all organisms (Arora & Singh, 1970 b) [1]. Mansour and Sied (1981) [9] reported that foliar spray of zinc at 0.5 and 1.0 per cent concentrations increased fruit set, reduced pre-harvest abscission and increased yield; at picking time fruit characters were good. Effect of zinc spray on yield have earlier been also reported by Mansour and Sied (1981) [9], Pandey *et al.* (1988) [11], Sharma *et al.* (1991) [14], Dahiya *et al.* (1993) [6], Kundu and Mitra (1999) [8], Balakrishnan (2000) [2], Balakrishnan (2001) [3], Bhatia *et al.* (2001) [4], Meena *et al*. (2005) [10] and Tiwari and Shant (2010) [17] in guava.

Quality characters

The quality parameters of guava fruits were significantly improved by the spray of zinc sulphate. The maximum TSS (10.74 ^{0}Brix) was recorded under treatment Zn_3 ($ZnSO_4$ @ 0.75%), which were significantly superior to the other levels of Zn ($ZnSO_4$ @ 0.25%, $ZnSO_4$ @ 0.50%), while minimum TSS (9.65 ^{0}Brix). The maximum titrable acidity (0.69 %) was recorded under the treatments Zn ($ZnSO_4$ @ 0.25% & $ZnSO_4$ @ 0.50%), while the minimum was recorded under the treatment Zn_3 ($ZnSO_4$ @ 0.75%). The maximum ascorbic acid mg/ 100 g (156.85 g) was recorded under the treatments Zn_3 ($ZnSO_4$ @ 0.75 %), while the minimum was recorded under the treatment Zn_1 ($ZnSO_4$ @ 0.25%). The enhanced physical growth parameters of guava fruits may be due to the fact that Zn acts as catalyst in the oxidation and reduction process and is also of great importance in sugar metabolism. The acid under the influence of zinc might have either been fastly converted into sugars and their derivatives by the reactions, involving the reversal of glycolytic pathway or be used in respiration or both. Decrease in acidity due to zinc spray is in agreement with the observations of Rajput and Chand (1976) [13]. Singh and Chhonkar (1983) [16] recorded significant increase in total soluble solids, reducing sugar and ascorbic acid content in 'Mrig-bahar' guava pulp with foliar spray of 0.4 per cent zinc sulphate solution over control. Increase in sugar by zinc might be due to the active enzymatic reaction like transformation of carbohydrates, activity of hexokinase and formation of cellulose. This present investigation finds support from Pandey *et al*. (1988) [11] and Prasad *et al*. (2005) [12] in guava.

Interaction effect of phosphorus and zinc sulphate

Yield attributing Parameters

The combined application of phosphorus and zinc sulphate showed great improvement in yield attributing characters of guava. The maximum number of fruit (211.66) was obtained under P_4 X Zn_3 (P_2O_5 600 g/ plant & $ZnSO_4$ @ 0.75 %) and minimum number of fruit (176.67) obtained with P_1 X Zn_1 (P_2O_5 300 g/ plant & $ZnSO_4$ @ 0.25 %). The higher weight per fruit (211.15 g), yield per plant (44.69 kg) and yield per hectare (124.25 q) was noted under P_4 X Zn_3 (P_2O_5 600 g/ plant & $ZnSO_4$ @ 0.75 %) whereas, the minimum weight per fruit (168.12 g), yield per plant (29.70 kg) and yield per hectare (82.57 q) noticed under P_1 X Zn_1 (P_2O_5 300 g/ plant & $ZnSO_4$ @ 0.25 %).

Quality characters

The chemical parameters of guava fruits were not significantly improved by the combined application of phosphorus and zinc sulphate over the lower concentrations. The maximum TSS (11.11 ^{0}Brix) was found in treatment combination P_4 X Zn_3 (P_2O_5 600 g/ plant & $ZnSO_4$ @ 0.75 %) and minimum (8.50 ^{0}Brix) was found in P_1 X Zn_1 (P_2O_5 300 g/ plant & $ZnSO_4$ @ 0.25 %). The maximum titrable acidity (0.70) was found in treatment P_1 X Zn_2 (P_2O_5 300 g/ plant & $ZnSO_4$ @ 0.50 %) and P_2 X Zn_2 (P_2O_5 400 g/ plant & $ZnSO_4$ @ 0.50 %) whereas the minimum (0.67 %) was in P_1 X Zn_3, P_4 X Zn_2 and P_4 X Zn_3. The increase in T.S.S. under the influence of micronutrients might be due to hydrolysis of complex polysaccharides into simple sugars, synthesis of metabolites and rapid translocation of photosynthetic products and minerals from other parts of plant to developing fruits. Several workers observed similar results as, Ghosh (1986) [7], Balakrishnan (2000) [2] and Balakrishnan (2001) [3] in guava.

Table 1: Effect of phosphorus and zinc sulphate on yield and quality parameters of guava.

Treatments	Number of fruits per plant)	Weight of fruit (g)	Yield of fruit per plant (kg)	Yield per hectare (q)	Total soluble solid (^{0}Brix)	Titrable acidity (%)	Ascorbic acid (mg/100g)
Phosphorus							
P_1 300g/plant	194.66	188.13	36.81	102.32	9.61	0.69	148.61
P_2 400g/plant	197.88	192.81	38.28	106.43	10.15	0.69	150.37
P_3 500g/plant	204.00	195.60	39.97	111.10	10.45	0.68	152.16
P_4 600g/plant	205.11	198.46	40.77	113.33	10.54	0.68	152.60
S.Em.±	0.420	0.666	0.157	0.437	0.310	0.012	2.096
C.D. at 5%	1.22	1.937	0.457	1.270	NS	NS	NS
$ZnSO_4$							
Z_1 0.25%/ plant	189.00	177.31	33.57	93.31	9.65	0.69	145.21
Z_2 0.50% plant	203.91	194.88	39.74	110.49	10.17	0.69	150.76
Z_3 0.75% plant	208.33	209.06	43.56	121.09	10.74	0.68	156.85
S.Em.±	0.363	0.577	0.136	0.378	0.268	0.010	1.815
C.D. at 5%	1.058	1.678	0.396	1.099	0.771	NS	5.277

Table 2: Interaction effect of phosphorus and zinc sulphate on yield and quality parameters of guava.

Treatments		Number of fruits per plant)	Weight of fruit (g)	Yield of fruit per plant (kg)	Yield per hectare (q)	Total soluble solid (^{0}Brix)	Titrable acidity (%)	Ascorbic acid (mg/100g)
Interaction (PXZ)								
$T_{(1)}$	P_1Z_1	176.67	168.12	29.70	82.57	8.50	0.71	144.54
$T_{(2)}$	P_1Z_2	202.66	190.20	38.55	107.16	9.92	0.70	146.64
$T_{(3)}$	P_1Z_3	204.66	206.06	42.17	117.25	10.42	0.67	154.66
$T_{(4)}$	P_2Z_1	185	175.00	32.37	90.00	9.91	0.69	144.81
$T_{(5)}$	P_2Z_2	201.66	194.12	39.15	108.83	10.11	0.70	149.64
$T_{(6)}$	P_2Z_3	207.00	209.32	43.33	120.45	10.43	0.68	156.66
$T_{(7)}$	P_3Z_1	196	182.03	35.68	99.18	10.08	0.68	145.22
$T_{(8)}$	P_3Z_2	206.00	195.07	40.18	111.71	10.27	0.68	153.73

$T_{(9)}$	P_3Z_3	210	209.70	44.04	122.42	11.01	0.69	157.54
$T_{(10)}$	P_4Z_1	198.33	184.08	36.51	101.50	10.12	0.69	146.26
$T_{(11)}$	P_4Z_2	205.33	200.16	41.10	114.26	10.38	0.67	153.02
$T_{(12)}$	P_4Z_3	211.66	211.15	44.69	124.25	11.11	0.67	158.54
S.Em.±		0.727	1.154	0.272	0.757	0.536	0.021	3.631
C.D. at 5%		2.116	3.356	0.791	2.201	NS	NS	NS

Conclusion

It is concluded that soil application of phosphorus and foliar spray of zinc sulphate and their interaction had significantly improved the Yield and chemical parameters of guava. Individual spray of phosphorus i.e. P_4 (P_2O_5 600 g/ plant) followed by P_3 (P_2O_5 500 g/ plant), and individual spray of zinc sulphate i.e. Zn_3 ($ZnSO_4$ @ 0.75 %) followed by Zn_2 ($ZnSO_4$ @ 0.50 %) were found to be the best treatments for almost yield and quality parameters of guava plant. In the interaction effect of phosphorus and zinc sulphate, the treatment P_4 X Zn_3 (P_2O_5 600 g/ plant & $ZnSO_4$ @ 0.75 %) followed by P_3 X Zn_3 (P_2O_5 500 g/ plant & $ZnSO_4$ @ 0.75 %) were found to be the best treatments for almost yield and quality parameters of guava plant.

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