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Effect of foliar spray of nutrients on fruiting and yield attributes of guava (*Psidium guajava* L.)

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Abstract

The present investigation was conducted at the Regional Horticultural Research Station, ASPEE College of Horticulture, Navsari Agricultural University, Navsari, Gujarat during the year 2021-22 on guava cv. VNR Bihi. The experiment was laid out in a completely randomized design with three repetitions and nine treatments which include a foliar spray of nutrients like 1.0 % urea, 1.5 % urea, 2.0 % urea, 0.4 % $ZnSO_4$, 0.6 % $ZnSO_4$, 0.8 % $ZnSO_4$, 0.5 % boron, 1.0 % boron and compared with control (water spray). Foliar sprays of nutrients were given in second fortnight of June and 20 days after the first spray. The result revealed that maximum fruit set (74.37 %) at marble stage, fruit retention (68.70 %) at harvesting stage, number of fruits per tree (52.33), average fruit weight (447.86 g), marketable fruit yield (21.08 kg tree-1 and 35.15 t ha^{-1}), fruit length (9.03 cm), fruit diameter (9.72 cm), fruit volume (472.67 cm^3) and minimum fruit drop (31.30 %) were recorded in foliar spray of 0.8 % $ZnSO_4$ in guava cv. VNR Bihi.

Keywords: Guava, VNR Bihi, Urea, $ZnSO_4$, Boron.

INTRODUCTION

Guava (*Psidium guajava* L.) is an important fruit crop of India. It is also known as "Apple of Tropics". It belongs to the order Myrtales and family Myrtaceae. The guava tree flowers thrice in a year *i.e.* February, June-July and October - November depending upon climatic conditions. The respective *bahars* are called *Ambe*, *Mrig* and *Hasta bahar*. Among all of these *bahars*, *Mrig bahar* crop gives fruits during winter. The main objective of crop regulation is to force the tree to rest and produce profuse blossoms and fruits during any one of the two or three flushes. To get the winter crop it is necessary to regulate flowering by restricting irrigation, exposing the roots, deblossoming, pruning and bending of twigs. Higher amounts of fertilizers need to be applied to the soil because some amount of fertilizers lost through leaching and some amount of fertilizers become unavailable to the plants owing to complex chemical processes. Boron also plays an important role in flowering, fruiting, photosynthesis, hormone movement, cell division, differentiation and development, sugar translocation, pollen germination, pollen tube growth and active salt absorption (Baranwal *et al.*, 2017) [2]. Urea is a source of nitrogen, an essential primary macro-nutrient for the plants. Nitrogen is an important constituent of protoplasm and was helpful in chlorophyll formation there by increasing the photosynthetic activity of leaves. The photo assimilates were translocated to the shoots, which resulted in an increase in number of flowers per shoot, fruit set percentage, number of fruits per shoot and reduction of fruit drop which leads to higher fruit yield per tree (Kumar *et al*., 2017) [10]. Zinc (Zn) is an essential micro element for plants. The Guava crop is very responsive to Zn nutrient. A foliar spray of zinc resulted in maximum fruit retention and minimum fruit drop due to zinc is required for the synthesis of tryptophan, which is a precursor of auxin (IAA) and stimulates the synthesis of endogenous auxin which prevents the abscission (Yadav *et al*., 2017) [22]. Keeping the above in view, an investigation was carried out to analyse the effect of foliar spray of nutrients on fruiting and yield attributes of guava.

MATERIALS AND METHODS

The present investigation was conducted at the Regional Horticultural Research Station, ASPEE College of Horticulture, Navsari Agricultural University, Navsari, Gujarat during the year 2021-22 on guava cv. VNR Bihi. Five-year-old guava trees were selected and uniform cultural practices were done during the course of investigations. The trees were planted at a distance of 3 m × 2 m. The experiment was laid out in a completely randomized design with three repetitions and nine treatments which include foliar spray

of nutrients *viz.*, T_1: 1.0 % urea, T_2: 1.5 % urea, T_3: 2.0 % urea, T_4: 0.4 % $ZnSO_4$, T_5: 0.6 % $ZnSO_4$, T_6: 0.8 % $ZnSO_4$, T_7: 0.5 % boron, T_8: 1.0 % boron and T_9: control (water spray). The foliar sprays of nutrients were given in second fortnight of June and 20 days after first spray. Pruning of guava trees was done during first week of May and RDF (250-250-300 g NPK plant^{-1} with 10 kg FYM) was applied after pruning. Observation of fruit set (%) at the marble stage, fruit retention (%) at harvesting stage and fruit drop (%) at harvesting stage were calculated by following formula.

$$\text{Fruit set (\%) at marble stage} = \frac{\text{Number of set fruit at marble stage}}{\text{Number of flowers}} \times 100$$

$$\text{Fruit retention (\%) at harvesting stage} = \frac{\text{Number of fruits at harvesting stage}}{\text{Number of fruits set at marble stage}} \times 100$$

$$\text{Fruit drop (\%) at harvesting stage} = \frac{(A - B)}{A} \times 100$$

A: Total number of fruit set at marble stage
B: Total number of fruits at harvesting stage

The number of fruits per tree, average weight of fruit, fruit length and diameter, fruit volume, fruit yield (kg tree^{-1} and t ha^{-1}) were recorded during experiment and statistical analysis of data were carried out as per the method prescribed by Panse and Sukhatme (1985) [12].

RESULTS AND DISCUSSION

Fruiting parameters

A perusal of the data given in Table 1 revealed the maximum fruit set at the marble stage (74.37 %), fruit retention at the harvesting stage (68.70 %) and minimum fruit drop at the harvesting stage (31.30 %) were recorded in a foliar spray of 0.8 % $ZnSO_4$ (T_6) which was statistically at par with treatment T_5, T_7, T_3 and T_4. However, the minimum fruit set (58.58 %), minimum fruit retention (52.43 %) and maximum fruit drop (47.57 %) at the marble stage were recorded in control (T_9). Increased fruit set might be due to foliar application of zinc inducing vegetative growth such as the emergence of more vegetative flush and increasing the leaf area that ultimately increases the photosynthetic rate. Zinc plays an important role in the translocation of carbohydrates; auxin synthesis to sink; and increases pollen viability and fertilization (Jatav *et al*., 2016) [6]. It may reduce fruit drop and increase fruit retention by stimulating the synthesis of endogenous auxins and increased auxin concentration at the distal end of fruits, which prevent the formation of the abscission layer and allow the fruit to remain attached to the shoot, resulting in lower fruit drop (Parmar *et al*., 2014 and Hada *et al*., 2014) [4, 13]. These results are in close conformity with the earlier report Hada *et al.* (2014) [4], Kumar *et al.* (2015) [9], Patel and Singh (2021) [14], Sau *et al.* (2018) [17], Yadav *et al.* (2017) [21] and Yadav *et al.* (2017) [22] in guava; Mahida *et al.* (2018) [11] in mango.

Table 1: Effect of foliar spray of nutrients on fruit set (%), fruit retention (%) and fruit drop (%) of guava cv. VNR Bihi

Treatments	Fruit set (%)	Fruit retention (%)	Fruit drop (%)
T_1	52.58 (63.04)	50.03 (58.73)	39.97 (41.27)
T_2	54.27 (65.83)	50.56 (59.59)	39.44 (40.41)
T_3	56.46 (69.38)	52.50 (62.85)	37.50 (37.15)
T_4	55.46 (67.80)	51.17 (60.66)	38.83 (39.34)
T_5	58.44 (72.54)	53.81 (65.10)	36.19 (34.90)
T_6	59.66 (74.37)	56.00 (68.70)	34.00 (31.30)
T_7	58.33 (72.36)	54.52 (66.27)	35.48 (33.73)
T_8	54.30 (65.89)	50.08 (58.78)	39.92 (41.22)
T_9	49.96 (58.58)	46.40 (52.43)	43.60 (47.57)
S.Em. ±	1.74	1.61	1.61
C.D. at 5 %	5.17	4.80	4.80
C.V. %	5.43	5.41	7.30

Values in parenthesis are original values, whereas outside parenthesis are arcsine transformed values

Yield parameters

The data presented in Table 2 indicated that the maximum number of fruits per tree (52.33) was found with foliar application of 0.8 % $ZnSO_4$ (T_6), which was statistically at par with treatment T_5. It might be due to zinc, which has helped in more fruit retention per shoot, which results in an increased number of fruits per plant (Tirkey *et al.*, 2018) [19]. The maximum average weight of fruit (447.86 g) was also recorded in the same treatment, which was statistically at par with T_7, T_5, T_8, T_3 and T_4. This might be due to zinc spray's significant increase in the fruit width and length because zinc is reported to regulate the semi-permeability of cell walls, thus mobilising more water into the fruits (Pippal *et al*., 2019) [16]. While minimum number of fruits per tree (44.67) was recorded in 1.0 % boron (T8) and the minimum average weight of fruit (360.23 g) was noted in control (T9). It is evident from the data that maximum fruit yield (21.08 kg tree^{-1} and 35.15 t ha^{-1}) was found in 0.8 % $ZnSO_4$ (T_6), which was statistically at par with T_5 and T_7. However, the minimum Marketable fruit yield (16.26 kg tree^{-1} and 27.10 t ha^{-1}) was noted in control (T_9). The possible reason behind the increased fruit yield might be the cumulative effect of zinc that has helped in improving yield attributing characteristics like an increase in flowering, fruit set, number and weight of fruits and a decrease in fruit drop (Jat and Kacha, 2014) [5]. Furthermore, zinc acts as a catalyst in the oxidation and reduction processes and is also of great importance in sugar metabolism, which might have improved the physical characteristics of guava fruit and thus increased the yield per tree (Pippal *et al*., 2019) [16]. The similar findings were observed by Arshad and Ali (2016) [1], Patel and Singh (2021) [14], Patle *et al.* (2019) [15], Pippal *et al.* (2019) [16], Sau *et al.* (2018) [17], Singh *et al.* (2017) [18] and Zagade *et al*. (2017) [23] in guava; Kumar *et al.* (2017) [8] in aonla; Mahida *et al.* (2018) [11] in mango.

Physical parameters

The data presented in Table 2 indicated that maximum fruit diameter (9.72 cm) and fruit length (9.03 cm) were observed in 0.8 % $ZnSO_4$ (T_6), which was statistically at par with T_7, T_5, T_8, T_4 and T_3. The same treatment also gave maximum fruit volume (472.67 cm^3), which was statistically at par with T_5, T_7 and T_8. Whereas, the minimum fruit length (7.52 cm), fruit diameter (8.18 cm) and fruit volume (407.33 cm^3) were noted in control (T_9). This increase in length, diameter and volume of guava fruit may be because mineral nutrients (Boron and zinc) appeared to have an indirect role in hastening the process of cell division and cell elongation due to which size, weight and volume would have improved (Yadav *et al*., 2017) [21]. Similar results for the physical parameters were

reported by Arshad and Ali (2016) [1], Goswami *et al.* (2012) [3], Sau *et al.* (2018) [17], Singh *et al.* (2017) [18], Waskela *et al.* (2013) [20] and Yadav *et al.* (2017) [21] in guava; Kamei *et al.* (2019) [7] and Zaman *et al.* (2019) [24] in citrus.

Table 2: Effect of foliar spray of nutrients on fruit physical and yield parameters of guava cv. VNR Bihi

Treatments	Number of fruits per tree	Average weight of fruit (g)	Marketable fruit yield (kg tree^{-1})	Marketable fruit yield (t ha^{-1})	Fruit length (cm)	Fruit diameter (cm)	Fruit volume (cm^3)
T_1	45.67	375.37	16.69	27.82	7.96	8.42	410.67
T_2	46.00	397.04	17.17	28.62	8.17	8.53	413.33
T_3	46.33	404.69	17.33	28.88	8.19	8.74	415.33
T_4	46.67	401.22	18.14	30.24	8.22	8.82	418.33
T_5	49.67	441.42	20.35	33.93	8.72	9.49	457.33
T_6	52.33	447.86	21.08	35.15	9.03	9.72	472.67
T_7	47.33	443.12	19.91	33.19	8.81	9.62	456.00
T_8	44.67	436.30	18.31	30.51	8.35	8.90	449.67
T_9	45.33	360.23	16.26	27.10	7.52	8.18	407.33
S.Em. ±	1.52	16.70	0.85	1.42	0.29	0.34	15.74
C.D. at 5 %	4.53	49.63	2.53	4.22	0.86	1.01	46.77
C.V. %	5.60	7.02	8.04	8.04	6.00	6.61	6.29

CONCLUSION

Owing to the results obtained during this experiment, it can be concluded that pruning of guava trees during first week of May, foliar spray of 0.8 % $ZnSO_4$ in second fortnight of June and 20 days after first spray gave the best results in terms of fruiting parameters (*i.e.*, fruit set at marble stage, fruit retention and fruit drop at harvesting stage), yield parameters (*i.e.*, marketable fruit yield, average fruit weight and number of fruits per tree) and fruit physical parameters (fruit length, fruit diameter and fruit volume).

Conflict of Interest

There is no conflict of interest.

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