Current Horticulture 13(3): 73–76, July–September 2025
DOI: 10.5958/2455-7560.2025.00046.2
Received: 29 November 2023; Accepted; 11 February 2025

Response of foliar feeding of nutrients on quality attribute of guava (*Psidium guajava*)

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Abstract

The experiment was conducted at Department of Fruit Science. K.N.K. College of Horticulture, Mandsaur,during 2017-18,factorial randomized block design replicated three times. The treatment consisted of two factor (A) variety V_1- Chittidar, V_2- Allahabad Safeda and factor (B) nine levels of nutrients- N_0- control, N_1-zinc sulphate @ 0.3%, N_2- zinc sulphate @ 0.4%,N_3- calcium nitrate @ 1%,N_4- calcium nitrate @ 2%,N_5 -potassium sulphate @ 1%,N_6- potassium sulphate @ 2%,N_7- boron @ 0.2%,N_8- boron @ 0.4%. Among, varieties, maximum TSS (11.59^{0}Brix) and non-reducing sugar (4.39%) were found in Chittidar (V_1) and maximum, TSS/Acid ratio (36.79) , reducing sugar (5.62%) and ascorbic acid (156.84 mg/100 pulp)was recorded in Allahabad Safeda (V_2) and the minimum acidity (0.32%) in Allahabad Safeda (V_2). The maximum, TSS (12.60^{0}Brix), non-reducing sugar (4.56%) and TSS/ acid ratio (43.77)were observed in N_6potassium sulphate @ 2%, maximum reducing sugar (5.74%), ascorbic acid,(170.28mg/100 pulp) and total sugar (9.68%) in N_8 (boron@0.4%) and minimum, acidity (0.28%) was recorded in N_2 (zinc sulphate @0.4%).

Keywords: Guava, Nutrients, Variety, Quality, Foliar feeding, Reducing sugar and Non-reducing sugar.

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Guava (*Psidium guajava* L.) is the fourth most important fruit crop in area and production (Anjanawe *et al.,* 2024). Foliar feeding of nutrients is advantageous in terms of low application rate, uniform distribution of fertilizer material and quick response to applied nutrients as stated by Dongre *et al.* (2022). 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 growth and development of plant, quality produce and uptake of major nutrients as stated by Zagade *et al.* (2020). Hence an experiment was conducted.

MATERIALS AND METHODS

The experiment was conducted on eleven year old well-established guava orchard planted at 6.0 m × 6.0 m spacing during 2017-18 Guava Chittidar and Allahabad Safeda were used. This experiment was laid out in factorial randomized block design with three replications comprising eighteen treatments including two variety V_1- Chittidar, V_2- Allahabad Safeda and nine levels of nutrients- N_0- control, N_1-zinc sulphate @ 0.3%, N_2- zinc sulphate @ 0.4%,N_3- calcium nitrate @ 1%,N_4- calcium nitrate @ 2%,N_5 -potassium sulphate @ 1%,N_6- potassium sulphate @ 2%,N_7- boron @ 0.2%,N_8- boron @ 0.4%. The nutrients were applied through foliar spray on 25 September 2017 in guava plant. The observations on quality attributes were recorded as per standard procedures. Hand refractometer was used for determination of TSS in ^{0}Brix. The percent titrable acidity was estimated by simple acid / alkaline titration method as described in AOCC (1984) .The ascorbic acid was estimated as per Assay method given by (Ranganna, 1986) . The reducing sugar, total sugar per cent in fruit juice was estimated by the method as suggested by (Nelson, 1944) and non-reducing sugar is estimated by subtracting of reducing sugar in total sugar.

RESULTS AND DISCUSSION

The minimum acidity (0.32%) was observed in Allahabad Safeda (V_2) and maximum (0.33%) in Chittidar (V_1). The minimum, acidity (0.28%) was recorded in N_2 (zinc sulphate @0.4%) and maximum (0.38%) in N_0 (control)(Table-1 and Figure-1). Among, treatment combinations, minimum, acidity (0.25%) was recorded in V_2N_2 (Allahabad Safeda with zinc sulphate@0.4%) and maximum (0.40%) in V_2N_0 (Allahabad Safeda with control). It might be due to lower acidity in fruits due to higher accumulation of sugar, better translocation of sugar into fruit tissues conversion of organic acids into sugars. Similar finding have also been reported by Jat and Kacha (2014), Kumar *et al.* (2015) and Kumar *et al.* (2017).

Among, varieties maximum TSS (11.59^{0}Brix) was found in Chittidar (V_1) and minimum,TSS (11.35^{0}Brix) in Allahabad Safeda (V_2). The maximum, TSS (12.60^{0}Brix) in N_6 (potassium sulphate @ 2%) and the minimum (9.83^{0}Brix) in N_0 (control). Among, treatment combinations, significantly highest TSS (12.67^{0}Brix) was recorded in treatment V_1N_6 (Chittidar with potassium sulphate@2%),followed by V_2N_6 (Allahabad Safeda

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with potassium sulphate@2%) with respect to TSS (12.57^{0}Brix). The minimum (9.74^{0}Brix) was found in V_1N_0 (Chittidar with control).It might be due to highest TSS in those due to, potassium has predominant role in translocation of photo-assimilates; sugar and soluble solids, which are responsible for increased TSS (Table-1 and Figure-1). The present results regarding TSS are in accordance with the findings of Kumar *et al.* (2015), Choudhary *et al.* (2017) and Kumar *et al.* (2017).

The total soluble solids/acid ratio was significantly found during investigation. With respect to variety maximum, TSS/acid ratio (36.79) was recorded in Allahabad Safeda (V_2) and minimum (35.09) in Chittidar (V_1).Among, foliar application of nutrients highest TSS/ acid ratio (43.77) was observed in N_6 (potassium sulphate @ 2%) and minimum (25.25) in N_0 (control) (Table-1 and Figure-1). Among the treatment combination of variety and nutrients, significantly highest, TSS/Acid ratio (47.62) was recorded in V_2N_6 (Allahabad Safeda with potassium sulphate@2%) followed by V_2N_2 (Allahabad Safeda with zinc sulphate@0.4%) with respect to TSS/Acid ratio (45.34). The minimum (25.66) was found in V_1N_0 (Chittidar with control). It might be due to increase TSS/acid ratio is due to consistent decrease in acid content and increase in TSS resulted into an increase in TSS/acid ratio. It may be due to that the increased sugar and reduced leaf starch content, which was due to more transformation of starch into sugar and its translocation into the fruits. These results are conformity with the finding of Kumar *et al.* (2009) in litchi and Kumar *et al.* (2017).

The maximum reducing sugar (5.62%) was found in Allahabad Safeda (V_2) and minimum (5.02) was found in V_1 (Chittidar) (Table-2 and Figure-2). With respect to nutrients maximum reducing sugar (5.74%) was recorded in N_8 (boron@0.4%) and minimum (4.85) in N_6 (potassium sulphate @ 2%). The interactions study of varieties and nutrients, maximum reducing sugar(5.78%) was obtained in the treatments V_2N_8 (Allahabad Safeda with boron@0.4%), followed by V_1N_8 (Chittidar with boron@0.4%) with respect to reducing sugar (5.71%). The minimum (4.16) in V_1N_6 (Chittidar with potassium sulphate@2%). The results are in agreement with the earlier findings of Kaur and Dhillon (2006), Dutta and Banik (2007) and Bhatt *et al.* (2025).

The maximum non-reducing sugar (4.39%) was recorded in the variety of Chittidar (V_1) and minimum (3.75%) in Allahabad Safeda (V_2). With respect to nutrients maximum non-reducing sugar (4.56%) was recorded in N_6Potassium sulphate @ 2% and minimum (3.57%) in N_0 control (Table-2 and Figure-2). The interactions of varieties and nutrients, the results found that significantly higher non- reducing sugar (5.18%) was recorded in V_1N_6 (Chittidar with potassium sulphate @2%), followed by V_1N_4 (Chittidar with Calcium nitrate @ 2%) (5.17%). The minimum in V_2N_0 (Allahabad Safeda with control). The results are in agreement with the earlier findings of Dutta and Banik (2007), Kumar *et al.* (2015) and Nehra and Malik (2024).

The maximum total sugar (9.41%) was recorded in Chittidar (V_1) and minimum (9.37) was found in Allahabad Safeda (V_2). With respect to nutrients, maximum total sugar (9.68%) was observed in N_8 (boron@0.4%) and minimum (9.03%) in N_0 (control). The treatment combinations of variety and nutrients was found non-significant the highest total sugar (9.73%) in V_1N_8 (Chittidar with boron@0.4%), followed by V_2N_8(Allahabad Safeda) 9.64%(Table-2 and Figure-2).The higher percentage of total sugar, reducing and non-reducing sugar might have been due to efficient translocation of photosynthesis to the fruits by regulation of boric acid. The positive effects of boron on reducing sugar are in agreement with the findings of Dutta and Banik (2007), Bhatt *et al.* (2012), Kumar *et al.* (2015) and Parmar *et al.* (2020).

The maximum ascorbic acid (156.84mg/100 pulp) was found in the variety of Allahabad Safeda (V_2) and minimum (154.43mg/100 pulp) in Chittidar (V_1) (Table-2 and Figure-2). The maximum (170.28mg/100 pulp) was observed in N_8 (boron@0.4%) and minimum (136.09mg/100 pulp) in N_0 (control). The interactions of varieties and nutrients, the results was found non-significant the higher ascorbic acid (173.15mg/100 pulp) was recorded in V_2N_8 (Allahabad Safeda with Boron @ 0.4%.), followed by V_2N_7 (Allahabad Safeda with Boron @ 0.2%) 169.20mg/100 pulp. The minimum (133.66mg/100 pulp) in V_1N_0 (Chittidar with control).It might be due to augmentation of ascorbic acid percentage of guava fruit might have been due to higher synthesis of nucleic acid, on account of maximum availability of plant metabolism. The result of present study are closely conformity with the findings of Awasthi and Lal (2009), Yadav *et al.* (2011), Bhatt *et al.* (2012) , Baranwal *et al.* (2017).

CONCLUSION

Thus, concluded the variety and nutrients and their combinations significantly influenced the quality attributes and treatment combinations, the maximum TSS (12.67^{0}Brix) and non reducing sugar (5.18%) were found in V_1N_6 (Chittidar with potassium

sulphate@2%) and minimum in V_2N_0 (Allahabad Safeda with control).

Table 1: Effect of foliar application on quality attribute of guava.

Treatment	Acidity (%)	TSS (°Brix)	TSS/Acid ratio
Varieties			
V_1	0.33	11.59	35.09
V_2	0.32	11.35	36.79
S.Em±	0.005	0.03	0.27
CD at 5%	0.014	0.11	0.78
Nutrients			
N_0	0.38	9.83	25.25
N_1	0.29	11.83	40.43
N_2	0.28	11.69	42.00
N_3	0.34	11.08	32.59
N_4	0.31	11.20	35.68
N_5	0.30	12.13	39.79
N_6	0.29	12.60	43.77
N_7	0.37	10.81	29.01
N_8	0.34	12.02	34.89
S.Em±	0.01	0.08	0.58
CD at 5%	0.03	0.24	1.67
Interactions			
V_1N_0	0.38	9.74	25.66
V_1N_1	0.31	11.97	37.81
V_1N_2	0.30	11.90	38.68
V_1N_3	0.33	11.17	33.52
V_1N_4	0.32	11.37	34.83
V_1N_5	0.32	12.13	38.00
V_1N_6	0.31	12.67	39.94
V_1N_7	0.36	10.90	30.00
V_1N_8	0.33	12.57	37.35
V_2N_0	0.40	9.93	24.85
V_2N_1	0.27	11.70	43.05
V_2N_2	0.25	11.48	45.34
V_2N_3	0.34	11.00	31.66
V_2N_4	0.30	11.03	36.54
V_2N_5	0.29	12.13	41.59
V_2N_6	0.26	12.64	47.62
V_2N_7	0.38	10.74	28.04
V_2N_8	0.35	11.48	32.43
S.Em±	0.015	0.11	0.82
CD at 5%	0.043	0.34	2.36

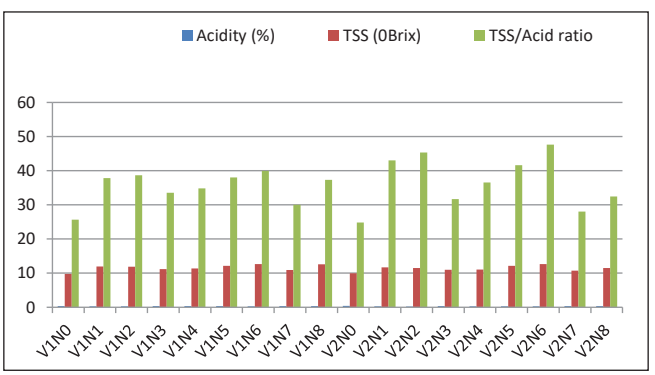

Fig. 1 Effect of foliar application on quality attribute of guava

Table 2: Effect of foliar application on quality attribute of guava

Treatments	Reducing sugars (%)	Non-reducing sugars (%)	Total sugars (%)	Ascorbic acid (mg/100 pulp)
Varieties				
V_1	5.02	4.39	9.41	154.43
V_2	5.62	3.75	9.37	156.84
S.Em±	0.08	0.009	0.05	0.78
CD at 5%	0.25	0.026	NS	2.26
Nutrients				
N_0	5.46	3.57	9.03	136.09
N_1	5.63	3.65	9.28	161.49
N_2	5.69	3.86	9.55	164.10
N_3	4.89	4.43	9.33	147.20
N_4	5.06	4.51	9.57	150.14
N_5	4.86	4.41	9.27	150.33
N_6	4.85	4.56	9.41	155.35
N_7	5.66	3.68	9.35	165.86
N_8	5.74	3.94	9.68	170.28
S.Em±	0.19	0.019	0.11	1.66
CD at 5%	0.54	0.055	0.32	4.79
Interactions				
V_1N_0	5.44	3.63	9.07	133.66
V_1N_1	5.62	3.77	9.39	161.54
V_1N_2	5.69	3.90	9.59	162.89
V_1N_3	4.23	5.04	9.27	147.10
V_1N_4	4.50	5.17	9.67	150.44
V_1N_5	4.21	4.93	9.14	149.07
V_1N_6	4.16	5.18	9.33	155.18
V_1N_7	5.65	3.82	9.47	162.53
V_1N_8	5.71	4.02	9.73	167.42
V_2N_0	5.49	3.51	9.00	138.53
V_2N_1	5.64	3.54	9.18	161.44
V_2N_2	5.70	3.81	9.51	165.32
V_2N_3	5.56	3.83	9.39	146.95
V_2N_4	5.62	3.86	9.48	149.84
V_2N_5	5.51	3.90	9.41	151.60
V_2N_6	5.55	3.95	9.50	155.53
V_2N_7	5.69	3.54	9.23	169.20
V_2N_8	5.78	3.86	9.64	173.15
S.Em±	0.26	0.027	0.16	2.36
CD at 5%	0.77	0.078	NS	NS

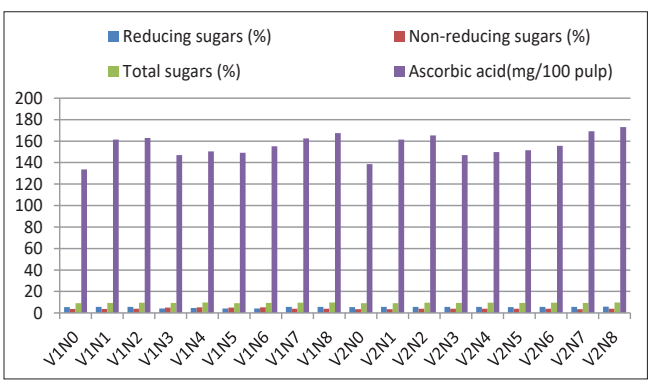

Fig.2 Effect of foliar application on quality attribute of guava

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