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EFFECT OF FOLIAR APPLICATION OF NUTRIENTS ON PHYSICAL ATTRIBUTES OF GUAVA (*PSIDIUM GUAJAVA* L.) CV. L-49

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Abstract–The present investigation entitled "Effect of foliar application of nutrients on physical attributes of guava cv. L-49" was carried out at Department of Horticulture, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani during the year 2018-19. The experiment was laid out in Randomized Block Design with eleven treatments with replicated thrice. The details of treatments are T_1- Urea @ 0.5%, T_2- Urea @ 1%, T_3- Potassium sulphate @ 0.5%, T_4- Potassium sulphate @ 1%, T_5- Borax @ 0.5%, T_6- Borax @ 0.5%, T_7- Zinc sulphate @ 0.5%, T_8- Zinc sulphate @ 1%, T_9- Ferrous sulphate @ 0.5%, T_{10}- Ferrous sulphate @ 1%, T_{11}- Control. The maximum Number of flowers per shoot (8.43), fruit set (69.15%), fruit retention (66.23%) observed with foliar application of borax 1% (T_6) was similarly, fruit length (7.10 cm), fruit breadth (6.48 cm), average weight of fruit (209.17 g), fruit volume (192.21 ml), pulp weight (202.86 g), pulp percent (96.98 %), seed weight and pulp to seed ratio (1.32.20) was also recorded with foliar application of Borax @ 1% (T6). Whereas, the minimum values for all attributes were recorded under control (T_{11}).

INTRODUCTION

Guava (*Psidium gaujava* L.), the ''Apple of tropics'' and ''Poor man's apple'' is one of the most popular fruits grown in tropical, sub-tropical and some parts of arid regions of India. The fruit belongs to the family Myrtaceae. It is the fifth most important fruit in the area after mango, citrus, banana and apple and fifth most important fruit in the production after banana, mango, citrus and papaya. It's has gained considerable prominence owing to its high nutritive value and is a rich source of vitamin C along with minerals like iron, calcium and phosphorus. It also contains substantial quantities of carbohydrates, sugar and pectin, pleasant aroma, good flavor and availability at moderate price makes it an ideal fruit for nutritional security. Though this crop is hardiest in nature and adoptable to variety of soil and agro-climatic condition, it gives good response to the nutrition in increasing fruit production.

The total area under its cultivation in India is 261.7 ha. with an annual production of 3648.2 MT and productivity of 13.9 MT/ha, (Anomy, 2017). National Horticultural Board, India exports 1,425.39 MT of guava to the countries such as Shrilanka, Nepal, USA, Netherland and Malaysia for 618.97 lacs Rs.

For higher production timely nutrient application is mandatory. Role of major as well as minor nutrients is well understood. Generally, major nutrients are applied with a care but, the micronutrients are not much given importance. In high density planting as the plant population is more per unit area. The requirement of nutrients is also supposed to be more. It has been observed that, standardization of nutrient application of major nutrients as per requirement is carried on an adhoc basis, micronutrient play an important role in production and its deficiency leads in lowering the productivity. Guava plants also shows micronutrients deficiency and could be responsible for lesser yield and quality. Foliar feeding of nutrients to fruit plants has gained much importance in recent years which is quite economical and obviously an ideal way of evading

the problems of nutrients availability and supplementing the fertilizers to the soil. Nutrients like Nitrogen, phosphorus and potassium play a vital role in promoting the plant vigour and productivity, whereas micronutrients like zinc, boron and iron perform a specific role in the growth and development of plant experiment and of undertaken to find out suitable micronutrient for guava quality produce.

MATERIALS AND METHODS

The experiment was conducted on well-established orchard of 5 years old which are planted at 2.5 X 3 m spacing under high density planting was carried out 2018 -19 during mrig bahar season at Department Horticulture, College of Agriculture, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani. The experiment was laid out in Randomized Block Design (RBD) with three replication and eleven treatments viz., T_1- Urea @ 0.5%, T_2- Urea @ 1%, T_3- Potassium sulphate @ 0.5%, T_4- Potassium sulphate @ 1%, T_5- Borax @ 0.5%, T_6- Borax @ 0.5%, T_7- Zinc sulphate @ 0.5%, T_8- Zinc sulphate @ 1%, T_9- Ferrous sulphate @ 0.5%, T_{10}- Ferrous sulphate @ 1%, T_{11}- Control**.** The foliar application of these treatments was done on also reported at 35 and 70 days after flowering. Observations were recorded for Number of flowers per shoot, fruit set, fruit retention, fruit size (length and breadth), weight, volume, seed weight,pulp weight and pulp percent and pulp to seed ratio. The data was analysed stastically and presented in tables as per methods suggested (*Panse and Sukhatme,* 1985).

Fruit set: It was calculated as number of fruit set, divided by number of flowers appeared. It expressed in percentage.

Fruit set (%) = No. of fruit set / No. of flower appeared X 100

Fruit retention (%): It was computed as number of fruits retained till maturity, divided by number of fruit set and expressed in percentage.

Fruit retention (%) = No. of fruit reaches at till maturity / No. of fruit set X 100

Pulp (%): Measuring the weight of fruit and after cutting the fruit measuring the weight of pulp of fruit was recorded with electric weighing balance.

Pulp (%) = Weight of fruit / Weight of pulp X 100

Pulp: seed ratio: Pulp: Seed Ratio

The pulp and seed were separated from ripe fruit and pulp and seeds were weighed separately on digital balance. The ratio was calculated by dividing the value of weight of pulp with the value of weight of seed.

Pulp: seed ratio = Weight of pulp / Weight of seed

RESULTS AND DISCUSSION

Number of flowers per shoot

Data presented in Table 1 indicated that, treatments do not affect significantly on number of flowers per shoot regarding physical attributes in presented under appropriate heading and discussed with available literature of below.

The treatments were applied after flowering to increase the fruit set, fruit retention etc. (Kumar *et al.,* 2017).

Fruit set (%)

Data presented in Table 1 regarding fruit set percentage indicated that, treatments affected significantly on fruit set. Significantly maximum fruit set (69.15%) was recorded by foliar application of borax @ 1% (T_6) which was at par with treatment T_8 (68.22%), T_{10} (67.27%) and T_7 (67.15%), however minimum fruit set (54.69%) percentage was recorded in T_{11}. Significantly maximum fruit set percentage in treatment T_6 is due to foliar application of borax @ 1%, which plays an important role in translocation of carbohydrates auxin synthesis to the sink and increased in pollen viability and fertilization.

More fruit set is due to foliar application of boron 1% which helps to increase the fruit set either by improving pollen germination or by helping the growth of pollen tubes hence fertilized in timely fertilization before the stigma loses its receptivity or style becomes non-functional. Hence, maximum fruit set percentage was observed in guava (Yadav *et al.*, 2014; Parmar *et al.*, 2014; Yadav *et al.*, 2017; Shreekant *et al.*, 2017).

Fruit retention (%)

Significantly highest fruit retention (66.23%) was observed by foliar application of borax 1% (T_6) which was at par with treatment T_8 (65.97%) and lowest fruit retention (57.71%) was recorded in control significantly maximum fruit retention was observed with foliar application ofborax @ 1%and which was at par with zinc sulphate @ 1%, more fruit retention in these treatments is due to more fruit setting percentage as compared to control and other treatments.

Table 1. Effect of foliar application of nutrients on physical attributes of guava cv. L-49

Tr.no.	Treatments	No. of flowers per shoot	Fruit set(%)	Fruit retention (%)	Fruit length (cm)	Fruit breadth (cm)	Average Weight of fruit (g)	Fruit volume (ml)	Pulp weight (g)	Pulp (%)	Seed weight (g)	Pulp to seed ratio
T_1	Urea @ 0.5%	8.03	66.11	59.20	5.60	5.72	148.01	136.11	142.01	95.94	6.12	1: 23.72
T_2	Urea @ 1%	7.31	66.46	61.04	5.80	6.14	153.99	144.79	147.54	95.80	6.18	1: 24.34
T_3	Potassium sulphate @ 0.5%	6.33	65.27	64.15	4.32	4.82	139.17	126.22	132.90	95.49	6.27	1: 21.48
T_4	Potassium sulphate @ 1%	6.23	65.45	65.15	4.72	5.57	145.54	134.70	138.77	95.34	6.17	1: 22.96
T_5	Borax @ 0.5%	7.71	68.18	63.32	6.50	5.91	179.27	164.19	173.24	96.63	6.03	1: 28.73
T_6	Borax @ 1%	8.43	69.15	66.23	7.10	6.48	209.17	192.21	202.86	96.98	6.30	1: 32.20
T_7	Zinc sulphate @ 0.5%	7.40	67.15	63.28	6.12	5.96	167.38	158.16	160.90	96.12	6.37	1: 25.16
T_8	Zinc sulphate @ 1%	8.25	68.22	65.97	6.74	6.36	187.15	172.89	180.70	96.55	6.40	1: 28.33
T_9	Ferrous sulphate @ 0.5%	7.10	58.50	54.74	5.00	5.27	142.39	130.01	136.17	95.62	6.22	1: 21.90
T_{10}	Ferrous sulphate @ 1%	7.04	67.27	64.35	5.40	5.41	158.08	142.36	151.54	95.85	6.29	1: 24.26
T_{11}	Control	6.14	54.69	57.71	4.10	4.07	124.82	114.22	118.33	94.73	6.49	1: 18.41
	S.E.±	0.77	0.37	0.35	0.12	0.26	4.20	2.70	1.92	4.55	0.37	0.40
	C.D at 5%	NS	1.11	1.05	0.36	0.79	12.41	7..99	5.67	13.44	1.11	NS

It means borax and zinc play vital role in fruit retention and pollen germination and pollen tube growth, promote the auxin synthesis in plant system which might be delayed the formation of abscission layer during early stages of fruit development in guava (Shreekant *et al.*, 2017; Yadav *et al.*, 2017 and Baranwal *et al.*, 2017).

Days to first harvesting

Data presented in Table 2 and illustrated in Fig. 4, indicated that, significantly minimum days to first harvesting (103.70) was recorded in treatment T_6 which was statistically at par with treatment T_7 (112.90), T_{10} (113.10), T_4 (117.70), T_3 (118.40) and T_2 (119.10) maximum days to first harvesting (120.40) was recorded in control.

Significantly minimum days to first harvesting were observed in all treatments as compared to control. It means foliar application of nutrients play a vital role in fruit set, fruit retention and fruit development and ultimately fruit harvesting.

The earlyharvesting might be due to borax which reduce maturity duration which is enzymatic reaction, cell division as well in growth.These results are in conformity with the findings in guava (Chander *et al.*, 2017).

Fruit length (cm)

As per Table 3, significantly maximum fruit length (7.10 cm) was recorded in the treatment T_6 (borax @ 1%) which was statistically at par with treatment T_8 (6.74 cm) and minimum fruit length (4.10 cm) was recorded in control.

The treatment T_6 (Borax 1%) was recorded maximum percent increase (73.33%) over control and minimum (5.52%) was record in T_3 (Potassium sulphate @ 0.5%). It means foliar application of nutrients particularly borax and zinc increase fruit length, width or breadth.

It seems that foliar sprays of boron improved the length of fruit which might have brought beneficial effects on regulated the cell wall permeability, thereby allowing more mobilization of water. Same result was obtained in guava (Shreekant *et al.*, 2017; Yadav *et al.*, 2017; Baranwal *et al.*, 2017).

Fruit breadth (cm)

Data presented in Table 3 indicated that, treatments were affected significantly with respect to fruit breadth. The foliar application of Borax @ 1% was recorded maximum fruit breadth (6.48 cm) which was at par with treatment T_2 (6.14 cm), T_7 (5.96 cm),

T_5 (5.91 cm) and T_1 (5.72 cm). However minimum fruit breadth (4.07 cm) was recorded in T_{11}.

It means maximum percent increasing in fruit breadth (59.21%) over control was observed in borax 1% and minimum percent increase over control in T_3 (Potassium sulphate @ 0.5%).

The foliar spray of micro nutrients in the present investigation might be because it improves the internal physiology of developing fruit in terms of better supply of water, nutrients and other compounds vital for their growth and development (Shreekant *et al.*, 2017; Yadav *et al*., 2017; Baranwal *et al.,* 2017).

Average weight of fruit (g)

The foliar application of nutrients at the time of flowering on guava was found to be significant (Table 1). Maximum average weight of fruit (209.17 g) was record by foliar application of borax 1% (T_6) which was (67.57%) more as compared to control and which was statistically superior over rest of the treatments.

The higher fruit weight in treatment T_6 might be due to more accumulation of carbohydrates, dry matter in fruits and increase in cell division, cell elongation and sugar metabolism.

This increase in average weight of fruit with foliar application of borax 1% is in guava (Arrora *et al*., 1972; Yadav *et al*., 2017) and in pomegranate (Tanuja *et al*., 2016).

Fruit volume (ml)

From Table 1, it was observed that, the nutrients affected significantly on fruit volume. The foliar application of borax @ 1% (T_6) was recorded significantly highest fruit volume (192.21 ml) *i.e.,* 68.28% more as compared to control, which was followed by treatment T_8 (172.89ml) *i.e.* 51.37% more as compared to control and significantly minimum fruit volume (114.22 ml) was recorded in T_{11}(control).

The maximum volume which plays important role in borax involvement of cell division, cell expansion and increased volume of intracellular space in mesocarpic cells.

Similarly, fruits of treatment T_6 have maximum fruit length, breadth and average weight of fruit, hence volume is more as compared to other treatments in guava (Shreekant *et al.*, 2017; Yadav *et al.*, 2017; Baranwal *et al.*, 2017).

Pulp weight (g)

Data presented in Table 1 regarding Pulp weight as influenced by foliar application of nutrients was found to be significant. Significantly maximum pulp weight (202.86 g) was found in the treatment T_6 which was followed by treatment T_8 (180.70 g) and minimum pulp weight (118.33 g) was recorded in control.

The in foliar application of borax recorded maximum percent increase in pulp weight (71.43%) over control, which was significantly highest and minimum percent increase in pulp weight was observed in T_3, significantly maximum pulp weight is done to maximum fruit weight, fruit volume as compared to other treatments and control. This may be due to borax which helps in active enzymatic reaction like transformation of carbohydrates, activity of hexokinase and formation of cellulose in guava (Kumar *et al.*, 2017, Singh *et al.*, 2018).

Pulp (%)

Significantly maximum pulp percent (96.98%) was observed in treatment T_6 which was at par with treatment T_8 (96.55%), T_7 (96.12%), and T_1 (95.94%) however significantly minimum pulp percent (94.73%) was recorded in T_{11}.This may be due to boron which plays an important role in more absorption of water, nutrients and increase the volume of inter cellular spaces in the pulp.

Significantly highest weight of fruit, volume of fruit and pulp weight hence maximum pulp percent in mango (Singh *et al*., 2015).

Seed weight (g)

Seed weight of guava presented in Table 1, influenced by foliar application of nutrients do not show significant variation among the treatments.

This might be due to boron which increase in pulp content by an increasing in accumulation of starch in the inter-cellular spaces of fruit cells.

The decrease in the number of seeds per fruit. Similar results were also reported in guava (Kumar *et al.,* 2017).

Pulp to seed ratio

Effect of foliar application of nutrients on pulp to seed ratio of guava shows significant variation among the treatments from the Table 1. The treatment T_6 *i.e.* foliar application of borax @ 1% was recorded maximum pulp to seed ratio (1:32.20) which was at par with the treatment T_8 (1:28.33), T_5 (1:28.73) and minimum pulp to seed ratio (1:18.41) was observed in T_{11}.

The maximum pulp to seed ratio is due to

maximum pulp weight and minimum seed weight as compared to control, similar results were also reported in guava (Singh *et al*., 2018).

CONCLUSION

The physical parameters of fruits with respected Fruit set, fruit retention, fruit length, fruit breadth, average weight of fruit, fruit volume, pulp weight, pulp percent, seed weight and pulp: seed ratio were obtained maximum with the foliar application of Borax @ 1%. Therefore, it may be concluded that, foliar spray of Borax @ 1% can be recommended to guava growers for obtaining better physical attributes of winter season of guava.

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