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Effect of foliar application of nutrients on yield and economics 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. Potassium sulphate @ 1% recorded maximum number of fruits per tree (174.08) (T_4), The maximum fruit yield per tree (31.03 kg) and fruit yield per hectare (124.14 tonnes/ha), The highest gross monetary return per hectare (Rs.5,58,630) was obtained in treatment Borax @ 1% (T_6) and which was followed by the treatment Zinc sulphate @ 1% (T_8). The highest Benefit: ratio was recorded in treatment Borax @ 0.5% (T_6) which was closely followed by treatment Zinc sulphate @ 1% (T_8) and the minimum values for all these parameters were observed in Control (T_{11}).

Keywords: foliar application, nutrients, yield, economics, *Psidium guajava* L.

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, I ndia 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 show 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. Hence, present.

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 fruits per tree, Yield per tree (kg), Yield per ha (ton), Cost of cultivation, Gross monetary returns, Net monetary returns, Benefit: cost ratio.

The data was analysed statically and presented in tables as per methods suggested by Panse and Sukhatme (1985).

Result and Discussion

Effect on Yield

Number of fruits per tree

Significantly highest number of fruits per tree (174.08) was recorded by foliar application of potassium sulphate 1%, which was 47.62% more as compared to control, and statistically at par with treatment T_{10} (171.95) which was 45.81% more as compared to control, T_9 (168.44) and T_2 (165.86). Significantly lowest number of fruits (132.92) per tree was recorded in control.

Fruit yield per tree (kg)

Significant highest yield per tree (31.03kg) was recorded by foliar application of borax 1% (T_6) which was 73.15% more as compared to control and statistically at par with treatment T_8 (28.79 kg), which was 60.65%, More as compared to control and lowest yield per tree (17.92 kg) per tree was observed in control.

The increase in yield was obviously due to promotion of starch formation followed by rapid transportation of carbohydrates in plants activated by micronutrients like boron. Which help in maximum fruit set percentage and fruit retention. Similar results were also found by Gurjar *et al.* (2015) in mango.

Fruit yield tonne per hectare

The foliar application of borax 1% (T_6) was recorded significantly maximum fruit yield (124.14 tonne/ha) which was 73.19 more as compared to control and statistically at par with treatment minimum yield T_8 (115.16 tonns/ha) and was recorded in T_{11} 71.68 ton/ha. This might be due to borax to their stimulatory effect on plant metabolism and production of auxin like chemicals which helps to increase fruit set, fruit retention and fruit size and yield per tree and yield per hectare. Similar results were and also observed by Chander *et al.* (2017) in guava.

Effect on Economics

Cost of cultivation (Rs. /ha)

The data reveals that, the highest cost of cultivation (Rs. 1,24.146/ha) was recorded in the treatment of Borax @ 1% followed by the treatment T_8 (Rs. 1,15.160/ha), while the lowest cost of cultivation (Rs. 71,680/ha) was recorded in control. This could be attributed to cost incurred on chemicals and the labour charges required for foliar application.

The result obtained in the present study is in agreement with that earlier reported by Zagade*et al. (*2017), Mahaveer Suman *et al.* (2016) in guava.

Gross monetary returns (Rs. /ha)

The highest gross monetary return per hectares (Rs.5, 58,630) was recorded in treatment Borax @ 1% (T_6) followed by treatment T_8 (Rs. 4,83,672), while the lowest gross returns per hectares (Rs. 2,50,880) was recorded in control. It might due to production of highest fruit yield with the foliar application of Borax @ 1% which also increases quality.

Similar results were also reported by Zagade *et al.* (2017) in guava

Net monetary return (Rs. /ha)

The highest net monetary returns per hectare (Rs.4,34,484) was obtained in the treatments Borax @ 1% (T_6)which was followed by the treatment T_8 (Rs.3,68,512) while, the lowest net returns per hectares (Rs. 1,79,200) was recorded in T_{11}. This could be attributed to production of higher yield of fruits with good quality. The result obtained in the present study is in agreement with that reported by Zagade *et al.* (2017) in guava.

Benefit Cost ratio (B: C)

The data regarding benefit: cost ratio of treatments is presented in Table 11, the highest benefit: cost ratio was recorded in treatment T_6 (borax @ 1%) (1: 3.5) which was followed by treatment T_8 (zinc sulphate @ 0.5%) (1: 3.2), while the lowest benefit: cost ratio (1: 2.5) was recorded in control. The maximum B: C ratio in this treatment was due to higher net returns as compared to control.

The obtained results are line with Zagade *et al*. (2017), reported that better gross monetary returns and comparatively moderate cost of cultivation that results in high benefit: cost ratio.

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

Tr. no.	Treatments	No. of fruits /tree	% increase over control	Fruit yield/ tree (kg)	% increase over control	Fruit yield (tonne/ha)	% increase over control
T_1	Urea @ 0.5%	159.53	35.28	23.61	31.75	94.45	31.77
T_2	Urea @ 1%	165.86	40.66	24.5	36.71	98.00	36.71
T_3	Potassium sulphate @ 0.5%	161.53	37.98	22.48	25.44	89.92	25.44
T_4	Potassium sulphate @ 1%	174.08	47.62	25.33	41.35	101.33	41.36
T_5	Borax @ 0.5%	136.98	16.16	24.55	36.99	98.21	37.01
T_6	Borax @ 1%	148.35	25.8	31.03	73.15	124.14	73.19
T_7	Zinc sulphate @ 0.5%	140.81	19.41	23.56	31.47	94.24	31.47
T_8	Zinc sulphate @ 1%	153.87	30.49	28.79	60.65	115.16	60.65
T_9	Ferrous sulphate @ 0.5%	168.44	42.84	23.97	33.76	95.90	33.79
T_{10}	Ferrous sulphate @ 1%	171.95	45.81	27.18	51.67	108.73	51.69

T_{11}	Control	132.92	-	17.92	-	71.68	-
S.E.±		3.43	-	1.18	-	4.75	-
C.D at 5%		10.14	-	3.51	-	14.04	-

Table 2: Effect of foliar application of nutrients on B: C ratio of guava cv. L-49

Tr. no.	Treatments	Total Cost of Cultivation (Rs/ha)	Yield (t/ha)	Gross Monitory returns (Rs/ha)	Net Monitory returns (Rs/ha)	CBR
T_1	Urea @ 0.5%	94453	94.45	377800	283347	3.0
T_2	Urea @ 1%	98000	98.00	372400	274400	2.8
T_3	Potassium sulphate @ 0.5%	89920	89.92	359680	269760	3.0
T_4	Potassium sulphate @ 1%	101333	101.33	405320	303987	3.0
T_5	Borax @ 0.5%	98213	98.21	392840	294627	3.0
T_6	Borax @ 1%	124146	124.14	558630	434484	3.5
T_7	Zinc sulphate @ 0.5%	94240	94.24	376960	282720	3.0
T_8	Zinc sulphate @ 1%	115160	115.16	483672	368512	3.2
T_9	Ferrous sulphate @ 0.5%	95906	95.90	383600	287694	3.0
T_{10}	Ferrous sulphate @ 1%	108733	108.73	434920	326187	3.0
T_{11}	Control	71680	71.68	250880	179200	2.5

Conclusion

The treatments T_4 (Potassium sulphate @ 1%) recorded highe st number of fruits per tree (174.08) however lowest number of fruits per tree (132.92) were observed in treatment T_{11} (Control).Maximum fruit yield per tree (31.03 kg) and fruit yield tonnes per hectare (124.14 tonnes/ha) was recorded in T_6 (Borax @ 1%) whereas, minimum fruit yield per tree (17.92 kg/tree) and fruit yield tonnes per hectare (115.16 tonnes/ha) was observed in T_{11} (Control).The highest cost of cultivation (Rs. 1,24.146/ha), gross monetary return per hectares (Rs.5, 58,630), net monetary returns per hectare (Rs. 4,34,484) and B:C ratio (1:3.5) is observed with treatment T_6 (Borax @ 1%) and lowest cost of cultivation (Rs. 71,680/ha), gross returns per hectares (Rs. 2,50,880), net returns per hectares (Rs. 1,79,200) and B:C ratio (1:2.5) was observed with treatment T_{11} (Control).

From the experiment, it may be concluded that, the foliar application of Borax @ 1% at 35 and 70 days after flowering was found superior and it was closely at par with the application of Zinc sulphate @ 1% for improving the yield and economic returns.

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