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HORTICULTURE

Effect of foliar application of micronutrients on yield and economics of guava (*Psidium Guajava* L.) CV. L-49

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Abstract

A field study was carried out at the Fruit Research Station, Himayatbagh, Aurangabad, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, during 2014-2015. The experiment was laid out in Randomized Block Design (RBD) with 12 treatments and three replications. Observations were recorded on growth, physical and quality characters of guava. The maximum number of fruits per plant and B : C ratio were recorded under treatment T_{10} (boric acid @ 0.3% + ferrous sulphate @ 0.4% + magnesium sulphate @ 0.7% + manganese sulphate @ 0.5% + zinc sulphate @ 0.5%) while highest yield/tree kg and yield /ha (Mt), highest GMR, NMR and EIOC (₹./ha), were recorded under treatment T_{11} (boric acid @ 0.3% + ferrous sulphate @ 0.4% + magnesium sulphate @ 0.7% + manganese sulphate @ 0.5% + zinc sulphate @ 0.5% + copper sulphate @ 0.4%).

Highlights

- The highest GMR, NMR and EIOC (₹./ha), were recorded in *guava* under treatment with boric acid @ 0.3% + ferrous sulphate @ 0.4% + magnesium sulphate @ 0.7% + manganese sulphate @ 0.5% + zinc sulphate @ 0.5% + copper sulphate @ 0.4%.

Keywords: Micronutrients, guava, economics, yield, income

Fruit crops occupy a central role in the world of agriculture. They are adapted to a wide range of soil and climatic conditions. The need for increasing fruit consumption has become a global priority in context to health, as world's most wide spread and debilitating nutritional disorders are caused due to diets lacking in vitamins and minerals. Guava (*Psidium guajava* L.) "Apple of the tropics" is an important fruit crop of country, not because of large area and production but due to its wider edapho-climatic adaptability, hardly to various biotic and abiotic stresses, precocious and prolific bearing habit, quality fruit with high nutritive value, medicinal attribute, use both as fresh fruit and after processing in different value added products and considered as multipurpose tree due to its utility as a fruit, fuel, fodder, timber and it is highly remunerative crop. It is a very rich source of vitamin C and A along with minerals like iron, calcium, and phosphorus. Guava is one of the fourth most important fruit crop in India after Mango, Banana and Citrus (Ray 2002). It also contains substantial quantities of carbohydrates, sugars and pectin. Owing to excellent taste and flavour, high nutritional value and wide availability at moderate price the fruit is often called as "Poor man's apple". The conventional products of guava are jelly, jam, pulp, concentrate, juice, cheese, toffee, dehydrated guava and canned guava. Use of different mixed and single micronutrients like, zinc sulphate, ferrous sulphate, copper sulphate, magnesium sulphate, manganese sulphate, boric acid are known to play

Table 1: Effect of micronutrients spray on number of fruits per plant, yield per tree (kg) and yield per ha (tonnes) of guava.

	Treatments	Number of fruits per plant	PIOC	Yield per tree (kg)	PIOC	Yield per ha (tonnes)	PIOC
T_1	M_1	226.66	29.31	50.68	54.98	20.27	54.85
T_2	M_2	200.13	14.17	41.28	26.24	16.70	27.58
T_3	M_3	180.17	2.78	39.30	20.18	15.68	19.79
T_4	M_4	176.66	0.78	36.73	12.32	14.67	12.07
T_5	M_5	221.33	26.27	51.68	58.04	20.65	57.75
T_6	M_6	180.17	2.78	35.63	8.96	14.28	9.09
T_7	$M_1 + M_2$	210.06	19.84	46.74	42.94	18.61	42.17
T_8	$M_1 + M_2 + M_3$	205.66	17.33	46.99	43.70	18.76	43.32
T_9	$M_1 + M_2 + M_3 + M_4$	215.04	22.68	51.51	57.52	20.56	57.07
T_{10}	$M_1 + M_2 + M_3 + M_4 + M_5$	260.17	48.42	63.00	92.66	25.26	92.97
T_{11}	$M_1 + M_2 + M_3 + M_4 + M_5 + M_6$	240.00	36.92	63.78	95.05	25.40	94.04
T_0	Control	175.29	-	32.70	-	13.09	-
	SEm ±	8.51		1.90		0.91	
	C.D. at 5%	24.97		5.58		2.67	

M_1 – H_3BO_3 – 0.3 %, M_2 – $FeSO_4$ – 0.4 %, M_3 – $MgSO_4$ – 0.7 %, M_4 – $MnSO_4$ – 0.5 %, M_5 – $ZnSO_4$ – 0.5 %, M_6 - $CuSO_4$ – 0.4%

PIOC- Percent Increase Over Control

Table 2: Effect of micronutrients spray on economics feasibility of guava.

	Treatments	Cost of cultivation (₹/ha)	GMR (₹/ha)	NMR (₹/ha)	EIOC ₹ ha^{-1}	EYOC Mt ha^{-1}	EYOC (%)	B: C Ratio
T_1	M_1	100156	243264	143108	83020	7.18	54.85	2.42
T_2	M_2	96544	200379	103835	43746	3.61	27.58	2.10
T_3	M_3	97480	188189	90709	30621	2.59	19.79	2.02
T_4	M_4	108072	176019	67946.6	7858	1.58	12.07	1.75
T_5	M_5	89072	247769	158697	98609	7.56	57.75	2.78
T_6	M_6	107688	176155	68466.6	8378	1.19	9.09	1.59
T_7	$M_1 + M_2$	100624	223317	122693	62604	5.52	42.17	2.22
T_8	$M_1 + M_2 + M_3$	98392	225177	126785	66697	5.67	43.32	2.29
T_9	$M_1 + M_2 + M_3 + M_4$	95132	246682	151550	91461	7.47	57.07	2.59
T_{10}	$M_1 + M_2 + M_3 + M_4 + M_5$	98852	303120	204268	144180	12.17	92.97	3.07
T_{11}	$M_1 + M_2 + M_3 + M_4 + M_5 + M_6$	100388	304762	204374	144285	12.31	94.04	3.04
T_0	Control	96960	157048	60088.5	-	-	-	1.62

M_1 – H_3BO_3 – 0.3 %, M_2 – $FeSO_4$ – 0.4 %, M_3 – $MgSO_4$ – 0.7 %, M_4 – $MnSO_4$ – 0.5 %, M_5 – $ZnSO_4$ – 0.5 %, M_6 - $CuSO_4$ – 0.4%

GMR- Gross Margin Of Return, NMR- Net Margin Of Return, EIOC- Excess Income Over Control, EYOC- Excess Yield Over Control, B:C- Benefit Cost Ratio.

a crucial role in growth, yield and quality of fruits (Alloway, 2008, Hasani *et al.* 2012, Eiada *et al.* 2013, and Kumawat *et al.* 2012, Rakshit *et al*. 2013). The present study will contribute in understanding the growth and yield of guava fruits at harvest as influence by pre-harvest spray of different micronutrients spray, which may help in increasing the growth, yield and quality of guava fruits.

Materials and methods

The experiment was conducted during 2014-2015, on uniform 6 years old plants of cv. L-49 (Sardar) guava planted at the spacing of 6 m × 6 m at the Fruit Research Station, Himayatbagh, Aurangabad of Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani. Aurangabad district of Marathwada region is situated in upper Godavari basin and extern north of east of Marathwada. Aurangabad is situated at 21.5^0 N latitude and 70.5^0 E longitudes with an altitude of 60 meters above the mean sea level (MSL). The experiment was laid out in a Randomized Block Design (RBD) with three replications and twelve treatments these are T_1 (boric acid @ 0.3%), T_2 (ferrous sulphate @ 0.4%), T_3 (magnesium sulphate @ 0.7%), T_4 (manganese sulphate @ 0.5%), T_5 (zinc sulphate @ 0.5%), T_6 (copper sulphate @ 0.4%), T_7 (boric acid @ 0.3% + ferrous sulphate @ 0.4%), T_8 (boric acid @ 0.3% + ferrous sulphate @ 0.4% + magnesium sulphate @ 0.7%), T_9 (boric acid @ 0.3% + ferrous sulphate @ 0.4% + magnesium sulphate @ 0.7% + manganese sulphate @ 0.5%), T_{10} (boric acid @ 0.3% + ferrous sulphate @ 0.4% + magnesium sulphate @ 0.7% + manganese sulphate @ 0.5% + zinc sulphate @ 0.5%), T_{11} (boric acid @ 0.3% + ferrous sulphate @ 0.4% + magnesium sulphate @ 0.7% + manganese sulphate @ 0.5% + zinc sulphate @ 0.5% + copper sulphate @ 0.4%), T_{12} (water spray). The sprays were applied two times at fruit set stage and 15 days after first spray. Recommended dose of nutrients at the rate of FYM @ 10 kg/plant, 800 g N, 400 g P_2O_5, and 400 g K_2O/tree were given to all trees (Anonymous, 2012). The half dose of nitrogen was given just at the beginning of monsoon and remaining half was given at fruit set stage.

The number of fruits per plant was recorded at each harvest and total was calculated at last harvesting by summation of values of all pickings, yield per tree (kg) was calculated by total yield of fruits at each harvest was weighed for each tree on pan balance and yield per tree was computed by marking the summation of yield values at each harvest till the last harvest and the yield per hectare (Mt) was calculated by multiplying the value of yield/tree (kg) by total number of plants/hectare and dividing the result by 1000. Benefit : cost (B :C) ratio was worked out by using formula of gross monetary returns (₹ ha^{-1})/cost of cultivation (₹ ha^{-1}).

Results and discussion

Effect on Yield

The yield attributes were significantly increased with treatments T_{10} and T_{11}. The highest number of fruit per plant (260.17) was recorded under the treatment T_{10} which was 48.42 per cent higher as compare to control. The maximum yield kg per tree (63.78) was recorded under the treatment T_{11} which was 95.05 per cent higher as compare to control and maximum yield (25.40 Mt/ha) was recorded under treatment T_{11} which was 94.04 higher as compare to control (Table 1). The increase in yield of guava fruits by application of micronutrient treatments may be due to its leads to improvement in yield contributing characters like size and weight of fruits, fruit set percent, fruit retention per cent as evident by the present study which finally increased the yield. Increased fruit set and reduced fruit drop as a result of boron, iron, magnesium, manganese, zinc and copper spray could give higher number of fruits and consequently the yield. The present results are in conformity with the findings of Bagali *et al.* (1993), Rajkumar *et al.* (2014), Jat and Kacha (2014), and Gaur *et al.* (2014).

Effect on Economics

The economic feasibility calculated for various treatments showed that the application of treatment T_{11} (boric acid @ 0.3% + ferrous sulphate @ 0.4% + magnesium sulphate @ 0.7% + manganese sulphate @ 0.5% + zinc sulphate @ 0.5% + copper sulphate @ 0.4%) has resulted the maximum gross return of ₹ 3,04,762/ha which was ₹ 1,44,285/ha excess over control with highest net profit (₹ 2,04,374/ha) which was 94.06 per cent higher than control, while highest B:C ratio (3.07) was found under treatment T_{10} (boric acid @ 0.3% + ferrous sulphate @ 0.4% + magnesium sulphate @ 0.7% + manganese sulphate

@ 0.5% + zinc sulphate @ 0.5%). The highest percent increase in net profit due boric acid @ 0.3% + ferrous sulphate @ 0.4% + magnesium sulphate @ 0.7% + manganese sulphate @ 0.5% + zinc sulphate @ 0.5% + copper sulphate @ 0.4% (T_{11}) treatment may be because of highest yield and qualitative fruits under this treatment (Table 2). The present results are in conformity with the findings of Pandy *et al*. (1989) and Dutta and Banik (2007).

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