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Effect of Foliar Application of Micronutrients on Growth, Yield and Fruit Quality of Guava (*Psidium guajava*) cv. Allahabad Safeda.

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ABSTRACT

The present investigations on **"Effect of foliar application of micronutrients on growth, yield and fruit quality of Guava (*Psidiumguajava*) cv. Allahabad safeda"** was conducted at the farm, Village- SarawanBodla, Tehsil- Malout, Distt- Sri Muktsar Sahib, Punjab during 2018-2019. Experiments were laid out in randomized block design (RBD) with thirteen treatments viz. T_1- Zn_1 @ 0.5 %, T_2-Zn_2 @ 1.0 %, T_3-Cu_1 @ 0.5 %, T_4- Cu_2 @ 1.0 %, T_5- B_1 @ 0.5 %, T_6-B_2 @ 1.0 %, T_7- Fe_1 @ 0.5%, T_8- Fe_2 @ 1.0 %, T_9 Mg_1 @ 0.5 %, T_{10} Mg_2 @ 1.0 %, T_{11} Mn1 @ 0.5 %, T_{12} Mn_2 @ 1.0 % and T_{13} Control. The maximum growth parameters *viz*., plant height (cm), stem girth (cm) canopy volumeE-W (m), canopy volume N-S (m)were reported with the application of T_2*i.e.*Zn_2 @ 1.0 % which was at par with application of T_1-Zn1 @ 1.0 % and T_4 – Cu2 @ 1.0 % and it was significantly superior over the other treatments at all stages of observation. The maximum yield kg plant^{-1} and total no. of fruits plant^{-1} was recorded in T_2*i.e.*Zn_2 @ 1.0 %which was at par with application of T_1-Zn_1 @ 1.0 % and T_4 – Cu_2 @ 1.0 %and it was significantly superior over all treatments. The maximum fruit weight was reported in T_2*i.e.*Zn_2 @ 1.0 %which was at par with application of T_1-Zn_1 @ 1.0 % and T_4 – Cu_2 @ 1.0 %. The maximum chemical parameters *viz.*, TSS (^{0}Brix), ascorbic acid (mg/100g) and all sugars (%) were reported with the application of T_2*i.e.* .Zn_2 @ 1.0 % which was at par with application of T_1-Zn_1 @ 1.0 % and T_4 – Cu_2 @ 1.0 % and it was significantly superior over the other treatments at all stages of observation.

Keywords: Guava, Micronutrient, RBD, Foliar, yield, fruit quality

INTRODUCTION

Guava (*Psidiumguajava*L.) is one of the most popular fruits grown in tropical, sub-tropical regions of India, which belongs to the family Myrtaceae. It is the fifth most important fruit in area after mango, banana, citrus and apple and fifth most important fruit in production after banana, mango, citrus and papaya.This fruit is a native of tropical America and extensively grown in South Asian countries. It is successfully grown all over the country but leading guava growing states are Uttar Pradesh, Bihar. Rewa, Neemuch, Ratlam, Khandwa and Mandsaur (Anonymous, 2018). In India, guava shares 4.5 % in area and 11.4 % in production and the total area and production of guava are about 0.26 million hectare and 39,97,000 MT, respectively (Anonymous, 2018).

Guava fruit contains water (80-82%), protein (0.71%), fat (0.5%), carbohydrate (11-13%) and acids (2.4%). Among fruits, it ranks third in vitamin-C content after Barbados cherry and Aonla. Guava fruits are rich in dietary fibers and vitamin C and have moderate levels of folic acid (Rajkumar*et. al.* 2017). It also contains substantial quantities of carbohydrates, sugars and pectin. Owing to excellent taste and flavor, high nutritional value and wide availability at moderate price the fruit is often called as “Poor man’s apple” (Suman *et. al.* 2016).

Foliar application is based on the principle that the nutrients are quickly absorbed by leaves and transported to different parts of the plant to fulfill the functional requirement of nutrition. This method is highly helpful for the correction of element deficiencies to restore disrupted nutrient supply, overcome stress factors limiting their availability and it plays a very important role in improving fruit set, productivity and quality of fruits and recovery of nutritional and physiological disorder in fruit trees (Shukla, 2011).

Foliar Fertilization of nutrients is advantageous in terms of low application rate, uniform distribution of fertilizer materials and quick response to applied nutrients (Mishra *et al*., 2017). However, plants with no foliar application showed un-satisfactory results regarding all the parameters. Too low or high concentration of Zinc solution may reduced the yield and yield parameters of guava (Arshad and Ali 2016).

MATERIAL AND METHOD

The experiment was conducted in the research farm of Mr. Lakhwinder Singh, Village- SarawanBodla, Tehsil- Malout, Dist- Sri Muktsar Sahib. The present investigations were made on eight year old Guava trees growing in the Orchard. Thirty nine trees which were uniform in size & vigour and given cultural practices as per package of practices recommended by Punjab Agricultural University, Ludhiana were selected for the present study. All the treatment was applied as a last week September. During the course of studies, recommended cultural practices were followed in the experimental materials.Experiments were laid out in randomized block design (RBD) with thirteen treatments viz. T_1- Zn_1 @ 0.5 %, T_2- Zn_2 @ 1.0 %, T_3- Cu_1 @ 0.5 %, T_4- Cu_2 @ 1.0 %, T_5- B_1 @ 0.5 %, T_6-B_2 @ 1.0 %, T_7- Fe_1 @ 0.5%, T_8- Fe_2 @ 1.0 %, T_9 Mg_1 @ 0.5 %, T_{10} Mg_2 @ 1.0 %, T_{11} Mn1 @ 0.5 %, T_{12} Mn_2 @ 1.0 % and T_{13} Control.

Observations were recorded on growth parameters like Plant height (cm), Leaf area (cm^2) and Yield parameters like Total number of fruits (per tree), Fruit yield (kg/ tree and t/ha) and also

Fruit quality parameters like Total soluble solids (TSS), Acidity (Titrable acidity), Ascorbic acid (mg/100g) and Total sugars (%).

RESULTS AND DISCUSSION

GROWTH PARAMETERS

The data pertaining to the tree height of different treatment combinations have been presented in table-1.It is evident from the Table that different treatments strikingly resulted in difference in average tree height of plant. Maximum tree height increase (27.33 cm) was recorded in treatment T_2 (Zn_2 @ 1 %) which was statistically at par with height increase 24.67 cm in treatment T_4 (Cu_2@ 1 %) and 21 cm in treatment T_1 (Zn_1 @ 0.5 %). The minimum tree height (12 cm) was recorded in treatment T_{13} (control).

The relevant data of leaf area different treatment combinations have been presented in table represented in Table-1.It is clearly evident from the data that different treatments show significant difference in leaf area. From Table it is clearly showed that the maximum leaf area

was recorded 41.51 cm^2 in treatment T_2 (Zn_2 @ 1 %) which was statistically at par with 40.74 cm^2 in treatment T_1 (Zn_1 @ 0.5 %) and 39.67 cm^2 in treatment T_4 (Cu_2 @ 1 %). The minimum leaf area (29.14 cm^2) was recorded in treatment T_{13} (control).

These results are in agreement with the findings of Kumar*et al*. (2015), Razzaq et al. (2013), Neilsen and Hogue (1983).

YIELD PARAMETERS

It is clearly evident from the data that different treatments show significant difference in no. of fruits per tree. From it is clearly showed that the maximum no. of fruits (228.67) was found in treatment T_2 (Zn_2 1.0 %) which was statistically at par 220.33 in treatment T_1 (Zn_1 0.5 %) and 213.33 in treatment T_4 (Cu_2 1.0 %). The minimum no. of fruits (190.67) was recorded in treatment T_{13} (control). It is clearly evident from the data that different treatments show significant difference in yield per tree. It is clearly showed that the maximum yield per tree (42.81 kg) was observed in treatment T_2 (Zn_2 1.0 %) which was statistically at par 40.80 kg in treatment T_1 (Zn_1 0.5 %) and 40.16 kg in treatment T_4 (Cu_2 1.0 %). The minimum yield per tree (18.22 kg) was recorded in treatment T_{13} (control).These results are in agreement with the findings ofZagade*et al*. (2017).

FRUIT QUALITY PARAMETERS

From Table-2 it is clearly showed that the maximum fruit TSS 8.96 (^{0}Brix) was recorded in treatment T_2 (Zn_2 @ 1.0 %) which was statistically at par TSS (8.89 ^{0}Brix) in treatment T_1 (Zn_1 @ 0.5 %) and 8.64 ^{0}Brix in treatment T_4 (Cu_2 @ 1.0 %). The minimum TSS (7.24 ^{0}Brix) was recorded in treatment T_{13} (control). The relevant data ascorbic acid of different treatment combinations have been presented in Table-3. From Table it is clearly showed that the maximum fruit titratable acidity (0.80) was recorded in treatment T_{13} (control) which was statistically at par 0.73 in treatment T_{10} (Mg_2 @ 1.0 %). The minimum fruit titratable acidity (0.52) was recorded in treatment T_2 (Zn_2 @ 1.0 %).

The data reported that total sugars of different treatment combinations have been presented in Table-4. It is clearly evident from the data that different treatments show significant

difference in total sugar. From Table it is clearly showed that the maximum fruit total sugar (8.30 %) was recorded in treatment T_2 (Zn_2 @ 1.0 %) which was statistically at par (8.23 %) in treatment T_1 (Zn_1 @ 0.5 %) and (8.16 %) in treatment T_4 (Cu_2 @ 1.0 %). The minimum total sugar (6.06 %) was recorded in treatment T_{13} (control).

TABLE 1:- Effect of Foliar application of micronutrients on tree height and leaf area of guava tree.

Symbol	Treatments	Tree height increase (cm)	Leaf area (cm^2)
T_1	Zn_1 @0.5 %	21.00	40.74
T_2	Zn_2 @ 1.0 %	27.33	41.51
T_3	Cu_1 @ 0.5 %	19.33	37.43
T_4	Cu_2 @ 1.0 %	24.67	39.67
T_5	B_1 @ 0.5 %	18.00	37.39
T_6	B_2 @ 1.0 %	23.00	34.67
T_7	Fe_1 @ 0.5 %	14.67	33.20
T_8	Fe_2 @ 1.0 %	19.67	32.97
T_9	Mg_1@ 0.5 %	14.00	32.17
T_{10}	Mg_2 @ 1.0%	19.00	32.37
T_{11}	Mn_1 @ 0.5%	13.67	32.14
T_{12}	Mn_2 @ 1.0%	15.67	31.80
T_{13}	Control	12.00	29.14
S. Em. ±		1.41	0.98

$CD_{(0.05)}$		4.11	2.87

Table-2:- Effect of foliar application of micronutrients on TSS, ascorbic acid and titratable acidity of guava fruit.

Symbols	Treatments	TSS (^{0}Brix)	Ascorbic acid (mg/100g)	Acidity (titratable acidity)
T_1	Zn_1 @0.5 %	8.89	173.72	0.61
T_2	Zn_2 @ 1.0 %	8.96	179.14	0.52
T_3	Cu_1 @ 0.5 %	8.43	162.36	0.70
T_4	Cu_2 @ 1.0 %	8.64	169.92	0.70
T_5	B_1 @ 0.5 %	8.26	156.34	0.70
T_6	B_2 @ 1.0 %	8.42	152.51	0.72
T_7	Fe_1 @ 0.5 %	8.30	149.26	0.70
T_8	Fe_2 @ 1.0 %	8.25	150.31	0.71
T_9	Mg_1@ 0.5 %	8.56	147.35	0.71
T_{10}	Mg_2 @ 1.0%	8.36	149.38	0.73
T_{11}	Mn_1 @ 0.5%	7.39	147.92	0.71
T_{12}	Mn_2 @ 1.0%	7.78	145.58	0.72
T_{13}	Control	7.24	137.12	0.80
S. Em. ±		0.16	3.36	0.02

$CD_{(0.05)}$		0.46	9.80	0.07

Table-3:- Effect of foliar application of micronutrients on total sugar of guava fruit.

Symbols	Treatments	Total sugar
T_1	Zn_1 @0.5 %	8.23
T_2	Zn_2 @ 1.0 %	8.30
T_3	Cu_1 @ 0.5 %	7.06
T_4	Cu_2 @ 1.0 %	8.16
T_5	B_1 @ 0.5 %	7.07
T_6	B_2 @ 1.0 %	6.78
T_7	Fe_1 @ 0.5 %	6.87
T_8	Fe_2 @ 1.0 %	7.12
T_9	Mg_1@ 0.5 %	6.85
T_{10}	Mg_2 @ 1.0%	6.55
T_{11}	Mn_1 @ 0.5%	6.53
T_{12}	Mn_2 @ 1.0%	6.29
T_{13}	Control	6.06
S. Em. ±		0.08
$CD_{(0.05)}$		0.25

CONCLUSION

On the basis of results obtained from various treatments, it can be concluded that the application of treatment T_2*i.e.* Zn_2 1.0 % gave best results in quality and yield parameters which was at par with treatment T_1*i.e.* Zn_1 0.5 % and T_4*i.e.* Cu_2 1.0 %.

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