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Influence of foliar application of various micronutrients on economics of guava

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Abstract
The present study was conducted in a well-established guava orchard of 9 years old Sardar guava trees planted at 5×5 m having uniform growth and productivity at the Instructional-cum-Research Farm, Department of Horticulture, College of Agriculture, Latur, during *mrig bahar* 2015-16. The experiment was laid out in Randomized Block Design (RBD) with eleven treatments replicated thrice.A wide range of variations in cost of cultivation, monetary returns and benefit : cost ratio were observed due to foliar application of different micronutrients. The highest gross monetary returns per tree (Rs.1422.80) and per hectare (Rs.5,68,800) were obtained in treatment (T_7) Zinc sulphate @ 1%. The highest net monetary returns per tree (Rs.1207) and per hectare (Rs.4,82,680) were obtained in the treatment (T_7) zinc sulphate @ 1%. The highest B:C ratio was recorded in treatment (T_7) Zinc sulphate @ 1%. The minimum values for all these parameters were observed in control (T_1) treatment.

Keywords: Guava, GMS, NMR, B:C

Introduction

The Guava (*Psidium guajava* L.) ‘‘apple of tropics” is one of the important fruit crops in India. Though it is native to tropical America its cultivation has expanded to all tropical countries and become especially important in India (Samson 1980) [1]. It belongs to the natural order myrtal and family myrtaceae. The Guava is one of the most common and important fruit crop cultivated all over India. It is fourth most important fruit crop in area and production after mango, banana and citrus. It is classified under genus *Psidium* which contains 150 species, but only *Psidium guajava* exploited commercially. It was introduced in 17th century in India by Portuguese people.

Micronutrient play an important role in production and its deficiency leads in lowering the productivity. Guava plants also shows micronutrient 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, copper and iron perform a specific role in the growth and development of plant, quality produce and uptake of nutrients.

Micronutrient especially Copper, Boron, Iron and Zinc are responsible for metabolic activities in fruit physiology. Application of micronutrients should be at first growth phase and before flowering. Zinc takes part in chlorophyll synthesis, involved in biosynthesis of plant growth hormone and plays positive role in photosynthesis and nitrogen metabolism. Zinc is essential for auxin and protein synthesis, seed production and proper maturity. It also increase the fruit size as well as yield. Boron is a constituent of cell membrane and essential for cell division. It acts as a regulator of potassium/calcium ratio in the plant helps in nitrogen absorption and translocation of sugar in plant. It also increase nitrogen availability to the plant. Iron increases the chlorophyll content of leaves, reflecting the colour of leaves. Iron plays critical role in metabolic process such as DNA synthesis, respiration and photosynthesis. Copper is one of the micronutrients needed in very small quantities by plants. Copper activates some enzymes in plants which are involved in lignin synthesis and it is essential in several enzyme systems. It is also required in the process of photosynthesis and assist in plant metabolism of carbohydrates and proteins.

Material and Methods

The present investigation was conducted at Instructional-cum-Research Farm, Department of Horticulture, College of Agriculture, Latur, during 2015-16. Geographically Latur is situated between 18^{0}05' to 18^{0}75' North latitude and between 76^{0}25' to 77^{0}25' East longitude has an elevation of 540 to 634 meter above the Mean Sea Level (MSL). The area falls under the semi arid tropics. The average annual precipitation (worked on the basis of last thirty three years) of the district is 434.8 mm, mostly concentrated during the monsoon months from June to October. The experimental site was fairly uniform with gentle slope. The soil was medium black, slightly alkaline with uniform texture, colour and having good drainage. The experiment was conducted on well established orchard of 9 years old Sardar guava trees which are planted at 5.0 × 5.0 m spacing. The experiment was laid out in Randomized Block Design (RBD) with eleven treatments replicated thrice.The treatments comprised of Control (T_1), Copper Sulphate@ 0.5% (T_2), Copper Sulphate@ 1% (T_3), Ferrous Sulphate@ 0.5% (T_4), Ferrous Sulphate@ 1% (T_5), Zinc Sulphate@ 0.5% (T_6), Zinc Sulphate@ 1% (T_7), Borax@ 0.25% (T_8), Borax@ 0.5% (T_9), $CuSO_4$@ 0.5%+ $FeSO_4$@ 0.5% + $ZnSO_4$@ 0.5% + Borax@ 0.25% (T_{10}), $CuSO_4$@ 1%+ $FeSO_4$@ 1% + $ZnSO_4$@ 1% + Borax@ 0.5% (T_{11}). The foliar application of these treatments as per the plan was made at 35 and 70 days after flowering.

Result and Discussion

Effect of treatments on Economics of Guava

The economics of guava cultivation under the influence of different treatments of foliar application of different micronutrients was studied (Table 1). The results showed that, the lowest cost of cultivation (Rs.80590/ha) was required in control treatment (T_1). While, the highest cost of Rs. 92,790/ha was required in the treatment of $CuSO_4$ @ 1% + $FeSO_4$ @ 1% + $ZnSO_4$ @ 1% + Borax @ 0.5% (T_{11}). The lowest cost of in control treatment (T_1) could be due to as there no expenditure towards the cost of either inputs or its of application. However, the highest cost in treatment of $CuSO_4$ @ 1% + $FeSO_4$ @ 1% + $ZnSO_4$ @ 1% + Borax @ 0.5% (T_{11}) could be attributed due to cost incurred on chemicals and the labour charges required for foliar application.

Regarding the economic returns, the maximum gross monetary returns (Rs.1422.8/tree) was obtained in the treatment of $ZnSO_4$ @ 1% (T_7). While, it was minimum (Rs.976/tree) in control treatment (T_1). This could be attributed to production of highest yield of fruits with the application of zinc sulphate.

Regarding the economic returns, the maximum gross monetary returns (Rs.5,68,800/ha) were obtained in the treatment of $ZnSO_4$ @1% (T_7). While, it was minimum (Rs.3,90,400/ha) in control treatment (T_1). This could be attributed to production of highest yield of fruits with the application of zinc sulphate. The maximum net monetary returns (Rs.1207/tree) were obtained in the treatment of $ZnSO_4$ @1% (T_7). While, it was minimum (Rs.774/ha) in control treatment (T_1). This could be attributed to production of higher yield of fruits with comparatively low cost of cultivation. While, low yield in control treatment leads to minimum values of gross and net monetary returns.

The maximum net monetary returns (Rs.4,82,680/ha) were obtained in the treatment of $ZnSO_4$ @1% (T_7). While, it was minimum (Rs.3,09,810/ha) in control treatment (T_1). This could be attributed to production of higher yield of fruits with comparatively low cost of cultivation. While, low yield in control treatment leads to minimum values of gross and net monetary returns.

As regards to the benefit: cost ratio, the highest B: Cratio (6.60) was obtained in the treatment of $ZnSO_4$ @1% (T_7)and it was followed by treatment (T_6). Whereas, the lowest benefit: cost ratio (4.84) was obtained in T_1. The highest benefit: cost ratio in the treatment of T_7 could be attributed to better gross monetary returns and comparatively moderate cost of cultivation that resulted in high benefit: cost ratio. The variation in benefit: cost ratio due to foliar application of different chemicals in guava were also reported by Pandey *et al.* (1989) [3] and Dutta and Banik (2007) [2]. They have reported comparatively higher benefit: cost ratios ranging from 1:34 to 1:43 due to foliar application of different nutrients and growth regulators. These finding are at quite higher side when compared with the results obtained in the present investigation. Variation in cost of cultivation or the variations in the market price realized for the produce may lead to the such kind of results.

Table 1: Economics of guava cultivation as influenced by foliar application of various micronutrients

Treatment details	Cost of cultivation (Rs./ha)	Gross monetary returns/ tree	Gross monetary returns/ ha	Net monetary returns/ tree	Net monetary return/ ha	Benefit: cost ratio
T_1-Control	80590	976	390400	774	309810	4.84
T_2-Copper Sulphate@ 0.5%	84670	1157	462800	946	378130	5.46
T_3-Copper Sulphate@ 1%	87790	1296	518400	1076	430610	5.90
T_4-Ferrous Sulphate@ 0.5%	82390	1038	415200	833	332810	5.03
T_5-Ferrous Sulphate@ 1%	83230	1178	471200	970	387970	5.66
T_6-Zinc Sulphate@ 0.5%	84890	1338	535200	1126	450310	6.30
T_7-zinc Sulphate@ 1%	86120	1422	568800	1207	482680	6.60
T_8-Borax@ 0.25%	87100	1316	526400	1099	439300	6.04
T_9-Borax@ 0.5%	88400	1372	548800	1151	460400	6.20
T_{10}-$CuSO_4$@ 0.5%+ $FeSO_4$@ 0.5% + $ZnSO_4$@ 0.5% + Borax@ 0.25%	89900	1360	544000	1135	454100	6.05
T_{11}- $CuSO_4$@ 1%+ $FeSO_4$@ 1% + $ZnSO_4$@ 1% + Borax@ 0.5%	92790	1398	559200	1166	466410	6.02

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