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Impact of foliar spray of micronutrients and plant growth regulators on growth and yield of Guava (*Psidium guajava* L.) cv. L-49

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Abstract— *Guava (Psidium guajava L.), Botanically, guava belongs to the family Myrtaceae. Its basic chromosome number is 11 (2n 2x = 22), foliar application is based on the principle that the nutrients are quickly absorbed by leaves and transported to different parts of the plant to fulfil the functional requirement of nutrition. Experiment was carried out at the Horticultural Research Farm-1, Department of Horticulture, Babasaheb Bhimrao Ambedkar University (A Central University), Vidya Vihar, Rae Bareli Road, Lucknow-226025 (U.P.), India during the year 2020-2021, to study the impact of foliar spray of micronutrients and plant growth regulators on guava fruit performance. Observations are recorded fruit set, fruit retention, fruit length, fruit width, fruit weight, fruit volume and fruit yield, applications of foliar spray with Borax 0.5%+GA_3 40 ppm is most effective in performance of guava fruits viz, fruit set (70.28 %), fruit retention (61.35 %), fruit length (8.68 cm), fruit width (7.83 cm), fruit weight (139.96 g) fruit volume (125.80 ml) and fruit yield (64.85 kg/tree).*

Keywords— ***Guava (Psidium guajava L.), Micronutrients, PGR.***

I. INTRODUCTION

Guava (*Psidium guajava* L.), Botanically, guava belongs to the family Myrtaceae. Its basic chromosome number is 11 (2n 2x = 22) also known as "apple of the tropics" and poor man's apple, is the most important, highly productive, delicious and nutritious fruit, grown commercially throughout tropical and subtropical regions of India. Its fruits are available throughout the year except during the summer season. It occupies a pride place amongst the important fruits grown in the country and claims to be the fourth most important fruit in area and production after mango, banana and citrus. It is cultivated in India since early 17th century. Due to its wider adaptability in diverse soils and agro-climatic regions, low cost of cultivation, prolific bearing and being highly remunerative with nutritive values, it has gained more popularity among the fruit growers (Das *et al*., 1995). This fruit is a native of tropical America and extensively grown in South Asian countries. The leading guava growing states are Uttar Pradesh, Bihar, Madhya Pradesh and Maharashtra. The important of guava is due to fact that it is hardy fruit and which can be grown in poor alkaline soil or poorly drained soil. It can be grown in soil with pH ranging 4.5-8.5 withoutany irrigation. It can stand above 46^0C temperature. Guava does equally well under tropical and sub-tropical climatic conditions (Gaur *et al*., 2014a). However, guava crop has three distinct periods of flowering and fruiting. The three distinct flowering periods are Ambe (February-March), Mrig (June-July) and Hastabahar (October-November) and fruiting periods for these bahar are July-August, October-December and February-April, respectively (Shukla *et al*., 2009). Foliar application is based on the principle that the nutrients are quickly

absorbed by leaves and transported to different parts of the plant to fulfil 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 important role in improving fruit set, productivity and quality of fruits and recovery of nutritional and physiological disorders in fruit trees.

Zinc is the important constitute of several enzyme systems which regulate various metabolic reaction associated with water relation in the plant. Zinc is essential for auxin and protein synthesis, seed production and proper maturity. It also increases fruit size as well as yield. Zinc is essential for improving the vegetative growth of guava trees obtained in terms of terminal shoots, shoot diameter and number of leaves per shoot (Price *et al*., 1972) Among them, NAA induces more fruiting, promotes flowering, whereas, GA_3 increases fruit retention. Ethrel a ripening hormone induces early and uniform ripening (Jensen *et al*., 1975). It has been seen that different nutrients in association of plant growth regulators increase economic yield facilitating harvesting (Pandey *et al*., 1988). It is therefore, necessary to standardize the most effective combination to increase yield of quality fruits in guava. NAA is important growth regulator of auxin group, which helps to reduce fruit drop and improve fruit set and quality specially TSS. By the application of NAA, TSS and ascorbic – acid content of fruit is increased and acidity reduce. NAA reduce the number of seed of the fruits. It also induces heavier fruiting and promoting flowering (Sharma and Tiwari 2015). Maximum yield during winter season due to heavy defoliation and deblossoming in the rainy season crop. It might be due to phytotoxic influence of higher concentrations of NAA on the guava foliage which caused burning and defoliation thereby resulting in low accumulation of photosynthates responsible for the fruit growth.

II. MATERIAL AND METHODS

The present investigation was carried out at the Horticultural Research Farm-1, Department of Horticulture, Babasaheb Bhimrao Ambedkar University (A Central University), Vidya Vihar, Rae Bareli Road, Lucknow- 226025 (U.P.), India during the year 2020-2021. Climatic conditions: Geographically, Babasaheb Bhimrao Ambedkar University, (A Central University), Vidya Vihar, Rae Bareli Road, Lucknow (U.P.), India situated is situated 123 m above mean sea level (MSL) in the subtropical zone of central Uttar Pradesh at 26 55' North Latitude and 80 59' East longitude The climate of Lucknow is characterized by sub- tropical with hot, dry summer and cool winters. This region received an average annual rainfall of 650-750 mm, which is distributed over a period of more than 100 days with peak period during January-June. The average relative humidity is 60% in different seasons of the year. Experiment was laid out in Randomized Block Design with three replications. The details of the treatments were T_1- Control, T_2- $ZnSO_4$ 0.5%, T_3- Borax 0.5%, T_4- NAA 40 ppm, T_5- GA_3 40 ppm, T_6- $ZnSO_4$ 0.5%+Borax 0.5%, T_7- $ZnSO_4$ 0.5%+NAA 40 ppm, T_8- $ZnSO_4$ 0.5%+GA_3 40 ppm, T_9- Borax 0.5%+NAA 40 ppm, T_{10} - Borax 0.5%+GA_3 40 ppm T_{11} - $ZnSO_4$ 0.5% + Borax 0.5% + NAA 40 ppm, T_{12} - $ZnSO_4$ 0.5% + Borax 0.5% + GA_3 40 ppm. Observations were recorded for fruit set, fruit retention, fruit length, fruit weight, fruit volume, fruit yield. Data were subjected to statistical analysis.

III. RESULT AND DISCUSSION

Applications of Borax 0.5%+GA_3 40 ppm (T_{10}) showed a statistically significant impact on fruit performance. The maximum fruit set was noted in Borax 0.5%+GA_3 40 ppm (T_{10}) followed by was noted in $ZnSO_4$ 0.5%+GA_3 40 ppm (T_8). The plant under control showed minimum fruit set in (T_1). Fruit set by GA_3 spray was due to profuse flowering. It might have increased the fruit set either by improving pollen germination or by helping its receptivity or the style becomes non-functional (Mandal *et al*., 2016). In the present investigation, micronutrients increased fruit set percentage which might be due to the reason that these nutrients play an important role in translocation of carbohydrates and in auxin synthesis to the sink and increase pollen viability and fertilization (Yadav *et al*., 2014). Maximum fruit retention was noticed in Borax 0.5%+GA_3 40 ppm (T_{10}) followed by $ZnSO_4$ 0.5%+GA_3 40 ppm (T_8). The minimum fruit retention was found in control (T_1) Zinc and Boron which proved helpful in maintaining better nutritional status of plants which ultimately led to beneficial effect in hastening fruit retention. These results are in accordance to the findings of Raj Kumar *et al.* (2010), maximum fruit length (8.68 cm) was obtained with the spray of Borax 0.5%+GA_3 40 ppm (T_{10}) followed by (8.46 cm) was noted in $ZnSO_4$ 0.5%+GA_3 40 ppm (T_8). The minimum fruit length (7.16cm) was recorded under control (T_1). Similar result was also found by Rajput and Chand (1976), Singh et al. (2004), and Pal *et al*. (2008) in guava and the maximum fruit width found in application of Borax 0.5%+GA_3 40 ppm (T_{10}) followed by as notedin $ZnSO_4$ 0.5%+GA_3 40 ppm (T_8). The minimum fruit width was recorded under control (T_1). Improvement in quality of fruits due to zinc sulphate found by Rajput and Chand (1976), Singh et al. (2004), and Pal *et al*. (2008) in guava. The maximum fruit

weight was obtained with the spray of Borax 0.5%+GA_3 40 ppm (T_{10}) followed by as noted in $ZnSO_4$ 0.5%+GA_3 40 ppm (T_8). The minimum fruit weight was recorded under control (T_1). Similar result was also found by Kumar *et al.*, (2013), average fruit weight, and reduced the seed percent and seed pulp ratio which ultimately increased the yield per tree, maximum fruit volume was obtained with thespray of Borax 0.5%+GA_3 40 ppm (T_{10}) followed by as notedin $ZnSO_4$ 0.5%+GA_3 40 ppm (T_8). While, minimum fruit volume was found in control (T_1). Similar result was also found by Kanpure *et al.*, (2016) as well as the maximum fruit yield was obtained with the spray of Borax 0.5%+GA3 40 ppm (T_{10}) followed by as noted in ZnSO4 0.5%+GA3 40 ppm (T_8). While minimum fruit yield was found in control (T_1). The observations also indicated that all treatments enhanced the yield with greater degree with higher concentrations. Similar result was also found by Balakrishnan (2000).

Table 1: Effect of PGR and micronutrients on fruit set, fruit retention, fruit length, fruit width, fruit volume, fruit yield

Treatments	Fruit set %	Fruit retention (%)	Fruit length(cm)	Fruit width (cm)	Fruit weight(gm)	Fruit volume (ml)	Fruit Yield (kg/plant)
T_1 Control	46.41	39.50	7.16	6.12	104.87	95.07	47.33
T_2 ZnSO4 0.5%	56.74	52.71	7.87	6.19	116.32	107.53	53.14
T_3 Borax 0.5%	57.23	55.07	8.10	6.70	125.40	111.36	57.12
T_4 NAA 40 ppm	59.03	56.21	8.24	6.39	113.60	105.00	54.39
T_5 GA3 40 ppm	55.18	52.06	8.04	6.56	120.66	115.44	53.92
T_6 ZnSO4 0.5%+Borax 0.5%	57.94	58.45	7.93	6.23	129.86	120.55	58.09
T_7 ZnSO4 0.5%+NAA 40 ppm	65.10	56.04	8.06	7.19	128.38	117.67	57.47
T_8 ZnSO4 0.5%+GA3 40 ppm	68.85	57.91	8.46	7.39	133.07	123.03	59.27
T_9 Borax 0.5%+NAA 40 ppm	61.24	53.98	8.11	6.61	119.65	121.12	56.11
T_{10} Borax 0.5%+GA3 40 ppm	70.28	61.35	8.68	7.83	139.96	125.80	64.85
T_{11} ZnSO4 0.5% + Borax 0.5% + NAA 40 ppm	63.39	58.73	8.11	6.3	122.57	119.37	56.29
T_{12} ZnSO4 0.5% + Borax 0.5% + GA3 40 ppm	58.27	52.65	8.30	6.88	130.50	117.50	58.33
S.Em. ±	0.64	0.35	0.42	0.07	0.77	0.40	0.26
C.D. at 5%	1.89	1.05	0.14	0.23	2.27	1.18	0.77

IV. CONCLUSION

Application of foliar spray done with Borax 0.5%+GA_3 40 ppm results revealed that significantly increase in maximum fruit set, fruit retention, fruit length, fruit width, fruit weight, fruit volume, fruit yield per plant (kg/plant) and followed treatment application with $ZnSO_4$ 0.5%+GA_3 40 ppm as compare to control.

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