www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(3): 5209-5211

www.thepharmajournal.com
Received: 19-12-2022
Accepted: 23-01-2023

Kriparam Meena
M.Sc. Ag. (Horticulture), Department of Horticulture, School of Agricultural Sciences and Technology, Babasaheb Bhimrao Ambedkar University, Vidya-Vihar, Rae Bareli Road, Lucknow, Uttar Pradesh, India

RS Verma
Assistant Professor, Department of Horticulture, School of Agricultural Sciences and Technology, Babasaheb Bhimrao Ambedkar University, Vidya-Vihar, Rae Bareli Road, Lucknow, Uttar Pradesh, India

Shatrunjay Yadav
Research Scholar, Department of Horticulture, School of Agricultural Sciences and Technology, Babasaheb Bhimrao Ambedkar University, Vidya-Vihar, Rae Bareli Road, Lucknow, Uttar Pradesh, India

Vipnesh Singh
Research Scholar, Department of Horticulture, School of Agricultural Sciences and Technology, Babasaheb Bhimrao Ambedkar University, Vidya-Vihar, Rae Bareli Road, Lucknow, Uttar Pradesh, India

Lalit Kumar
Research Scholar, Department of Horticulture, School of Agricultural Sciences and Technology, Babasaheb Bhimrao Ambedkar University, Vidya-Vihar, Rae Bareli Road, Lucknow, Uttar Pradesh, India

Dharamraj Meeana
Department of Horticulture, School of Agricultural Sciences and Technology, Babasaheb Bhimrao Ambedkar University, Vidya-Vihar, Rae Bareli Road, Lucknow, Uttar Pradesh, India

Corresponding Author:
RS Verma
Assistant Professor, Department of Horticulture, School of Agricultural Sciences and Technology, Babasaheb Bhimrao Ambedkar University, Vidya-Vihar, Rae Bareli Road, Lucknow, Uttar Pradesh, India

Effect of zinc and boron on growth parameters of guava (*Psidium guajava* L.) cv. L-49

Kriparam Meena, RS Verma, Shatrunjay Yadav, Vipnesh Singh, Lalit Kumar and Dharamraj Meeana

Abstract
A field experiment was conducted during 2020-21 at Horticulture Research Farm-1, BBAU, Lucknow on 15- year- old guava plants "Studies on the effect of foliar spray of Micronutrient on growth parameter of guava (*Psidium guajava* L.) cv. L-49" revealed Annual shoot growth (cm), Increase in plant height (cm,) Increase in plant spread (cm), Increase in stem girth (cm), Leaf area (cm) were significantly affected by foliar application of Zinc sulphate and boron. All parameters best performed under the Treatment (T_8) where the dose of Zinc and Boron (Borax 0.2%+ Zinc Sulphate 0.2%) applied as foliar spray.

Keywords: Guava, zinc, boron and growth parameters

Introduction
Guava (*Psidium guajava* L.) is one of the most popular fruits grown in tropical, sub-tropical and some parts of arid region of India. Guava is an evergreen, shallow-rooted shrubs or small tree with spreading branches. Guava is most important cultivated species of *Myrtaceae* family, it is considered to be the apple of tropics because of its desert and culinary use. Guava is one of the most popular fruits grown in tropical, sub-tropical and some parts of arid region of India The fruit ranges from round, ovoid, to pear-shaped, growing up to 2-5 in (5-12.5 cm) long. The thin skin varies in colour from pale green to light-yellow, blushed with pink for certain cultivars. Underneath the skin is a layer of flavourful sweet and tangy flesh with colour varying from white, yellowish, light pink, dark pink, or red. When immature, the fruit is green, hard, and very astringent. When ripe, some varieties have a custard-like consistency while others are crispy like an apple. It is suitable for table purpose and yields about 25t/ha. The major guava producing state of India are Uttar Pradesh, Maharashtra, Madhya Pradesh, Bihar, West Bengal, Punjab, Gujarat. Now it is cultivated in tropical and subtropical parts of several countries like India, Hawaii, Mexico, Cuba, Sri Lanka, Venezuela, Brazil, Thailand, New Zealand, Philippines, Indonesia, Malaysia, Australia, Israel, Pakistan, and Bangladesh etc. India is the leading producer of guava in the world Bhatia *et al.,* (2001) [1]. The fruit type is berry and it is an excellent source of vitamin C (210-305 mg/100 g) and pectin (0.5-1.8%) but has low energy (66 Cal/100 g). Guava leaf is rich in tannins (9-12%), the leaves also contain 0.3% essential oil (with eugenol) and triterpenoids which may contribute the overall medicinal activity (Chapman, 1964) [3]. Micronutrients are those trace elements which are essential for the normal healthy growth and reproduction of plants. For a trace element to be essential for either plant (i.e., a micronutrient), it needs to satisfy three criteria: (1) the organism cannot grow and reproduce normally without the element, (2) its action must be specific and unable to be replaced by any other element and (3) its action must be direct. However, advocated that an element can also be regarded as essential if it is a component of a molecule known to be an essential metabolite, even if it cannot be demonstrated that it fulfils all of the criteria. It is very important that the micronutrient element requirements of crops are met as well as their macronutrient needs if they are to yield satisfactorily and bear products (e.g., grains and fruits) of acceptable quality. The dose response curves for all micronutrients show that, just as yields can be affected by deficiencies, they can also be reduced by toxicity due to excessive concentrations of the same elements. It is therefore important that soils and/or crops are monitored to ensure that the available micronutrient concentrations in soils are in the optimum range, being neither too low, nor too high. Typical dose–response graphs for micronutrients and non-essential elements (Arnon and Stout, 1939) [11]. The foliar application of micro-nutrients plays a vital role in improving the quality and comparatively more effective for rapid

recovery of plants. The yield parameter like average fruit weight, number of fruits/tree and yield/tree are increased by the spray of micro-nutrients. Zinc is 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 is also increase fruit size as well as yield. Zinc is essential for improving the vegetative growth of guava trees in terms of terminal shoots, shoot diameter and number of leaves per shoot. Boron is a constituent of cell membrane and essential for cell division. It is role as a regulator of potassium/calcium ratio in plant and help in nitrogen adsorption and translocation of sugar in plant. Boron increase nitrogen availability to plant. It is involved in the synthesis of cell wall components. It has a role in pollen viability and good fruit set. It increases the growth of primary and lateral roots .

The experiment comprised foliar sprays of boron, zinc, calcium and potassium at two stages, viz., at fruit set or two weeks after fruit set on guava plant. The foliar fertilization showed an increasing trend towards plant height (12.17% with 0.03% Zn two weeks after fruit set), fruit weight (150 g with 0.03% B two weeks after fruit set), volume (147.67 with 0.03% B two weeks after fruit set) and yield (52.50 kg/tree with 0.01% Zn two weeks after fruit set). Similarly, pulp: seed ratio (94.88 with 0.5% K two weeks after fruit set), TSS (11.500Brix with 0.5% K on fruit set) and total sugars (7.36% with 0.5% K two weeks after fruit set) also increased by foliar fertilization while it showed a trend towards decreasing per cent fruit drop (5.90% with 0.03% Zn two weeks after fruit set) and acidity content (0.26% with 0.5% K two weeks after fruit set). The seed hardness (11.48 kg with 0.01% B on fruit set) showed non uniform pattern. The stage of growth also affected the growth, yield and quality of guava fruits. Results indicated that foliar fertilization when done two weeks after fruit set influenced plant growth and fruit quality.

Materials and Methods

Experimental Location: The present inspection entitled "Effect of Zinc and Boron on Growth, Yield and Quality of Guava (*Psidium guajava* L.) cv. L - 49" was carried out at Horticulture Research Farm-I, Department of Horticulture, Babasaheb Bhimrao Ambedkar University, Vidya-Vihar, Rae Bareli Road, Lucknow 226 025 (U.P.) during the winter season of 2020-21. The information of methodology adopted in this experiment has been presented below: 3.1 Climatic conditions: Geographically, Babasaheb Bhimrao Ambedkar University, (A Central University), Vidya-Vihar, Rae Bareli Road, Lucknow (U.P.), India situated at 80055'East longitude and 26046' North latitude and 123 meter above MSL (mean sea Level). 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. It also received scattered showers during summer months. In general, the temperature ranges from 5.50 to 250. The average relative humidity is 60% in different seasons of the year. The soil of the experimental field was medium black with good drainage and uniform texture with medium NPK status.

Experimental details: 15- year- old uniform guava plants of L-49 cultivar planted at 6×6 m a part growing. Experiment was carried out in Randomized Block Design with three replications. Each replication was comprised of nine treatments and each treatment imposed on one tree which was treated as a unit.

T_0 control, T_1 Zinc Sulphate0.1%, T_2Zinc Sulphate0.2%, $T_3$0.1% Borax, T_4 0.2% Borax, T_5 0.1% Borax + 0.1%Zinc Sulphate, T_6 0.1% Borax + 0.2%Zinc Sulphate, T_7 0.2% Borax + 0.1%Zinc Sulphate, T_8 0.2% Borax + 0.2%Zinc Sulphate, spraying of micro nutrients were done before flowering first week of August and second after flowering was laid out in RBD with three replications. Observations recorded to be fruit set, fruit retention, fruit length, fruit width, fruit weight, fruit volume, specific gravity, fruit yield per plant (kg/plant) and yield (q/ha). The data so obtained were analysed statically.

Observation recorded: Annual shoot growth (cm), Increase in plant height (cm, Increase in plant spread (cm)) Increase in stem girth (cm), Leaf area (cm) were estimated.

Statistical analysis: The analysis of variance (ANOVA) for randomised block design (RBD) was performed using the OPSTAT (http://14.139.232.166/opstat) programme, according to the criteria provided by Gomez and Gomez (1984). Fisher and Yates' table was used for comparing 'F' values and computing critical difference (CD) at a 5% level of significance.

Result and Discussion

The data presented in Table and fig. 1, revealed that the maximum increasing in annual shoot growth 55.40 cm T_8 (Borax 0.2%+ Zinc Sulphate 0.2%) and followed by T_7 54.80 (Borax 0.2%+ Zinc Sulphate 0.1%) in comparison to T_0 (Control) 38.40 which is minimum. Maximum Plant height were noted (21.44 cm) T_8 (Borax 0.2%+ Zinc Sulphate 0.2%) followed by T_7 54.80 (Borax 0.2%+ Zinc Sulphate 0.1%) and minimum plant height recorded 16.24 T_0 (control) Plant spread 34.44 cm T_8 (Borax 0.2%+ Zinc Sulphate 0.2%), highest stem girth 16.11 cm T_8 (Borax 0.2%+ Zinc Sulphate 0.2%) followed byT_7 (Borax 0.2%+ Zinc Sulphate 0.1%) Lowest recorded in T_0 (Control). Maximum Leaf area 83.88 cm T_8 (Borax 0.2%+ Zinc Sulphate 0.2%) followed by T_7 (Borax 0.2%+ Zinc Sulphate 0.1%) and minimum recorded T_0 (Control). These findings are in line with earlier reports of Lal and Sen (2000) [7], and Kumawat *et al.*, (2012) [10], who have shown that application of micronutrients alone or in combinations had significant effect on plant height, plant spread, shoot length and leaf area, in guava plant. Zinc is essential components of enzymes responsible for nitrogen and carbohydrates metabolism respectively, thereby resulting into increase in uptake of nitrogen by the plant. Further, involvement of Zn in the synthesis of tryptophan, which is a precursor of indole acetic acid synthesis, consequently it increased the tissue growth and development. It has important role in starch metabolism, and acts as co-factor for many enzymes, affects photosynthesis reaction, nucleic acid metabolism and protein biosynthesis (Alloway, 2008) [4].

Table 1: "Effect of Zinc and Boron on Growth parameters of Guava (*Psidium guajava* L.) cv. L - 49"

Treatments	Annual shoot growth (cm)	Increase in plant height (cm)	Increase in plant spread (cm)	Increase in stem girth (cm)	Leaf area (cm2)
T_0	38.40	16.24	21.16	10.49	64.84
T_1	40.16	16.80	22.10	11.08	69.08
T_2	43.25	16.89	23.68	11.28	71.68
T_3	44.08	17.50	25.67	12.48	77.01
T_4	45.10	18.25	27.08	13.80	74.56
T_5	46.07	19.00	28.80	14.11	78.36
T_6	49.75	19.11	30.20	14.28	79.24
T_7	54.80	20.07	32.04	15.90	82.11
T_8	55.40	21.44	34.44	16.11	83.88
SE(m)±	1.06	0.921	1.12	0.514	1.45
CD at 5%	3.70	3.06	4.13	3.06	3.14

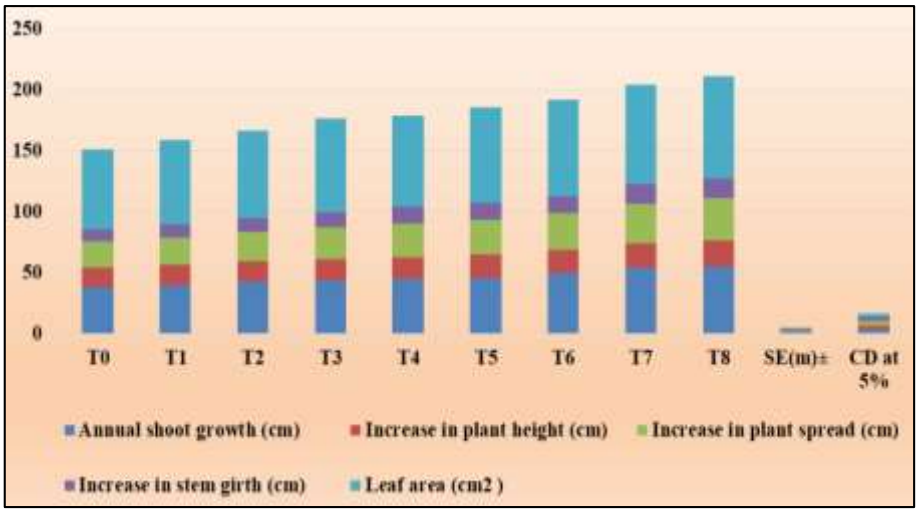

Fig 1: Effect of Zinc and Boron on Growth parameters of Guava (*Psidium guajava* L.) cv. L - 49

Conclusion

On the basis of results obtained in the present investigation it is concluded that the foliar spray of Borax 0.2% + $ZnSO_4$ 0.2% was found to be most beneficial treatment for growth parameters like as annual shoot growth, increase in plant height, plant spread, stem girth and leaf area. Thus, the use of these micronutrients in balanced way may be suggested for growers to obtaining better yield and quality of guava. Thus we can be recommended to guava growers for commercial cultivation of winter season guava (*Psidium guajava* L.), under Lucknow condition area in U.P.

References

1. Alloway BJ. Micronutrients and crop production: An introduction. In Micronutrient deficiencies in global crop production. Springer, Dordrecht; c2008, p. 1-39.
2. Arnon DI, Stout PR. The essentiality of certain elements in minute quantity for plants with special reference to copper. Plant physiology. 1939 Apr;14(2):371.
3. Bhatia SK, Yadav S, Ahlawat VP, Dahiya SS. Effect of foliar application of nutrients on the yield and fruit quality of winter season guava cv. L-49. Haryana Journal of Horticultural Sciences. 2001;30:6-7.
4. Chapman HD. Suggested foliar sampling and handling techniques for determining the nutrient status of some field, horticultural and plantation crops. Indian Journal of Horticulture. 1964;21:97-119.
5. Elyaman W, Bradshaw EM, Uyttenhove C, Dardalhon V, Awasthi A, Imitola J, *et al.* IL-9 induces differentiation of TH17 cells and enhances function of FoxP3+ natural regulatory T cells. Proceedings of the National Academy of Sciences. 2009 Aug 4;106(31):12885-12890.
6. Hada TS, Singh BK, Karma V, Singh SP. Effect of different levels of boron and zinc on flowering, fruiting and growth parameter of winter season guava (*Psidium guajava* L.) cv. L-49, 2014.
7. Kaushik DK, Gupta M, Kumawat KL, Basu A. NLRP3 in flamma some: key mediator of neuro inflammation in murine Japanese encephalitis. PLoS One. 2012;7(2):e32270.
8. Kumar Jitendra, Kumar R, Rai R, Mishra DS. Response of 'Pant Prabhat'guava trees to foliar sprays of zinc, boron, calcium and potassium at different plant growth stages. The Bioscan, 10(2), 495-498.49. Asian Journal of Horticulture, 2015;9(1):53-56.
9. Kumar R, Tiwari R, Kumawat BR. Quantitative and qualitative enhancement in guava (*Psidium guajava* L.) cv. Chittidar through foliar feeding. International Journal of Agriculture Sciences; c2013.
10. Lal G, Sen NL, Jat RG. Yield and leaf nutrient composition of guava as influenced by nutrients. Indian Journal of Horticulture. 2000;57(2):130-132.
11. Obaid EA, Al-Hadethi MEA. Effect of foliar application with manganese and zinc on pomegranate growth, yield and fruit quality. J Hort. Sci. & Ornamental Plants. 2013;5(1):41-45, 9:177-81.
12. Rajan S, Hudedamani U. Genetic resources of guava: importance, uses and prospects. In Conservation and utilization of horticultural genetic resources; c2019. p. 363-383. Springer, Singapore.