Biological Forum – An International Journal **14(2): 1282-1285(2022)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Influence of Foliar Feeding of Ca, Zn and Cu with and without Borax on Physical Parameters of Winter Season guava (*Psidium guajava* L.) cv. L-49

Ravi Pratap[1*], R.K.S. Gautam[2], Vishal Gangwar[1], Pradeep Kumar[3] and Rahul Kumar Yadav[3]
[1]M.Sc. Scholar, Department of Fruit Science,
CSA University of Agriculture & Technology, Kanpur-208002, (Uttar Pradesh), India.
[2]Assistant Professor, Department of Fruit Science,
CSA University of Agriculture & Technology, Kanpur-208002, (Uttar Pradesh), India.
[3]M.Sc. Scholar, Department of Fruit Science,
Banda University of Agriculture & Technology, Banda -210001, (Uttar Pradesh), India.

(Corresponding author: Ravi Pratap)*
(Received 09 April 2022, Accepted 06 June, 2022)
(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: The present investigation entitled "Influence of foliar feeding of Ca, Zn and Cu with and without Borax on fruit set, yield and quality of winter season guava (*Psidium guajava* L.) cv. L-49" was conducted at guava orchard of Kalyanpur nursery, Department of Fruit Science, Chandra Shekhar Azad University of Agriculture and Technology, Kanpur 208002 during 2019-2020. 39 guava trees with even size and vigour were selected and were sprayed with various concentrations of different nutrients (Ca(NO) @ 0.50% and 1.0%), ($ZnSO_4$@ 0.50% and 1.0%) and ($CuSO_4$ @ 0.60% and 0.80%) with and without borax (1.0%). The investigation was conducted in RBD (Randomised Block Design) with 13 treatments which replicated thrice. Fruits were analysed for their physical and biochemical characteristics in the laboratory of Department of Fruit Science, C.S.A.U.A&T, Kanpur. The results of present study revealed that the fruit physical characters i.e. No. of flower per shoot (60.82%), Fruit set (67.30%), Fruit retention (62.54%),fruit length (6.98 cm), fruit width (6.80 cm), weight (150 g), volume (155.30 cc) and yield (56.30 kg per tree) were improved significantly with the use of $ZnSO_4$ 1.0% + Borax 1.0% (T_{10}).

Keywords: Borax, Guava, Quality, Yield and Zinc Sulphate.

INTRODUCTION

Guava (*Psidium guajava* L.) "Apple of the tropics" is one of the most encouraging fruit crops of India and is viewed as one of the impeccable healthfully important remunerative crops (Singh *et al.,* 2000). Not because of its large area or production, but because of its wider edapho-climatic adaptability, resistance to 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 various value added products, and classification as a multipurpose tree due to its utility as a fruit, fuel, fodder, and timber (Suman *et al.*, 2016).

Guava belongs to the family 'Myrtaceae' with basic chromosome number n=11, It was first brought to India in the 17^{th} century by the Portuguese. It is native to Tropical America, ranging from Mexico to Peru, and has since become a commercially important crop in nations such as Brazil, Mexico, China, Malaysia, the Hawaiian Islands, Cuba, and India (Yadav *et al*., 2014).

It is hardy fruit which can be grown in poor alkaline or poorly drained soils. It can be grown in soil with pH ranging from 4.5 to 7.5. It can withstand up to the maximum temperature of 46^0C even with scanty rainfall of less than 25cm.However in subtropical climate there are three distinct periods of growth and fruiting. These three distinct periods are Ambebahar, Mrigbaharand Hastabahar (Shukla *et al.*, 2008).

Guava is an edible fruit that grows on an evergreen shrub or small tree. The fruit of the guava is a real berry. A berry is a fleshy or pulpy indehiscent fruit in which the entire ovary wall ripens into a relatively soft pericarp, the seeds are embedded in the ovary's common meat, and there are usually more than one seed. The trunk of the guava tree is slender, with smooth green to red-brown bark. The base of the trunk may be branched, and the branches may drop low to the ground. The plant's leaves are oval or elliptical in shape, with a smooth upper surface and a hairy under surface. Guava has a berry-like fruit and solitary white blooms. The fruit is round in shape and varies in colour from green to yellow. The interior flesh might be white, yellow, pink, or red in colour, with numerous yellowish seeds. Guava trees can reach a height of 10 metres (33 feet) and live for 40 years (Vora *et al.,* 2018).

The ripe fruit has a moisture content of 79.50 percent, 15.25 percent dry matter, 3.20 percent crude fibre, and very little ash. The TSS ranges between 8.5 and 10.5 percent. The main sugar in guava green mature fruit is fructose. The unique taste guava has been linked to a number of volatile chemicals, including hydrocarbons, alcohol, and carbonyls. Polymerization of leucoanthocyanins is responsible for the decrease in astringency as the fruit matures. The nutritional value in guava fruit are found (per 100g of fruit pulp) as total sugar 5.0 to 10.25g, protein 0.9 to 1.40g, crude fat 0.10 to 0.70g, vitamin A 250 I.U., vitamin C 210 to 305mg, pectin 0.5 to 1.8g, niacin 0.20 to 2.30mg, thiamin 0.02 to 0.06mg, riboflavin 0.02 to 0.04mg, calcium 10.50 to 31.80mg, phosphorus 21.00 to 39.60mg and iron 0.55 to1.36mg (Adsule and Kadam 2005).

Zinc is involved in chlorophyll synthesis, plant growth hormone biosynthesis, and plays a favourable function in photosynthesis and nitrogen metabolism. Auxin and protein synthesis, seed formation, and appropriate maturity all require zinc. It also boosts the size and productivity of the fruit. Boron is a mineral that is found in cell membranes and is required for cell division. It assists with nitrogen uptake and sugar translocation by regulating the potassium/calcium ratio in the plant. It also improves the plant's nitrogen availability. Copper is required in numerous enzyme systems and stimulates several enzymes involved in lignin production in plants. It also plays a role in photosynthesis and the metabolism of carbohydrates and proteins in plants (Zagade *et al.,* 2017).

Calcium is important nutrient for root development and cell division as well as chromosome stability. It also seems to have a regulating role in respiration and several metabolic disorders. It also plays a great role in the neutralization of some organic acid. In plant, it prevented the accumulation of oxalic acid. Calcium is essential for the development of fruit quality (Shanker *et al.,* 2019).

MATERIALS AND METHODS

During the academic year 2019-2020, the current study was conducted at the Kalyanpur nursery's guava orchard, Department of Fruit Science, Chandra Shekhar Azad University of Agriculture & Technology Kanpur (U.P.) India. The climate at the experimental site is semi-arid and subtropical. The orchard's soil is sandy loam that is well drained and aerated. The soil texture was rather loose, which was ideal for plant root development. For this study, twelve year old uniform guava plants were taken at a distance of 6 metres apart. The suggested package of methods for guava nutrient application and other orchard management measures were followed. In the month of June 2019, the experiment was set up in a Randomized Block Design with three replications. Per plot, one plant was used as a unit. Thirteen treatments in toto *viz*., T_1 (Ca $(NO_3)_2$ 0.50%), T_2 (Ca $(NO_3)_2$ 1.0%),T_3 ($ZnSO_4$ 0.50%), T_4 ($ZnSO_4$ 1.0%),T_5 ($CuSO_4$0.60%), T_6 ($CuSO_4$ 0.80%), T_7 (Ca $(NO_3)_2$ 0.50%) + Borax (1.0%), T_8 (Ca $(NO_3)_2$ 1.0%) + Borax (1.0%), T_9 ($ZnSO_4$ 0.50%) + Borax (1.0%), T_{10} ($ZnSO_4$ 1.0%) + Borax (1.0%), T_{11} ($CuSO_4$ 0.60%) + Borax (1.0%), T_{12} ($CuSO_4$ 0.80%) + Borax (1.0%), T_{13} Control (water spray) were sprayed (foliar feeding) 20 Sept. 2019 (18 days before first flowering) and on 14 Nov. 2019 (after fruit setting).

Number of flowers per shoot was calculated by count method from selected branches in each direction and in each treatment and their average was expressed as number of flowers per shoot. The fruit set was calculated by dividing the number of fruits set by the number of flowers that appeared. It's measured in percentages. Fruit retained was calculated by dividing the number of fruits kept till maturity by the number of fruits set and expressing the result in percentage. With the use of a digital Vernier Calliper, the length and breadth of 10 sample fruits from each treatment were measured and expressed in centimetres (cm). On a physical balance, the weight of the above-mentioned fruits was recorded, and the average was represented in gram per fruit. The volume of the fruit was measured in millilitres (ml) using a volumetric flask. At each harvesting, the weight of the fruits was recorded, and the total yield per plant was computed at the final harvesting. The statistical analysis of the data obtained in several sets of experiments was calculated according to Panse and Sukhatme's recommendations (1985).

RESULTS AND DISCUSSION

Enhancement of flower per shoot was observed 10.08 (Maximum) and 8.18% respectively with the treatment of T_{10} and T_4 respectively over control. Due to Zinc as well as Boron. Zinc has an important role in the hydrolysis of complex polysaccharides into simple sugars, metabolite synthesis, and fast translocation of photosynthetic products and minerals from other parts of the plant. Boron also responded more prominent in role of translocation of carbohydrates and auxin synthesis which emphasize to enhancing of fruiting parameter this fruiting parameter i.e. flowering. So the combined treatment of T_{10} promoted maximum flowering in this experimentation. These findings are in line with the reports of Singh and Brahmachari (1999); Balakrishnan (2001); Kumar *et al.* (2010); Trivedi *et al.* (2012); Yadav *et al.* (2015); Bhoyar and Ramdevputra (2017) in guava.

Combined treatment of T_{10} gave significantly enhancement of fruit setting in this experimentation. Foliar application of Boron might be have proved helpful in maintaining better nutritional status of guava plant which ultimately proved beneficial in enhancing attitude of higher number of fruit setting. Similarly zinc also play important role for carbohydrate and phosphorus metabolism and it is essential for carbon dioxide utilization and evolution which gave strengthening phenomenon of fruit attached to peduncle due to this process of action fruit set enhanced. These findings are also co-related with the reports of Ali *et al.* (1993); Trivedi *et al.*,(2012); Hada *et al.* (2014); Kumar *et al.* (2015); Zagade *et al.* (2017) in guava.

Combined treatment of $ZnSO_4$ 1.0% + Borax 1.0% (T_{10}) significantly enhanced (62.54%) fruit retention percentage. Closely followed by treatment of $ZnSO_4$ 1.0% (T_4) recording 59.70% fruit retention against control. Increasement in fruit retention might have been observed due to combined effect of micronutrient of Boron and Zinc. Zinc acts synthesis of plant growth substances and enzymes and essential for promoting certain metabolic reactions. Boron responded important role in translocation of carbohydrate and auxin synthesis regulating sink and enhancing in pollen viability and fertilization which create more strengthening of the fruit attachment with peduncle of the fruit. These findings are conformity with the reports of E1 Sherif *et al.,* (2000); Awasthi and Lal (2009); Rajkumar *et al.* (2017); Yadav *et al.,* (2017); Yadav *et al.* (2011) in guava fruit.

Foliar spray of different treatments proved beneficial in increasing the length, width, weight, volume and yield of fruit as compared to control (Table 1). The maximum length (6.98 cm), width (6.80 cm), weight (150 g), volume (155 cc) and yield (56.30 kg per plant) of fruit was recorded in T_{10} which was closely followed by T_8,T_9,T_4,T_8, and T_9 respectively. The minimum length, width, weight, volume, and yield of fruit was recorded in control plants.

These parameters i.e. length of fruit, width of fruit and volume of fruit might have been enhanced due to combined action of zinc and Boron. In this investigation Zinc acts as promoter of chlorophyll synthesis water uptake and auxin synthesis and it is essential component of many proteins and also enhances rate of antioxidant enzymes as well as different metabolic process of plant. Boron also promotes the activation of enzyme reaction like transformation of carbohydrate, activity of hexokinase and formation of cellulose.These findings are agreements with the reports of Yadav *et al.* (2017); Pal *et al.* (2008); Singh *et al.* (2004) in guava and Singh *et al.* (2018) in sweet orange.

These increases in fruit yield were caused by the mineral nutrients (Boron and Zinc) appearing to play an indirect function in hastening the progressive process of cell division and cell elongation, resulting in increased size, weight, and volume.In this contest weight as well as yield of fruit were enhanced in this experimentation. These results inconformity with the reports of Rajkumar *et al.*, (2014), Rajkumar *et al.*, (2017); Zagade *et al.* (2017); Yadav *et. al.* (2017); Singh *et al.* (2019); Sachin *et al.* (2019) in guava.

CONCLUSION

The yield and physical parameters of fruits with respect No. of flower per shoot (60.82%), Fruit set (67.30%), Fruit retention (62.54%), fruit length (6.98 cm), fruit width (6.80 cm), weight (150 g), volume (155.30 cc) and yield (56.30 kg per tree) were obtained maximum with the foliar application of $ZnSO_4$ 1.0% + Borax 1.0% (T_{10}). Second effective treatment was $ZnSO_4$ 1.0% (T_4) in investigation.

So, it is advised to guava growers and orchardist to spraying of $ZnSO_4$ 1.0% + Borax 1.0% (T_{10}) for obtaining better yield and quality of winter season guava fruits.

Table 1: Influence of foliar feeding of Ca, Zn and Cu with and without Borax on Physical Parameters of winter season guava (*Psidium guajava* L.) cv. L-49.

Treatments	Number of flower per shoot	Fruit set (%)	Fruit retention (%)	Fruit length (cm)	Fruit width (cm)	Fruit weight (g)	Volume (cc)	Yield (kg/tree)
T_1 (Ca $(NO_3)_2$ 0.50%)	57.53	64.08	47.20	6.41	6.32	122.61	131.15	47.34
T_2 (Ca $(NO_3)_2$ 1.0%)	57.76	63.55	53.15	6.55	6.41	127.80	138.71	49.15
T_3 ($ZnSO_4$ 0.50%)	57.95	63.90	52.46	6.33	6.44	132.26	139.29	50.08
T_4 ($ZnSO_4$ 1.0%)	59.77	66.18	59.70	6.60	6.60	146.05	144.20	52.85
T_5 ($CuSO_4$ 0.60%)	56.03	59.89	53.66	6.25	6.25	118.87	130.35	43.90
T_6 ($CuSO_4$ 0.80%)	57.40	63.32	55.05	6.40	6.37	125.19	136.12	45.38
T_7 (Ca $(NO_3)_2$ 0.50%) + Borax (1.0%)	57.75	65.70	50.31	6.83	6.50	129.80	142.06	49.10
T_8 (Ca $(NO_3)_2$ 1.0%) + Borax (1.0%)	57.92	64.88	56.45	6.91	6.62	134.30	149.60	51.31
T_9 ($ZnSO_4$ 0.50%) + Borax (1.0%)	58.35	65.45	55.60	6.72	6.65	139.18	148.20	53.15
T_{10} ($ZnSO_4$ 1.0%) + Borax (1.0%)	60.82	67.30	62.54	6.98	6.80	150.55	155.36	56.30
T_{11} ($CuSO_4$ 0.60%) + Borax (1.0%)	56.61	60.97	55.08	6.64	6.44	125.78	141.25	45.90
T_{12} ($CuSO_4$ 0.80%) + Borax (1.0%)	57.66	63.26	58.40	6.78	6.58	132.08	147.56	47.65
T_{13} Control (water spray)	55.25	54.88	41.96	5.69	5.57	120.56	128.85	34.15
S.E. (d)	0.68	0.97	1.35	0.32	0.07	1.34	1.81	1.58
C.D. at 5%	1.40	2.00	2.80	0.66	0.14	4.67	3.75	3.27

Acknowledgement. My advisor, Dr. R.K. Singh Gautam, and all faculty members of the Department of Fruit Science, Collage of Horticulture, CSA University of Agriculture and Technology, Kanpur 208002, (U.P.) supported the research by providing us with the essential resources.

Conflict of Interest. None.

REFERENCES

Adsule, R. N. and Kadam, S. S. (2005). Guava In: Hand Book of Fruit Science and Technology : Production, Composition, Storage and Processing. pp: 419-433.

Ali, W., Pathak, R. A. and Yadav, A. L. (1993). Effect of foliar application of nutrients on guava (*Psidium* *guajava* L.) cv. Allahabad Safeda. *Prog. Hort.*, *23*(1-4): 14-21.

Awasthi, Priya and Lal, shant (2009). Effect of foliar sprays calcium, boron and zinc on the yield and quality of guava (*Psidium guajava* L.). *Pantnagar Journal of Research*, *7*(2): 223-225.

Balakrishnan, K. (2001). Effect of foliar application of micronutrients on guava. *Madras Agricultural Journal*, *88*(4/6): 316-317.

Bhoyar, M. G. and Ramdevputra, M. V. (2017). Effect of foliar spray of zinc, iron and boron on the growth, yield and sensory characters of Guava (*Psidium guajava* L.) c.v. Sardar L-49. *Journal of Applied and Natural Science*, *8*(2): 701-704.

E1 Sherif, A.A., Saeed, W.T. and Nauman, V.F. (2000). Effect of foliar application of potassium and zinc on behavior of Mantakhab E.L. Kanater guava trees. *Bulletin faculty Agri Univ. Cario.*, *51*(1): 73-84.

Hada, T. S.; Singh, B. K.; Karma Veer and Singh, S. P. (2014). Effect of different levels of boron and zinc on flowering, fruiting and growth parameter of winter season guava (*Psidium guajava* L.) cv. L-49. *Asian Journal of Horticulture*, *9*(1): 53-56.

Kumar, Raj, Tiwari, J.P. and Lal, Shant (2010). Influence of zinc sulphate and boric acid spray on vegetative growth and yield of winter season guava (*Psidium guajava* L.) cv. Pant Prabhat. *J. Res.*, *8*(1): 135-138.

Kumar, Jitendra, Kumar, Rajesh; rai, Ratna and Mishra, D.S. (2015). Response of pant prabhat guava trees to foliar spray of zinc, boron, calcium and potassium at differet plant growth stages. *The Bioscan*, *10*(2): 495-498.

Panse, V. G. and sukhatme, P. V. (1985). Statistical method of agriculture workers, *ICAR, New Delhi.*

Pal, Anju; Pathak, R.K.; Pal, Krishna and Singh, Tejbir (2008). Effect of foliar application of nutrients on yield and quality of guava (*Psidium guajava* L.) fruits cv. Sardar. *Prog. Res.*, *3*(1): 89-90.

Rajkumar; Tiwari, J. P. and Lal, Shant (2014). Effect of foliar application of zinc and boron on fruit yield and quality of winter season guava (*Psidium guajava* L.) cv. Pant Prabhat. *Annals of Agri Bio Research*, *19*(1): 105-108.

Rajkumar, Tiwari, J. P., Lal, Shant, Kumar, Mohit and Kumar, Ashwani. (2017). Effect of boron and zinc application on nutrient uptake in guava (*Psidium guajava* L.) cv. Pant Prabhat leaves. *Int. J. Curr. Microbiol. App. Sci*, *6*(6): 1991-2002.

Shanker, Karuna, Misra, Sanyat, Topwal, Mukesh and Singh, V. K. (2019). A Research Review on Use of Micronutrient in Fruit Crops. *International Journal of Current Microbiology and Applied Sciences*, *8*(8): 3014-3025.

Shukla, A.K.; Kaushik, R.A., Pandey, D. and Sarolia, D.K. (2008). In: Guava. Published by Maharana Pratap University of Agriculture and technology, Udaipur (RAJASTHAN) INDIA pp: 7.

Singh, G; Singh, A.K. and Pandey, D. (2000). Effect of cropping patterns on fruiting behaviour of guava. *Annals of Agricultural Research*, *21*(2): 175-82.

Suman, Mahaveer; Dubalgunde, S.V.; Poobalan, Ooty and Sangma, Pency D. (2016). Effect of foliar application of micronutrients on yield and economics of guava (*Psidium guajava* L.) CV. L-49. *International Journal of Agriculture, Environment and Biotechnology*, *9*(2): 221-224.

Singh, G, Singh, A. K. and Pandey, D. (2000). Effect of cropping patterns on fruiting behaviour of guava. *Annals of Agricultural Research*, *21*(2): 175-82.

Sachin, K., Arvind, K., Vipin; Tripathi, S. K. and Kumar, Mukesh (2019). Effect of foliar application of micronutrients on physical quality parameters of guava (*Psidium guajava* L.) Cv. Lalit. *Annals of Horticulture*, *12*(2): 130-133.

Singh, Anubhav and Kaur, Gurpinder (2019). Effect of foliar application of micronutrients on yield and quality of guava cv. Sardar. *Journal of Pharmacognosy and Phytochemistry*, *SP1*: 156-158.

Singh, Ramendra; Chaturvedi, O.P. and Singh, Raghuvendra (2004). Effect of pre-harvest spray of zinc, boron and calcium on the physico-chemical quality of guava fruit (*Psidium guajava* L.). *International Seminar on Recent Trend on Hi-Tech Hort. And P.H.T.*, Kanpur, February 4-6: 2004-204.

Singh, U. P. and Brahmachari, V. S. (1999). Effect of potassium, zinc, boron and molybdenum on the guava (*Psidium guajava* L.) cv. Allahabad safeda. *Orissa J. Hort.*,48(4): 312-314.

Singh, Yogendra; Thakur, Nidhika and Meena, N.K. (2018). Studies on the effect of foliar spray of Zn, Cu and B on growth, yield and fruit quality of sweet orange (*Citrus sinensis* L.) cv. Mosambi. *International Journal of Chemical Studies*, *6*(5): 3260-3264.

Trivedi, Nitinm Singh, Devi, Bahadur, Vijay, Prasad, V. M. and Collis, J. P.(2012). Effect of foliar application of zinc and boron on yield and fruit quality of guava (*Psidium guajava* L.). *HortFlora Research Spectrum*, 1(3): 281-283.

Vora, J.D., Mankame, Gautami and Madav, Pranay (2018). Biochemical and nutritional assessment of guava *(Psidium Guajava* L.). *Journal of Biotechnology and Biochemistry*, *4*(5): 01-07.

Yadav, Ajay, Verma, R.S., Ram, R.B., Kumar, Viplaw and Yadav, Ram Kewal (2017). Effect of foliar application of micronutrients on physical parameters of winter season Guava (*Psidium guajava* L.) cv. Lalit. *Plant Archives*, *17*(2): 1457-1459.

Yadav, H. C., Yadav, A. L., Yadav, D. K. and Yadav, P. K.(2011). Effect of foliar application of micronutrients and GA_3 on fruit yield and quality of rainy season guava (*Psidium guajava* L.) cv. L-49. *Plant Archives*, 11(1): 147-149.

Yadav, R.K.; Ram, R.B.; Meena, M.L.; Kumar, Vikash and Singh, H.D. (2015). Response of foliar spray of micronutrients on fruit set, yield and quality of winter season guava (*Psidium guajava* L.) cv. Allahabad Safeda. *Environment and ecology*, *33*(1B): 444-447.

Yadav, R.K., Ram, R.B, Kumar, Vikash, Meena, M.L. and Singh, H.D. (2014). Impact of micronutrients on fruit set and fruit drop of winter season guava (*Psidium guajava* L.) cv. Allahabad Safeda. *Indian Journal of Science and Technology*, *7*(9): 1451–1453.

Zagade, P.M.; Munde, G.R. and Shirsath, A.H (2017). Effect of foliar application of micronutrients on yield and quality of Guava (*Psidium guajava* L.) cv. Sardar. *Journal of Pharmacy and Biological Sciences*, *12*(5): 56-58.

How to cite this article: Ravi Pratap, R.K.S. Gautam, Vishal Gangwar, Pradeep Kumar and Rahul Kumar Yadav (2022). Influence of Foliar Feeding of Ca, Zn and Cu with and without Borax on Physical Parameters of Winter Season guava (*Psidium guajava* L.) cv. L-49. *Biological Forum – An International Journal*, *14*(2): 1282-1285.