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Shivpoojan
Dept. of Horticulture,
BBAU, Vidya Vihar, Lucknow,
Uttar Pradesh, India

Ankit Kumar Pandey
Department of Horticulture
(Fruit and Fruit Technology),
BAU, Sabour, Bihar, India

RB Ram
Dept. of Horticulture,
BBAU, Vidya Vihar, Lucknow,
Uttar Pradesh, India

Rajni Rajan
Department of Horticulture
(Fruit and Fruit Technology),
BAU, Sabour, Bihar, India

Rakesh Kumar Pandey
Department of Horticulture
(Fruit and Fruit Technology),
BAU, Sabour, Bihar, India

Correspondence
Shivpoojan
Dept. of Horticulture,
BBAU, Vidya Vihar, Lucknow,
Uttar Pradesh, India

Efficacy of foliar application of micronutrients on fruit set in winter season guava (*Psidium Guajava* L.) cv. Lalit

Shivpoojan, Ankit Kumar Pandey, RB Ram, Rajni Rajan and Rakesh Kumar Pandey

Abstract
Guava is an important fruit crop of India. The plants are hardy in nature and therefor have wider adoptability in the Country. The fruits of guava are available throughout the year but spring-summer; rainy season and autumn winter crops are common. Among all fruiting seasons, best quality of fruits is obtained in winter season. To further improve the fruit yield and quality of winter guava cultivar Lalit, an experiment was conducted to investigate the effect of foliar spray of micronutrients especially boron and calcium to during 2017-18 at Dept. of Horticulture, BBA University, Lucknow. The spray of $CaCl_2$0.2% +Boron 0.1% was found to be the best with 66.54% fruit set.

Keywords: Foliar application, micronutrients, fruit, winter season guava, *Psidium guajava* L. cv. Lalit

Introduction
Guava (*Psidium guajava* L.) is the fourth largest fruit crop in India. It is one of the common fruit liked by poor and rich people in the tropical and subtropical countries. The genus *Psidium* belongs to family Myrtaceae and sub family Myrtoideae originated in tropical America. Other important fruits members of this family include Jamun, Java plum, Nutmeg etc. Its chromosome number is 2n=22 (n=11).Because of its hardiness, adaptability, productivity and nutritive value, it surpasses most other fruits and gives handsome returns involving very little input (Singh, 2005) [8]. Guava trees are very hardy, prolific bearer and need comparatively less attention which make its cultivation more remunerative (Tyagi and Patel, 2004) [11] and it can be grown in alkaline and poorly drained soil (Lal *et al*., 2017) [5].

Guava is considered as apple of the tropics owing to its high in vitamin C (75- 260 mg 100 g-l pulp), good source of thiamine (0.03 - 0.07 mg 100 g-l pulp) and riboflavin (0.02-0.04 mg 100 g-l pulp) (Singh *et al*., 2003). Guava fruit is also a good source of nutrients and minerals like phosphorus (22.5- 40.0 mg 100g-l), calcium (10.0-30.0 mg 100 g-l) and iron (0.60-1.39 mg 100 g-l) (Singh 2003).It contains good amount of pectin (0.5-1.8%) (Adsule and Kadam, 1995) [1] Hence fruits are used for preparation of jelly and other processed products.

Guava is a climacteric fruit (Akamine and Goo, 1979; Brown and Wills, 1983) [2, 4], with relatively short shelf life due to their rapid rate of ripening. Its skin and flesh colors vary from variety to variety depending on the amount and type of pigments.

A guava fruit contains 80-82% water, 0.71% protein, 0.5% fat, 11-13% carbohydrate and 2.4% acids. Among fruits, it ranks third in vitamin-C content after Barbados cherry and aonla. and rated as the cheap and good source of vitamin C. The fruits are consumed either fresh or processed in the form of products like jam, jelly, juices, nectar, ready to serve (RTS) etc. Among all these products, guava jelly is most famous.

Problems do occur in flowering and fruit set of guava clones. Guavas generally have pollen with high rates of germination except for triploid clones. Fruit set in the triploid cultivars is good when grown together with diploid clones as a pollen sources. Environmental conditions play an important role in determining the flowering and fruiting of guava. Although, full sunlight is required for efficient flowering and fruiting the periods of water stress are critical to enhance flowering. Often under favourable conditions many white flowers either solitary or in groups of two or three arising from the leaf axils of young shoots and abundant fruits can be seen on guava trees. The guava bears solitary flowers or in a cyme of two to three flowers on the current season's growth, in the axils of the leaves.

Normally, the bearing twigs grow a few centimetres long, putting our 4 or 5 leaves. If the flower sets, the terminal bud ceases the grow until the next growing season. The flowering bud is a mixed type and the flowering shoots bear the flower laterally. The axillary buds are not produced all over the shoot and may appear scattered. The flowering or blooming period varies from 25 to 45 days depending on the variety, season and region.

Guava is basically self-pollinated, although some strains seem to produce more fruits when cross-pollinated with another variety. The main pollinator of guava is the honeybee. The initial fruit set in nature is quite high. Where 80-86% of the flowers set fruit. However, due to severe fruit drop, only 34 to 56% of the fruits reach maturity. In seedless clones, the final retention is as low as 6%. The fruit drop may be due to different physiological and environmental factors. The formation of fruit is first noticed 12 days after flowering and the guava fruit takes about 15 to 17 weeks from fruit set to harvest.

Guava flowers throughout the year but three distinct seasons known as "Bahar"(Ambe, Mrig and Hasta bahar) are common in north India Lal *et al*., 2013 [6] Due to the continuous flowering and heavy crop load on trees, the size of the fruits remains usually very small.

Foliar application of nutrients can be more effective than soil application (Zaman and Schumann, 2006) [13]. The foliar spray of borax and calcium chloride not only improves the size but also enhance quality parameters of the fruits. Boron is important for ovule development, pollen tube growth and fruit set. Micronutrient such as boron is a constituent of cell membrane and essential for cell division. Calcium, as a constituent of the cell wall, plays an important role in forming cross-bridges, which influence cell wall strength and regarded as the last barrier before cell separation.

Borax response was more positive due to boron which play an important role in translocation of carbohydrates, auxin synthesis and increased pollen viability and fertilization. It acts as a regulator of potassium/calcium ratio in the plant and helps in nitrogen absorption and translocation of sugar in plant. Boron increases nitrogen availability in plant. It was believed that boron brings about inactivation of superfluous growth hormone by formation of complex compound. These activities improve width length of fruit which ultimately increase the yield of fruit (Singh and Bramhachari, 1999) [10]. Therefore present investigation was conducted to see the effect of calcium and boran on fruit set in guava.

Method and Materials

Nineteen year-old uniform guava plants of cultivarLalit planted at 6x6 m distance in Horticultural Research Farm, Department of Horticulture, Babasaheb Bhimrao Ambedkar University Lucknow were taken for investigation. Eight treatments viz.(T1), Calcium chloride 0.1% (T2),Calcium chloride 0.2% (T3), Borax 0.1%(T4), Borax 0.2% (T5), Calcium chloride 0.1% + Borax 0.1% (T6), Calcium chloride 0.1% + Borax 0.2% (T7), Calcium chloride 0.2% + Borax 0.1%(T8),Calcium chloride 0.2% + Borax along with control (T0).were applied through foliar spray in first week of August and second week of September during 2017-18. The experiment was laid out in RBD with three replication. Observations were recorded for fruit set using standard methodology. The data so obtained were analyzed statically to see the impact of various treatment combinations.

Results and Discussion

A perusal of data presented in table show the significant response of foliar feeding on fruit set. The highest fruit set (66.54%) was noted in calcium chloride 0.2% + Borax 0.1% (T7), followed by (62.59%) in Calcium chloride 0.2% + Borax 0.2% (T8). The plant under control showed minimum fruit set (47.12%). Borax response was more positive due to boron which plays an important role in translocation of carbohydrates, auxin synthesis to the sink and increased pollen viability and fertilization. The Borax has a key role in cell division and cell elongation resulting onincreased vegetative growth and direct effect on photosynthesis activity of plants. Thecalcium chloride helps in synthesis of plant growth substances and enzymes essential for promoting certain metabolic reactions. The minimum number of flower, fruit set, fruit retention and maximum fruit drop percentage were recorded under control. These results in accordance with the finding of Yadav *et al.* (2011) in guava and Awasthi and Lal (2009) [3] in ber.

Table 1: Efficacy of foliar application of micronutrients on fruit set of guava cv. Lalit

Treatments	Fruit Set (%)
T_0 (Control)	47.127
T_1 (Calcium chloride 0.1%)	57.877
T_2 (Calcium chloride 0.2%)	55.870
T_3 (Borax 0.1%)	54.600
T_4 (Borax 0.2%)	52.063
T_5 (Calcium chloride 0.1% + Borax 0.1%)	59.033
T_6 (Calcium chloride 0.1% + Borax 0.2%)	60.283
T_7 (Calcium chloride 0.2% + Borax 0.1%)	66.543
T_8 (Calcium chloride 0.2% + Borax 0.2%)	62.597
SEm ±	0.79
CD 0.05	2.38

Conclusion

The highest fruit set and minimum fruit drop percentage was found with foliar spray of calcium chloride 0.2% + borax 0.1% followed by calcium chloride 0.2% + borax 0.2% per cent. Based on the results obtained during the investigation, it can be concluded that "Lalit" cultivar of guava has significant response to foliar feeding of calcium chloride and boron when subjected to foliar spray during August-September. Hence this treatment can be recommended to the guava growers for obtaining better yield of fruits under Lucknow condition.

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