International Journal of Advanced Biochemistry Research

**ISSN Print:** 2617-4693
**ISSN Online:** 2617-4707
NAAS Rating: 5.29
IJABR 2025; 9(5): 281-283
www.biochemjournal.com
Received: 02-02-2025
Accepted: 06-03-2025

**Ram Karan Chauhan**
M.Sc. Student, Department of Fruit Science, College of Horticulture and Forestry, AU, Kota, Rajasthan, India

**Jitendra Singh**
Professor, Department of Fruit Science, College of Horticulture and Forestry, AU, Kota, Rajasthan, India

**Prerak Bhatnagar**
Associate Professor, Department of Fruit Science, College of Horticulture and Forestry, AU, Kota, Rajasthan, India

**Ladhu Ram**
Assistant Professor, Department of Fruit Science, College of Horticulture and Forestry, AU, Kota, Rajasthan, India

**Bhuvnesh Nagar**
Assistant Professor, Department of Fruit Science, College of Horticulture and Forestry, AU, Kota, Rajasthan, India

**Corresponding Author:**
**Ram Karan Chauhan**
M.Sc. Student, Department of Fruit Science, College of Horticulture and Forestry, AU, Kota, Rajasthan, India

# Time-specific shoot bending: It's role in improving quality and productivity of guava (L-49)

**Ram Karan Chauhan, Jitendra Singh, Prerak Bhatnagar, Ladhu Ram and Bhuvnesh Nagar**

**DOI:** https://www.doi.org/10.33545/26174693.2025.v9.i5d.4326

**Abstract**
The guava variety Lucknow-49 (L-49), known for its excellent fruit quality and productivity, requires effective crop management practices to maximize yield. One promising method for crop regulation is branch bending, a horticultural technique that redirects plant growth and enhances Quality. This study investigates the impact of branch bending on fruit quality parameters of L-49 guava. This approach provides a sustainable, low-cost strategy for small and medium-scale farmers aiming to boost productivity and meet consumer demand for high-quality guava. The results demonstrated that quality attributes were significantly influenced by bending treatment at different time interval. The maximum TSS ($11.75^0$B), total sugar (7.61%), reducing sugar (5.21%) and non-reducing sugar (2.28%) along with ascorbic acid (198.66 mg/ 100g pulp) were recorded in $T_1$ treatment ($30^{th}$ May bending).

**Keywords:** Shoot bending, time, *Psidium guajava*, TSS, quality

## Introduction
Guava (*Psidium guajava* L.), often referred to as the "Apple of the Tropics" or "Poor Man's Apple," is a highly valued fruit crop in tropical and subtropical regions. A member of the Myrtaceae family, guava is believed to have originated in Tropical America. In India, it holds considerable commercial significance, ranking fourth in both cultivation area and production—following mango, banana, and citrus in area, and mango, banana, and citrus in yield. As of 2023, guava is cultivated across approximately 359,000 hectares, contributing an annual yield of about 5.59 million metric tonnes. Key guava-producing states include Uttar Pradesh, West Bengal, and Andhra Pradesh.

Fruit quality in guava is determined by a combination of physical and biochemical parameters such as fruit weight, size, pulp-to-seed ratio, TSS, acidity, ascorbic acid (vitamin C) content, flavor, and texture. Achieving consistency in these attributes is essential for consumer acceptance and market value. Cultural practices such as shoot bending, a non-chemical crop regulation technique, have shown promise in improving flowering and fruit quality by altering hormonal balance, improving carbon-to-nitrogen ratio, and encouraging bud break. The timing of shoot bending is particularly crucial, as it affects the plant's physiological response, ultimately influencing both yield and fruit quality.

Therefore, the present study aims to evaluate the effect of different shoot bending times on the quality parameters of guava, with a focus on improving fruit characteristics and optimizing production. One effective technique to enhance quality is shoot bending, which involves training branches to grow closer to the ground. Ideally conducted 15-30 days prior to expected flowering, this method begins with the removal of leaves, developing shoots, and any early flowers. The shoots are then bent and secured using ropes and pegs. This manipulation increases tension within the wood and reduces phloem development, thereby slowing the movement of photosynthates away from the shoot. The resulting higher carbon-to-nitrogen ratio encourages floral bud development and fruit set. Unlike vertical shoots, which typically remain barren, bent shoots stimulate previously dormant buds and significantly improve flowering and fruit production.

Overall, guava branches naturally grow in an upright fashion, which often results in limited fruiting. Such vertical growth contributes to lower productivity. As emphasized by Sheriff (2013) [8], plant response to bending is influenced by both genetic variation and the timing of

the intervention. Therefore, it is essential to investigate the effects of bending in guava to understand its potential for improving flowering, fruiting, and overall yield.

## Materials and Methods

The present investigation was conducted from March 2022 to February 2023 on the Instructional farm, Department of Fruit Science, College of Horticulture and Forestry, Jhalarapatan city, Jhalawar (Agriculture University, Kota). The experiment consists of 09 treatments and was laid out in simple randomized block design with three replications. All observations were recorded from time to time on randomly selected five shoot tagged per plant in each replication. All other cultural practices were followed as per recommendations. The data recorded during the course of investigation were statistically analyzed by using analysis of variance Panse and Sukhatme (1985) [9].

The observations on various quality attributes like TSS, total sugar, reducing sugar and non-reducing sugar along with ascorbic acid. Total yield per bent shoot per plant was calculated by weight of final fruits after harvesting. TSS in fruit pulp was estimated by hand refractometer and presented in $^0$B.

## Results and Discussion

### Effect of time of shoot bending on quality attributes

The data appeared that TSS (11.75$^0$B), total sugar (7.61%), reducing sugar (5.21%), non-reducing sugar (2.40%) and ascorbic acid (198.66 mg/ 100g pulp) content were comparatively better in $T_1$ treatment (15$^{th}$ May bending). The better quality attributes of fruits in $T_1$ treatment (30$^{th}$ May bending) may be attributed to prevailing favorable climatic condition with availability of comparatively longer period of fruit growth and development in comparison to other treatment. Further, under this treatment ($T_1$-30$^{th}$ May bending) the lower minimum (night) temperatures prevailing during the winter months (October-February) might also contributed to the better fruit quality such as TSS, total sugar, ascorbic acid, etc. Kliewer and Lider (1970) [3] found that besides retarding the loss of respiratory substrates, low temperature also enhances photosynthate translocation from leaves to other plant parts. Due to decrease in temperature vegetative growth in guava slowed down throughout the winter season allowing the plant to accumulate more food reserves, notably in the fruits (Rathore, 1976) [4].

### Effect of time of shoot bending on yield attributes

The data showed that the yield attributes viz. number of fruits per bent shoot at harvest (28.66 fruits) and estimated yield (4.96 kg/ bent shoot) were found significantly superior in treatment $T_1$ (30$^{th}$ May bending). However, fruit weight (185.66 g) was found significantly superior in treatment $T_4$ (15$^{th}$ July bending). Such result may be explained behind the fact that in the month of July there had been high vegetative growth that might influenced production of $GA_3$ associated to promotion of cell enlargement and cell division favouring better size of leaf, high amount of auxin synthesis and consequently high photosynthesis which ultimately might led to better yield attributes (Carpenter *et al.*, 2018) [1]. There is inverse relationship between fruit weight and number of fruits. Samant and Kishore, 2021 has also reported same negative association between fruit weight and number of fruits. Hence, heavy crop load in bent guava plants in $T_1$ (bending on 30$^{th}$ May) could be the reason for significant reduction in fruit weight and associated attributes as it is governed by source-sink partitioning of photosynthates. Further, the better yield attributes under $T_1$ treatment (30$^{th}$ May bending) might be due to its appropriateness on time scale in atune with natural phenological development in guava plants.

**Table 1:** Effect of time of shoot bending on number of fruits per bent shoot at harvest, yield and Fruit weight.

| Treatment | Number of fruits per bent shoot at harvest | Estimated yield (kg/ bent shoot) | Fruit weight (g) |
|---|---|---|---|
| $T_0$ (Control) | 20.44 | 3.75 | 183.66 |
| $T_1$ (30$^{th}$ May) | 28.66 | 4.96 | 173.33 |
| $T_2$ (15$^{th}$ June) | 26.33 | 4.63 | 176.33 |
| $T_3$ (30$^{th}$ June) | 24.33 | 4.38 | 180.33 |
| $T_4$ (15$^{th}$ July) | 21.66 | 3.97 | 185.66 |
| $T_5$ (30$^{th}$ July) | 19.33 | 3.33 | 172.66 |
| $T_6$ (15$^{th}$ August) | 17.66 | 2.94 | 166.66 |
| $T_7$ (30$^{th}$ August) | 15.33 | 2.46 | 161.66 |
| $T_8$ (15$^{th}$ September) | 13.00 | 2.07 | 159.66 |
| SEm (±) | 0.32 | 0.09 | 0.50 |
| | 0.65 | 0.26 | 1.52 |

**Table 2:** Effect of time of shoot bending on TSS, total sugar, reducing sugar, non-reducing sugar and ascorbic acid

| Treatment | TSS (degree brix) | Total sugar (%) | Reducing sugar (%) | Non reducing sugar (%) | Ascorbic acid (mg per 100g pulp) |
|---|---|---|---|---|---|
| $T_0$ (Control) | 10.20 | 5.87 | 4.17 | 1.61 | 186.33 |
| $T_1$ (30$^{th}$ May) | 11.75 | 7.61 | 5.21 | 2.28 | 198.66 |
| $T_2$ (15$^{th}$ June) | 11.46 | 7.00 | 4.73 | 2.15 | 195.00 |
| $T_3$ (30$^{th}$ June) | 10.90 | 6.59 | 4.53 | 1.95 | 191.66 |
| $T_4$ (15$^{th}$ July) | 10.40 | 6.13 | 4.30 | 1.73 | 188.00 |
| $T_5$ (30$^{th}$ July) | 10.00 | 5.83 | 4.03 | 1.71 | 184.33 |
| $T_6$ (15$^{th}$ August) | 9.66 | 5.73 | 3.70 | 1.92 | 166.66 |
| $T_7$ (30$^{th}$ August) | 9.33 | 4.97 | 3.44 | 1.45 | 161.00 |
| $T_8$ (15$^{th}$ September) | 8.60 | 4.50 | 3.20 | 1.23 | 158.00 |
| SEm (±) | 0.04 | 0.09 | 0.07 | 0.02 | 0.80 |
| CD (5%) | 0.12 | 0.27 | 0.12 | 0.07 | 1.41 |

## Conclusion

On the basis of results obtained from the field experiment entitled “Time of shoot bending in guava (*Psidium guajava* L.) cv. Sardar affects flowering, yield and quality”, it is concluded that the bending treatment had significant effect on yield and quality attributes in guava plants. Among the different treatments of bending. The yield attributes viz. number of fruits per bent shoot at harvest (28.66 fruits) and estimated yield (4.96 kg/ bent shoot) were found significantly superior in treatment $T_1$ (30$^{th}$ May bending). The quality attributes viz. TSS (11.75$^0$B), total sugar (7.61%), reducing sugar (5.21%), and non-reducing sugar (2.40%) along with ascorbic acid (198.66 mg/ 100g pulp)

were observed comparatively better in treatment $T_1$ (15th May bending) treatment. Based on the present investigations, it may concluded that exposing the guava plant to bending is beneficial in improving quality attributes.

**Acknowledgement**
With great reverence, I express my warmest feeling with deepest sense of gratitude, sincere regards and heartfelt thanks to my Major Advisor Dr. Jitendra Singh, Professor and Head, Deptt. of Fruit Science for his encouragement and moral support showed on me and inspiring guidance, scientific proficiency, constructive criticism and constant encouragement whole hearted cooperation in the preparation of the manuscript.

**References**

1. Carpenter S. Effect of foliar spray of gibberellic acid and urea on growth, flowering, yield and quality of guava (*Psidium guajava* L.) cv. L-49 [M.Sc. thesis]. Kota (India): Agriculture University; 2018. p. 101-102.
2. Ito A, Yaegaki H, Hayama H, Kusaba S, Yamaguchi I, Yoshioka H. Bending shoots stimulates flowering and influences hormone levels in lateral buds of Japanese pear. HortScience. 1999;34(7):1224-1228.
3. Kliewer WM, Lider LA. Effects of the day temperature and light intensity on growth and composition of *Vitis vinifera* L. fruits. Journal of the American Society for Horticultural Sciences. 1970;95:766-769.
4. Rathore DS. Effect of season on the growth and chemical composition of guava (*Psidium guajava* L.) fruits. Journal of Horticultural Sciences. 1976;51(1):41-47.
5. Samant D, Kishore K. Response of guava var. Arka Amulya to branch bending during winter and summer in the Eastern tropical region of India. Journal of Environmental Biology. 2021;42:720-726.
6. Thriveni V, Mishra A, Roy A, Viswanath M. Doubling the guava farming based farmer's income through enhancing productivity using hi-tech practices. The Pharma Innovation. 2021;10(8):358-362.
7. Wolstenholme BN. Resource allocation and vegetative-reproductive competition: opportunities for manipulation in evergreen fruit trees. Acta Horticulturae. 1990;275:451-460.
8. Sheriff MJ, Love OP. Determining the adaptive potential of maternal stress. Ecology letters. 2013 Feb;16(2):271-280.
9. Panse VG, Sukhatme PV. Statistical methods for agricultural workers. 4th ed. New Delhi: Indian Council of Agricultural Research; 1985.