International Journal of Environment and Climate Change

Volume 13, Issue 12, Page 375-379, 2023; Article no.IJECC.110151
ISSN: 2581-8627
(Past name: British Journal of Environment & Climate Change, Past ISSN: 2231–4784)

Effect of Pre-harvest Application on Physical Attributes of Guava (*Psidium guajava* L.) in cv. L–49: Plant Growth Regulators and Bagging

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/IJECC/2023/v13i123693

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/110151

Original Research Article

Received: 08/10/2023
Accepted: 13/12/2023
Published: 19/12/2023

ABSTRACT

The present investigation was conducted to study the Effect of pre-harvest application of plant growth regulators (PGR) and bagging on Physical attributes of Guava (*Psidium guajava* L.) in cv. L - 49. The research was carried out at the main experiment station Horticulture, Department of Fruit

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Sciences, Acharya Narendra Deva University of Agriculture and Technology, Narendra Nagar, Kumarganj, Ayodhya 224229 (U.P.) India during the year 2022-23. The experiment was conducted in a Randomized Block Design with three replications and 8 treatments GA_3 (50 ppm) and NAA (20 ppm) and GA_3 (50 ppm) +NAA (20 ppm), GA_3 (50 ppm) with bagging, and NAA (20 ppm) with bagging. GA_3 (50 ppm) + NAA (20 ppm) with bagging, bagging (white polythene), and control applied on spray 45 days before harvesting. It is concluded that among the different treatments. T_6 GA_3 (50 ppm) + NAA (20 ppm) with bagging, was recorded maximum Fruit length (4.90 cm), Fruit width (6.62 cm), Fruit weight (158.20 gram), Fruit volume (161.60 cm^3), Specific gravity (0.98 g/cm^3) therefore, recommended for application to the Guava tree in the sub-tropical region of Uttar Pradesh in order to obtain better quality fruit.

Keywords: Guava; pre-harvest; NAA; GA_3; bagging.

1. INTRODUCTION

"Guava (*Psidium guajava* L.) is the apple of the tropics and is one of the popular fruits grown in tropical, sub-tropical and some parts of arid regions of India. Guava fruit belongs to the family Myrtaceous" [1]. "It grows in a variety of soil types, from sandy loam to clay loam pH ranging from 5.5 to 7.5 without any irrigation. It can stand maximum above 46°C temperature and lowest 12°-14°C. Best-quality Guava is obtained where the night temperature (100°C) is low during the winter season" [2]. "Guava is grown on 262,000 hectares in India, with an annual production of 3,648 thousand metric tonnes and a productivity of 13.9 metric tonnes/ha. With an annual production of 919.94 metric tonnes, Uttar Pradesh has the most area under guava cultivation (49.01 thousand ha.). Madhya Pradesh and Bihar are the next largest producers. Punjab has the highest productivity, at 22.46 tonnes per hectare" (NHB-2016-17).

"Guava is a climacteric fruit and an excellent source of ascorbic acid. Vitamin C, dietary fibre, pectin and minerals. Guava fruits are used as fresh fruit as well as making jam, jelly, paste, toffees, candy etc. Guava fruits, leaves and roots are used for curing diarrhoea, dysentery and other traditional medicines. Guava is available at a cheap rate and is popularly known as the 'apple of plains and poor man's apple'. In north India agro-climate conditions guava flowers twice a year-first in April-May for the rainy season crop and then, in September-October for the winter season crop. Generally, fruit yield is higher in rainy season crops compared to the winter season" [3], Guava fruits are most commonly harvested by hand. Firm yellow to half-yellow mature fruits are harvested. Guava fruits can be kept in ventilated polyethene bags for 10 days at an ambient temperature of 18°-200°C. Guava is very popular as a fresh fruit because of its excellent taste, high vitamin content and 100 per cent edibility.

"In this modern area use of plant growth regulators is becoming quite popular in the field of horticulture; plant growth regulators play a significant, role in many physiological phenomena. There has been widespread application of plant growth regulators in service of the fruit industry. These are used in vegetative propagation, artificial induction of seed lessness, increase in fruit set, prevention of pre-harvest drop, regulation of flowering, fruit size, inhibition of growth, and thinning of flower and fruit. Various types of plant growth regulators like NAA, 2,4-D, 2,4,5, T, GA_3 and TIBA are used for improving the flowering, fruit set, fruit quality as well yield. Recently it was observed that foliar application of plant growth regulator (GA_3) exerted a favourable effect on the physico-chemical characteristics of guava fruits at harvest" [4].

"Though the fruit quality of rainy seasons is insipid, watery, and poor in quality, bowing to the cold, fruits don't ripen, become too little, or become too hard. To further boost fruit quality throughout the wet season, practices must therefore be standardized. Apical dominance, flower and fruit set, cell growth, geotropism, and photoperiod are all impacted by growth regulators like GA_3 and NAA. In both the winter and rainy seasons, GA_3 has the maximum fruit retention and yield, followed by acetone, activated dry yeast, and NAA. In addition to increasing fruit weight, total soluble solids (TSS), and lowering sugars, total sugar, and vitamin C, the growth regulators spray also reduces tannin and fruit acidity. Fruit's total soluble solids content, vitamin C concentration, and acidity are all enhanced and decreased by the addition of NAA" [5].

2. MATERIALS AND METHODS

The present investigation was conducted at the Department of Fruit Sciences, Acharya Narendra Deva University of Agriculture and Technology, Narendra Nagar, Kumarganj, Faizabad 224229 (U.P.) India during the year 2022-23. The experiment was laid out in randomized block design with 8 treatments, namely: T_0-Control (water spray), T_1- GA_3 (50 ppm), T_2- NAA (20 ppm), T_3- GA_3 (50 ppm) + NAA (20 ppm), T_4- GA_3 (50 ppm) with Bagging, T_5- NAA (20 ppm) with Bagging, T_6- GA_3 (50 ppm) + NAA (20 ppm) with Bagging, T_7-Bagging (White polyethene).

The experiment was replicated three times. The region enjoys a sub-humid and subtropical climate, with an average annual rainfall of about 1200 mm, of which about 85 per cent is concentrated from mid-June to late September. The winter months are cold and dry and there are occasional frosts during this period, with westerly warm winds starting from July and continuing till the onset of monsoon. Ten-year-old plants were used in the experiment. The spraying of the different combinations was done 45 days before harvesting. The data was collected on physical parameters under the following heads: Fruit length (cm), Fruit breadth (cm), Volume of fruit (cm^3), Specific gravity, and Fruit weight (g). The data obtained during experimentation were statistically analyzed as per the method given by Panse and Sukhatme [6].

3. RESULTS AND DISCUSSION

3.1 Fruit Length (cm)

Fruit length, as clearly presented in Table 1, revealed that the response of the maximum fruit length (4.90 cm) was recorded in GA_3 (50ppm) + NAA (20ppm) with Bagging followed by GA_3 (50 ppm) + NAA (20 ppm) (4.80 cm) minimum fruit length was recorded in control (3.25).

The same outcomes were also observed for fruit length, which was (7.79 cm) in NAA 225 ppm, which was comparable to GA_3 (60 ppm) in the control. The longer fruit length in the rainy season was significantly impacted by the higher dose spray of NAA and GA_3. Fruit length increases as a result of an increase in cell division, larger-sized cells, and increased metabolic activity brought on by chemical stimuli.

3.2 Fruit Width (cm)

It is evident from the data presented in Table 1, that the application of all treatments considerably increased fruit width when The GA_3 (50 ppm) + NAA (20 ppm) with Bagging treatment recorded the widest fruit at (6.62 cm,) followed by the GA_3 (50 ppm) + NAA (20 ppm) at (6.48 cm) and the Minimum fruit width by control at (4.39 cm.).

Table 1. Show fruit length, fruit width, fruit weight, fruit volume and specific gravity in Guava

No.	**Treatments**	**Fruit length (cm)**	**Fruit width (cm)**	**Fruit weight (g/fruit)**	**Fruit volume (cm^3)**	**Specific gravity (g/cm^3)**
T_0	Control (water spray)	3.25	4.39	121.80	124.10	0.90
T_1	GA_3 (50 ppm)	4.00	5.40	135.40	139.80	0.92
T_2	NAA (20 ppm)	4.10	5.54	138.00	142.50	0.93
T_3	GA_3 (50 ppm) + NAA (20 ppm)	4.80	6.48	151.80	153.70	0.96
T_4	GA_3 (50 ppm) with Bagging	4.60	6.21	145.70	150.50	0.94
T_5	NAA (20 ppm) with Bagging	4.50	6.08	139.80	142.60	0.95
T_6	GA_3 (50 ppm) + NAA (20 ppm) with Bagging	4.90	6.62	158.20	161.60	0.98
T_7	Bagging (White polythene)	3.90	5.27	129.60	132.60	0.91
SEm±		0.16	0.18	0.96	0.50	0.012
CD at 5%		0.48	0.56	2.94	1.53	0.038

The same finding is supported by the observation that during the wet season, NAA 200 ppm recorded maximum fruit width (7.77 cm), whereas control recorded minimum fruit width (5.77 cm). The fruit width varied from (5.77 to 7.77cm) across all treatments. The fruit width increased with higher concentrations of NAA and GA_3 and reduced with higher concentrations of GA_3. Wider fruits may result from more cell division, larger cells, and increased metabolic activity when chemical stimuli are present [7].

3.3 Fruit Weight (g)

The results shown in Table 1, make it very evident that as compared to the control all the treatments had significantly higher fruit weights. The maximum fruit weight (158.20 g) was recorded in GA_3 (50 ppm) + NAA (20 ppm) with Bagging followed by (151.80 g) obtained from the pre-harvest application by GA_3 (50 ppm) + NAA (20 ppm) while the minimum fruit weight found in control (121.80 g).

The same result was supported by the findings of Yadav et al. [8], and Sharma et al. [9] in Guava. Reported increased fruit weight in Sardar guava when NAA and GA_3 with nutrients were applied before fruit set. The current findings are also in agreement with the results proposed by Ranjan et al. [10] Who confirmed that stimulated cell division and cell elongation due to the application of NAA and GA_3 may be the reason behind increased fruit size.

3.4 Fruit Volume (cm^3)

The data collected on fruit volume are clearly displayed in Table 1, showing that all treatments had a significant impact on fruit volume. The highest fruit volume (161.60 cm^3) was recorded in GA_3 (50 ppm) + NAA (20 ppm) with Bagging, followed by GA_3 (50 ppm) + NAA (20 ppm) (153.70 cm^3), while the minimum fruit volume (124 cm^3) was found in the control.

Fruit's increasing moisture content and TSS content are to blame for their consistent weight and volume increases. The increase in intercellular gaps, which causes the maximum amount of food substances and water to accumulate as maturity advances, is what causes the rapid growth from 90 to 150 days.

3.5 Specific Gravity (g/cm^3)

The findings in Table 1, make it abundantly evident that the various treatments had a considerable impact on specific gravity. The highest fruit specific gravity (0.98 g/cm^3) was observed in GA_3 (50 ppm) + NAA (20 ppm) with bagging, followed by GA^3 (50 ppm) + NAA (20 ppm) (0.96 g/cm^3), and the lowest specific gravity (0.90 g/cm^3) was discovered in control [11].

The change of insoluble starch into soluble sugars probably is what causes the drop in the specific gravity of fruits as they develop. Consequently, pre-harvest application losses assisted in maintaining a greater value of specific gravity [12,13,14].

4. CONCLUSION

Based on the results of this present investigation, it can be concluded that treatment is evident from the observation above that foliar application of GA_3 (50 ppm) + NAA (20 ppm) with bagging produced the maximum GA_3 (50 ppm) + NAA (20 ppm) with bagging, was recorded maximum Fruit length (4.90 cm), Fruit width (6.62 cm), Fruit weight (158.20 gram), Fruit volume (161.60 cm^3) and Specific gravity (0.98 g/cm^3), is the most effective combination to increase growth parameters in guava. Therefore, these treatments can be recommended for Guava growers for better growth of trees in their orchards.

ACKNOWLEDGEMENT

Regards and appreciation are offered to Dr. Bhanu Pratap, major advisor in the Department of Fruit Science, to the distinguished committee members, as well as to my closest friends, for their wise advice, encouraging criticism, and support during the research and manuscript-writing processes.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Agnihotri A, Tiwari R, Singh OP. Effect of crop regulators on growth yield and quality of guava. Annals of Plant and Soil Research. 2005;15(1):56-57.
2. Dhaliwal GS, Singla R. Studies on the time of anthesis and dehiscence in different genotypes of guava in winter and rainy season crops. Indian J. of Hort. 2002;59:157-161.

3. Rathore DS, Singh RN. Flowering and fruiting in three cropping patterns of guava. Indian J. Hort. 2009;34:331-336.
4. Kher R, Shoo-Baht Wali VK. Effect of foliar application of GA_3, NAA and CCC on physico-chemical characteristics of guava cv. Sardar. Haryana J. Hort. 2005;34 (1/2):31-32.
5. Sharma R, Tiwari R. Effect of growth regulator sprays on growth, yield and quality of guava under Malwa plateau conditions. Annals Plant Soil Res. 2015;17 (3):287-91.
6. Panse VG, Sukhatme PV. Statistical Methods for Agriculture Workers. ICAR, New Delhi; 1985.
7. Singh G, Pandey D, Rajan S, Singh AK. Crop regulation in guava through different crop regulating treatments. Fruits. 1996;51: 241-6.
8. Yadav S, Bhatia SK, Godara RK, Rana G. Effect of growth regulators on the yield and quality of winter season guava cv. L-49. Haryana J. Hort. Sci. 2001;30(1-2):1-2.
9. Sharma A, Wali V. K., Sharma, R.M. and Sharma B. Effectiveness of various crop regulation treatments. An Int. Quart. J. Life Sci. 2016;11(1):335-338.
10. Ranjan R, Purohit SS. Prasad V. Plant Hormones: Action and Application. Agrobios, India. 2003:183–189.
11. Afroz S, Mishra S, Bahadur V. Impact of Nutrient Application and Bagging on Development and Quality of Guava (*Psidium guajava* L.). International Journal of Plant & Soil Science. 2023;35(18):857-864.
12. Godge P.V., Kale P.N. Developmental physiology of ber. Journal of Maharashtra Agricultural University.1991;16:224-5.
13. Anonymous. Horticulture Statistics at a Glance. National Horticulture Board, Ministry of Agriculture, Government of India; 2017
14. Kanpure RN, Tiwari R, Barholia, AK, Kushwah SS, Mishra SN, Lekhi R. Effect of pre harvest spray of gibberellic acid, calcium nitrate and potassium sulphate on post harvest behaviour of winter guava (*Psidium guajava* L.) fruits. Journal of Pharmacognosy and Phytochemistry. 2019;8(3):3955-3959.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/110151