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Determining The Effect of Plant Growth Regulators on Growth, Yield and Quality of Guava (*Psidium guajava* L. Cv. Allahabad Safeda)

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Authors' contributions

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

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Original Research Article

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ABSTRACT

Aim: Guava (*Psidium guajava* L.) is a member of the family Myrtaceae and the order Myrtales which is 4th most important crop in India after mango, increasing productivity. Therefore, In addition to Plant growth regulator are required for proper growth, yield and quality of guava.

Study Design: The experiment comprised of 10 treatments of different levels of PGR replicated thrice in a Randomized Block Design. The main objective of the experiment was to find out the effect of different PGR on growth, quality as well as to evaluate the yield and yield attributes of guava. Three concentrations of gibberellic acid (GA_3) at 100, 150 and 200 ppm, three concentrations of naphthalene acetic acid (NAA) at 50, 100, and 150 ppm, and three concentrations of Brassinosteriods at 200, 400, and 600 ppm.

Place and Duration of Study: So, to find out Effect of Plant Growth Regulators and Brassinosteroids on Growth, Yield and Quality of Guava (*Psidium Guajava* L. Cv. Allahabad Safeda") A field experiment was conducted at the Central Research Farm, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences (SHUATS), Prayagraj, during 2021- 22.

Results: Treatment T9, which consisted of the T9 (Naphthalene Acetic Acid (NAA) @150ppm) had the best effect on Plant height (335.7 cm), number of flowers per plant (61.3), fruiting buds per plant (151.8), number of fruits per plant (48.23), fruit weight (137.7 g), Fruit length (5.36 cm), fruit

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diameter (7.33), weight of pulp/fruit (104.57 g), weight of seed/fruit (6.74 g), total soluble salts (TSS) (10.97° Brix), vitamin C content (188.52 gm) ,total sugar (8.03), acidity (1.27 %) and yield (33.3 t/ha).

Conclusion: According to the present investigation it is concluded that treatment T9 T9 (Naphthalene Acetic Acid (NAA) @150 ppm) was found most effective in terms of growth, yield and quality of Guava (*Psidium Guajava* L. Cv. Allahabad Safeda").

Keywords: Brassinosteriods; GAA; growth; guava; NAA; yield.

1. INTRODUCTION

Guava (*Psidium guajava* L.) is one of most important fruit crops of the tropics and sub-tropics parts of the world. It belongs to the family “Myrtaceae”. It was largely grown in warm tropical countries of the world. It is grown all over the tropical and subtropical regions and in all parts of India. Guava grows equally well under tropical and sub-tropical climatic conditions. Under tropical climate due to availability of sufficient heat and moisture, fruits produce almost continuously. Its origin is in tropical America and adopted well for commercial cultivation throughout tropics due to its hardy nature, prolific bearing, high ascorbic acid content (Negi and Rajan, 2007). Guava fruit contains 82.50 per cent water, 2.45 percent reducing sugar, 2.23 percent non-reducing sugar, 9.73 percent total soluble solids, 0.48 percent ash and 260 mg vitamin-C per 100 gm of fruit pulp as well as good amount of iron, calcium and phosphorus. These constituents may differ with the cultivar, stage of maturity and season. Guava ripe rapidly and being highly perishable, it can be stored for 2 to 3 days under ambient condition [1]. It is the fourth most important fruit crop in area as well as production after Mango, Banana and Citrus. It is also called as the “Apple of the Tropics” and contains high vitamin C, mineral content and pectin. The pulp contains vary number and hardness of seeds and it is off white to deep pink depending on the variety. Guava can be used for the treatment of dysentery, hypertension, diabetes etc. [2]. It also has wide adaptability, potential of fruiting all year round and it can withstand drought condition. Over all Guava is a hardy plant but the young plants are susceptible to severe frost that can result in mortality. Guava is propagated through sexual method as well as vegetative methods of propagation [3]. Though guava can be successfully propagated by seeds but the vegetative methods of propagation are preferred as through seedling propagation genetic purity cannot be maintained since it can result in genetical variations which can affect the fruit quality, shape size and yield. And seedling plants take 6-7 years to come into bearing stage therefore they are used to raise rootstocks for budding and grafting. There are many methods of vegetative propagation in Guava like layering, cutting, grafting, stooling and budding. Propagation by cuttings can either be done by root cutting or shoot cutting. But root cuttings are not as popular as stem cuttings. Since, propagation by root cutting can only be done from parent plants that have been started from cuttings [4]. Stem cutting is a vegetative method of propagation in which a piece of stem with at least three nodes and internodes are used for propagation. As per the length of internode, the length of the cutting is decreased to ensure at least one node remains inside the soil (KiflemariamYehuala Belachew 2011). The cuttings should be from a healthy plant and should be flexible. The cuttings have to be treated with plant growth regulators to promote rooting.

In recent years, guava is getting more popularity in the international trade due to its nutritional value and various processing products like jelly, jam, sherbat, ice cream, cheese, canned fruit, RTS, nectar, squash and powders [5]. Guava is propagated sexually by seeds and asexually by budding, grafting. layering and cutting [6] (Chandra *et al.,* 2004). Vegetative propagation of guava is widely practiced to ensure true to type and early bearing of fruits. Propagation by cutting from mature trees may be one of the important options to avoid the genetic segregation and maintain the quality of variety. The demand of quality planting stocks of fruit crops like guava is growing rapidly. Conventional methods of propagation such as air layering, inarching or stooling cannot fully meet the requirement of planting stock, because of the dependency of weather conditions and low success rate. Therefore, there is a urgent need to develop cost effective protocol, which is fast and can provide the same, high quality genetically true to type planting material. The fruit have high nutritive value and sells at low prices, but is not quite popular to all classes of people, mainly due to its seediness; the seeds being numerous and hard. The number of the seeds varies in different varieties from 300 to 500 per fruit [7]. Therefore, it is important to develop seedless cultivar or to induce seedless fruit by the exogenous application of plant growth regulators (PGRs).

In current years, guava is getting greater recognition withinside the worldwide alternate because of its dietary price and numerous processing merchandise like jelly, jam, sharbat, ice cream, cheese, canned fruit, RTS, nectar, squash and powders. Vegetative propagation of guava is extensively practiced to make sure proper to kind and early bearing of culmination. The call for of first-class planting shares of fruit plants like guava is developing swiftly. Conventional strategies of propagation consisting of air layering, inarching or stooling cannot completely meet the requirement of planting stock, due to the dependency of climate situations and coffee fulfilment rate. The fruit have excessive nutritive price and sells at low prices, however isn't always pretty famous to all training of people, especially because of its seediness; The wide variety of the seeds varies in distinct sorts from three hundred to 500 according to fruit Sardoei, A.S. Therefore, it's miles crucial to expand seedless cultivar or to set off seedless fruit through the exogenous utility of plant boom regulators (PGRs). Auxins specially IBA, NAA and IAA had been mentioned to set off rooting in the various plant species with various fulfilment. In present day times, air layering propagation strategies the usage of boom regulators all through wet seasons are getting used to gain greater fulfilment. Role of brassinosteroid in fruit ripening became studied through. Brassinosteroids manage a vast variety of responses in plant, inclusive of seed germination, stem and root elongation, vascular differentiation, leaf enlargement and apical dominance. In addition to their position in plant development, brassinosteroids have the cap potential to defend vegetation from numerous environmental stresses, inclusive of drought, severe temperatures, heavy metals, herbicidal damage and salinity.

The use of growth regulators in enhancing rooting for cuttings is well documented for guava. To overcome the drawbacks, intermittent mist systems are widely used for semi-hardwood, hardwood and herbaceous cuttings. Many workers have used growth regulators in different species. There are numerous natural and synthetic auxins: indoleacetic acid (IAA), indole butyric acid (IBA), naphthaleneacetic acid (NAA) and 2, 4-diclorophenoxyacetic acid (2,4-D). Synthetic auxins are utilized for several purposes in horticulture and agriculture for the formation of adventitious roots from stem cuttings. Auxins particularly IBA, NAA and IAA have been reported to induce rooting in many of the plant species with varied success. However, the response to different growth substances varied from species to species, changing physiological and environmental conditions. Most of the workers have reported IBA and NAA as better growth regulator than other for inducing rooting in cutting and layering due to their stable nature. In modern times, air layering propagation techniques using growth regulators during rainy seasons are being used to achieve more success. However, the rooted layers obtained, have low rooting and survival percentage after transplantation in the field [8]. Brassinosteroid is a steroidal hormone, produced by terpinoid pathway. It was first identified from rape seed (*Brassica napus*) pollen grains, and hence the name brassinosteroids. It promotes pollen germination and pollen tube growth. Role of brassinosteroid in fruit ripening was studied by [9]. Brassinosteroids (BRs) is a group of plant hormone, could be used in regulation of various developmental processes in plants. Importantly, applied use of brassinosteriods and its analogous could alter the ripening process, quality, chilling tolerance and postharvest diseases in various fruits. BRs also regulate the activity of defence related enzymes which could develop strong defence mechanism against different microorganisms. Brassinosteroids control a broad range of responses in plant, including seed germination, stem and root elongation, vascular differentiation, leaf expansion and apical dominance. Interestingly, each of these responses is also controlled by auxins, suggesting there might be considerable interplay between these two hormones in the control of development. In addition to their role in plant development, brassinosteroids have the ability to protect plants from various environmental stresses, including drought, extreme temperatures, heavy metals, herbicidal injury and salinity.

Growth regulators like GA_3 and NAA impacts flower and fruit setting, yield and first-class of fruit, mobileular boom, apical dominance, geotropism and photoperiod. GA_3 had the very best fruit retention accompanied through Amcotone, activated dry yeast and NAA in each iciness and wet seasons. The boom regulators spray similarly will increase fruit weight, Total Soluble Salts (TSS), carotene, decreasing sugars, general sugars and nutrition-C and reduced tannin and fruit acidity. Hence, the present study was undertaken to find out the effect of different Plant growth regulators Brassinosteriod growth and fruit quality of Guava (*Psidium Guajava* L.) Cv. Allahabad Safeda and to study the yield and yield attributes of Guava (*Psidium Guajava* L.) Cv. Allahabad Safeda.

2. MATERIALS AND METHODS

The field experiment was conducted at Central Research Farm, Department of Horticulture, Sam Higginbottom Institute of Agriculture & Sciences, Prayagraj (U.P.). During the year of 2021-2022.

The experiment material consists of Guava (*Psidium guajava* L. Cv. Allahabad Safeda). The experiment was layout in Randomised Block Design (RBD) with three replications and ten treatments and the treatment consists of Brassinosteroids @ 200ppm, Brassinosteroids @400ppm, Brassinosteroids @600ppm, Gibberellic Acid (GA3) @100ppm, Gibberellic Acid (GA3) @150ppm, Gibberellic Acid (GA3) @200ppm, Naphthalene Acetic Acid (NAA) @50ppm, Naphthalene Acetic Acid (NAA) @100ppm, Naphthalene Acetic Acid (NAA) @150ppm, reason of selected of treatement is that to stimulate physiologically activity, root growth, flowering and development of guvava plant.

The experiment site is fairly levelled land with sandy loam soil of uniform fertility status with low clay and high sand percentage. Soil samples were collected randomly from depth of 0-30 cm and the soil was analyzed for pH, organic carbon, available nitrogen, available phosphorus and available potassium.

Experimental plot was prepared 15 days prior to transplanting. The soil was ploughed manually, levelled and the weeds were rooted out. The land was brought to a fine tilth by thorough tillage. The experimental area was laid out with plot size (1m × 1m) with 30cm bunds between the plots. Irrigation channels of 50cm were provided between rows of plots. The plants were irrigated immediately after application of fertilizers. During Zaid season, irrigation was applied as and when required during fruit development stages.

The fruits were harvested at full matured stage. During the experimental period harvesting was done in three pickings at an interval of eight to ten days. For the present study, 10 plants of guava Var. Allahabad Safeda were selected randomly, replicated thrice and treated with plant growth regulators. The observations were recorded from 30 plants that were selected randomly and tagged in each replication. The observations on growth, flowering and flowering, yield and quality parameters were determined and Economics of each treatment were computed and statistically analyzed.

The yield and yield contributing characters of guava were recorded after the picking of ripe fruits of each plant. The total soluble solids contents was determined with the help of ERMA Hand Refractometer (0 t0 30°Brix) by putting a drop of juice on the prism slide and readings were taken.

The refractometer were calibrated with distilled water before use of every time. Ascorbic acid was estimated titrimetically using 2-6 dichlorophenolindophenol method (Sadasivam and manickam, 1992). Twenty gram of fruit pulp was homogenized in % metaphosphoric acid (extracted solution) and the volume was make to 100ml in a volumetric flask and was titrated against dye, the reading was noted and content of ascorbic is calculated (mg/100g fresh fruit pulp). Five millilitre of the working standard solution was pipette in a conical flask then 100 ml of of 4.0 % oxalic acid was added and into it and titrated against thedye till the appearance of pink colour. Burette reading was recorded at the point at which colour of the solution changed to pink.

Total Sugar (%): 50 ml of the clarified solution was pipetted into 250ml flask and added 5g of citric acid and 50 ml of water. It was boiled gently for 10 min to complete inversion of sucrose, and then cooled. Transferred to 250 ml flask and neutralized with 1N NaOH using phenolphthalein and was titrated with Fehling solution.

3. RESULTS AND DISCUSSION

3.1 Growth Parameters

3.1.1 Plant height (cm)

The data on plant height (cm) Effect Of Plant Growth Regulators On Growth, Yield And Quality Of Guava (Psidium Guajava L. Cv. Allahabad Safeda). Treatment T9 (Naphthalene Acetic Acid (NAA) @150ppm) was found best and recorded significantly the highest plant height i.e., 5.85 m followed by T8 (Naphthalene Acetic Acid (NAA) @100ppm) i.e., 5.68 m. where-as treatment T0 Control recorded significantly the lowest plant height i.e., 3.77 m. The increase in plant height due to application of NAA was due to the fact that NAA enhances the growth of plant by cell enlargement and cell elongation mechanism through increasing amylase activity, permeability, formation of energy rich phosphate (ATP) and cell wall plasticity while, decreases viscosity and wall pressure. The results are in accordance with the findings of by Mohammed et al., [10] and Singh et al., (1992) in guava tree.

3.2 Flowering and Fruiting

3.2.1 Number of flowers

The data on Number of flowering on the Effect of Plant Growth Regulators on Growth, Yield and Quality of Guava (Psidium Guajava L. Cv. Allahabad Safeda). The max. Number of flowers was recorded in treatment T9 Naphthalene Acetic Acid (NAA) @150ppm (61.3) followed by treatment T8 Naphthalene Acetic Acid (NAA) @100ppm (57.73) and minimum number of flowers was recorded in treatment T0 control i.e, (50.4). The increase in number of flowers per plant due to application of NAA might be due to the fact that NAA treatments significantly increased the plant height. It important to note that increased plant height increased the production of flowers, mentioned that NAA effect might be due enhancement of cell enlargement, not cell division. This also reported that Ghora, Y., Vasilakakis, M. and Stavroulakis, G. [11].

3.2.2 Number of fruits per plant

The data on Number of fruits per plant on the Effect Of Plant Growth Regulators On Growth, Yield And Quality Of Guava (Psidium Guajava L. Cv. Allahabad Safeda). The max. Number of fruits per plant was recorded in treatment T9 Naphthalene Acetic Acid (NAA) @150ppm (48.23) followed by treatment T8 Naphthalene Acetic Acid (NAA) @100ppm (44.5) and min. was recorded in treatment T0 control (30.89). Application of NAA significantly increased the number of fruits/plant. The increasing number of fruits per plant by NAA treatment might be due to the rapid and better nutrient translocation from roots to apical parts of the plant. The increase in concentration resulted in increasing number of fruits per plant. These results are in accordance with Bhosle et al [12] and Singh et al [13].

3.3 Yield Parameters

3.3.1 Weight of fruits (gm)

The data on Weight of fruit on the Effect Of Plant Growth Regulators on Growth, Yield And Quality Of Guava (Psidium Guajava L. Cv. Allahabad Safeda). The maximun weight of fruit was recorded in treatment T9 Naphthalene Acetic Acid (NAA) @150ppm (137.7 g) followed by treatment T8 Naphthalene Acetic Acid (NAA) @100ppm (130.37 g) and minimum weight of fruit was recorded in treatment T0 Control (103.5 g). This increased fruit weight due to NAA concentration might be due to the fact that NAA mediated higher level of metabolites from the leaves towards fruits which resulted in heavier fruits as compared to other treatments. The results are in accordance with findings of Bhosle et al [12]. NAA induced cell elongation by enlargement of vacuoles and loosening of cell wall which caused increase in fruit weight, fruit number and yield and is being confirmed by the findings of Yadav et al [13] in guava fruits.

3.3.2 Fruit yield per hectare (kg/ha)

The data on Fruit yield on the Effect of Plant Growth Regulators on Growth, Yield and Quality of Guava (Psidium Guajava L. Cv. Allahabad Safeda). The maximum Fruit yield per hectare was recorded in treatment T9 Naphthalene Acetic Acid (NAA) @150ppm (33.33 kg) followed by treatment T8 Naphthalene Acetic Acid (NAA) @100ppm (31.73 kg) and minimum was recorded in treatment T0 Control (21.47 kg). The foliar application of NAA maintains the ongoing physiological and biochemical functions which influence the pattern of organ differentiation that might have changed the uptake translocation and accumulation mineral nutrients in plant. Similar results observed by, which supports the results obtained in the present investigation. Iqbal, M., Khan, M. Q., jalai-ud-Din Khalid and Rehman, M [14,15].

3.3.3 Fruit length (cm)

The data on Fruit length on the Effect of Plant Growth Regulators on Growth, Yield And Quality Of Guava (Psidium Guajava L. Cv. Allahabad Safeda). The maximum fruit length was recorded in treatment T9 Naphthalene Acetic Acid (NAA) @150ppm (5.36 cm) followed by treatment T8 Naphthalene Acetic Acid (NAA) @100ppm (5.30 cm) and minimum was recorded in treatment T0 Control (4.56 cm).

Table 1. Effect of Plant Growth Regulators on Growth and fruit parameters of Guava (Psidium Guajava L. Cv. Allahabad Safeda)

Treatment	Treatment combination	Plant height (cm)	Number of flowers	Number of fruits per plant
T_0	Control	3.77	50.4	30.89
T_1	Brassinosteroids@200 ppm	4.36	51.4	34.5
T_2	Brassinosteroids @400 ppm	4.71	53.46	37.46
T_3	Brassinosteroids @600 ppm	4.83	54.77	39.3
T_4	Gibberellic Acid (GA3) @100 ppm	5.25	53.13	36.15
T_5	Gibberellic Acid (GA3) @150 ppm	4.37	53.6	37.13
T_6	Gibberellic Acid (GA3) @200 ppm	4.59	56.57	40.4
T_7	Naphthalene Acetic Acid (NAA) @50 ppm	5.07	54.83	41.47
T_8	Naphthalene Acetic Acid (NAA) @100 ppm	5.68	57.73	44.5
T_9	Naphthalene Acetic Acid (NAA) @150 ppm	5.85	61.3	48.23
F-test		**S**	**S**	**S**
C.D. at 5%		**0.13**	**0.55**	**0.66**
S.Ed. (+)		**1.61**	**0.18**	**0.22**

Table 2. Effect of Plant Growth Regulators on Yield and Quality of Guava (Psidium Guajava L. Cv. (Allahabad Safeda)

Treatment	Treatment combination	Weight of fruit (g)	Fruit yield per hectare (kg)	Fruit length (cm)	Fruit diameter	Volume of Fruit (cc)	Weight of pulp per fruit (g)	Ascorbic Acid (mg/100g) (90 days)	Total Soluble Solids (^{o}Brix)	Total Sugar	Acidity (%)
T_0	Control	103.5	21.47	4.56	6.05	148.5	78.90	149.36	9.43	7.15	1.48
T_1	Brassinosteroids@200ppm	105.3	22.43	4.86	6.14	153.2	81.35	156.62	9.50	7.24	1.36
T_2	Brassinosteroids @400ppm	112.19	24.33	4.91	6.23	158.6	85.87	162.03	9.67	7.47	1.35
T_3	Brassinosteroids @600ppm	113.71	27.86	5.09	6.37	166.1	89.54	165.57	9.92	7.57	1.33
T_4	Gibberellic Acid (GA3) @100ppm	106.3	25.83	5.14	6.27	157.1	86.78	171.46	10.17	7.49	1.28
T_5	Gibberellic Acid (GA3) @150ppm	113.97	28.76	5.08	6.38	162.3	90.34	175.48	10.27	7.73	1.27
T_6	Gibberellic Acid (GA3) @200ppm	118.76	30.43	5.18	6.49	168.3	92.65	184.54	10.33	7.86	1.23
T_7	Naphthalene Acetic Acid (NAA) @50ppm	128.23	31.8	5.23	6.83	172.7	95.86	184.54	10.89	7.97	1.26
T_8	Naphthalene Acetic Acid (NAA) @100ppm	130.37	31.73	5.30	7.13	174.5	99.08	186.63	10.97	8.03	1.27
T_9	Naphthalene Acetic Acid (NAA) @150ppm	137.7	33.33	5.36	7.33	178.4	104.57	188.52	11.27	8.17	1.20
F-test		S	**S**	S	**S**	**S**	**S**	**S**	**S**	**S**	**S**
CD (5%)		4.71	0.46	0.01	0.03	1.12	0.02	0.90	0.009	0.01	0.04
SE. d (+)		1.38	0.15	0.006	0.01	0.37	0.13	0.30	0.02	0.04	0.01

This could be due to the fact that NAA treatment might have produced a dominant role in increasing the cell division and cell enlargement and consequently cell wall which later might have increased the free passage of solutes to the fruits. Similarly also reported that fruit diameter (7.30 cm) increased due to the application of NAA @200 ppm in guava. Similar findings were also reported Abbas et.al [16,17] in guava.

3.3.4 Fruit diameter

The data on Fruit diameter on the Effect of Plant Growth Regulators on Growth, Yield And Quality Of Guava (Psidium Guajava L. Cv. Allahabad Safeda). The maximum fruit diameter was recorded in treatment T9 Naphthalene Acetic Acid (NAA) @150ppm (7.33) followed by treatment T8 Naphthalene Acetic Acid (NAA) @100ppm (7.13) and minimum was recorded in treatment T_0 Control (6.05). This could be due to the fact that NAA treatment might have produced a dominant role in increasing the cell division and cell enlargement and strengthening of middle lamella and consequently cell wall which later might have increased the free passage of solutes to the fruits. Similarly also reported that fruit diameter (7.30 cm) increased due to the application of NAA @200 ppm in guava. Similar findings were also reported by Abbas et.al., [18] in guava.).

3.3.5 Volume of fruit

The data on Volume of fruit on the Effect of Plant Growth Regulators on Growth, Yield and Quality of Guava (Psidium Guajava L. Cv. Allahabad Safeda). The max. Volume of fruit was recorded in treatment T9 Naphthalene Acetic Acid (NAA) @150ppm (178.4 cc) followed by treatment T8 Naphthalene Acetic Acid (NAA) @100ppm (174.5 cc) and min. was recorded in treatment T0 Control (148.5 cc). The above result might be due to the fact that NAA induced cell elongation and loosening of cell wall which caused increase cell mass as a result the volume of the fruit increased. Similar observations were reported by Prajapati and Singh [14].

3.3.6 Weight of pulp per fruiting

The data on Weight of pulp per fruit on the Effect of Plant Growth Regulators on Growth, Yield and Quality of Guava (Psidium Guajava L. Cv. Allahabad Safeda). The max. Weight of pulp per fruit was recorded in treatment T9 Naphthalene Acetic Acid (NAA) @150ppm (104.57 g) followed by treatment T8 Naphthalene Acetic Acid (NAA) @100ppm (99.08 g) and min. was recorded in treatment T0 Control (78.90 g). This increased pulp weight due to NAA concentration might be due to the fact that NAA mediated higher level of metabolites from the leaves towards fruits which resulted in heavier fruits as compared to other treatments. The results are in accordance with findings of Bhosle et al. [12]. NAA induced cell elongation by enlargement of vacuoles and loosening of cell wall which caused increase in fruit weight, fruit number and yield and is being confirmed by the findings of Yadav et al., [13] in guava fruits.

3.4 Quality Parameters

3.4.1 Total Soluble Solids (^{o}Brix)

The data on Total Soluble Salts on the Effect of Plant Growth Regulators on Growth, Yield and Quality of Guava (Psidium Guajava L. Cv. Allahabad Safeda). The maximum Total Soluble Solids was recorded in treatment T9 Naphthalene Acetic Acid (NAA) @150ppm (11.27) followed by treatment T8 Naphthalene Acetic Acid (NAA) @100ppm(10.97) and minimum was recorded in treatment T_0 Control (9.43). The increased in total soluble solids might be due to the auxin synthesis, which increased the metabolites available for total soluble solids formation. Similar types of results were also obtained by, Garasiya et.al.[15] in guava & Agrawal and in sapota.

3.4.2 Vitamin C (mg)

The data on Vitamin C on the Effect of Plant Growth Regulators on Growth, Yield and Quality of Guava (Psidium Guajava L. Cv. Allahabad Safeda) The max. Vitamin C content was recorded in treatment T_9 Naphthalene Acetic Acid (NAA) @150ppm (188.52) followed by treatment T_8 Naphthalene Acetic Acid (NAA) @100ppm (186.63) and min. was recorded in treatment T_0 Control (149.36). Similar types of results were also obtained by Garasiya et.al.[15] in guava in sapota.

3.4.3 Total sugar

The data on Total Sugar on the Effect of Plant Growth Regulators on Growth, Yield and Quality of Guava (Psidium Guajava L. Cv. Allahabad Safeda). The maximum Total Sugar content was recorded in treatment T9 Naphthalene Acetic Acid (NAA) @150ppm (8.17) followed by treatment T8 Naphthalene Acetic Acid (NAA) @150ppm (8.03) and minimum was recorded in treatment T0 Control (7.15). The application of plant growth regulators may have increased the activity of the enzymes such as amylases, which hydrolyze the complex polysaccharides in to simple sugars. Auxin has been reported to accelerate the translocation of metabolites from other parts of the plant towards developing fruits. These findings are supported by the results obtained by Garasiya et.al.[15] in guava in sapota.

3.4.4 Acidity (%)

The data on Acidity on the Effect of Plant Growth Regulators on Growth, Yield and Quality of Guava (*Psidium Guajava* L. Cv. Allahabad Safeda). The max. acidity was recorded in treatment T_1 Brassinosteroids @200ppm (1.48) followed by treatment T_2 Brassinosteroids @400ppm (1.36) and min. was recorded in treatment T_9 Naphthalene Acetic Acid (NAA) @150ppm (1.20). Contrary to the observation, Acidity is generally reduced by the foliar application of NAA because it helps in preventing excessive polymerization of sugar and accumulation of more sugar in the cells of plant. However high level of NAA may lead to antagonistic effect which leads to accumunlation of more sugar. Similar reports were Jaya lakshmi [16], Singh [5] in guava.

4. CONCLUSION

On the basis of present investigation, it is concluded that the treatment T_9 (Naphthalene Acetic Acid (NAA) @150 ppm) was found the best in terms of vegetative growth Plant height (cm), number of flowers, and yield and quality parameters number of fruits per plant, weight of fruit (gm), fruit yield per plant, fruit length (cm), fruit diameter, volume of fruit, weight of pulp per fruit (gm), TSS (°Brix), Acidity (%), Ascorbic Acid (mg/100g).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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