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EFFECT OF GROWTH SUBSTANCES ON YIELD AND QUALITY ATTRIBUTES OF GUAVA (*Psidium guajava* L.) *CV*. SHWETA

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ABSTRACT

The investigation was carried out to study effect of growth substances on yield and quality attributes of guava (*Psidium guajava* L.) cv. Shweta which was carried out during 2023-24 at the Instructional Farm, Department of Fruit Science, College of Horticulture, Banda University of Agriculture and Technology, Banda (U.P.). The experiment was laid out in Randomized Block Design with 8 treatments and 3 replications. Various concentrations of two different plant growth substances, Biomagic and Salicylic acid and their combination were applied foliar two times (14 August and 12 September). The treatments investigated the effect of growth substances which include is Biomagic and Salicylic acid on different application. The treatment T_8 (Biomagic 4ml per lit. water + Salicylic acid 200 ppm) recorded the most efficient in physical growth, showing such as a maximum polar diameter (8.36 cm), equatorial diameter (7.96 cm), fruit weight (222.19 g), fruit volume (225.22 cc), fruit specific gravity (0.99), pulp weight (180.87 g) and seed cavity weight (47.34 g). Additionally, treatment T_4 (Salicylic acid 200 ppm) was superior in quality parameter, recorded with the highest TSS (13.13 ^{o}Brix), lowest titratable acidity (0.29%), maximum ascorbic acid (261.67 mg/100 pulp) and the highest levels of total sugars (10.17%), reducing sugars (6.19%), and soluble pectin (1.98%). The study provides the valuable insights into optimizing guava fruit growth, yield and quality through targeted apply the growth substances on guava plant.

Keywords **:** Growth substances, yield, quality, biomagic, salicylic acid, shweta etc.

Introduction

Guava (*Psidium guajava* L.) is a monoecious deciduous tree in the Myrtaceae family. The 150 genera and 5000 species that make up the genus *Psidium* are extensively dispersed over the tropical regions of Asia, Africa, and America. The fruit, which may weigh upwards of 500g depending on the type and the location, matures in around 120 days after flowering, has a distinct smell and contains many seeds. It grows in soil that has a pH between 4.5 to 8.5. It can tolerate temperatures higher than 46 ^{o}C. In both tropical and sub-tropical climates, guava grows equally well (Gaur *et al.*, 2014). The fruit is tasty, climacteric, and nourishing. In addition, it has 74–84% hydration, 13-26% dry matter, 0.8–1.5% protein, 0.4-0.7% fat, and 0.5–1.0% ash. The fruit is also regarded as a great source of pectin (1.15%) and vitamin C (299 mg/100g fruit). The fruit has a commendable quantity of vitamins, minerals, and thiamine, riboflavin, and vitamin A. The minerals include phosphorus (23–37 mg/100g fruit), calcium (14–30 mg/100g fruit), and iron (0.6–1.4 mg/100g fruit). Among table fruits, guavas have the highest concentration of vitamin C (Bal *et al.*, 2014). Guavas bloom twice or occasionally three times a year in northern India. *Ambe bahar* refers to the spring blooming, *Mrig bahar* to the June or monsoon blossoming, and *Hast bahar* to the third flowering that occurs in October. *Hast bahar* fruits ripen in the spring, commonly known as the summer season, while *Ambe bahar* fruits ripen in July-September and *Mrig bahar* fruit ripen in November-

February. The guava has three separate flowering and fruiting seasons in subtropical climates. A selection from the half-sib crop of apple color is the Shweta cultivar. The tree is medium-sized, semi-vigorous, and produces a lot of fruit.

The application of bio-stimulants activates various physiological processes that improve nutrient use efficiency, encouraging plant development and permitting the decrease of fertilizer consumption, bio-stimulants have garnered attention for sustainable agriculture. Extracts from biological raw materials that contain bioactive chemicals are known as bio-stimulants. A biomagic product is a biological enhancer derived from microorganisms that comprises several biological substances that impact the growth of plants. Amino acids are the main components used in the creation of proteins, and this product contains them. Amino acids are needed by plants for general growth and development, vitamins are needed for plant growth and help plants grow by supplying necessary nutrients, and micro and macro elements are needed for all metabolism and cellular processes. A completely natural plant hormone called salicylic acid (SA) boosts resistance to biotic stresses. It contributes positively to ion uptake, nutrient transport throughout the plant, and plant growth, increases resistance to disease and postpones the ripening of fruit. Salicylic acid controls a number of biological processes, including the generation of heat in plants, resistance to disease, germination of seeds, gender a polarization and ethylene production. Stress-tolerant plants exhibit enhanced salicylic acid production or tolerance to stress mechanisms activated by increasing salicylic acid content in the plant through external treatments. Salicylic acid lengthens guava shoots, increases leaf area, and number of leaves.

Materials and Methods

The present investigation entitled "Effect of growth substances on yield and quality attributes of guava (*Psidium guajava* L.) *cv*. Shweta" a field experiment will be conducted at the Instructional Farm, Department of Fruit Science, College of Horticulture, Banda University of Agriculture and Technology, Banda during *Mrig bahar* (2023-24). Five-year-old uniform guava cv. Shweta trees with spacing 4 m × 4 m were selected for the experiment. Uniform sized fruits free from bruises, mechanical damage, and insect/pest attack were chosen. The design of the experiment was Randomized Block Design with three replications and eight treatments combinations as follows viz., T_1 (Biomagic 3ml per lit. water), T_2 (Biomagic 4ml per lit. water), T_3 (Salicylic acid 100 ppm), T_4 (Salicylic acid 200 ppm), T_5 (Biomagic 3ml per lit. water + Salicylic acid 100 ppm), T_6 (Biomagic 3ml per lit. water + Salicylic acid 200 ppm), T_7 (Biomagic 4ml per lit. water + Salicylic acid 100 ppm) and T_8 (Biomagic 4ml per lit. water + Salicylic acid 200 ppm). The observations were recorded on five randomly selected plants from each treatment on yield attributes like fruit set (%), fruit retention (%), fruit maturity (days), and fruit yield per tree (kg), while physical parameters like polar diameter (cm), equatorial diameter (cm), fruit weight (g), fruit volume (cc), specific gravity, flesh thickness (cm), seed cavity size (cm), pulp weight (g), seed cavity weight (g), number of seed per fruit and chemical parameters like total soluble solid (^{o}Brix), titratable acidity (%),TSS: acid ratio, total sugars (%), reducing sugars (%), non-reducing sugars (%), ascorbic acid (mg/100g pulp), soluble pectin (%), reported by Ahmad *et al.* (2021) in plum, Qasim *et al.* (2020) in guava and Sharma *et al.* (2021) in guava.

The TSS was recorded using Erma Hand Refractometer (range 0-32 ^{0}Brix). Ascorbic acid was determined by using 2, 6-dichlorophenol-indophenol dye method (Freed, 1966). Total sugars content of the fruits was determined by the method described by Dubois *et al.* (1956) and Estimation of reducing sugar by Nelson (1944). The data recorded during the course of investigation were subjected to the statistical analysis as described by Gomez and Gomez (1984). It determined the critical difference and standard error of the difference in mean (SEd) between the treatments at a 5% level of significance.

Results and Discussion

The data presented in the Table No. 1 revealed that the growth characters viz. maximum fruit set (76.08%) was recorded in treatment T_4 followed by (70.01%) treatment T_3. Minimum percentage fruit set (54.01%) was recorded in treatment T_1. However, the maximum fruit retention (64.72%) data was observed in treatment T_4 followed by (60.43%) treatment T_3 while the minimum fruit retention (40.12%) data was recorded in treatment T_1. Similarly result found in Lenka *et al.* (2019) in guava plant. The obtained results of SA spray are in line with those reported by Nicholas and Embree (2004) who found that SA resulted in increased fruit retention in apple and citrus fruit tree. The minimum fruit drop (35.50%) is found in treatment T_4 whereas, the maximum fruit drop (60.16%) was found with the treatment T_1. Similarly result found in Lenka *et al.* (2019) in guava plant. The maximum number of days (138.67 days) required for the fruit maturity in treatment T_2 followed by (137.67 days) treatment T_1 to mature whereas, the minimum number of days (125.33 days) for fruit maturity was

taken by treatment T_4. The maximum fruit yield per tree (18.60 kg) was found in treatment T_8 followed by the (17.57 kg) treatment T_7 while the minimum fruit yield per tree (11.30 kg) was found in treatment T_3. Application of salicylic acid increased the number of fruits per tree ultimately increased the total yield of the tree in mango Rahmani *et al.* (2017), Similarly result found in Shaddad and Sheren (2022) in pomegranate fruit.

Mean data presented in Table No. 2 clearly show that the highest polar diameter (8.36 cm) was observed in the treatment T_8 followed by (7.84 cm) treatment T_7 while the smallest polar diameter (6.37 cm) was observed in the treatment T_3. The increase in length and diameter of guava fruit may be that higher concentration of mineral nutrients (boron and zinc) appears to have direct role in hastening the process of cell division and cell elongation due to which size and weight of fruits would have improved. However, the maximum equatorial diameter (7.96 cm) was measured in the treatment T_8, followed by the (7.49 cm) treatment T_7 while the minimum equatorial diameter (5.53 cm) was found in treatment T_3. Increased equatorial diameter could be the result of accelerated cell growth and division brought on by a favourable environment. The maximum fruit weight (222.19 g) was recorded in the treatment T_8, followed by (208.47 g) treatment T_7. Whereas, the minimum fruit weight (149.25 g) was recorded in the treatment T_3. Similarly result observed in Shaddad and Sheren (2022) in pomegranate. The result is observed that the treatment T_8 had the maximum fruit volume (225.22 cc) which was significantly superior over the all different treatment, followed by (215.06 cc) treatment T_7 respectively. The minimum fruit volume (173.06 cc) was found with treatment T_3 similarly result found in Sau *et al.* (2015) in Allahabad Safeda. The maximum specific gravity (0.99) was observed in the treatment T_8, followed by (0.98) treatment T_7 while the minimum specific gravity (0.86) was observed in the treatment T_3. The highest seed cavity size (4.43 cm) was found in the treatment T_8 followed by (4.18 cm) treatment T_7. The minimum seed cavity size (3.33 cm) was found in the treatment T_3. The highest pulp weight (180.87 g) was found in treatment T_8 followed by (166.75 g) treatment T_7 while the lowest pulp weight (123.98 g) recorded in treatment T_3. Similarly result found in Mosa *et al.* (2021) in guava. The highest flesh thickness (3.53 cm) was measure in treatment T_8, followed by (3.31 cm) treatment T_7. The lowest flesh thickness (2.21 cm) was found in treatment T_3. Thickness of the fruit flesh is proportionate to the weight and diameter of fruit. Similarly result found in Supapvanich *et al.* (2017). The maximum seed cavity weight (47.34 g) which is found in treatment T_8, followed by (41.72 g) treatment T_7 while the minimum seed cavity weight (25.27 g) was found in treatment T_3. Seed cavity weight is directly proportional to fruit weight if fruit weight is increasing in a particular treatment, then seed cavity weight will also increase in accordance to total fruit weight. The minimum number of seed (261.20) was found in treatment T_3 while the maximum number of seed (295.90) was found in treatment T_2.

Chemical parameter mean data presented in Table No. 3 and Fig. 1 clearly show that the highest TSS (13.13 ^{o}Brix) was recorded with the treatment T_4 followed by (12.60 $^{\circ}$Brix) treatment T_3. The lowest TSS (9.58 °Brix) was found in the treatment T_1. This could be happened due to the effect of salicylic acid application resulted in sugar accumulation and metabolic changes in fruit which ultimately resulted in more accumulation of soluble solids in fruits Kumar and Garg (2012). Similarly result found in Lenka *et al.* (2019) in guava plant. However, the minimum titratable acidity (0.29%) respectively was recorded with treatment T_4. Whereas, the maximum titratable acidity (0.44%) was found in the treatment T_1 similarly result found in Lenka *et al.* (2019) in guava, when the fruits were treated with 5mM SA. The maximum TSS: acid ratio (45.46) was observed in treatments T_4, followed by (42.44) treatment T_3. While the minimum TSS: acid ratio (27.96) was recorded in the treatment T_1. Salicylic acid application increased the TSS: acid ratio of the fruit Gattass *et al.* (2018); Kanwal *et al. (*2021) and Kaur *et al.* (2022). The highest amount of total sugars (10.17%) found in treatment T_4, followed by (9.65%) treatment T_3. While the lowest amount of total sugars (7.59%) was found in treatment T_1. The maximum quantity of reducing sugars (6.19%) was found in treatment T_4, followed by (5.85 %) treatment T_3. While the minimum quantity of reducing sugars (4.46%) was found in treatment T_1. Similar results were reported by Lacerda *et al.* (2022) in guava. The maximum non-reducing sugars (3.98%) respectively were recorded with treatment T_4, followed by (3.80%) treatment T_3. However, the minimum non-reducing sugars (3.13%) were found in treatment T_1. Similar results were reported by Sushmitha *et al.* (2019) in guava. The ascorbic acid of (261.67 mg/100 pulp) respectively, were recorded maximum with treatment T_4 however, the minimum ascorbic acid (197.10 mg/100 pulp) was recorded in treatment T_1. Salicylic acid also has positive impact on the ascorbic acid content of the fruit Gattas *et al.* (2018) mango and Washington novel orange tree. Soluble pectin of (1.98%) respectively, were recorded maximum with treatment T_4 however, the minimum soluble pectin

(1.38%) recorded in treatment T_2. Similar results were reported by Supapvanich *et al.* (2017) in guava.

Conclusion

On the basis of above finding, it was concluded that the application of different growth substances on guava plant had a significantly affected growth, yield and quality parameter. The combination of salicylic acid and biomagic resulted in fruit physical parameter, another application of salicylic acid is resulted in better in fruit set, fruit retention and all the fruit quality parameter were a significant response. On the basis of perusal of data, it may be concluded that the application of different plant growth substances was found beneficial for plant growth, yield and quality of guava cv. Shweta. All the plant growth substances were found significantly on the yield and quality attributes of fruits. It can be safely inferred that for better higher yield and yield attributing features.

Table 1 : Effect of Growth Substances on Yield Attributes of Guava

Treatments	Fruit set (%)	Fruit retention (%)	Fruit drop (%)	Fruit maturity (Days)	Yield per tree (kg)	Polar diameter (cm)	Equatorial diameter (cm)	Fruit weight (g)	Fruit volume (cc)	Specific gravity	Seed cavity size (cm)	Flesh thickness (cm)	Pulp weight (g)	Seed cavity weight (g)	Number of seeds
T_1	54.02	40.12	60.16	137.67	13.02	6.89	6.06	162.99	178.86	0.91	3.51	2.55	136.80	26.19	288.28
T_2	56.22	45.44	54.89	138.67	14.93	7.16	6.28	173.10	187.06	0.93	3.59	2.69	141.19	31.91	295.90
T_3	70.71	60.43	38.00	127.00	11.30	6.37	5.53	149.25	173.06	0.86	3.33	2.21	123.98	25.27	261.20
T_4	76.08	64.72	35.50	125.33	12.02	6.66	5.83	156.28	176.95	0.88	3.42	2.41	127.24	29.04	265.53
T_5	61.97	48.55	51.54	134.00	15.03	7.39	6.65	186.78	199.21	0.94	3.95	2.95	150.38	36.39	280.08
T_6	64.52	51.84	48.37	133.33	16.67	7.61	7.09	198.80	207.58	0.96	4.04	3.05	158.37	40.43	270.27
T_7	67.71	55.34	44.65	136.00	17.57	7.84	7.49	208.47	215.06	0.98	4.18	3.31	166.75	41.72	277.70
T_8	68.87	58.08	42.09	130.33	18.60	8.36	7.96	222.19	225.22	0.99	4.43	3.53	180.87	47.34	267.83
Mean	**65.01**	**53.06**	**46.90**	**132.79**	**14.89**	**7.28**	**6.61**	**182.23**	**195.37**	**0.93**	**3.80**	**2.83**	**148.19**	**34.78**	**275.84**
SEm (±)	**0.87**	**1.18**	**1.34**	**1.77**	**1.48**	**0.13**	**0.13**	**2.84**	**1.61**	**0.02**	**0.07**	**0.07**	**1.16**	**3.01**	**7.21**
CD at 5 %	**2.64**	**3.59**	**4.07**	**5.36**	**4.48**	**0.39**	**0.38**	**8.26**	**4.88**	**0.06**	**0.22**	**0.22**	**3.51**	**9.13**	**21.87**

Table 2 : Effect of Growth Substances on Chemical Attributes of Guava

Treatments	TSS (^{0}Brix)	Titratable acidity (%)	TSS: acid ratio	Total sugars (%)	Reducing sugars (%)	Non-reducing sugars (%)	Ascorbic acid (mg/100 g pulp)	Soluble pectin (%)
T_1	9.58	0.44	27.96	7.59	4.46	3.13	197.10	1.44
T_2	10.26	0.43	28.85	7.73	4.79	2.94	209.00	1.38
T_3	12.60	0.33	42.44	9.65	5.85	3.80	244.67	1.61
T_4	13.13	0.29	45.46	10.17	6.19	3.98	261.67	1.98
T_5	10.85	0.40	33.39	8.09	4.99	3.11	204.63	1.49
T_6	11.12	0.38	35.08	8.36	5.15	3.20	210.03	1.52
T_7	11.56	0.37	35.09	8.97	5.51	3.46	216.03	1.47
T_8	12.33	0.35	40.55	9.18	5.80	3.38	226.70	1.58
Mean	**11.43**	**0.37**	**36.10**	**8.72**	**5.34**	**3.37**	**221.23**	**1.56**
SEm (±)	**0.15**	**0.02**	**0.92**	**0.11**	**0.10**	**0.06**	**4.40**	**0.03**
CD at 5 %	**0.44**	**0.06**	**2.80**	**0.35**	**0.30**	**0.17**	**13.35**	**0.11**

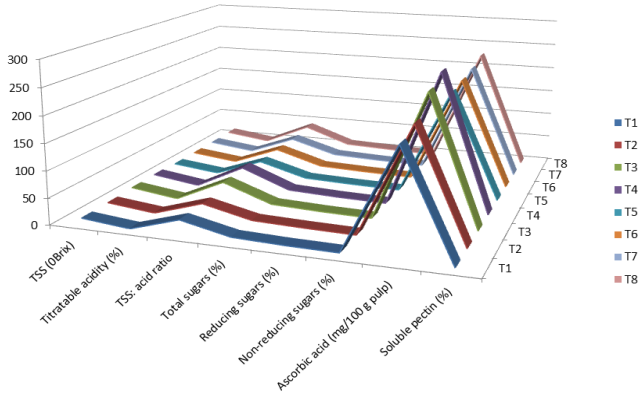

Fig. 1 : Effect of Growth Substances on Chemical Attributes of Guava

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