www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; SP-11(8): 45-48
© 2022 TPI
www.thepharmajournal.com
Received: 28-06-2022
Accepted: 30-07-2022

Manish Kumar
Research Scholar, Department of Horticulture, Maharana Pratap Horticultural University, Karnal, Haryana, India

Sushil Sharma
Department of Horticulture, CCS Haryana Agricultural University, Hisar, Haryana, India

JR Sharma
Department of Horticulture, CCS Haryana Agricultural University, Hisar, Haryana, India

Satpal Baloda
Department of Horticulture, CCS Haryana Agricultural University, Hisar, Haryana, India

Jyoti Bai Soni
Department of Horticulture, CCS Haryana Agricultural University, Hisar, Haryana, India

Corresponding Author
Manish Kumar
Research Scholar, Department of Horticulture, Maharana Pratap Horticultural University, Karnal, Haryana, India

Effect of pre-sowing treatments on seedling growth of guava

Manish Kumar, Sushil Sharma, JR Sharma, Satpal Baloda and Jyoti Bai Soni

Abstract
The present study was carried out to investigate the effect of pre-sowing treatments on seedling growth of guava (*Psidium guajava* L.).The experiment comprised of 13 different pre-sowing treatments with three replications. The results from the study revealed that pre-sowing treatments significantly influenced seedling growth of guava as among different pre-sowing treatments, Scraping of seed coat with sand paper + seeds soaked in GA_3 200ppm for 24 hours (T_5) performed best in terms of height of seedling (4.59cm), shoot length (6.75cm), root length (5.85cm), root: shoot ratio (0.87), number of leaves per seedling (12.40), leaf area of seedling (3.83cm^2) and total chlorophyll content (29.85 SPAD unit). Whereas, Girth of seedling was found maximum (1.34mm) in quick dip soaking in 30 sulphuric acid $T_{8(i)}$.

Keywords: Guava, pre-sowing treatments, gibberellic acid and seedling growth

1. Introduction
Guava (*Psidium guajava* L.) popularly known as "Apple of the tropics" or "Poor man's fruit" is an important commercial fruit crop of India. It is taxonomically belonging to the family Myrtaceae which contains nearly 150 species (Boricha *et al*., 2020) [2] and has gain recognition of being the most widely cultivated species of this family. In India, guava ranks fifth in position in terms of area and production after mango, banana, citrus and papaya. Its share in the total fruit production of India is approximately 4 per cent. In India, Guava occupies an area of 2.65 lakh hectares with an annual production of 40.54 lakh metric tonnes and productivity of 15.30 metric tonnes per hectare whereas, in Haryana guava is cultivated in an area of 0.12 lakh hectares with an annual production of 1.37 lakh metric tonnes and productivity of 11.33 MT/Ha (Anonymous, 2018) [1].

The area under guava cultivation increases day by day and farmers also adopted new techniques like high-density planting and meadow orcharding which leads to an increase in demand for budded and grafted plants but this demand is not fulfilled because of deficiency of superior seedling rootstock which might be due to poor seedling growth. However, to fulfill the increasing demand for quality rootstock, nurseryman has to raise large quantity of rootstocks with grantable size in a shorter time for the growers. Different methods like water soaking, mechanical scarification and chemical treatments using GA_3 are used to improve seedling growth. Hence, the present investigation was carried out to standardize the pre-sowing treatments for seedling growth of guava.

2. Materials and methods
The field experiment was conducted at Precision Farming Development Centre (PFDC), Department of Horticulture, CCS Haryana Agricultural University, Hisar in the year 2020-2021. The experiment was conducted in open field conditions and laid out in Randomized Block Design with 13 treatments of varying concentrations and time and replicated thrice. The treatments comprising of Scraping of seed coat with sand paper (T_1), Seed soaked in GA_3 100ppm for 24 hours (T_2), Seed soaked in GA_3 200ppm for 24 hours (T_3), Scraping of seed coat with sand paper + Seeds soaked in GA_3 100ppm for 24 hours (T_4), Scraping of seed coat with sand paper + Seeds soaked in GA_3 200ppm for 24 hours (T_5), 0.1% solution Potassium hydroxide soaking for 2 minutes (T_6), 0.2% solution Potassium hydroxide soaking for 2 minutes (T_7), 30% sulfuric acid soaking at different time intervals (Quick dip,1 minute and 3 minutes) (T_8) [1, 2, 3], 5% Hydrochloric acid soaking for 2 minutes (T_9), 10% Hydrochloric acid soaking for 2 minutes (T_{10}), Hot water soaking at 80 ^{0}C at different time intervals (Quick dip,

1 minute and 3 minutes) (T_{11}), Water soaking for 48 hours (T_{12}), Control (T_{13}). A set of five seedlings were selected in each treatment replication wise. In each treatment, fifty seeds were sown replication wise during the 1st week of August, 2020. Shoot length was measured from collar region to tip of shoot after 90 days of sowing. Stem girth was measured at 90 days after sowing with digital dernier caliper. Leaf area was recorded by a digital leaf area meter (CI-202 Portable laser leaf area meter). Total chlorophyll content were recorded by using MC-100 chlorophyll concentration meter at 90 days after sowing.

3. Results and discussion

The results along with the relevant discussion have been presented in prime heads as shoot length, root length, root-shoot ratio, girth of seedling, number of leaves per seedling, leaf area of seedling and total chlorophyll content.

3.1 Shoot length (cm)

It is apparent from the data that different pre-sowing treatments had a significant effect on shoot length (Table 1). Shoot length under different pre-sowing treatments ranged from 4.12cm to 6.75cm. Maximum shoot length (6.75cm) was recorded when seeds were treated with Scraping of seed coat with sand paper + Seeds soaked in GA_3 200ppm for 24 hours (T_5) that was statistically at par with quick dip soaking in 30% sulphuric acid solution $T_{8(i)}$ (6.53cm). Minimum shoot length (4.12cm) was found in Control (T_{13}). As GA_3 have a stimulating impact on the cell wall which causes it to release and transmit its calcium into the cytoplasm and also provides a favourable environment for water absorption through increased cell size and growth. GA_3 also stimulates amylase which converts the available carbohydrates into simple sugars, providing additional energy and nutrients for seedling growth (Vishwakarma, 2013) [16]. These findings were supported by Dadhaniya *et al*. (2020) [4] that seed soaked in GA_3 200ppm results in maximum shoot length in custard apple. Joshi *et al.* (2017) [5] also found similar results in Chironji.

3.2 Root length (cm)

It is perusal from the data presented in Table 1 that under different pre-sowing treatments root length ranged from 3.15cm to 5.85cm. Maximum root length (5.85cm) was observed when seeds were subjected to Scraping of seed coat with sand paper + Seeds soaked in GA_3 200ppm (T_5) for 24 hours that was statistically at par with quick dip soaking in 30% sulphuric acid solution $T_{8(i)}$ (5.58cm). In Control (T_{13}) treatment the minimum root length (3.15cm) was recorded. This might be due to fact that GA_3 promotes shoot growth which leads to higher production of photosynthates that moves through the phloem to the root zone and enhanced osmotic uptake of nutrients, resulting in elongation of the cells in the sub-apical region of roots (Salisbury and Ross, 1988) [11]. Rajput and Sharma (2020) [10] reported that application of GA_3 200ppm in custard apple results in higher root length (11.56cm). The results are also in accordance with the findings of Vasantha *et al.* (2014) [15] in tamarind and Pratibha *et al.* (2015) [9] in papaya.

3.3 Root-shoot ratio

Results given in Table 1 elucidated that root-shoot ratio was significantly affected by different pre-sowing treatments. Highest root-shoot ratio (0.87) was observed in Scraping of seed coat with sand paper + Seeds soaked in GA_3 200ppm for 24 hours (T_5) and followed by quick dip soaking in 30% sulphuric acid solution $T_{8(i)}$ and Scraping of seed coat with sand paper + Seeds soaked in GA_3 100ppm for 24 hours (T_4) i.e., 0.86 and 0.85, respectively. Whereas, lowest root-shoot ratio (0.76) was observed in the Control (T_{13}). High root-shoot ratio might be due to appropriate level of gibberellin acid which maintain high water content in the cell, enhanced cell division, elongation and multiplication which had promoted the overall growth of seedlings. Choudhary *et al.* (2018) [3] reported that papaya seed treated with GA_3 200ppm results in maximum root-hoot ratio.

3.4 Girth of seedling (mm)

It is evident from the data that different pre-sowing treatments had a significant effect on girth of seedlings (Table 2). Seedling girth varied from 1.01mm to 1.34mm. Girth of seedling (1.34mm) was found maximum in quick dip seed soaking in 30% sulphuric acid solution $T_{8(i)}$ that was statistically at par with Scraping of seed coat with sand paper + Seeds soaked in GA_3 200ppm for 24 hours (T_5), (1.31mm). Whereas, minimum girth of seedling (1.01mm) was recorded in Control (T_{13}). The possible reason may be due to corresponding number of days to emergence of seedling and mean germination time with corresponding treatments. Results are in conformity with findings of Sourabh *et al.* (2016) [13] in guava. They reported that seed soaked with sulphuric acid results in maximum girth of seedlings.

Table 1: Effect of different pre-sowing treatments on shoot length (cm), root length (cm) and root: shoot ratio

Treatment	Shoot Length (cm)	Root Length (cm)	Root-Shoot ratio
T_1 (Scraping of seed coat with sand paper)	4.50	3.50	0.78
T_2 (Seed soaked in GA_3 100ppm for 24hours)	5.45	4.45	0.82
T_3 (Seed soaked in GA_3 200ppm for 24hours	5.63	4.64	0.83
T_4 (Scraping of seed coat with sand paper + Seeds soaked in GA_3 100ppm for 24hours	6.30	5.35	0.85
T_5 (Scraping of seed coat with sand paper + Seeds soaked in GA_3 200ppm for 24hours)	6.75	5.85	0.87
T_6 (0.1% solution Potassium hydroxide soaking for 2 minutes)	5.85	4.85	0.83
T_7 (0.2% solution Potassium hydroxide soaking for 2 minutes)	5.48	4.35	0.80
T_8 (30% Sulfuric acid soaking) i. Quick dip	6.53	5.58	0.86
ii. 1 minute	5.09	4.07	0.80
iii. 3 minutes	4.68	3.85	0.83
T_9 (5% Hydrochloric acid soaking for 2 minutes)	4.97	4.03	0.81
T_{10} (10% Hydrochloric acid soaking for 2 minutes	6.07	5.10	0.84
T_{11} (Hot water soaking at 80° C) i. quick dip	4.65	3.60	0.77
ii. 1 minute	5.27	4.26	0.81
iii. 3 minutes	4.99	4.01	0.81

T_{12} (Water soaking for 48 hours)	4.25	3.30	0.77
T_{13} (Control)	4.12	3.15	0.76
C.D. at 5%	0.41	0.29	0.03

3.5 Number of leaves per seedling

Number of leaves per seedling under different pre-sowing treatments ranged from 9.20 to 12.40 (Table 2). Maximum number of leaves per seedling (12.40) was observed in Scraping of seed coat with sand paper + Seeds soaked in GA_3 200ppm for 24 hours (T_5) that was statistically at par with quick dip soaking in 30% sulphuric acid solution $T_{8\ (i)}$ and Scraping of seed coat with sand paper + Seeds soaked in GA_3 100ppm for 24 hours (T_4) (12.13 and 11.87, respectively). Results showed that minimum number of leaves per seedling (9.20) was observed in Control (T_{13}). It might be due to action of GA_3 at the apical meristem leading to more synthesis of nucleoprotein and growth of seedlings that resulted in higher leaf initiation (Sen and Ghunti, 1976) [12]. Salisbury and Ross (1988) [11] reported that GA_3 migrates into shoot apex, resulting in increased cell division and cell growth which apparently contributed to the development of young leaves. Results are in confirmation with the findings of Joshi *et al.* (2017) [5] in Chironji. They reported that maximum number of leaves (14.63) was observed in seed treated with GA_3 200ppm. Muralidhara *et al.* (2015) [6] also observed greater number of leaves (22.5) when mango stones were treated with GA_3 200ppm. Similar findings were reported by Dadhaniya *et al*. (2020) [4] in custard apple and Patil *et al.* (2017) [8] in Jamun.

3.6 Leaf area of seedling (cm^2)

Results obtained from the study (Table 2) revealed that different pre-sowing treatments had a significant effect on leaf area of seedling. Data showed that leaf area of seedling varied from 1.95cm^2 to 3.83cm^2. Maximum leaf area of seedling (3.83cm^2) was found in Scraping of seed coat with sand paper + Seeds soaked in GA_3 200ppm for 24 hours (T_5) that was statistically at par with Scraping of seed coat with sand paper + Seeds soaked in GA_3 100ppm (T_4) (3.69cm^2) while the minimum leaf area of seedling (1.95cm^2) was found in Control (T_{13}). Use of GA_3 might have boosted the leaf growth by enhancing cell division, multiplication and elongation, resulting in increased leaf area (Taiz and Zeiger, 2002) [14]. Results are in accordance with the findings of Choudhary *et al.* (2018) [3] in papaya. They observed that maximum leaf area was recorded in GA_3 200ppm.

3.7 Total chlorophyll content

Total chlorophyll content was significantly influenced by different pre-sowing treatments (Table 2). Results showed that maximum chlorophyll content (29.85 SPAD unit) was recorded in Scraping of seed coat with sand paper + Seeds soaked in GA_3 200ppm for 24 hours (T_5) followed by Scraping of seed coat with sand paper + Seeds soaked in GA_3 100ppm for 24 hours (T_4) and quick dip soaking in 30% sulphuric acid solution $T_{8\ (i)}$ i.e., 28.22 and 27.84 SPAD unit, respectively. Whereas, minimum total chlorophyll content (17.87 SPAD unit) was recorded in Control (T_{13}). Results are in accordance with the findings of Parab *et al.* (2017) [7] in papaya. They reported that maximum chlorophyll content was recorded when seeds were treated with GA_3 200ppm.

Table 2: Effect of different pre-sowing treatments on girth of seedlings (mm), number of leaves per seedling and leaf area of seedlings (cm^2)

Treatment	Girth of seedling (mm)	No. of leaves per seedling	Leaf area of seeding (cm^2)	Total chlorophyll content (SPAD unit)
T_1 (Scraping of seed coat with sand paper)	1.06	10.00	2.35	20.52
T_2 (Seed soaked in GA_3 100ppm for 24 hours)	1.20	11.20	3.30	25.73
T_3 (Seed soaked in GA_3 200ppm for 24 hours	1.22	11.33	3.37	26.83
T_4 (Scraping of seed coat with sand paper + Seeds soaked in GA_3 100ppm for 24 hours	1.28	11.87	3.69	28.22
T_5 (Scraping of seed coat with sand paper + Seeds soaked in GA_3 200ppm for 24 hours)	1.31	12.40	3.83	29.85
T_6 (0.1% solution Potassium hydroxide soaking for 2 minutes)	1.24	11.60	3.52	24.66
T_7 (0.2% solution Potassium hydroxide soaking for 2 minutes)	1.12	11.07	3.27	21.97
T_8 (30% Sulfuric acid soaking) i. Quick dip	1.34	12.13	3.43	27.84
ii. 1 minute	1.16	10.80	3.02	22.50
iii. 3 minutes	1.11	10.27	2.79	20.16
T_9 (5% Hydrochloric acid soaking for 2 minutes)	1.14	10.67	2.92	22.21
T_{10} (10% Hydrochloric acid soaking for 2 minutes	1.26	11.47	3.18	26.60
T_{11} (Hot water soaking at 80° C) i. Quick dip	1.10	10.40	2.79	21.03
ii. 1 minute	1.18	10.93	3.14	23.25
iii. 3 minutes	1.15	10.53	2.96	22.27
T_{12} (Water soaking for 48 hours)	1.03	9.33	2.08	18.71
T_{13} (Control)	1.01	9.20	1.95	17.87
C.D. at 5%	0.05	0.64	0.25	2.51

4. Conclusion

On the basis of experimental findings, it can be concluded that among the different pre-sowing treatments, scraping of seed coat with sand paper + seeds soaked in GA_3 200ppm for 24 hours (T_5) was the most effective treatment for enhancing shoot length, root length, root-shoot ratio, number of leaves per seedling, leaf area of seedling and total chlorophyll content. While, for girth of seedling quick dip seed soaking in 30% sulphuric acid solution $T_{8\ (i)}$ was found effective. Therefore, these pre-sowing treatments should be used for maximum seedling growth of guava.

5. References

1. Anonymous. Horticultural statistic at a Glance. National

Horticulture Board, Gurgaon, Ministry of Agriculture and Farmer Welfare, Government of India. 2018;146:179.
2. Boricha UK, Parmar BR, Parmar AB, Rathod SD, Patel MV, Pandey AK. Effect of pre-sowing treatments on seed germination and seedling growth of guava. The Pharma Innovation Journal. 2020;9(9):431-433.
3. Choudhary RC, Kanwar J, Chouhan GS, Singh P, Tanwar DR. Effect of GA_3 and growing media on seedling growth of papaya (*Carica papaya* L.) cv. Pusa Nanha. International Journal of Chemical Studies. 2018;6(6):1008-1012.
4. Dadhaniya DB, Kanzaria DR, Sejal B, Dhara T and Varuti P. Effect of time of sowing and chemical treatments on seedling growth of custard apple (*Annona squamosa* L.) cv. Sindhan. Chemical Sciences Review Letter. 2020;9(33):19-23.
5. Joshi CJ, Sharma DK, Gotur M, Rajan R. Effect of different chemicals on germination and seedling growth of Chironji (*Buchanania lanzan* Spreng.). Plant Archives. 2017;17(2):1483-1486.
6. Muralidhara BM, Reddy YTN, Akshitha HJ, Srilatha V. Effect of pre-sowing treatments on germination, growth and vigor of polyembryonic mango seedlings. Environment and Ecology. 2015;33(3):1014-1018.
7. Parab AM, Mathad JC, Malshe KV. Effect of pre-soaking chemicals on germination and subsequent seedling growth of papaya (*Carica papaya*) cv. Solo. International Journal of Chemical Studies. 2017;5(4):1812-1816.
8. Patil H, Tank RV, Bennurmath P, Gotur M. Effect of seed treatment and foliar spray of chemical substances on seedling growth of Jamun (*Syzygium cuminii* L.). International Journal of Chemical Studies. 2017;5(5):1676-1680.
9. Pratibha C, Teja T, Krishna PM. Effect of chemical treatments on the germination and subsequent seedlings growth of papaya (*Carica papaya* L.) seeds cv. Pusa Nanha. Journal of Agricultural Engineering and Food Technology. 2015;2(3):189-191.
10. Rajput K, Sharma TR. Effect of organic and inorganic sources on seed germination, growth and survival of custard apple (*Annona squamosa* L.) seedlings. Journal of Pharmacognosy and Phytochemistry. 2020;9(6):552-556.
11. Salisbury FB, Ross CW. Plant Physiology. CBS Publishers and Distributors, Delhi, 1988, 319-329.
12. Sen SK, Ghunti P. Effect of pre-sowing seed treatment on the germination and seedling growth in papaya. Orissa Journal of Horticulture. 1976;4:38-43.
13. Sourabh, Sharma JR, Baloda S. Effect of scarification treatments on seed germination of guava (*Psidium guajava* L.) under south western region of Haryana. The Ecoscan. 2016;9:409-414
14. Taiz L, Zeiger E. Plant physiology. 3rd edition, Sinauer Associates Inc. Publishers, Sunderland, 2002.
15. Vasantha PT, Vijendrakumar RC, Guruprasad TR, Mahadevamma M, Santhosh KV. Studies on effect of growth regulators and bio fertilizers on seed germination and seedling growth of tamarind (*Tamarindus indica* L.). Plant Archives. 2014;14(1):155-160.
16. Vishwakarma D. Effect of growing media and GA_3 on seed germination, growth and survival of acid lime (*Citrus aurantifolia* Swingle) var. Kagzi. Department of Horticulture, College of Agriculture, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Madhya Pradesh, 2013.