



## Research Paper

### Article history :

Received : 14.11.2013

Revised : 25.04.2014

Accepted : 04.05.2014

# Influence of pre-sowing treatments on vegetative growth parameters of seedling rootstock of guava (*Psidium guajava* L.)

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**ABSTRACT :** The present study was carried out to investigate the influence of pre-sowing treatments on the vegetative growth parameters of seedling rootstock of guava. The objective of the study was to find out the most suitable pre-sowing treatment for better seedling growth of guava rootstock. The study revealed that the pre-sowing treatments significantly enhanced the seedling height, stem girth, number of leaves per seedling, fresh and dry weight of stems, leaves and roots of seedling rootstock of guava. The maximum seedling height (4.90 cm), stem girth (0.32 cm) and number of leaves per seedlings (9.46) in 30 days after transplanting and 17.94 cm, 1.31 cm and 18.69, respectively in 120 days after transplanting were observed in scraping of seed coat with sand paper + seeds soaked in GA<sub>3</sub> 50 ppm for 24 hours as compared to control. Likewise, the maximum fresh and dry weight of stems (335.66 mg and 50.36 mg, respectively), leaves (830.53 g and 258.90 mg, respectively) and roots (344.80 mg and 74.10 mg, respectively) were observed in scraping of seed coat with sand paper + seeds soaked in GA<sub>3</sub> 50 ppm for 24 hours. Sowing of seeds without pre-sowing treatment showed poor results for all parameters.

**KEY WORDS :** Guava, Rootstock, Pre-sowing treatments, Vegetative growth

**HOW TO CITE THIS ARTICLE :** Brijwal, Manoj and Kumar, Rajesh (2014). Influence of pre-sowing treatments on vegetative growth parameters of seedling rootstock of guava (*Psidium guajava* L.). *Asian J. Hort.*, 9(1) : 120-123.

Guava (*Psidium guajava* L.), a member of family Myrtaceae, is an important fruit of tropical and sub-tropical regions of India. Guava occupies an area of 205 thousand hectares in India with approximate production of 2462 thousand metric tonnes (Anonymous, 2011). Maharashtra ranked first in area (36 thousand hectares) and production (311 thousand metric tonnes) however, maximum productivity (29 metric tonnes per hectares) was recorded in Madhya Pradesh. As the area under guava increasing day by day, the demand of budded and grafted plants also increasing but this demand is not fulfilled because of unavailability of superior seedling rootstocks which might be due to poor seedling growth. To meet the growing demand of planting material (grafts), nursery man has to produce more number of rootstocks with graftable size in a shorter time. It is, therefore, highly essential to accelerate the growth of seedlings with pre-sowing treatments to attain graftable size earlier and reduce the nursery cost. Therefore, enhancement of seedling growth

is important in propagation and breeding programmes, as well as for testing and using germplasm. Hence, the present studies were undertaken to standardize the pre-sowing treatments for raising seedling rootstocks of guava.

## RESEARCH METHODS

The present investigation was carried out at Horticultural Research Centre (HRC), Patharchatta, Department of Horticulture, Govind Ballabh Pant University of Agriculture and Technology, Pantnagar, Uttarakhand in the year 2011-2012. The experiment was laid out in Randomized Block Design (RBD), with three replications and twelve treatments viz., seeds soaked in tap water for 24 hours (T<sub>1</sub>), seeds soaked in tap water for 48 hours (T<sub>2</sub>), scraping of seed coat with sand paper (T<sub>3</sub>), scraping of seed coat with sand paper + seeds soaked in GA<sub>3</sub> 50 ppm for 24 hours (T<sub>4</sub>), scraping of seed coat with sand paper + seeds soaked in GA<sub>3</sub> 100 ppm for 24 hours (T<sub>5</sub>), seeds soaked in 5% hydrochloric acid for 2 minutes (T<sub>6</sub>), seeds soaked

in 10% hydrochloric acid for 2 minutes ( $T_7$ ), seeds soaked in 5% sulphuric acid for 2 minutes ( $T_8$ ), seeds soaked in 10% sulphuric acid for 2 minutes ( $T_9$ ), seeds soaked in 0.1 % potassium hydroxide for 2 minutes ( $T_{10}$ ), seeds soaked in 0.2 % potassium hydroxide for 2 minutes ( $T_{11}$ ) and control ( $T_{12}$ ). Observations on seedling height was measured with the help of ruler, stem girth was recorded by Vernier callipers, number of leaves per seedling was recorded by counting the total number of fully developed leaves, fresh and dry weight of stems was measured from leafless stem which was chopped into pieces and weighed in milligrams than these pieces of stem were kept in oven at  $60 \pm 2^\circ\text{C}$  temperature till constant weighed and data were expressed in milligrams and for the measurement of fresh and dry weight of leaves, all the leaves of a seedling were plucked along with petiole and weight was taken with the help of balance and expressed in milligrams than these plucked leaves were kept in oven at  $60 \pm 2^\circ\text{C}$  temperature till constant weighed and data were expressed in milligrams and for the measurement of fresh and dry weight of roots, all roots including tap roots were separated from seedling, washed and weighed in milligrams then these washed roots were kept in oven at  $60 \pm 2^\circ\text{C}$  temperature till constant weighed and data were expressed in milligrams.

### RESEARCH FINDINGS AND DISCUSSION

It is apparent from the data presented in Table 1 that pre-sowing treatments had significant effect on seedling height, stem girth and number of leaves per seedling. The maximum seedling height (4.90 cm), stem girth (0.32 cm) and number of leaves per seedling (9.46) in 30 days after transplanting and 17.94 cm, 1.31 cm and 18.69, respectively in 120 days after transplanting were observed in scraping of seed coat with sand paper + seeds soaked in  $\text{GA}_3$  50 ppm for 24 hours ( $T_4$ ). Whereas, the lowest 2.68 cm, 0.21 cm and 7.33 in 30 days after transplanting and 10.59 cm 0.21cm and 11.84, respectively in 120 days after transplanting were recorded in control ( $T_{12}$ ). These results are in agreement with the findings of Biradar *et al.* (2005) in guava. The increase in height and stem girth as result of  $\text{GA}_3$  application might be due to the fact that  $\text{GA}_3$  increase somatic uptake of nutrients, causing cell elongation and thus increasing height and girth of the plant (Faucht and Watson, 1958). The increase in number of leaves per seedling as results of  $\text{GA}_3$  application might be due to fact that  $\text{GA}_3$  moves into the shoot apex, increase cell division and cell growth apparently lead to increased development of young leaves (Salisbury and Ross, 1988). Similar results were also reported by EI-Dengawy (2005) in loquat.

The data on fresh and dry weight of stems presented in Table 2 reveal that different pre-sowing treatments had a non significant effect on fresh weight while significant effect on dry weight of stems of guava seedlings. The seedlings obtained from scraping of seed coat with sand paper + seeds

**Table 1 : Effect of pre-sowing treatments on seedling height, stem girth and number of leaves per seedling of guava**

Treatments	Seedling height (cm)		Stem girth (cm)		Number of leaves per seedlings	
	30 days after transplanting	120 days after transplanting	30 days after transplanting	120 days after transplanting	30 days after transplanting	120 days after transplanting
$T_1$ (Seeds soaked in tap water for 24 hours)	3.44	13.93	0.25	0.81	7.40	13.12
$T_2$ (Seeds soaked in tap water for 48 hours)	3.72	14.37	0.28	0.85	7.93	17.07
$T_3$ (Scraping of seed coat with sand paper)	3.88	14.78	0.24	0.94	8.13	17.24
$T_4$ (Scraping of seed coat with sand paper + Seeds soaked in $\text{GA}_3$ 50 ppm for 24 hours)	4.90	17.94	0.32	1.31	9.46	18.69
$T_5$ (Scraping of seed coat with sand paper + Seeds soaked in $\text{GA}_3$ 100 ppm for 24 hours )	4.84	16.89	0.27	1.20	9.13	15.97
$T_6$ (5% Hydrochloric acid for 2 minutes)	3.95	12.91	0.22	1.26	8.80	13.70
$T_7$ (10% Hydrochloric acid for 2 minutes)	4.11	15.93	0.26	1.19	8.40	15.58
$T_8$ (5% Sulphuric acid for 2 minutes)	4.11	13.37	0.25	1.14	8.73	17.64
$T_9$ (10% Sulphuric acid for 2 minutes)	3.81	13.16	0.22	1.05	8.80	12.69
$T_{10}$ (0.1 % Potassium Hydroxide for 2 minutes)	4.25	16.00	0.27	1.02	8.90	15.56
$T_{11}$ (0.2 % Potassium Hydroxide for 2 minutes)	3.47	13.80	0.24	0.93	8.33	13.82
$T_{12}$ (Control)	2.68	10.59	0.21	0.73	7.33	11.84
C.D. (P=0.05)	0.69	2.68	0.04	0.24	1.25	3.41
S.E.±	0.25	0.91	0.01	0.08	0.42	1.16

**Table 2 : Effect of pre-sowing treatments on fresh and dry weight of stems, leaves and roots of seedling rootstock of guava**

Treatments	Fresh weight of stems (mg)	Dry weight of stems (mg)	Fresh weight of leaves (mg)	Dry weight of leaves (mg)	Fresh weight of roots (mg)	Dry weight of roots (mg)
T <sub>1</sub> (Seeds soaked in tap water for 24 hours)	286.63	40.26	667.30	171.46	275.03	46.40
T <sub>2</sub> (Seeds soaked in tap water for 48 hours)	282.76	40.63	580.10	81.43	230.03	47.43
T <sub>3</sub> (Scraping of seed coat with sand paper)	295.50	44.63	663.10	75.36	323.90	60.50
T <sub>4</sub> (Scraping of seed coat with sand paper + Seeds soaked in GA <sub>3</sub> 50 ppm for 24 hours)	335.66	50.36	830.53	258.90	344.80	74.10
T <sub>5</sub> (Scraping of seed coat with sand paper + seeds soaked in GA <sub>3</sub> 100ppm for 24 hours )	269.66	36.70	674.26	94.03	308.56	60.13
T <sub>6</sub> (5% Hydrochloric acid for 2 minutes)	276.53	42.20	647.60	97.96	263.26	52.76
T <sub>7</sub> (10% Hydrochloric acid for 2 minutes)	297.96	44.00	738.30	172.03	267.86	60.66
T <sub>8</sub> (5% Sulphuric acid for 2 minutes)	257.10	40.56	784.03	168.36	301.53	69.53
T <sub>9</sub> (10% Sulphuric acid for 2 minutes)	280.00	41.43	818.66	77.06	260.50	50.80
T <sub>10</sub> (0.1 % Potassium Hydroxide for 2 minutes)	301.70	39.46	809.20	177.53	282.03	52.13
T <sub>11</sub> (0.2 % Potassium Hydroxide for 2 minutes)	290.53	36.96	663.36	172.20	254.30	45.66
T <sub>12</sub> (Control)	224.26	32.26	457.90	75.03	212.73	31.20
C.D. (P=0.05)	NS	7.26	203.54	61.84	30.59	15.64
S.E.±	18.05	2.47	69.40	21.08	10.43	5.33

NS=Non-significant

soaked in GA<sub>3</sub> 50 ppm for 24 hours (T<sub>4</sub>) recorded the maximum fresh (335.66 mg) and dry weight of stems (50.36 mg). The minimum fresh (224.26 mg) and dry weight of stems (32.26 mg) were recorded from control (T<sub>12</sub>). Similar results of maximum fresh and dry weight of stems due to GA<sub>3</sub> pre-sowing seed treatment were also reported by Chaudhari and Chakrawar (1982) in Rangpur lime. The maximum fresh and dry weight of stems obtained from GA<sub>3</sub> pre-soaked seeds might be due to the higher seedling height with corresponding GA<sub>3</sub> treatments. Fresh and dry weight of leaves (830.53 mg and 258.90 mg) were significantly maximum with seedlings obtained from scraping of seed coat with sand paper + seeds soaked in GA<sub>3</sub> 50 ppm for 24 hours (T<sub>4</sub>). The minimum fresh and dry weight of leaves (457.90 mg and 75.03 mg) of seedlings was recorded from control (T<sub>12</sub>). Similar increase in fresh and dry weight of leaves of seedlings due to pre-sowing of seeds in GA<sub>3</sub> were reported by Palanisamy and Ramamoorthy (1987) in papaya. The maximum fresh and dry weight of leaves of seedlings obtained from GA<sub>3</sub> pre-soaked seeds might be due to the fact that more number of leaves with corresponding GA<sub>3</sub> treatments and GA<sub>3</sub> improve the rate of photosynthesis and cause greater accumulation photosynthetes (Alvin, 1960). Scraping of seed coat with sand paper + seeds soaked in GA<sub>3</sub> 50 ppm for 24 hours (T<sub>4</sub>) recorded the maximum fresh (344.80 mg) and dry weight of roots (74.10 mg) of seedlings and the minimum fresh (212.73 mg) and dry weight of roots (31.20 mg) of seedlings were noticed in control (T<sub>12</sub>). Similar increase in fresh and dry weight of roots of seedlings due to pre-soaking of seeds in GA<sub>3</sub> was reported by Shanmugavelu (1970) in some tree species which support the present finding. The maximum fresh and dry weight of roots of seedlings with GA<sub>3</sub> pre-treatments might be due to the fact that GA<sub>3</sub> elongates the cells in the sub-apical region causing elongation of roots which in turn contribute to the increase in fresh and dry weight of roots of seedlings.

**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<sub>3</sub> 50 ppm for 24 hours (T<sub>4</sub>) was the most effective treatment for enhancing seedling height, stem girth, number of leaves per seedling, fresh and dry weight of stems, leaves and roots of guava rootstock. Sowing of seeds without pre-sowing treatment showed poor results for all parameters.

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