



Effect of time, techniques and environment of propagation on performance of guava (*Psidium guajava*)

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ABSTRACT

An experiment was conducted at Horticultural Research Centre of Sardar Vallabhbhai Patel University of Agriculture and Technology-Meerut, to study the effect of time and techniques of propagation on bud/graft success and quality parameters in guava (*Psidium guajava* L.). Maximum survival percent (82.30) was recorded with patch budding performed in March under shade condition. Wedge grafting recorded minimum number of days to bud sprout (13.86 days) under shade conditions whereas, patch budding had recorded maximum number of days to bud sprout (36.86 days) under open conditions. The sprouting percentage of budded or grafted plant was higher under shade condition than open condition. Based on results obtained in the present study, it may be concluded that, patch budding was found to be better over wedge grafting in respect of survival, sprouting, plant and growth traits.

Key words: Guava, Propagation condition, Propagation techniques, Survival

Guava (*Psidium guajava* L.) is one of the most common and major fruits of India and considered the fourth most important fruit in area and production after mango, banana and citrus. Guava is hardy, prolific bearer and highly remunerative fruit. However, the greatest handicap in guava plantation is indiscriminate multiplication of plants from unreliable sources by nursery men. Non-availability of quality planting material and consequent substitution of poor quality seedlings had adversely affected the guava production and productivity. Guava plants have been propagated through seeds for a long time. Propagation from seeds results in considerable variation in the size, shape and quality of fruits. Vegetative propagation in guava results in true-to-type crop with short juvenile phase. Guava is vegetatively propagated through budding (Gupta and Malhotra 1985, Kaundal *et al.* 1987), air layering (Singh and Singh 1970, Sharma *et al.* 1978, Manna *et al.* 2004), stooling (Rathore 1984, Pathak and Saroj 1988) and inarching (Mukherjee and Majumder 1983). Joshi *et*

al. (2016) and Abbas, *et al.* (2013) standardized different techniques in guava and found similar results. In view of above facts, an experiment was formulated to determine the appropriate time, suitable method and favourable condition of propagation in guava.

MATERIALS AND METHODS

The present investigation was conducted at Horticultural Research Centre of the institute during 2017-18. In the experiments performance of different method (patch budding and wedge grafting) and different time (first week of March and mid July) of propagation in guava to see the comparison of patch budding and wedge grafting under open and protected condition in guava cv. Lalit were studied. The scion shoots 15 to 18 cm long of pencil thickness (0.5-1.0 cm) with 3 to 4 healthy buds were used for grafting. Selected scion shoots were defoliated on the mother plant, about one week prior to detachment. At the same time, the apical growing portion of selected shoots was also beheaded with the help of secateurs, which helped in forcing the dormant buds to swell. After selection of the scion material, rootstock was headed back, leaving 12 to 15 cm long stem above the polyethylene bag. The beheaded rootstock was split open about 4.0 to 4.5 cm deep through the centre from cut end of the rootstock with grafting knife. A grafting wedge shaped cut, slanting from both the sides 4.0-4.5 cm long was made on the lower side of the scion shoot. The scion stick was inserted into the split of the stock and pressed properly so that cambium tissues of rootstock and scion stick could come in contact with each

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other. The stock and scion combination was then tied with the help of 150 gauge, 2 cm wide and 25 to 30 cm long polyethylene strip.

In patch budding, the scion stick with well swollen buds were separated from mother plant and wrapped in newspaper with moist sphagnum moss and tied in gunny bags to avoid the desiccation of buds. Budding and grafting operations were performed immediately just after the collection of scion sticks. The experiment was laid out in factorial randomized block design and was replicated thrice. The data were then analyzed as per method suggested by Panse and Sukhtame (1985).

The observations were recorded regularly on success of grafting and budding such as days taken for bud sprouting, sprouting percentage, stem girth (cm), shoot per live budded or grafted plant, leaves per live budded or grafted plant, plant height (cm), plant spread (cm) and finally survival percentage were recorded at 120 DAG, and were analysed statistically for interpretation of results.

RESULTS AND DISCUSSION

Maximum number of days to bud sprout was recorded (36.86 days) when patch budding was done in the mid July under open condition, where as minimum number of days to bud sprout were recorded when patch budding was performed in the first week of March (13.86 days) under shade condition in wedge budding followed by patch budding done in March (18.86 days) under shade condition (Table 1). Maximum number of days to sprout (26.43) were recorded when wedge grafting was done in the July under open condition, while in case of wedge grafting minimum numbers of days to bud sprout was recorded in the first week of March (13.86 days) under shade condition followed by wedge grafting done in the first week of March (15.04 days) under shade condition. So wedge grafting recorded minimum number of days to bud sprout (13.86 days) whereas, patch budding had recorded maximum number of days to bud sprout (36.86 days). As far as growing condition was concerned, the performance of budded or grafted plants was found better under shade condition in respect of bud sprouting.

Wedge grafted plants took minimum time to bud breaking as compared to patch budded plants. These findings

were similar to the findings obtained by Singh *et al.* (2005) who had reported that wedge grafted plants sprouted early as compared to the plants propagated by other techniques of vegetative propagation. The lesser time taken by wedge grafted plants to sprout might be due to better contact of cambial layers of stock and scion resulting in early callus formation and initiation of subsequent growth (Chandel *et al.* 1998). While wedge grafted plants sprouted very late when grafting made during the month of July under open condition. Similar results had been reported by Lal (1993) and Singh *et al.* (1979) who found that high atmospheric humidity increased the sprouting of scion buds of mango grafts.

The maximum plant sprouting percentage was revealed in case of patch budding performed in July. There were 66.96% sprouting when patch budding was done in mid-July, whereas the minimum sprouting percentage (36.16%) was found when patch budding was done in the first week of March in open conditions, followed by patch budding performed in the first week of March (38.13%) in shade conditions. Sprouting percentage was higher when patch budding and wedge grafting was done in July rather than these techniques performed in March.

Out of propagation techniques, patch budding was found to be better over wedge grafting in respect of sprouting percentage. The sprouting percentage of budded or grafted plant was higher under shade condition than other condition. It may be due to the suitable temperature and relative humidity. Rao *et al.* (1984) also obtained maximum graft success percentage in the month of march under shade conditions.

Maximum stem girth of the plant was recorded (1.45 cm) when wedge grafting was done in the March under shade condition, whereas minimum stem girth of the plant was recorded when wedge grafting was performed in July (1.29 cm) under open condition followed by wedge grafting done in March (1.35 cm) under open condition. Maximum stem girth of the plant (1.28 cm) were recorded when patch budding was done in the March under shade condition, while in case of patch budding minimum stem girth of the plant was recorded in July (1.01 cm) under open condition followed by patch budding done in the first week of March (1.21 cm) under open condition. The results are further

Table 1 Effect of time and techniques of vegetative propagation on days taken for bud sprouting and sprouting percentage in guava

Techniques of vegetative propagation	Time of propagation	Days taken for bud sprouting		Sprouting percentage	
		Open condition	Shade condition	Open condition	Shade condition
Patch budding	March	21.86	18.86	36.16	38.13
	July	36.86	35.46	64.50	66.96
Wedge grafting	March	15.40	13.86	54.80	59.86
	July	26.43	24.06	62.30	64.13
Method of propagation (A)		0.881		0.814	
Time of budding and grafting (B)		0.38		1.009	
Growing condition (C)		0.604		1.331	
Interaction (A×B×C)		1.208		NS	

supported by the fact that during rainy season the excellent climate condition viz optimum temperature, adequate relative humidity with high rainfall and soil moisture proved to be the most favourable for vegetative growth (Singh 2007). The highest graft was noticed in budded/grafted in March which might be because of the fact that the budded and grafted plants in March under shade condition received fairly long periods of favourable temperature, relative humidity and soil moisture for vegetative growth (Singh 2007). Maximum plant height was recorded (75.50 cm) when patch budding was done in the March under shade condition, where minimum plant height was recorded when patch budding was performed in March (72.60 cm) under open condition followed by patch budding done in July (72.93 cm) under open condition.

Maximum plant height (43.36 cm) were recorded when wedge grafting was done in the March under shade condition, while in case of wedge grafting minimum plant height was recorded in July (39.33 cm) under open condition followed by wedge grafting done in July (41.03 cm) under shade condition. As far as growing condition was concerned, the performance of budded or grafted plants was found better under shade condition in respect of plant height (Table 2). The present findings were also in accordance with the finding of Singh *et al.* (1978) who observed maximum stem girth with patch budding performed in March under shade condition and lowest in plants budded in July under open

condition. The results of the study also confirm the findings of Aulakh (1998) who observed maximum stem girth when patch budding was performed in the month of May followed by the month of June. Pandey and Prasad (1979), Abbas *et al.* (2013) and Ahmad *et al.* (2015) also recorded the highest growth under patch budding when performed during March followed by July under open condition.

The perusal of data presented in Table 3 revealed that the maximum number of shoot per live budded or grafted plant was recorded (1.23) when patch budding was done in March under shade condition, where as minimum number of shoot per live budded or grafted plant were recorded when patch budding was performed in July (0.87) under open condition followed by patch budding done in July (1.04) under shade condition.

Maximum number of shoot per live budded or grafted plant (0.50) were recorded when wedge grafting was done in March under shade condition, while in case of wedge grafting minimum number of shoot per live budded or grafted plant was recorded in July (0.33) under open condition followed by wedge grafting done in July (0.35) under shade condition. So patch budding recorded maximum number of shoot per live budded or grafted plant (1.23), whereas wedge grafting had recorded minimum number of shoot per live budded or grafted plant (0.33).

Maximum number of leaves per live budded or grafted plant (18.23) were recorded when wedge grafting was done

Table 2 Effect of time and technique of vegetative propagation on stem girth and plant height in guava

Technique of vegetative propagation	Time of propagation	Stem girth (cm)		Plant height (cm)	
		Open condition	Shade condition	Open condition	Shade condition
Patch budding	March	1.21	1.28	72.60	75.50
	July	1.01	1.22	72.93	74.50
Wedge grafting	March	1.35	1.45	42.62	43.36
	July	1.29	1.37	39.33	41.03
Method of propagation (A)		0.016		0.765	
Time of budding and grafting (B)		0.02		1.448	
Growing condition (C)		0.026		0.967	
Interaction (A×B×C)		0.052		NS	

Table 3 Effect of time and technique of vegetative propagation on shoot per live budded or grafted plant and number of leaves per budded or grafted plant

Technique of vegetative propagation	Time of propagation	Shoot per live budded or grafted plant		Number of leaves per budded or grafted plant	
		Open condition	Shade condition	Open condition	Shade condition
Patch budding	March	1.11	1.23	18.50	20.37
	July	0.87	1.04	11.85	12.36
Wedge grafting	March	0.44	0.50	17.89	18.23
	July	0.33	0.35	10.92	11.44
Method of propagation (A)		0.009		1.005	
Time of budding and grafting (B)		0.019		0.162	
Growing condition (C)		0.016		0.188	
Interaction (A×B×C)		0.033		0.367	

Table 4 Effect of time and technique of vegetative propagation on plant spread and survival percentage in guava

Technique of vegetative propagation	Time of propagation	Plant spread (cm)		Survival percentage after 120 days	
		Open condition	Shade condition	Open condition	Shade condition
Patch budding	March	18.33	20.3	81.10	82.30
	July	16.60	17.51	55.27	60.30
Wedge grafting	March	5.63	6.51	19.70	28.06
	July	3.86	4.73	20.83	23.77
Method of propagation (A)		0.202		1.77	
Time of budding and grafting (B)		0.193		0.626	
Growing condition (C)		0.255		0.881	
Interaction (A×B×C)		0.511		1.762	

in March under shade condition, while in case of wedge grafting minimum number of leaves per live budded or grafted plant was recorded in July (10.92) under open condition followed by wedge grafting done in July (11.44) under shade condition. So patch budding recorded maximum number of leaves per live budded or grafted plant (20.37) whereas, wedge grafting had recorded minimum number of leaves per live budded or grafted plant (10.92).

Maximum plant spread was recorded (20.30 cm) when patch budding was done in the March under shade condition, where minimum plant spread was recorded when patch budding was performed in July (16.60 cm) under open condition followed by patch budding done in July (17.15 cm) under shade condition while Maximum plant spread (6.51 cm) were recorded when wedge grafting was done in the March under shade condition, while in case of wedge grafting minimum plant spread was recorded in July (3.86 cm) under open condition followed by wedge grafting done in July (4.73 cm) under shade condition. Maximum plant spread in budding and grafting might be due to large area of contact of cambium between stock and scion and more availability of food material at the union point. This might be due to appropriate environmental conditions like temperature and humidity in protected conditions and grafted plants faced longer period in rainy season (Akram *et al.* 2016, Shyamal *et al.* 2012 and Rani *et al.* 2015).

While comparing the success rate of both the techniques of vegetative propagation patch budding was found to be significantly better (81.10% to 82.30%) in open shade condition respectively in the month of March over wedge grafting in which maximum survival percentage (28.06) in the month of March under shade conditions and minimum (19.70) under opened condition in the same month.

As far as the time of propagation is concerned, higher success rate (19.70% to 82.30%) was recorded in the month of March in both the techniques of propagation. These results confirm the findings of Nowshad *et al.* (2005) who had reported that patch budding was most successful in guava as compared to other techniques of propagation, namely, veneer grafting and wedge grafting. The higher percentage of success recorded under patch budding can possibly be attributed to the firmness with which the bud is held with

the stem of root stock without any interference from the plant tissue (Rao *et al.* 1977).

Conclusion

Maximum survival percent (82.30%) was recorded with patch budding performed in March under shade condition. Wedge grafting recorded minimum number of days to bud sprout (13.86 days), whereas patch budding had recorded maximum number of days to bud sprout (36.86 days). The sprouting percentage of budded or grafted plant was higher under shade condition than other condition. Patch budding was found to be better over wedge grafting in respect of survival percent, sprouting percent, plant height, number of shoot and number of leaves.

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