

EFFECT OF LENGTH AND VARIETY OF SCION IN STONE GRAFTING OF MANGO

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ABSTRACT

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A study was conducted for mass multiplication of mango through stone grafting during last week of July, 2002. Mango seedlings of 15 days old were grafted with three varieties of scion viz. BARI Aam-1, BARI Aam-3 and Langra. Five categories of scion length (5.0, 7.5, 10.0, 12.5 and 15.0 cm.) were used in grafting. Langra performed the best in all categories of scion length whereas BARI Aam-3 succeeded the least. Maximum final success (76.67%) was recorded in 10.0 cm long scions followed by 7.5 cm long ones (70.00%) in variety Langra. Minimum final success was (23.33%) when 5.0 cm long BARI Aam-3 scions were used for stone grafting. Scions of 15.0 cm length in the grafts of all the varieties produced the longest shoots.

Key words: Mango, propagation and stone grafting

INTRODUCTION

Mango (*Mangifera indica* L.) belongs to the family Anacardiaceae and almost grown all over Bangladesh. It is believed to be originated in the Indo-Burma region (Popenoe, 1920; Mukherjee, 1951; Bal, 1997) which obviously includes Bangladesh (Hossain, 1989). It occupies 125045 acre of land producing 187880 tones of mango in Bangladesh (BBS, 2003). It is repeatedly uttered as the "king of fruits" having delicious taste, captivating flavor with multifarious color and excellent source of nutritive values.

Traub and Auchter (1934) first reported about stone grafting of mango. Now-a-days, this technique is becoming commercially popular in India and elsewhere. Due to graft-success, convenience and ease of stone grafting in commercial cultivars, it would be economically viable compared to traditional methods (Patil *et al.*, 1991). Earlier workers have reported varying degrees of success of stone grafting in different names such as bench grafting, epicotyl grafting, seedling grafting etc. (Kashyap *et al.*, 1989). Success in stone grafting may vary depending upon use of rootstock, variety of scion, length of scion, grafting season *etc.* Chakrabarty and Sadhu (1989) had a faster graft-take in Langra than in Bombai and Himsagar due to more rapid formation of callus and vascular continuity. In case of scion length 6, 8 and 10 cm long scion shoots of 6 cultivars were grafted onto an unnamed rootstock where 8 cm long scions gave best result (Radhamony *et al.*, 1989). In another experiment, 10 cm long scions showed better performance than those of 5 or 15 cm length (Chakrabarty and Sadhu, 1984). However, moderate temperature and high relative humidity are major factors related to success of grafts (Ram, 1997). So, the study was undertaken with the following objectives: a) To standardize the length of scion for better success in stone grafting of mango, b) To evaluate the response of different scion varieties in stone grafting.

MATERIALS AND METHODS

Seeds collected from the variety BARI Aam-1 were sown in seedbed and freshly emerged seedlings were placed in 8"x10" polyethylene bags to grow them up. Fifteen days old seedlings were used for grafting. Ten seedlings were grafted in cleft method in each treatment. Fifteen days old, mature and plump 5.0, 7.5, 10.0, 12.5 and 15.0 cm long scion shoots of BARI Aam-1, BARI Aam-3 and Langra were used for grafting. Grafting was done in the last week of July, 2002. Similar thickness of scions and rootstocks were selected. The rootstocks were beheaded at a height of 5-8 cm above the collar region. A 3-5 cm long vertical cutoff was given into the beheaded seedlings. The scion shoot was mended in wedge shape in such a manner so that it fits into the rootstock well. Then it was tied firmly with polyethylene film to secure close contact between the cambium layers of scion and rootstock. The grafts were covered with polyethylene papers from below the grafting zone. Data were collected 150 days after grafting. Leaf area was measured by multiplying the product of length and maximum breadth of leaf with the "k" value = 0.737 (Saidha and Rao, 1985). Shoot length was measured at just above grafting.

RESULTS AND DISCUSSION

Days to sprouting

Days to sprouting was significantly varied by length of scion shoot on the stone grafting in mango (Table 1). A maximum day (17.67) was required for bud sprouting was observed in the grafts of 5.0 cm long scion, which differed significantly from the other treatments. The quickest sprouting was found in the grafts of 10.0 cm long scions (14.22 days). In case of variety, maximum period of sprouting (16.97 days) was required in the grafts of BARI Aam-3 followed by BARI Aam-1. Langra gave the quickest sprouting (14.31 days) and differed significantly to the grafts of other varieties. The interaction effect of length and variety of scion on days to sprouting in the grafts of different treatment combinations was statistically insignificant.

Table 1. Effect of length and variety of scion on sprouting and success of the grafts in stone grafting of mango

Treatments	Days to first sprouting	Days to completion of sprouting	Initial success (%)	Final success (%)
Scion length				
L ₁	17.67 a	23.94 a	50.00 b	36.67 c
L ₂	15.69 b	22.34 b	56.67 ab	47.78 b
L ₃	14.22 c	20.40 d	62.22 a	55.56 a
L ₄	15.74 b	20.69 d	52.22 b	42.22 bc
L ₅	15.61 b	21.30 c	50.00 b	42.22 bc
Scion variety				
V ₁	16.08 b	22.36 b	52.67 b	40.67 b
V ₂	16.97 a	22.87 a	42.67 c	32.67 c
V ₃	14.31 c	19.97 c	67.33 a	61.33 a
Interaction				
L ₁ V ₁	17.97	24.03 ab	53.33 de	40.00 e-g
L ₁ V ₂	18.67	24.83 a	40.00 ef	23.33 h
L ₁ V ₃	16.37	22.97 cd	56.67 cd	46.67 de
L ₂ V ₁	15.97	22.77 c-e	50.00 d-f	40.00 e-g
L ₂ V ₂	16.93	23.47 bc	46.67 d-f	33.33 f-h
L ₂ V ₃	14.17	20.80 c	73.33 ab	70.00 ab
L ₃ V ₁	14.20	20.77 g	56.67 cd	46.67 de
L ₃ V ₂	15.73	22.23 d-f	46.67 d-f	43.33 d-f
L ₃ V ₃	12.73	18.20 i	83.33 a	76.67 a
L ₄ V ₁	15.87	21.70 f	56.67 cd	43.33 d-f
L ₄ V ₂	17.43	21.87 ef	43.33 d-f	30.00 gh
L ₄ V ₃	13.94	18.50 i	66.67 bc	60.00 bc
L ₅ V ₁	16.40	22.53 c-f	46.67 d-f	33.33 f-h
L ₅ V ₂	16.07	21.97 ef	36.67 f	33.33 f-h
L ₅ V ₃	14.37	19.40 h	56.67 cd	53.33 cd
CV%	3.75	2.37	12.96	12.80

Means in a column followed by the same letter(s) or without letter are not significantly different at 5% level by DMRT.

L₁=5.0 cm, L₂=7.5 cm, L₃=10.0 cm, L₄=12.5 cm and L₅=15.0 cm; V₁=BARI Aam-1, V₂= BARI Aam-3 and V₃= Langra

Days to completion of sprouting

Days to completion of sprouting was significantly influenced by the length of scion on the stone grafting in mango (Table 1). The grafts of 5.0 cm long scions took the longest period (23.94 days) to completion of sprouting followed by the grafts of 7.5 cm long scions. The shortest period was rerecorded in the grafts of 10.0 cm long scions, which was statistically similar to the grafts of 12.5 cm long scions. Among varieties, grafts of BARI Aam-3 scions took longest time (22.87 days) while it was the lowest in the grafts of Langra scions. In case of interaction, the longest period was required for the grafts of BARI Aam-3 grafted with 5.0 cm long scion (24.83 days) and was statistically similar to the grafts of BARI Aam-1 grafted with the same length of scions which may be due to lesser reserve food. Langra grafted as 10.0 and 12.5 long scions took the shortest period statistically.

Initial success

The length of scion shoots significantly affected the initial success among the grafts in stone grafting of mango (Table 1). The highest initial success (62.22%) was recorded from the grafts of 10.0 cm long scions, which was statistically similar to grafts prepared from 7.5 cm long scions. For varieties, the highest initial success (67.33%)

was recorded from the grafts of Langra scions followed by those of BARI Aam-1. In case of interaction, the highest initial success (83.33%) was recorded from the grafts of 10.0 cm long Langra scions while the lowest success (36.67%) was observed in the grafts of 15.0 cm long BARI Aam-3 scions.

Final success

Significant difference was observed on the final success among the grafts of different length of scions (Table 1). Maximum final success (55.56%) was achieved from the grafts produced from 10.0 cm long scions followed by the 7.5 cm ones. The grafts obtained from the shortest (5.0 cm) scions had minimum final success (36.67%), which was statistically similar to the grafts produced from 12.5 and 15.0 cm long scions. In case of variety, maximum final success (61.33%) was achieved by the grafts of Langra scions and differed significantly to the grafts of rest of the varieties while the minimum was obtained from the grafts of BARI Aam-3 scions. In case of interaction, maximum final success (76.67%) was achieved from the grafts of 10.0 cm long Langra scions and was statistically similar to the grafts of 7.5 cm long scions of same variety. Final success was the lowest in the grafts of 5.0 cm long BARI Aam-3 scions (23.33%). The grafts of Langra scion succeed more than 50.00% final success with all the scion lengths except the shortest one (5.0 cm). This might be due to having optimum nutrient and hormonal status by longer scions as well as good callusing capability of Langra variety. Shakur and Reza (1995) obtained 79.80% final survivability on the stone grafting with Khirsapat variety.

Table 2. Effect of length and variety of scion on growth parameters of the grafts in stone grafting of mango

Treatments	Shoot length (cm)	Shoot diameter (cm)	No. of growth flushes	Number of leaves	Leaf area per plant (sq. cm)
Scion length					
L ₁	16.67 e	0.51 c	1.14 b	7.76 d	127.40 d
L ₂	18.23 d	0.54 b	1.82 a	10.58 c	217.40 c
L ₃	22.06 c	0.59 a	2.06 a	11.94 b	267.20 a
L ₄	24.13 b	0.57 ab	2.02 a	12.36 ab	241.10 b
L ₅	27.04 a	0.54 b	2.05 a	12.94 a	232.00 bc
Scion variety					
V ₁	21.05 b	0.62 a	1.77 b	11.27 b	183.70 b
V ₂	20.09 c	0.53 b	1.64 b	9.20 c	154.80 c
V ₃	22.55 a	0.55 b	2.05 a	12.88 a	304.40 a
Interaction					
L ₁ V ₁	14.33 h	0.58	1.16 ef	7.00 g	94.76 g
L ₁ V ₂	14.50 h	0.52	1.05 f	6.67 g	95.18 g
L ₁ V ₃	15.17 h	0.51	1.35 d-f	9.62 ef	192.10 de
L ₂ V ₁	17.63 g	0.59	1.75 b-d	10.57 de	185.40 de
L ₂ V ₂	16.90 g	0.53	1.55 c-e	8.75 f	149.50 f
L ₂ V ₃	20.17 f	0.55	2.04 ab	12.43 bc	317.20 b
L ₃ V ₁	21.67 e	0.62	1.85 bc	12.03 cd	233.50 c
L ₃ V ₂	20.27 f	0.55	1.86 bc	10.33 ef	211.30 cd
L ₃ V ₃	24.23 cd	0.55	2.39 a	13.47 a-c	356.90 a
L ₄ V ₁	24.13 cd	0.61	2.11 ab	13.53 a-c	219.80 cd
L ₄ V ₂	22.97 de	0.54	1.86 bc	9.66 ef	171.50 ef
L ₄ V ₃	25.80 b	0.54	2.17 ab	13.90 ab	331.90 ab
L ₅ V ₁	27.47 a	0.60	2.00 a-c	13.23 bc	198.00 de
L ₅ V ₂	25.30 bc	0.53	1.94 a-c	10.60 de	165.60 ef
L ₅ V ₃	27.87 a	0.56	2.18 ab	15.00 a	332.50 ab
CV%	3.85	3.85	8.34	8.19	8.94

Means in a column followed by the same letter(s) or without letter are not significantly different at 5% level by DMRT.

L₁=5.0 cm, L₂=7.5 cm, L₃=10.0 cm, L₄=12.5 cm and L₅=15.0 cm; V₁=BARI Aam-1, V₂=BARI Aam-3 and V₃=Langra

Shoot length

The longest shoot (27.04 cm) was obtained from the grafts of 15.0 cm long scions followed by the grafts of 12.5 cm long ones which differed statistically to the grafts of other scion lengths (Table 2). The shortest shoot (16.67 cm) was produced by the grafts obtained from 5.0 cm long scions. It was revealed from the observation that there was a positive correlation between the length of scion used and length of shoot produced. Majumder *et al.* (1972) also concluded that the grafts having larger scions made more linear growth of scion shoot but Kanwar and Bawja (1974) found no appreciable effect of length of scions on the linear growth of successful grafts. In case of variety, the longest shoots were obtained from the grafts of Langra (22.55 cm) followed by BARI Aam-1. Due to interaction, the longest shoot (27.87 cm) was produced in the grafts obtained from the grafts of 15.0

cm long Langra scions followed by the grafts of BARI Aam-1 of same length whereas the shortest shoot was found in 5.0 cm long BARI Aam-1 scions.

Shoot diameter

The thickest shoot (0.59 cm) was recorded in the grafts of 10.0 cm long scions and was statistically identical to the grafts of 12.5 cm long ones (Table 2). The thinnest shoot (0.50 cm) was produced in the grafts of 5.0 cm long scions. In case of variety, maximum shoot diameter (0.62 cm) was recorded from the grafts of BARI Aam-1 scion shoot which was significantly different to other two varieties. No significant variation in shoot diameter of grafts was observed due to interaction effect of different length and varieties of scion.

Number of growth flushes

Significant variation was observed in number of growth flushes among the grafts during in stone grafting (Table 2). The grafts produced by 10.0 cm long scions gave maximum number of flushes (2.06) and was statistically similar to the grafts of all scion length except the grafts of 5.0 cm. In respect of varieties, grafts of Langra had maximum number of flushes (2.05) which was significantly different to other varieties. In case of interaction, the highest number of growth flushes (2.39) was counted in the grafts of 10.0 cm long Langra scions which is statistically similar to the grafts of 7.5 and 12.5 cm long scion of same variety, the grafts of 12.5 cm long BARI Aam-1 scions as well as the grafts of 15.0 cm long scions of all of the varieties. Minimum number of growth flushes was produced in the grafts of 5.0 cm long scions of all the varieties.

Number of leaves

The grafts of 15.0 cm long scions, gave maximum number of leaves per plant (12.94), which was identical to the grafts of 12.5 cm long ones (Table 2). Minimum number of leaves was produced in the grafts of 5.0 cm long scions. In respect of varieties, maximum number of leaves per plant (12.88) was produced in the grafts of Langra whereas the grafts of BARI Aam-3 scions produced the minimum. For interaction, grafts of 15.0 cm long Langra scions produced maximum number of leaves per plant (15.00) which was identical to the grafts of 10.0 and 12.5 cm long scions as well as the grafts of 12.5 cm long BARI Aam-1 scions. Minimum number of leaves per plant (6.67) was produced in the grafts of 5.0 cm long BARI Aam-3 scion which was statistically similar to the grafts of BARI Aam-2 of same scion length.

Leaf area

Different lengths of scion shoots significantly affected leaf area per plant (Table 2). Maximum leaf area per plant (267.20 sq. cm) was observed in the grafts of 10.0 cm long scions whereas minimum leaf area (127.40 sq. cm) was achieved in the grafts of 5.0 cm long scions. In case of variety, the grafts of Langra produced significantly maximum leaf area per plant (304.40 sq. cm) followed by BARI Aam-1 (183.70 sq. cm). For interaction, maximum leaf area per plant (356.90 sq. cm) was recorded in the grafts of 10.0 cm long Langra scion which was identical to the grafts of 12.5 and 15.0 cm long scions of the same variety. Leaf area was minimum (94.76 sq. cm) in the grafts of 5.0 cm long BARI Aam-1 scion which was statistically similar to the grafts of BARI Aam-2 of the same scion length.

Considering the above results, conclusion might be drawn as; the final success in stone grafting of mango was ranged from 23.33 to 76.67% among different treatment combinations. Langra had the highest final success grafted with 10.0 as well as 7.5 cm long scions, and the grafts of BARI Aam-1 scions of 10.0 cm length gave moderate success (46.67%).

The author finally would like to recommend that 10.0 cm long scions of variety Langra could be recommended as the best combination to produce saplings successfully in stone grafting of mango. Further research should be carried out to study the matter adequately imparting different shading or covering effects, time of grafting, method of grafting, age of scion, defoliation of scion etc.

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