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Short communication

Studies on vegetative propagation of custard apple

Jitendra Kumar*, Harpal Singh and Krishan Pal**

Department of Horticulture, Chaudhary Charan Singh University Campus, Meerut 250005, Uttar Pradesh

ABSTRACT

A trial on custard apple grafting was undertaken to determine the optimum time, method and environmental conditions for higher success percent of grafts. Grafting methods, *i.e.* cleft, side and veneer were performed at 15-day interval starting from 15th February to 15th March (15th February, 29 February and 15th March) under two environments, *viz.* polyhouse and nethouse. Higher success of grafts (82%) was recorded in polyhouse when veneer grafting done on 15th February in comparison to nethouse conditions (76%). Time and method of grafting also showed the significant effect on success percent of grafts.

Key words: Custard apple, grafting time, grafting method, environment.

Custard apple or *sharifa* (*Annona squamosa* L.) belongs to family Annonaceae is an important desert fruit, popular with all classes of people, especially with the poorer sections. Custard apple is universally propagated through seeds, which causes genetically diverse seedlings most are characterized by a long juvenile period, irregular bearing and poor fruit quality. The value of vegetative propagation has been well recognized in perpetuation of horticultural plants. In order to produce true-to-type plants of custard apple, the method of vegetative propagation requires to be standardized for north Indian conditions, since this crop has gained popularity in this region.

The present investigation was carried out at Horticultural Experiment Station, CISH, Lucknow during spring season. The climate of the area is sub-tropical. The experiment was laid out in factorial randomized block design. There were total 47 treatments comprising two environmental conditions (polyhouse and nethouse), three methods of grafting (cleft, side and veneer), three times of propagation (15th February, 29th February and 15th March) and their interactions. All treatments were replicated three times. One-year-old uniform seedlings were used as a rootstock for propagation through grafting. Seedlings were raised through planting of seeds in nursery bed in January and one-month-old seedlings were transferred in black colour polythene bags, having a suitable medium. Well established, genetically true-to-type and uniform, vigorous, healthy, disease and pest-free mother plant of local custard apple was selected for taking scion branch. The statistical analysis of data was done as per Panse and Sukhatme (9).

*Corresponding author's E-mail: dhaka1968@gmail.com

**Department of Horticulture, Institute of Agricultural Sciences, Bundelkhand University, Jhansi 284128, Uttar Pradesh.

Data presented in Table 1 show that among the different environments, *i.e.* poly house and net house conditions, minimum time (21.15 days) required for bud sprouting was under polyhouse condition, while the period for bud sprouting was enhanced to 23.75 days when grafts were kept in nethouse condition. As regards time of grafting, plants grafted on 15th March took minimum time (16.67 days) to bud sprouting followed by February 29 (24.41 days) and February 15 (26.28 days), respectively. Among different grafting methods, minimum period was taken by the cleft grafted plants (21.67 days) for bud sprouting, which increased to 22.79 and 22.86 days in case of side and veneer grafted plants, respectively. This might be due to most favorable conditions in polyhouse on 15th March. March is considered as most favorable time for plant growth and development. Jacob *et al.* (1) reported the climatic conditions have influence on the sprout initiation as it could accelerate the meristematic activity in apical portions. Less time required for sprouting of plants grafted on 15th March might be due to gradual increase in temperature and sap flow during March. Good sap flow is responsible for grafting success (Pathak, 8).

It is evident from Table 1 that environment significantly influenced the success of grafts. The success of graft was higher (83.32%) in polyhouse condition after 30 days of grafting in comparison to nethouse condition (72.76%), which slowly decreased with time. The high success percent of grafts in polyhouse conditions might be due to more congenial micro-climate in polyhouse. Higher success percent of grafts is directly related with humidity and in experiment humidity level was higher in polyhouse condition. Madalageri *et al.* (5) also reported higher success percent of graft in custard apple under

Table 1. Effect of environment, time and method of grafting on bud sprouting and success of grafts.

Treatment	Days taken to bud sprouting	Success (%)		
		30 DAG	60 DAG	DAG
Environment (E)				
E_1-Polyhouse	21.15	83.32	73.32	68.87
E_2-Nethouse	23.73	72.76	67.76	58.89
CD at 5%	0.52	1.65	1.59	1.44
Time of grafting (M)				
M_1-February 15	26.28	88.32	79.98	75.00
M_2-February 29	24.41	81.65	71.66	61.65
M_3-March 15	16.67	71.65	59.99	54.99
CD at 5%	0.64	2.02	1.95	1.77
Method of grafting (G)				
G_1-Cleft grafting	21.67	81.65	73.34	65.55
G_2-Side grafting	22.79	78.32	64.99	60.55
G_3-Veneer grafting	22.86	81.66	73.33	65.57
CD at 5%	0.64	2.02	1.95	1.77

DAG = Days after grafting.

polyhouse conditions. Time of grafting also influenced the success of grafts (Table 1). The highest success of grafts was recorded with grafting on 15th February (88.32%) followed by the grafting on 29th February (81.65%) and 15th March (71.65%) 30 days after grafting. Similar trend was exhibited after 60 and 90 days after grafting. Higher success percent of grafts during 15th February as compared to 29th February and 15th March might be due to relative lower temperature and other favorable micro-climatic conditions conducive for success of grafts. The findings are in conformity with Swamy *et al.* (9) and Kesker *et al.* (4), who were of the opinion that weather played important role in success of grafts. As regards the effect of method of grafting on success percent of grafts was concerned, the highest success of grafts was recorded with veneer grafting (81.66%) followed by cleft grafting (81.65%) and side grafting (78.32%) 30 days after grafting. Similar pattern was observed 60 and 90 days after grafting. More contact area results in early healing and higher success. Nayak and Sen (4) also reported higher graft success in veneer and cleft grafting.

Data presented in Table 2 showed that grafting done on 15th March under polyhouse conditions (E_1M_3) recorded 14.54 days for bud sprouting, which was significantly lower as compared to other dates of grafting. As regards interaction between environment and methods of grafting, cleft method of grafting in polyhouse conditions (E_1G_1) required significantly less time (20.86 days) for bud sprouting as compared to nethouse conditions (22.47 days). Perusal of data on interaction between time of grafting and method of grafting shows that less time required for bud sprouting (16.48 days under M_3G_2, 16.60 days under M_3G_3 and 16.82 days under M_3G_1), when grafting done on 15th March as compared to other dates. This difference might be due to combined effect of environmental conditions and time of grafting. Favorable temperature and humidity in polyhouse supported metabolic activities for sprouting, while under nethouse only light intensity was regulated on 15th March temperature; which was higher in comparison to other dates of grafting. Enhancement in temperature might have helped in early sprouting. Similar findings were earlier reported by Jacob *et al.* (1) and Pathak (8).

Data in Table 2 clearly indicated that success percent of grafts was significantly influenced by the interaction of environment and time of grafting. The success of grafts was higher (89.98%) when grafted 15 February in nethouse condition after 30 days of grafting, while after 60 and 90 days of grafting higher success percent of grafts 83.32 and 80.00, respectively were recorded in grafting on 15th February under polyhouse conditions. It may be combined effect of weather conditions and more congenical micro-climate in polyhouse. As regards interaction effect of environment and method of grafting on success percent of grafts, the higher success (71.08%) was recorded with cleft grafting under polyhouse conditions (E_1G_1) after 90 days of grafting. Similar trends were also recorded after 30 and 60 days of grafting. Data presented in Table 2 on interaction between time and method of grafting showed that in early stage, *i.e.* after

Table 2. Interaction effect of environment (E) and time of grafting (M), environment (E) and method of grafting (G), Time of grafting (M) and method of grafting (G) on bud sprouting and success percent of grafts.

Treatment	Days taken to bud sprouting	Success percent of grafts		
		30 DAG	60 DAG	90 DAG
Environment (E) × Time of grafting (M)				
E_1M_1	24.33	86.66	83.32	80.00
E_1M_2	24.58	86.66	73.33	66.66
E_1M_3	14.54	76.66	63.33	59.98
E_2M_1	28.23	89.98	76.65	70.01
E_2M_2	24.24	76.66	70.00	56.66
E_2M_3	19.73	66.66	56.65	50.00
CD at 5%	0.90	2.86	2.76	2.51
Environment (E) × Method of grafting (G)				
E_1G_1	20.86	86.66	76.65	71.08
E_1G_2	20.93	80.00	70.00	67.77
E_1G_3	21.59	83.32	73.33	67.77
E_2G_1	22.47	76.66	69.98	60.00
E_2G_2	24.60	76.66	59.98	53.33
E_2G_3	24.13	79.98	73.33	63.34
CD at 5%	0.90	2.86	2.76	2.51
Time of grafting (M) × Method of grafting (G)				
M_1G_1	25.43	91.66	79.98	75.00
M_1G_2	26.76	86.65	74.98	71.66
M_1G_3	26.65	86.86	85.00	78.35
M_2G_1	22.75	76.66	75.00	61.65
M_2G_2	25.15	81.66	65.00	58.33
M_2G_3	25.33	86.65	75.00	65.00
M_3G_1	16.82	76.66	64.98	59.98
M_3G_2	16.48	66.66	55.00	51.66
M_3G_3	16.60	71.65	60.00	53.33
CD at 5%	1.10	3.49	3.37	3.07

DAG = Days after grafting.

30 days of grafting higher success percent of grafts (91.66) was recorded when cleft grafting was done on 15th February, while in later stage, *i.e.* after 60 and 90 days of grafting, higher success percent of grafts (85 and 78%, respectively) were recorded in veneer grafting done on 15th February. Higher success percent of grafts in veneer grafting on 15th February might be due to more favorable time and more contact area in this method, resulted early healing and higher success. Similar results were also obtained by Joshi *et al*. (3).

The interaction effect of environment, time and method of grafting on bud sprouting (Table 3) showed lowest time required (12.66 days) for bud sprouting when side grafted in polyhouse on 15th March in comparison to other treatments (Tables 1, 2 & 3). Early sprouting might be due to combined effect of environment, method and time of grafting. In polyhouse, favorable temperature and humidity might have supported metabolic activity leading to early bud sprouting. Similar findings were also reported by Joolka *et al.* (2).

Data on the interaction effect of all three factors, namely environment, time and method of grafting (Table 3) showed the significant effect in respect to success of custard apple grafts. The graft success after 30 days was significantly higher (93.33%) when cleft grafted on 15th February in polyhouse conditions ($E_1M_1G_1$), while after 60 and 90 days, grafting higher success of grafts, *i.e*. 86.00 and 82.00%, respectively were recorded in veneer grafting done on 15th February

Table 3. Interaction effect of environment (E), time of grafting (M) and method of grafting (G) on bud sprouting and success of grafts.

Treatment	Days taken to bud sprouting	Success (%)		
		30 DAG	60 DAG	90 DAG
$E_1M_1G_1$	23.87	93.33	83.30	78.66
$E_1M_1G_2$	25.62	83.33	80.00	76.66
$E_1M_1G_3$	23.50	90.00	86.00	82.00
$E_1M_2G_1$	21.88	80.00	80.00	73.00
$E_1M_2G_2$	24.70	86.66	73.33	60.00
$E_1M_2G_3$	27.16	93.30	66.66	66.66
$E_1M_3G_1$	16.85	86.66	66.66	63.30
$E_1M_3G_2$	12.66	73.33	60.00	60.00
$E_1M_3G_3$	14.11	76.00	63.33	56.66
$E_2M_1G_1$	27.00	90.00	76.66	73.33
$E_2M_1G_2$	27.90	93.30	73.30	60.00
$E_2M_1G_3$	29.80	86.66	80.00	76.70
$E_2M_2G_1$	23.62	73.33	70.00	50.00
$E_2M_2G_2$	25.60	76.66	56.66	56.66
$E_2M_2G_3$	23.50	83.33	80.00	63.00
$E_2M_3G_1$	16.80	66.66	63.30	56.66
$E_2M_3G_2$	20.30	60.00	50.00	43.33
$E_2M_3G_3$	19.10	73.30	56.66	50.00
CD at 5%	1.57	4.96	4.76	4.35

DAG = Days after grafting.

in polyhouse ($E_1M_1G_3$). Similar findings were also reported by Joolka *et al.* (2).

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