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Effect of different age groups of scion on success rate of softwood grafting in sapota

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Abstract

An experiment was carried out at College of Horticulture, Mudigere, Chikmagalur district, Karnataka state to know the effect of age of scion on success of soft wood grafting in Sapota. The different age groups viz 3 months, 6 months, 9 months and 12 months scions of sapota were used for grafting with 4 treatments and 5 replications. It is very evident from the study that out of four different age groups the relatively younger scions of 3 months old have taken minimum number of days for sprout initiation (9.80 days), 50% sprouting (16.20 days) and 100% sprouting (24.80 days). Three months aged scions also recorded maximum number of sprouts at 30 (1.17), 60 (1.20) and 90 (2.10) days after grafting (DAG), maximum number of leaves and leaf area index on 60 (6.16 and 2.07) and 90 (7.10 and 2.47) days after grafting, maximum length and breadth of leaves at 60 (6.70 cm and 3.57cm) and 90 (7.20cm and 4.10cm) days after grafting, maximum height of the graft at 30 (35.66cm), 60 (36.30 cm) and 90 (37.60 cm) days after grafting, scion girth at 60 (4.70mm) days after grafting, graft index at 30 (2423.50), 60 (2373.25) and 90 (2029.25) days after grafting, per cent graft success at 30 (50%), 60 (42.50%) and 90 (37.50%) days after grafting and maximum survival percentage (87.00%). Among different aged scions, 3 months age old scion resulted in maximum net income (₹ 18, 500 per 1000 grafts) and maximum cost: benefit ratio (1.76). Compared to the older scions (9.0 to 12.0 months) grafted on khirni root stocks.

Keywords: Sapota, Age of scion, Softwood grafting, Survival, Success rate

Introduction

Sapota (*Achras zapota* L.) is one of the important tropical fruits belongs to family Sapotaceae. It is called by the many other names viz chiku, sapodilla plum, zapota, noseberry etc. Many fruit growers were attracted towards cultivation of sapota on account of its better adoption to diverse soil and climatic conditions. Hence, there is ample scope for further increasing area under this crop. In the recent past, sapota has shown a phenomenal growth and attained the status of a major fruit crop after mango, banana and citrus. India is considered to be the largest producer of sapota in the world and it is being cultivated in an area of about 1.63 lakh hectare with a production of 14.95 lakh metric tonnes (Anonymous 2013) [1]. Among the several varieties cultivated in the state, the commercially important one is Kalipatti. Though the fruit crop is having vast scope, the expansion of area under cultivation is limited due to the non availability of sufficient genuine planting material. The major problem in sapota is difficulties in rapid clonal multiplication, since it is a difficult to root plants, comparatively takes longer time for rooting, less success and high percentage of post separation mortality of layers which necessitates resorting to grafting. The most commercial method of propagation in sapota at present is approach grafting. Success, survivability and growth of grafts depend upon many other factors including variety, grafting method, time of grafting, age of scion and rootstock and environmental conditions (Hartmann *et al.* 1997) [7]. Apart from season, pre-curing of the scion and age of the scion shoots plays an important role in the success of grafting. Successful grafting cannot be possible until the scion sticks of proper age are selected for the grafting. The age of scion plays a key role in success of grafting. Hence, there is a need for standardizing the age of the scion for high success rate in softwood grafting of sapota. Keeping this in view, the present investigation was carried out to know the effect of scion age on the success of sapota soft wood grafts.

Materials and methods

The present investigation consisted of 4 treatments i.e T₁ (Grafting with 3 months old sapota scion), T₂ (Grafting with 6 months old scion), T₃ (Grafting with 9 months old scion) and T₄ (Grafting with 12 months old scion) with 5 replications.. These different aged scions were grafted on one year old khirni root stocks. The observations recorded on number of days for bud initiation, days taken for 50% sprouting and 100% sprouting, number of bud sprouts per

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graft, sprout length, sprout girth, number of leaves per graft, length of the leaves, breadth of the leaves, leaf area index, height of the graft, girth of the scion, graft index, per cent graft success and survivability percentage.

Results and Discussion

In general, the analysis of variances in respect of all parameters studied in the present investigation showed significant differences among the treatments. The minimum time required for bud sprouting (9.80 days), 50 per cent (16.20 days) and 100 per cent (24.80 days) sprouting were found when 3 months aged scions were used. While, the

maximum time (14.60 days) required for bud initiation, 50 per cent (21.00 days) and 100 per cent (30.80 days) sprouting were found when 12 months aged scions were used. The maximum sprout length (3.63 cm) and sprout girth (4.02 cm) was found when 3 months aged scions were used. Whereas the minimum sprout length (2.33 cm) and sprout girth (3.25cm) was found when 12 months aged scions were used (Table 1). This may be probably due to more food materials reserved in young scions and actively growing stage that enhanced early bud breaking and increase in sprout length and girth.

Table 1: Effect of age of scion on number of days taken for bud sprouting, number of sprouts, sprout length and girth at different intervals in softwood grafting of sapota.

Treatment	Age of scion	Days taken for bud sprouting			Number of sprouts			Sprout length (cm)		Sprout girth (cm)	
		Initiation	50%	100%	30 DAG	60 DAG	90 DAG	45 DAG	45 DAG		
T ₁	3 months	9.80	16.20	24.80	1.17	1.20	2.10	3.63	4.02		
T ₂	6 months	11.40	17.40	26.40	1.10	1.14	1.52	3.11	3.99		
T ₃	9 months	13.00	19.40	27.88	1.11	1.13	1.26	2.86	3.38		
T ₄	12 months	14.60	21.00	30.80	1.05	1.06	1.12	2.33	3.25		
	S.Em±	0.18	0.42	0.63	0.03	0.03	0.08	0.19	0.23		
	C.D at 5%	0.56	1.30	1.95	0.09	0.09	0.25	0.56	0.68		

The results indicated clearly that, younger the age of the scion, better the sprouting percentage as the age of the scion has a relationship with regenerating ability of a plant which is found to be higher in younger scions and this could be due to the higher activity of meristematic cells in younger scions resulting in faster formation of callus and quick healing of bud union. It is also evident in this study that, as the age of the scion increased there was reduction in the sprouting percentage which could be due to the lack of intimate contact of cambial region of both stock and the scion bud. These results are in conformity with Aralikatti *et al.* (2011)^[2], Reddy and Melanta (1989)^[11]. They opined that the younger scions are better amenable than older ones. Keleskar (1988)^[18] also found similar results in jackfruit.

At 30, 60 and 90 days after grafting, it was observed that the number of sprouts per grafted plants were significantly maximum (Table 1) with 3 months old scion (1.17, 1.20 and 2.10 respectively), which was statistically at par with 6 months old scion (1.10, 1.14 and 1.52 respectively). The minimum number of sprouts per grafted plants was recorded with 12 months old scion (1.05, 1.06 and 1.12 respectively). The number of sprouts per grafted plants gradually decreased as the age of the scion increased. These results could be because of optimum temperature and humidity congenial for sprouting (Aralikatti *et al.* 2011)^[2]; it could also be attributed to initiation of cambial activity which might have resulted from the defoliation (Hartmann *et al.* 1997)^[7].

Significantly maximum number of leaves were noticed on three month aged scions at 60 (6.16) and 90 (7.10) days after grafting, while the minimum number of leaves (Table 2) was observed with 12 months old scion at 60 (4.38) and 90 (4.86) days after grafting. Significantly maximum length of leaves (6.70 cm and 7.20 cm) and breadth of the leaves (3.57 cm and 4.10 cm) per grafted plants was noticed on three month old scion at 60 and 90 days after grafting, while the minimum length of leaves (4.94 cm and 4.98 cm) and breadth of the leaves (3.26 cm and 3.46 cm) per grafted plants observed on 12 months old scion at 60 and 90 days after grafting respectively. Age of scion wood also significantly influence the length and breadth of leaves of the grafts. The lowest leaf length and breadth in case of aged scions may be due to late bud breaking and lack of active growing stage. The results are in the same line as reported by Singh *et al.* (2003)^[12]. The maximum leaf area index was noticed on three months age old scion at 60 (2.07) and 90 (2.47) days after grafting, while the minimum leaf area index was observed with 12 months old scion with 1.54 leaf area index at 60 days and 1.72 leaf area index at 90 days after grafting. The quick and strong union formation, better nutrient uptake and ample growing period might have caused better plant growth and more number of leaves per plant with more leaf area index. The results are in line with Chovatia and Singh (2000)^[4], Singh *et al.* (2003)^[12].

Table 2: Effect of age of scion on number of leaves, length and breadth of leaves, leaf area index at different intervals in softwood grafting of sapota.

Treatment	Age of scion	Number of leaves		Length of leaves (cm)		Breadth of leaves (cm)		Leaf area index	
		60 DAG	90 DAG	60 DAG	90 DAG	60 DAG	90 DAG	60 DAG	90 DAG
T ₁	3 months	6.16	7.10	6.70	7.20	3.57	4.10	2.07	2.47
T ₂	6 months	5.50	6.70	5.72	6.40	3.44	3.80	1.88	2.00
T ₃	9 months	5.10	5.50	5.03	5.63	3.42	3.68	1.77	1.82
T ₄	12 months	4.38	4.86	4.94	4.98	3.26	3.46	1.54	1.72
	S.Em±	0.20	0.26	0.13	0.21	0.06	0.14	0.09	0.11
	C.D at 5%	0.60	0.79	0.39	0.66	0.19	0.44	0.26	0.35

The height of graft at 30, 60 and 90 days after grafting was significantly maximum (35.66 cm, 36.30cm and 37.60 cm respectively) when 3 months old scion was used for grafting

which was statistically at par with 6 months old scion (35.16 cm, 35.60 cm and 36.10 cm respectively). The minimum height of the graft was recorded on 12 months old scion at 30,

60 and 90 days after grafting (33.80 cm, 34.20 cm and 35.20 cm) respectively. The maximum graft height was found (Table 3) with three months old scion which could be due to vigorous nature of the younger scions, resulting from the faster multiplication of meristematic cells in the juvenile scions. Similar results were obtained in guava by Patel *et al.* (2007)^[10]. These results are in conformity with Ghosh (2009)^[6] in case of ber, where the maximum height of the graft noticed on younger scions due to good compatibility between stock and scion which resulted in good vascular connection for movement of water and nutrients from stock to scion.

At 30 and 90 days after grafting, it was observed that the girth of the graft was found (Table 3) to be non significant. Maximum graft girth (4.70mm) was noticed when 3 months old scion was used at 60 days after grafting. The minimum girth of the graft (4.42mm) was recorded with 12 months old scion at 60 days after grafting. This may be due to early sprouting and synthesis of more photosynthates and the physiological maturity of scions which played an important role in the growth and success of grafts. The maximum girth of younger rootstocks could also be due to its vigorous nature as reported by Patel *et al.* (2007)^[10] in guava.

Table 3: Effect of age of scion on height of the graft and girth of graft at different intervals in softwood grafting of sapota.

Treatment	Age of scion	Height of the graft (cm)			Girth of graft (mm)		
		30 DAG	60 DAG	90 DAG	30 DAG	60 DAG	90 DAG
T ₁	3 months	35.66	36.30	37.60	4.68	4.70	4.82
T ₂	6 months	35.16	35.60	36.10	4.54	4.56	4.58
T ₃	9 months	34.59	34.93	35.73	4.48	4.50	4.52
T ₄	12 months	33.80	34.20	35.20	4.38	4.42	4.44
S.Em±		0.24	0.17	0.25	0.06	0.05	0.02
C.D at 5%		0.73	0.53	0.78	NS	0.16	NS

The percentage of graft success was significantly influenced by the different scion wood maturities of sapota. Among the three scions wood maturities, the 3 months age old one used as scion gave the highest success (64.60%, 62.00% and 58.00%) at 30, 60, and 90 days after grafting respectively (Table 4). This is probably due to more available form of food materials reserved in young terminal portion of scion. Three months age old scion was most vigorous and in juvenile condition, which helped on the highest graft success. The percentage of graft survivability was found maximum (87.00%) when graft operation was done with the 3 months aged shoots used as a scion. This may be due to the optimum

nutrient and hormonal status of the scion wood. The result of present experiment follows Parvin and Nasrin (2013) experiment. She found the highest percentages of success (88.59%) and survivability (84.71%) in Burmese grape, when terminal portion was used as scion. Biswas (2007)^[3], found the highest percentages of success (93.33%) and survivability (86.67%) in Indian olive when terminal portion was used as scion. Debanath (2007)^[5] also found the highest graft success (86%) and survivability (86%) when terminal portion of accession no. 68 of jackfruit was grafted as scion on the rootstock retaining leaves

Table 4: Effect of age of scion on graft index, per cent graft success and survival percentage of grafts at different intervals in softwood grafting of sapota.

Treatment	Age of scion	Per cent graft success			Survival percentage
		30 DAG	60 DAG	90 DAG	
T ₁	3 months	64.60	62.00	58.00	87.00
T ₂	6 months	59.60	57.60	54.60	84.00
T ₃	9 months	55.00	53.00	50.40	76.80
T ₄	12 months	51.00	50.00	49.40	68.00
S.Em±		1.33	1.36	1.17	4.24
C.D at 5%		4.09	4.19	3.59	13.05

Conclusion

From the above study, it is concluded that, the maximum success in case of softwood grafting in sapota can be achieved by the selection of younger scions of three to four months age are more beneficial with better overall graft growth. In future, more treatments in age of the scion with two or more different popular varieties may be studied for more robust and accurate results of sapota softwood grafting.

References

1. Anonymous. Indian Horticultural Base. National Horticultural Board, Gurgaon, India, 2013, 136.
2. Aralikatti G, Mokashi AN, Hegde RV, Patil RV, Angadi SG. Softwood grafting in Jackfruit. *Acta Horticulturae*, 2011; 842(1):567-572.
3. Biswas SR. Effect of scion maturity and stock leaf retention on the graft success and survivability of epicotyl grafting in Indian olive. M. Sc. Thesis submitted to the Department of Horticulture, Bangladesh Agricultural University, Mymensingh, Bangladesh, 2007.
4. Chovatia RS, Singh SP. Effect of time on budding and grafting success in Jamun *Syzygium cumini* Skeel. *Indian Journal of Horticulture*, 2000; 57:255-258.
5. Debanath S. Effect of scion maturity and stock leaf retention on the graft success and survivability of epicotyls grafting in two types of jackfruit, *M. Sc. Thesis* submitted to the Department of Horticulture, Bangladesh Agricultural University, Mymensingh, Bangladesh, 2007, 64.
6. Ghosh SN. Propagation studies in ber for commercial multiplication in nursery an *in situ*. *Acta Horticulturae*, 2009; 840:321-326.
7. Hartmann HT, Kester DE, Davies FT, Geneve RL. Plant propagation principles and practices. Prentice Hall of India Private Limited, New Delhi, 1997, 393-480.
8. Keleskar AJ, Desai AG, Salvi MJ. Studies on some factors affecting the success and growth of forked bud grafts of Jackfruit, *Maharashtra Agriculture University Journal*,

- 1988; 17(1):157-158.
9. Parvin, Nasrin. Effect of scion maturity and time of cleft grafting on the success survivability and growth in Burmese grape *Baccaurea ramiflora* Lour. Digital Repository, 2013; 101:151-153.
 10. Patel RK, Yadav DS, Singh A, Yadav RM. Performance of patch budding on different cultivars/hybrids of guava under mid hills of Meghalaya. *Acta Horticulturae*, 2007; 735:189-192.
 11. Reddy CV, Melanta KR. Effect of age of rootstock on the success of softwood grafting of mango in containers and in situ. *South Indian Horticulture*, 1989; 36(3):143-145.
 12. Singh DB, Saroj PL, Vashishtha BB. Effect of time of budding in propagation of lasoda *Cordia myxa*. *Progressive Horticulture*, 2003; 35:230-232.