

Interaction Effect of Age and Curing of Scion on Cost: Benefit Ratio of Softwood Grafting in Sapota (*Achras zapota* L.)

Tanuja P.* and Thippesha D.

Department of Fruit Science, College of Horticulture, University of Agricultural and Horticultural Sciences, Shivamogga, Karnataka State

*Corresponding Author E-mail: tanu.horti@gmail.com

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ABSTRACT

An experiment was conducted to know the effect age and curing of scion on cost:benefit ratio in softwood grafting of sapota from 2014 to 2015 at the College Research Farm, Department of Fruit Science, College of Horticulture, Mudigere. The sapota grafted on 3 months age old scion resulted in maximum net income (₹ 18,500 per 1000 grafts) and cost: benefit ratio (1.76), which were followed by 6 months age old scion (₹ 16,500 per 1000 grafts) and (1.57), whereas they are minimum (₹ 13,500 per 1000 grafts) and (1.28) in 12 months age old scion. The sapota grafted with 10 days cured scion resulted in maximum net income (₹ 20,750 per 1000 grafts) and cost: benefit ratio (1.93), which were followed by 8 days cured scion (₹ 16,750 per 1000 grafts) and (1.55), whereas they are minimum (₹ 7,750 per 1000 grafts) and (0.75) in 0 days cured scion. The 3 months age old with 10 days cured scion resulted in maximum net income (₹ 22,250 per 1000 grafts) and cost: benefit ratio (2.06), which were followed by 6 months age old with 10 days cured scion (₹ 20,250 per 1000 grafts) and (1.88), whereas they are minimum (₹ 10,050 per 1000 grafts) and (1.01) in 9 months age old with 0 days cured scion. The high benefit ratio is mainly because of using the three months age old scion with ten days curing which helped in giving the higher success rate because of their actively growing.

Key words: Sapota, Curing, Days after grafting, Age of Scion, Success rate, Cost benefit ratio

INTRODUCTION

Sapota (*Achras zapota* L.) is one of the important tropical fruits belongs to family Sapotaceae. 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 tonnes¹.

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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. But, there are difficulties in approach grafting, which is being practiced at present. This method is cumbersome, labour intensive and the rate of multiplication is also very low because of limited availability of scion shoots near the ground level of mother trees. So, the branches are to be bent or pandal is to be erected near to the mother tree, which makes watering difficult to the pots and involve additional expenses and labour. To overcome this problem, softwood grafting which is followed in mango and cashew may be tried. Softwood grafting was reported to be very easy, convenient in handling, involve simple skills and can be done within short time. The most important is that, it is a detached scion method. Hence, in order to have more grafting success with low cost and less labour intensive softwood grafting is being mainly practiced. 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 conditions². Pre-curing of the scion and age of the scion shoots plays an important role in the success of grafting. Defoliation of the scion also plays an important role in high success rate of grafting. Successful grafting cannot be possible until the scion sticks of proper age are selected for the grafting. The age of the scion plays a key role in success of grafting.

MATERIAL AND METHODS

The investigation was conducted with 18 treatments with three replications adopting factorial Randomized Block Design in the low cost polyhouse, Department of Fruit Science,

College of Horticulture, Mudigere, Karnataka State during 2014 to 2015. Soft wood grafting method was followed using four to six months old rootstock. For this, the top growth of rootstock was decapitated with sharp knife and secature. Then longitudinal cut of 5 cm length was given from the terminally pruned rootstock. A scion shoot of about same thickness was selected. The length of scion was about 8-10 cm. The basal end of scion was given two gentle sloping cuts of about 5 cm on opposite sides by removing the bark and a little wood giving a wedge shape. Care was taken to retain some bark on remaining two sides. The wedge shaped scion thus prepared was inserted into the 'V' shaped slit of the stock and secured firmly with 150 gauge thickness transparent polythene strip of 1.5 cm width and 30 to 45 cm length, to keep the stock and scion in firm contact. The scions were covered with small transparent tubular bag to prevent entry of water into the grafted portion and also to avoid desiccation of the scion by creating humidity and microclimate near and above the graft union region. The cost of production of grafts varied for the different experiments as follows.

RESULTS AND DISCUSSION

Effect of age of scion on cost: benefit ratio

Grafts with 3 months age old scion (T1) resulted in maximum net income (18,500 per 1000grafts) followed by T2 (6 months age old scion) (16,500 per 1000grafts), whereas it was minimum (13,500 per 1000 grafts) in T4 (control-12 months age old scion). The maximum cost: benefit ratio (1.76) was observed from the treatment T1 (3 months age old scion) followed by treatment T2 (6 months age old scion) (1.57), While, the minimum cost: benefit ratio (1.28) was recorded in T4 (control) (Table.19). This might be due to the more success percentage and quality grafts obtained by the use of three months age old scions. Three months age old scion was most vigorous and in juvenile condition, which helped on the highest graft success Mehne³ observed that grafting success decreased

significantly with increasing age of the scion.(table-1,2)

Effect of curing of scion on cost: benefit ratio

The 10 days cured scion (T6) resulted in maximum net income (20,750 per 1000grafts), followed by T5 (₹ 16,750 per 1000 grafts), whereas it was minimum (₹ 7750 per1000 grafts) in T1 (control - 0 days cured scion). The maximum cost: benefit ratio (1.93)was observed from the treatment T6 (10 days cured scion) followed by treatment T5 (8days cured scion) (1.55), While, the minimum cost: benefit ratio (0.75) was recorded inT1 (control) (Table 21). this might be due to early breaking and higher success percentage of the grafts by the use of pre- cured scions *i.e.*, ten days pre-cured scions. The success due to procuring may be due to swelling of buds resulting in better sprouting in precured scions as explained by Maiti and Biswas⁴.(table-3,4)

Interaction effect of age and curing of scion on cost: benefit ratio

The 3 months age old scion with 10 days cured scion (A1C6) resulted in maximum net income (₹ 22,250 per 1000 grafts), which was followed

by 6 months age old scion with 10 days cured scion (A2C6) (₹ 20,250 per 1000 grafts), whereas it was minimum (₹ 10,050 per 1000 grafts) in 9 months age old scion with 0 days cured scion (A3C1) The maximum cost: benefit ratio (2.06) was observed from the treatment 3 months age old scion with 10 days cured scion (A1C6) which was followed by the treatment with 6months age old scion with 10 days cured scion (A2C6) (1.88), While, the minimum cost: benefit ratio (1.01) was recorded in 9 months age old scion with 0 days cured scion(A3C1). The high benefit ratio is mainly because of interaction effect *i.e.*, by using the three months age old scion with curing which helped in giving the higher success rate because of their actively growing. The higher percentage of survival after grafting can be attributed to the possession of better activity of the cells by the juvenile condition of the scion and higher accumulation and the translocation of the food materials by the use of cured scion.The similar observations were reported in mango by Mukherjee and Majumdar⁵ and Singh and Srivastava⁶. (Table-5)

Table 1: Effect of age of scion on cost of production per thousand grafts in soft wood grafting of sapota

Treatments	Cost of production per 1000 grafts				Total cost of cultivation
	Rootstocks	Scions	Grafting	Maintenance charges	
T ₁ - 3 months age old scion	7000	500	1000	2000	10,500
T ₂ - 6 months age old scion	7000	500	1000	2000	10,500
T ₃ - 9 months age old scion	7000	500	1000	2000	10,500
T ₄ - 12 months age old scion	7000	500	1000	2000	10,500

Table 2: Effect of age of scion on cost : Benefit ratio of softwood grafting in sapota per thousand grafts.

Treatments	Total cost of production (₹)	Percent graft success	Total number of successful grafts	Gross income (₹)	Net income (₹)	cost : Benefit ratio
T ₁ - 3 months age old scion	10,500	58.00	580	29,000	18,500	1:1.76
T ₂ - 6 months age old scion	10,500	54.60	540	27,000	16,500	1:1.57
T ₃ - 9 months age old scion	10,500	50.40	500	25,000	14,500	1:1.38
T ₄ - 12 months age old scion	10,500	49.40	480	24,000	13,500	1:1.28

Table 3: Effect of curing of scion on cost of production per thousand grafts in soft wood grafting of sapota

Treatments	Cost of production per 1000 grafts				Total cost of cultivation
	Rootstocks	Scions	Grafting	Maintenance charges	
T ₁ - 0 days cured scion (control)	7000	500	1000	2000	9950
T ₂ - 2 days cured scion	7000	500	1000	1750	10,250
T ₃ - 4 days cured scion	7000	500	1000	1750	10,250
T ₄ - 6 days cured scion	7000	500	1000	2000	10,500
T ₅ - 8 days cured scion	7000	500	1000	2250	10,750
T ₆ - 10 days cured scion	7000	500	1000	2250	10,750

Table 4: Effect of curing of scion on cost : Benefit ratio of softwood grafting in sapota per thousand grafts

Treatments	Total cost of production (₹)	Percent graft success	Total number of successful grafts	Gross income (₹)	Net income (₹)	cost : Benefit ratio
T ₁ - 0 days cured scion (control)	9950	37.50	350	17,500	7750	1:0.75
T ₂ - 2 days cured scion	10,250	40.00	400	20,000	9750	1:0.95
T ₃ - 4 days cured scion	10,250	46.38	450	22,500	12,250	1:1.19
T ₄ - 6 days cured scion	10,500	50.00	500	25,000	14,500	1:1.38
T ₅ - 8 days cured scion	10,750	55.00	550	27,500	16,750	1:1.55
T ₆ - 10 days cured scion	10,750	62.50	630	31,500	20,750	1:1.93

Table 5: Interaction effect of age and curing of scion on cost:benefit ratio of softwood grafting in sapota per thousand grafts

Age of the scion	Curing of the scion	Total cost of production (₹)	Percent Graft success	Successful grafts	Gross income (₹)	Net income (₹)	Cost:benefit ratio
A₁-3 Months age old scion	C ₁ - 0 days	9950	42.67	420	21,500	11,050	1:1.11
	C ₂ - 2 days	10,250	48.00	510	25,500	15,250	1:1.48
	C ₃ - 4 days	10,250	51.33	480	24,000	13,750	1:1.34
	C ₄ - 6 days	10,500	52.67	520	26,000	15,500	1:1.47
	C ₅ - 8 days	10,750	56.66	560	28,000	17,250	1:1.60
	C ₆ - 10 days	10,750	64.00	660	33,000	22,250	1:2.06
A₂- 6 Months age old scion	C ₁ - 0 days	9950	41.33	410	20,500	10,550	1:1.06
	C ₂ - 2 days	10,250	45.67	450	22,500	12,250	1:1.19
	C ₃ - 4 days	10,250	45.67	450	22,500	12,000	1:1.17
	C ₄ - 6 days	10,500	51.63	510	25,500	15,250	1:1.48
	C ₅ - 8 days	10,750	54.96	540	27,500	16,250	1:1.51
	C ₆ - 10 days	10,750	62.92	620	31,000	20,250	1:1.88
A₃-9 Months age old scion	C ₁ - 0 days	9950	40.67	400	20,000	10,050	1:1.01
	C ₂ - 2 days	10,250	44.67	440	22,000	11,750	1:1.14
	C ₃ - 4 days	10,250	43.59	470	23,500	13,250	1:1.29
	C ₄ - 6 days	10,500	49.67	480	24,000	13,500	1:1.30
	C ₅ - 8 days	10,750	54.00	540	27,000	16,250	1:1.51
	C ₆ - 10 days	10,750	57.00	570	28,500	17,750	1:1.65

CONCLUSION

From present study it can be concluded that Sapota being commercially cultivated fruit crop, for the softwood grafting it is advised to use younger scions with the ten days curing. Pre-curing of scion is more beneficial in terms of better success rate along with better overall graft growth. Further the curing and selection of correct age group of scions had still improved the efficacy of the growth parameters resulting in better graft growth and success and giving a possibility of maintaining the vigour of the scion. The high benefit ratio is mainly because of interaction effect i.e., by using the three months age old scion with curing which helped in giving the higher success rate because of their actively growing.

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