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Success Rate of Softwood Grafting in Sapota as Influenced by Scion Diameter

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 of scion diameter on success rate of softwood grafts in sapota with 4 treatments replicated five times adopting Randomized Block Design during 2014 at the Research Farm, Department of Fruit Science, College of Horticulture, Mudigere, Chikmagalur district, Karnataka state.. The scions of different diameters viz., thin to thick scions of Sapota were used for grafting .It is very evident from the study that out of four different scion diameters the relatively thick scions taken minimum number of days for sprout initiation (9.80 days), 50% sprouting (16.20 days) and 100% sprouting (24.80 days). Thick 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 maximum length and breadth of leaves at 60 (6.70 cm and 3.57cm) and 90 (7.20cm and 4.10cm) days after grafting respectively. The maximum height of the graft at 30 (35.66cm), 60 (36.30 cm) and 90 (37.60 cm) days after grafting, per cent graft success at 30 (64.6%), 60 (62.00%) and 90 (58.00%) days after grafting and maximum survival percentage (87.00%). Among different diameter of scions with more diameter showed the good results compared to the scions with less diameter.

Key words: *Sapota, scion diameter, 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[1]. Among the several varieties cultivated in the state, the commercially important one is Kalipatti.

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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 necessiates 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[4]. Apart from season, pre-curing and age of the scion, scion diameter plays an important role in the success of grafting. Successful grafting cannot be possible until the scion sticks of proper diameter are selected for the grafting. The diameter of scion plays a key role in success of grafting. Hence, there is a need for standardizing the diameter of the scion for high success rate in softwood grafting of sapota.

MATERIAL AND METHODS

The present investigation consisted of 4 treatments i.e. T_1 (Thick scions), T_2 (Medium thick scions), T_3 (Medium thin scions) and T_4 (Thin scions) with 5 replications. The research was conducted during 2014 -15 in the low cost polyhouse in department of Fruit Science, College of Horticulture, Mudigere, Chikmagalur district of Karnataka state. These different scions were grafted on one year old khirni root stocks.

Diameter of the scion was measured at 5 cm above the graft union. The diameter of the scion was measured by 'Slide callipers' and was calculated by the following formula:

Diameter of the scion = Reading from main scale+(reading from vernier scale x vernier constant -mechanical error(±).

The observations recorded on number of days for bud initiation, days taken for 50% sprouting and 100% sprouting, number of bud sprouts per graft, sprout length, sprout girth, number of leaves per graft, length of the leaves, breadth of the leaves, height of the graft, 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 scions with thick diameter 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 scions of thin diameter were used. The maximum sprout length (3.63 cm) and sprout girth (4.02 cm) was found when scions with thick diameter were used. Whereas the minimum sprout length (2.33 cm) and sprout girth (3.25cm) was found when scions of thin diameter were used (Table - 1). This may be probably due to good cambial activity resulting in absorption of more food materials and actively growing stage that enhanced early bud breaking and increase in sprout length and girth. The results indicated clearly that, thicker the scion, better the sprouting percentage as the diameter of the scion has a relationship with regenerating ability of a plant which is found to be higher in thicker scions and this could be due to the higher activity of meristematic cells in thicker scions resulting in faster formation of callus and quick healing of bud union..These results are in conformity with Aralikatti *et al*.[2]. Similar results were also obtained in Mango by Reddy and Melanta[5]. They opined that the thicker scions are better amenable than older ones.

At 30, 60 and 90 days after grafting, it was observed that the number of sprouts per

grafted plants were significantly maximum (Table -1) when scions of thick diameter were used (1.17, 1.20 and 2.10 respectively), which was statistically at par with scions of medium thick diameter (1.10, 1.14 and 1.52 respectively). The minimum number of sprouts per grafted plants was recorded when scions of thin diameter were used (1.05, 1.06 and 1.12 respectively). The number of sprouts per grafted plants gradually decreased as the diameter of the scion decreased. These results could be because of optimum temperature and humidity congenial for sprouting[2], it could also be attributed to initiation of cambial activity.

Significantly maximum number of leaves were noticed on plants grafted with thicker scions at 60 (6.16) and 90 (7.10) days after grafting, while the minimum number of leaves (Table - 2) was observed plants grafted with thinner scions 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 thicker scions 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 thinner scions at 60 and 90 days after grafting respectively. Diameter of scion wood also significantly influence the length and breadth of leaves of the grafts. The lowest leaf length and breadth in case of thinner 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.*[6]. 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 The results are in the same line as reported by Chovatia and Singh[3]. and Singh *et al.*[6].

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 scions of thick diameter were used for grafting which was statistically at par with medium thick scions (35.16 cm, 35.60 cm and 36.10 cm respectively). The minimum height of the graft was recorded when thinner scions were used at 30, 60 and 90 days after grafting (33.80 cm, 34.20cm and 35.20cm) respectively. The maximum graft height was found (Table - 3) with thick scions which could be due to vigorous nature of the thick scions, resulting from the faster multiplication of meristematic cells . These results are in conformity with Ghosh in case of ber, where the maximum height of the graft noticed on thicker 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.

The percentage of graft success was significantly influenced by the different scion diameters of sapota. Among the four scions wood diameters , the thicker scion gave the highest success (64.60%, 62.00% and 58.00%) at 30, 60, and 90 days after grafting respectively (Table - 4).The percentage of graft survivability was found maximum (87.00%) when graft operation was done with the thicker diameter shoots used as a scion. This may be due to the optimum nutrient and hormonal status of the scion wood and might be due to the capacity of graft union due to cambial activities.

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

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

Treatment No.	scion Diameter (mm)	Days taken for bud sprouting			Number of sprouts			Sprout length (cm)	Sprout girth (mm)
		Initiation	50 percent	100 percent	30 DAG	60 DAG	90 DAG	45 DAG	45 DAG
T_1	Thick scions (5.02mm)	9.80	16.20	24.80	1.17	1.20	2.10	3.63	4.02
T_2	Medium thick scions (4.63mm)	11.40	17.40	26.40	1.10	1.14	1.52	3.11	3.99
T_3	Medium thin scions (4.38mm)	13.00	19.40	27.88	1.11	1.13	1.26	2.86	3.38
T_4	Thin scions (4.02mm)	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**

DAG –Days After Grafting

Table 2. Effect of diameter of scion on number of leaves, length and breadth of leaves, at different intervals in softwood grafting of sapota

Treatment No.	scion Diameter (mm)	Number of leaves		Length of leaves (cm)		Breadth of leaves (cm)	
		60 DAG	90 DAG	60 DAG	90 DAG	60 DAG	90 DAG
T_1	Thick scions (5.02mm)	6.16	7.10	6.70	7.20	3.57	4.10
T_2	Medium thick scions (4.63mm)	5.50	6.70	5.72	6.40	3.44	3.80
T_3	Medium thin scions (4.38mm)	5.10	5.50	5.03	5.63	3.42	3.68
T_4	Thin scions (4.02mm)	4.38	4.86	4.94	4.98	3.26	3.46
S.Em±		**0.20**	**0.26**	**0.13**	**0.21**	**0.06**	**0.14**
C.D at 5%		**0.60**	**0.79**	**0.39**	**0.66**	**0.19**	**0.44**

DAG –Days After Grafting

Table 3. Effect of diameter of scion on height of the graft at different intervals in softwood grafting of sapota.

Treatment No.	scion Diameter (mm)	Height of the graft (cm)		
		30 DAG	60 DAG	90 DAG
T_1	Thick scions (5.02mm)	35.66	36.30	37.60
T_2	Medium thick scions (4.63mm)	35.16	35.60	36.10
T_3	Medium thin scions (4.38mm)	34.59	34.93	35.73
T_4	Thin scions (4.02mm)	33.80	34.20	35.20
S.Em±		**0.24**	**0.17**	**0.25**
C.D at 5%		**0.73**	**0.53**	**0.78**

DAG –Days After Grafting

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

Treatment No.	scion Diameter (mm)	Per cent graft success			Survival percentage
		30 DAG	60 DAG	90 DAG	
T_1	Thick scions (5.02mm)	64.60	62.00	58.00	87.00
T_2	Medium thick scions (4.63mm)	59.60	57.60	54.60	84.00
T_3	Medium thin scions (4.38mm)	55.00	53.00	50.40	76.80
T_4	Thin scions (4.02mm)	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**

DAG –Days After Grafting

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