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## Influence of scion curing 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 curing of scion on success of soft wood grafting in Sapota. The different curing days viz., 0, 2, 4, 6, 8 and 10 days cured scions of Sapota were used for grafting with 6 treatments and 4 replications. It is very evident from the study that out of different days cured scions ten days cured scions have taken minimum number of days for sprout initiation. The minimum number of days taken for initiation of sprouting (9.00), 50 percent (17.95) and 100 percent (26.75) was observed in case of 10 days cured scion. Ten days cured scions also recorded maximum number of sprouts at 30 (1.55), 60 (2.08) and 90 (2.45) days after grafting, maximum number of leaves and leaf area index at 60 (5.30) (2.13) and 90 (6.55) (2.78) days after grafting, the maximum length and breadth of leaves at 60 (2.78 cm) (3.59 cm), and 90 (6.73 cm) (3.79 cm) days after grafting. Maximum height of the graft at 30 (36.50 cm), 60 (36.85 cm) and 90 (38.47 cm) days after grafting maximum scion girth at 60 (4.74 mm) days after grafting, graft index at 30 (2623.50), 60 (2473.25) and 90 (2129.25) days after grafting maximum percent graft success at 30 (68.75%), 60 (65.00%) and 90 (62.50%) day after grafting maximum survival percentage (84.00%) were observed when grafting was done with 10 days cured scion. Whereas the results of percentage and survivability were decreased with decrease in curing days and minimum results were found in 0 days cured scions. Pre-curing of scion is more beneficial in terms of better success rate along with better overall graft growth. Further, the curing 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.

**Keywords:** Sapota, curing 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. 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) [3]. Apart from season, 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. Keeping the importance of pre curing in success of soft wood grafting, the present investigation was taken up.

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## Materials and Methods

The present investigation consisted of 6 treatments i.e. T<sub>1</sub>-Grafting with 0 days cured scion, T<sub>2</sub>-Grafting with 2 days cured scion, T<sub>3</sub>-Grafting with 4 days cured scion, T<sub>4</sub>-Grafting with 6 days cured scion, T<sub>5</sub>-Grafting with 8 days cured scion and T<sub>6</sub>-Grafting with 10 days cured scion. 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 cured 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 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, percent graft success and survivability percentage. The leaf area and graft index are calculated by following formulas.

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

| Treatment No.  | Curing of scion | Days taken for scion sprouting |            |             | Number of sprouts |        |        | Sprout length (cm) | Sprout girth |
|----------------|-----------------|--------------------------------|------------|-------------|-------------------|--------|--------|--------------------|--------------|
|                |                 | Initiation                     | 50 percent | 100 percent | 30 DAG            | 60 DAG | 90 DAG | 45 DAG             | 45 DAG       |
| T <sub>1</sub> | 0 Days          | 17.08                          | 27.13      | 36.98       | 1.02              | 1.13   | 1.25   | 2.33               | 3.25         |
| T <sub>2</sub> | 2 Days          | 15.08                          | 24.65      | 35.80       | 1.03              | 1.19   | 1.27   | 2.86               | 3.38         |
| T <sub>3</sub> | 4 Days          | 13.18                          | 23.48      | 34.98       | 1.14              | 1.23   | 1.28   | 3.11               | 3.99         |
| T <sub>4</sub> | 6 Days          | 12.60                          | 22.35      | 33.70       | 1.22              | 1.28   | 1.35   | 3.63               | 4.02         |
| T <sub>5</sub> | 8 Days          | 10.90                          | 21.10      | 31.40       | 1.25              | 1.34   | 1.66   | 3.94               | 4.26         |
| T <sub>6</sub> | 10 Days         | 9.00                           | 17.95      | 26.75       | 1.55              | 2.08   | 2.45   | 4.18               | 4.83         |
| S.Em ±         | —               | 0.27                           | 0.28       | 0.77        | 0.06              | 0.03   | 0.03   | 0.19               | 0.23         |
| C.D. at 5%     | —               | 0.81                           | 0.83       | 2.31        | 0.18              | 0.10   | 0.09   | 0.56               | 0.68         |

DAG-Days after grafting

$$\text{Leaf area index} = \frac{\text{Leaf area (cm}^2\text{)}}{\text{Total area occupied by grafts (cm}^2\text{)}}$$

$$\text{Graft index} = \text{Mean graft height} \times \text{graft percentage}$$

## Results and Discussion

The minimum number of days taken for initiation of sprouting (9.00), 50 percent (17.95) and 100 percent (26.75) sprouting was observed in case of 10 days cured scion and the maximum number of days taken for initiation of sprouting (17.08), 50 percent (27.13) and 100 percent sprouting (36.78) was observed in case of 0 days cured scion. The highest sprout length (4.18 cm) and sprout girth (4.83 cm) were observed in 10 days cured scion. The better efficacy of defoliated scion shoots over undefoliated scion shoots maybe due to the fact that defoliation causes an immediate rise in sucrose content of phloem sap of the shoot which in turn increases the osmotic value thereby causing movements of solutes towards the apex of the shoot and initiate high meristematic activity at the bud level which

helps in better sap flow and good callus formation due to stimulation of cambium division, favouring better graft union (Maiti and Biswas, 1986) [5].

The number of bud sprouts as influenced by the scion curing period indicated that there was significant difference in scion curing period. The maximum number of bud sprouts (1.55, 2.08 and 2.45) were recorded in 10 days cured scion at 30, 60 and 90 days interval which was at par with (1.25, 1.34 and 1.66) 8 days cured scion. While, the minimum number (1.02, 1.13 and 1.25,) of bud sprouts per graft were noticed with 0 days cured scion at 30, 60 and 90 days interval. The influence of scion curing was significant on the number of bud sprouts. The maximum quantum of buds per graft was observed in the scions cured for 10 days. The influence of curing on the parameter could be attributed to initiation of cambium activity which might have resulted from the defoliation (Hartman *et al.*, 1997) [3]. The importance and beneficial effects of scion treatment through defoliation on sprouting, success and growth of mango grafts have also been emphasized by Mukharjee and Majumdar, 1964 [6], Reddy and Melanta, 1989 [8].

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

| Treatment No.  | Curing 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 <sub>1</sub> | 0 Days          | 3.53             | 4.05   | 1.55                  | 3.97   | 2.01                   | 2.77   | 1.13            | 1.55   |
| T <sub>2</sub> | 2 Days          | 3.75             | 4.63   | 1.70                  | 4.15   | 2.65                   | 3.17   | 1.34            | 1.70   |
| T <sub>3</sub> | 4 Days          | 4.14             | 4.87   | 1.95                  | 4.46   | 3.26                   | 3.56   | 1.60            | 1.95   |
| T <sub>4</sub> | 6 Days          | 4.23             | 5.00   | 2.09                  | 5.00   | 3.31                   | 3.57   | 1.74            | 2.09   |
| T <sub>5</sub> | 8 Days          | 5.03             | 5.28   | 2.28                  | 5.88   | 3.41                   | 3.66   | 1.91            | 2.28   |
| T <sub>6</sub> | 10 Days         | 5.30             | 6.55   | 2.78                  | 6.73   | 3.59                   | 3.79   | 2.13            | 2.78   |
| S.Em ±         | —               | 0.12             | 0.06   | 0.09                  | 0.13   | 0.08                   | 0.10   | 0.05            | 0.09   |
| C.D. at 5%     | —               | 0.37             | 0.17   | 0.28                  | 0.39   | 0.25                   | 0.31   | 0.15            | 0.28   |

DAG-Days after grafting

Significantly maximum number of leaves, were noticed on 10 days cured scion at 60 (5.30) and 90 (6.55) days after grafting, while the minimum number of leaves, were observed on 0 days cured scion were 3.53 and 4.05 respectively at 60 and 90 days after grafting. Maximum leaf

area indices of 2.13 and 2.78 were noticed on 10 days cured scion at 60 and 90 days after grafting, while the less leaf area indices of 1.13 and 1.55 were observed on 0 days cured scion. The maximum number of leaves per graft was recorded in case of 10 days cured scion was used. This may

be due to early bud breaking and ample growing period might have caused better plant growth and more number of leaves per plant with more leaf area index. The same sort of results were reported earlier by Chovatia and Singh, 2000<sup>[1]</sup>. The influence of scion curing was significant on length and breadth of leaves. The maximum length (2.78), (6.73) and breadth (3.59), (3.79) of leaves at 60 and 90 days after grafting was recorded in 10 days cured scion. While the lowest length and breadth of leaves were in case of 0 days cured scion. Similar effect of pre curing of scion on length and breadth of leaves was observed by Sarada *et al.*, 1997<sup>[9]</sup>. The maximum length and breadth of leaves was produced in grafts of the scion shoots grafted after 10 days of defoliation (Maiti and Biswas, 1986)<sup>[5]</sup>. The quick and strong union formation, better nutrient uptake with more photosynthetic activity and ample growing period might have caused better leaf growth as reported by Singh *et al.*, 2003<sup>[10]</sup>.

The height of the graft was significantly maximum (35.26 cm, 35.64 cm and 37.28 cm) at 30, 60 and 90 days after grafting respectively, when 10 days cured scion was used. The minimum height of the graft recorded on 0 days cured scion at 30, 60 and 90 days after grafting (31.58 cm, 32.61 cm and 34.23 cm) respectively. The maximum height of grafts may be due to prevailing congenial climatic condition along with availability of dormant and swollen terminal

buds of scion, which encouraged earlier sprouting and their continual growth. This could be also due to vigorous nature of the younger scions resulting from the faster multiplication of meristematic cells of the juvenile scions. Similar results were obtained in Guava by Patel *et al.*, 2007<sup>[7]</sup>.

The influence of scion curing was significant on the girth of the graft shoot at 60 days after grafting. The maximum girth (4.74 mm) was recorded in 10 days cured scion and the least girth (4.37 mm) was observed in 0 days cured scion.

The maximum girth in pre cured scion may be due to early sprouting of buds giving quick growth as explained by Patil *et al.*, 2012. Girth of scion was higher in grafts prepared with pre cured scion than normal scion (Sarada *et al.*, 1997)<sup>[9]</sup>.

Scions cured for 10 days prior to grafting had the highest percent of graft success (68.75%), (65.00%) and (62.50%) at 30, 60 and 90 days after grafting respectively, the lowest percentage of graft success (50.00%), (42.50%) and (37.50%) at 30, 60 and 90 days after grafting respectively, were recorded when scions cured for 0 days or uncured scions were used. The highest graft indices of 2623.50, 2473.25 and 2129.25 were recorded at 30, 60 and 90 days after grafting respectively in the case of defoliated scions. The higher success in such grafts due to prior defoliation was attributed to the activation of apical and axillary buds (Deulin, 1981)<sup>[2]</sup>.

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

| Treatment No.  | Curing of scion | Height of graft (cm) |        | Height of graft (cm) |        | Girth of scion (mm) |        |
|----------------|-----------------|----------------------|--------|----------------------|--------|---------------------|--------|
|                |                 | 30 DAG               | 60 DAG | 90 DAG               | 30 DAG | 60 DAG              | 90 DAG |
| T <sub>1</sub> | 0 Days          | 31.58                | 32.61  | 34.23                | 4.35   | 4.27                | 4.33   |
| T <sub>2</sub> | 2 Days          | 32.31                | 33.19  | 34.86                | 4.24   | 4.37                | 4.40   |
| T <sub>3</sub> | 4 Days          | 33.35                | 34.03  | 35.56                | 4.42   | 4.47                | 4.69   |
| T <sub>4</sub> | 6 Days          | 34.35                | 34.79  | 36.53                | 4.61   | 4.66                | 4.60   |
| T <sub>5</sub> | 8 Days          | 35.26                | 35.64  | 37.28                | 4.65   | 4.68                | 4.75   |
| T <sub>6</sub> | 10 Days         | 36.50                | 36.85  | 38.47                | 4.68   | 4.74                | 4.87   |
| S.Em ±         | —               | 0.33                 | 0.33   | 0.22                 | 0.14   | 0.06                | 0.14   |
| C.D. at 5%     | —               | 1.01                 | 0.99   | 0.67                 | NS     | 0.19                | NS     |

DAG-Days after grafting

Dormant bud sticks after grafting did not sprout up to a month as these bud-sticks normally failed to unite sometimes in adverse weather conditions. Similar views on higher degree of success with defoliated bud sticks were expressed by Sarada *et al.* (1997)<sup>[9]</sup>. The Period of Scion curing also significantly influenced the percentage of graft survivability. The graft survivability was significantly lowest (47.50%) in un procured scion (T<sub>1</sub>) and was maximum (84.00%) in longest period cured scion (T<sub>6</sub>). Ram and Bist in (1982) reported that in precured scions, the desiccation is less compared to freshly defoliated scions. Over the period of 30 to 90 days, there was increase in the percentage of graft survivability under all the methods of grafting and also scion curing period under the study. Examination of dried-up grafts showed that the absence of callus production resulted in a wide gap between the scion and stock which led to failure of grafts (Jose and Valsalakumari, 1991)<sup>[4]</sup>.

From present study, it can be concluded that Sapota being commercially cultivated fruit crop, for the softwood grafting it is advised to use 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 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.

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