ISSN Print: 2664-844X
ISSN Online: 2664-8458
NAAS Rating (2026): 4.97
IJAFS 2026; 8(7): 454-456
www.agriculturaljournals.com
Received: 23-05-2026
Accepted: 26-06-2026

Rakshita
M.Sc. Scholar, Department of Horticulture, Rajasthan College of Agriculture, MPUAT, Udaipur, Rajasthan, India

Virendra Singh
Professor, Department of Horticulture, Rajasthan College of Agriculture, MPUAT, Udaipur, Rajasthan, India

Palav Joshi
M.Sc. Scholar, Department of Horticulture, Rajasthan College of Agriculture, MPUAT, Udaipur, Rajasthan, India

Corresponding Author:
Rakshita
M.Sc. Scholar, Department of Horticulture, Rajasthan College of Agriculture, MPUAT, Udaipur, Rajasthan, India

Effect of softwood grafting period on vegetative characters of different varieties in sapota (*Acharas zapota* L.)

Rakshita, Virendra Singh and Palav Joshi

DOI: https://www.doi.org/10.33545/2664844X.2026.v8.i7f.1711

Abstract
The research was carried out at Horticulture Farm, Department of Horticulture, Rajasthan College of Agriculture, Maharana Pratap University of Agriculture and Technology, Udaipur during July, 2025 to February, 2026. The ten treatment combinations of Kalipatti and Cricket Ball grafted during 5 different periods *viz.* 1st fortnight of July, 2nd fortnight of July, 1st fortnight of August, 2nd fortnight of August, and 1st fortnight of September were evaluated with three replications under completely randomized design (CRD). The results exhibited significant effect of different treatment combinations, among which T_4 (Kalipatti grafted on 2nd fortnight of August) recorded maximum sprout length (10.12, 15.62 and 21.96 at 60, 90 and 120 DAG), branches at 150 DAG (3.96) and leaves per graft (10.44, 16.74 and 22.94 at 60, 90 and 120 DAG compared to all other treatment applied in cv. Kalipatti during investigation. While in Cricket Ball, treatment T_9 (Cricket Ball grafted on 2nd fortnight of August) recorded maximum sprout length (9.05, 14.08 and 19.12 at 60, 90 and 120 DAG), branches at 150 DAG (3.32) and leaves per graft (9.16, 14.56 and 19.76 at 60, 90 and 120 DAG compared to all other treatment applied in cv. Cricket Ball during investigation.

Keywords: Softwood grafting, Sapota, Vegetative parameters

Introduction
Sapota (*Acharas zapota* LS), belonging to the family Sapotaceae, has a chromosome number of 2n=26. It was originated in Mexico and is native to Central America. The genus *Manilkara* includes about 30 -32 species, out of which only a few are cultivated in India. Among these, *Manilkara acharas* is the commercially important species grown widely across tropical and subtropical regions of the country. Other species include *M. hexandra* (commonly known as Rayan or Khirni), which is used as a rootstock. In India, sapota is commercially grown in Maharashtra, Gujarat, Karnataka, Andhra Pradesh, Tamil Nadu and West Bengal. According to Department of Agriculture & Farmer's Welfare, Gujarat has the highest area under cultivation of sapota of approximately 27,000 hectare and have production of 2,74,000 million tonnes. The cultivation of sapota has attracted many farmers on account of its hardy nature and better adaptability to diverse soil and climatic conditions. There is 72-thousand-hectare area under sapota cultivation and 887 million tonne production in 2023-24 (Anonymous, 2024) [1].

Sapota plant is usually grown in tropical areas, but can also be grown in semi-tropical areas in green-house. It can be grown up to 1200 m. above sea level. Being a tropical fruit, it needs warm (10-38 °C) and humid climate (70% relative humidity) for growth. Alluvial, sandy loam, red laterite and medium black soil having good drainage system, with acidic to neutral pH, provide best environment for sapota (Bhaskar *et al.*, 2020) [2]. Kalipatti is one of the most widely grown varieties in India due to its high yield, sweetness and long shelf life. Cricket Ball is known for its large, round fruits and firm pulp. Improved selections like PKM-1, CO-1 and DHS-2 have been released to enhance productivity, uniformity and fruit quality. Many regional varieties such as Guthi, Pala and Kirtibharti are cultivated for local and niche markets (Tripathi and Karunakaran, 2020) [3]. Sapota is commercially propagated through asexual means, but seed propagation is limited to crop improvement owing to high heterozygosity and long juvenile phase. For true to type multiplication and commercial production of sapota, it becomes mandatory to propagate sapota through vegetative means.

Successful vegetative propagation is dependent upon various factors such as rootstock, season and technique of propagation, type of scion sticks etc. (Kaur *et al.,* 2020) [4]. Softwood grafting is a highly effective and commercially important method for the propagation of sapota, as it helps in producing true-to-type, early bearing and uniform plants. It stands out among other vegetative means due to its high success rate, simplicity and ability to produce quality planting material at large scale. It is especially effective when done on young, actively growing Khirni (*Manilkara hexandra*) rootstocks. This technique also facilitates the rapid multiplication of superior varieties. Monsoon and post-monsoon periods are generally considered the most favorable for grafting due to optimal humidity, temperature and active growing plant growth. Grafting during August and September is identified as optimal, yielding maximum success and survival percentages, along with vigorous early growth and leaf development (Kalalbandi *et al.,* 2014) [5].

Materials and Methods

An experiment was performed at the Horticulture Farm, Rajasthan College of Agriculture, MPUAT, Udaipur, during July 2025 to February, 2026. One year old Khirni rootstock was used and the experiment was laid out in CRD with ten treatments: T_1 – Kalipatti grafted on 1st fortnight of July, T_2 – Kalipatti grafted on 2nd fortnight of July, T_3 – Kalipatti grafted on 1st fortnight of August, T_4 – Kalipatti grafted on 2nd fortnight of August, T_5 – Kalipatti grafted on 1st fortnight of September, T_6 – Cricket Ball grafted on 1st fortnight of July, T_7 – Cricket Ball grafted on 2nd fortnight of July, T_8 – Cricket Ball grafted on 1st fortnight of August, T_9 – Cricket Ball grafted on 2nd fortnight of August, T_{10} – Cricket Ball grafted on 1st fortnight of September. Before the operation of grafting, the scion and the stock were defoliated and the stock was headed back at 10-15 cm. with the help of grafting knife, 3-5 cm deep vertical cut was made in the centre of this rootstock. Scion with same thickness of this rootstock was selected and a V-shaped cut was made in both side of lower part of scion similar to the length of that in the rootstock. It is inserted in the cleft of the stock and tied with polythene strip (Patel *et al.,* 2022) [6]. The observations from each treatment for sprout length (cm) at 60, 90 and 120 DAG, branches after 150 days, leaves per graft at 60, 90 and 120 DAG was recorded.

Experimental data collected and it was subjected to statistical analysis by using analysis of variance technique (ANOVA) which is explained by Panse and Sukhatme (1985) [7]. Critical Difference (CD) value was calculated whenever the 'F' test was found significant at 5% level.

Results and Discussion

Sprout length (cm):

Sprout length at 60 DAG

The sprout length increased up to 120 DAG (Table 1). Sprout length at 60 DAG showed significant results while numerically higher value of sprout length (10.12 cm) was observed in Kalipatti when grafted on 2nd fortnight of August (T_4), after that Cricket Ball grafted during 2nd fortnight of August (T_9) showed highest value (9.05 cm). The treatment T_6 (Cricket Ball grafted on 1st fortnight of July) produced lowest sprout length (6.45 cm).

Sprout length at 90 days: Further glance of data presented in Table 1 revealed that plant height at 90 DAS significantly influenced by different grafting period. Data revealed that highest sprout length at 90 DAS (15.62 and 14.08 cm) was found in treatment T_4 (Kalipatti grafted on 2nd fortnight of August) and then in T_9 (Cricket Ball grafted on 2nd fortnight of August) respectively.

Sprout length at 120 days

At 120 DAG, significantly higher sprout length (21.96) was observed with T_4 (Kalipatti grafted on 2nd fortnight of August) and after that, highest value (19.12 cm) was seen in T_9 (Cricket Ball grafted on 2nd fortnight of August). Lowest values of sprout length were observed in grafts of 1st fortnight of July in Cricket Ball (T_6).

Sprout length at 60, 90 and 120 DAG significantly increased with different grafting period. These outcomes might be due to higher maximum and minimum temperature and optimum relative humidity prevailing during this period. These results are supported with Wazarkar *et al.,* (2009) [8], Kalabandi *et al.* (2014) [5] in sapota.

Number of branches after 150 days

Number of branches after 150 days presented in Table 1 shows that the effect of different grafting period was found to be significant on the character of branches after 150 days. Kalipatti grafted on 2nd fortnight of August (T_4) and Cricket Ball grafted on 2nd fortnight of August (T_9) produced significantly higher number of branches after 150 days (3.96 and 3.32) respectively. While plants grafted on 1st fortnight of July in Cricket Ball (T_6), showed minimum number of branches (2.42 and 2.22). The increase in number of branches could be attributed to congenial environment owing to rapid callusing and early contact of cambial layers, quick healing and stronger graft union. These results are in accordance with the findings of Patel *et al.,* (2007) [9] in mandarins and Jeet *et al.,* (2025) [10] in mango.

Table 1: Effect of Softwood Grafting Period on various Vegetative Characters in different varieties of Sapota

	Treatments	Sprout length (cm)			Branches per graft after 150 days	Leaves per graft		
		60 DAG	90 DAG	120 DAG		60 DAG	90 DAG	120 DAG
T_1	Kalipatti grafted on 1st fortnight of July	6.82	10.44	14.32	2.42	6.74	10.82	14.88
T_2	Kalipatti grafted on 2nd fortnight of July	7.15	11.32	15.45	2.68	7.28	11.94	16.22
T_3	Kalipatti grafted on 1st fortnight of August	9.46	14.78	20.74	3.74	9.85	15.88	21.65
T_4	Kalipatti grafted on 2nd fortnight of August	10.12	15.62	21.96	3.96	10.44	16.74	22.94
T_5	Kalipatti grafted on 1st fortnight of September	9.38	14.86	20.82	3.68	9.72	15.62	21.36
T_6	Cricket Ball grafted on 1st fortnight of July	6.45	9.88	13.88	2.22	6.32	10.32	14.12
T_7	Cricket Ball grafted on 2nd fortnight of July	6.88	10.74	14.96	2.36	6.88	11.04	15.08
T_8	Cricket Ball grafted on 1st fortnight of August	8.74	13.42	18.54	3.14	8.92	14.02	18.94
T_9	Cricket Ball grafted on 2nd fortnight of August	9.05	14.08	19.12	3.32	9.16	14.56	19.76
T_{10}	Cricket Ball grafted on 1st fortnight of September	8.41	13.12	18.05	3.02	8.54	13.74	18.65
	S.Em.±	0.08	0.15	0.28	0.03	0.11	0.18	0.21
	CD (at 5%)	0.24	0.45	0.84	0.09	0.33	0.54	0.63

Leaves per graft

At 60 DAG

The data of leaves per graft recorded at 60 DAG is shown in Table 2. The leaves per graft showed significant results with different grafting period. The results revealed that maximum number of leaves per graft (10.44 and 9.16) at 60 DAG were recorded in treatment T_4 (Kalipatti grafted on 2nd fortnight of August) and then in T_9 (Cricket Ball grafted on 2nd fortnight of August) respectively.

At 90 DAG

Number of leaves per graft at 90 DAG showed significant results with different grafting period. The result revealed that the highest number of leaves per graft (16.74) was recorded in T_4 (Kalipatti grafted on 2nd fortnight of August) and second highest (14.56) was seen in T_9 (Cricket Ball grafted on 2nd fortnight of August).

At 120 DAG

Further examination of data pointed out that number of leaves per graft at 120 DAG also showed significant results with different grafting period. The highest number of leaves per graft (22.94 and 19.76) was recorded in treatment T_4 (Kalipatti grafted on 2nd fortnight of August) and then in T_9 (Cricket Ball grafted on 2nd fortnight of August) respectively.

This increase in number of leaves at 60, 90 and 120 days might be due to active growth of stock and scion because of favourable climatic conditions during the period of 2nd fortnight of August. This caused better uptake of nutrients and increase in cambial activity. Apart from this, the scion appears to be in a photosynthetically active state for increased sap flow and meristematic growth of the plant. These results are in accordance to Ghosh *et al.* (2010) [8] in Sapota, Uchoi *et al.* (2012) [11] in Jamun and Karna *et al.* (2018) [12] in Mango.

Conclusion

On the basis of this experimental study, it may be concluded that treatment T_4 (Kalipatti grafted on 2nd fortnight of August) was the superior of all the treatments and then in T_9 (Cricket Ball grafted on 2nd fortnight of August) significantly recorded highest values of vegetative characters *viz.,* sprout length (cm) at 60, 90 and 120 DAG, number of branches after 150 DAG and leaves per graft at 60, 90 and 120 DAG.

References

1. Anonymous. Department of Agriculture and Farmers Welfare. Horticultural Statistics at a Glance. 2024;28:150.
2. Baskar M, Hemalatha G, Muneeshwari P. Traditional and medicinal importance of sapota: Review. Int J Curr Microbiol Appl Sci. 2020;9(1):1711–1717.
3. Tripathi PC, Karunakaran G. Performance of sapota cultivars under high rainfall conditions of Coorg. Prog Hortic. 2020;52(2):147–150.
4. Kaur S, Boora RS, Singh D. Propagation studies in sapodilla (*Manilkara zapota* (L.) P. Royen): A review. Agric Rev. 2020;41(4):356–363.
5. Kalalbandi BM, Ziauddin S, Shinde BN. Effect of time of soft wood grafting on the success of sapota grafts in 50 per cent shade net under Marathwada conditions. Agric Sci Dig. 2014;34(2):151–153.
6. Patel PJ, Parekh DD, Kotecha AV, Masu MM. Effect of scion precuring and time of grafting on softwood grafting in sapota (*Manilkara achras* (Mill.) Fosberg) cv. Kalipatti. Pharma Innov J. 2022;11(10):914–917.
7. Panse VG, Sukhatme PV. Statistical methods for agricultural workers. New Delhi: Indian Council of Agricultural Research; 1985.
8. Wazarkar SS, Patel HC, Masu MM, Parmar AB, Sitapara HH. Effect of grafting dates and grafting materials on soft wood grafting in sapota [*Manilkara achras* (Mill.) Fosberg] under middle Gujarat agroclimatic conditions. Asian J Hortic. 2009;4(2):434–439.
9. Patel RK, Babu KD, Singh A, Yadav DS, De LC. Soft wood grafting in mandarin (*Citrus reticulata* Blanco): A novel vegetative propagation technique. Int J Fruit Sci. 2007;7(2):31–41.
10. Jeet A, Maji S, Dwivedi DH. Performance of soft wood grafting of Dashehari mango on various rootstocks. Plant Arch. 2025;25(1):2967.
11. Uchoi J, Raju B, Debnath A, Shira VD. Study on the performance of softwood grafting in jamun (*Syzygium cuminii* Skeels). Asian J Hortic. 2012;7(2):340–342.
12. Karna AK, Varu DK, Patel MK, Panda PA. Effect of grafting time on success of softwood grafting in mango (*Mangifera indica* L.). Int J Curr Microbiol Appl Sci. 2018;7(8):3072–3077.