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Influence of scion sticks storage methods on growth parameters of softwood grafting in mango var. Kesar

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Abstract
The present investigation on 'Influence of scion sticks storage methods on growth parameters of softwood grafting in mango var. Kesar' was carried out during August 2024 to March 2025 at Horticultural Research Farm, Department of Horticulture, B. A. College of Agriculture, AAU, Anand. The experiment comprised of two factors *viz.*, four levels of wrapping materials [W_1-Moist cotton cloth, W_2-Moist sphagnum moss, W_3-Moist jute bag, and W_4-Control (without wrapping)] and three levels of storage periods [D_1-1 day, D_2-3 days, and D_3-5 days]. The experiment was laid out in Completely Randomized Design (Factorial) involving twelve treatment combinations and three replications. It was recorded that scion sticks wrapping in moist sphagnum moss and storage for 1 day found significantly maximum number of leaves per graft, length of sprouted scion shoot, number of sprouts per graft, girth of graft and leaf area at 90 and 180 DAG in softwood grafting of mango var. Kesar.

Keywords: Days after grafting (DAG), grafting, wrapping material, storage period

Introduction
Mango is recognized as the national fruit of India. It is highly demanded fruit in international markets for its exceptional flavor, pleasant aroma, attractive color range and valuable nutritional content. The tree thrives in diverse ecological conditions, growing from sea level up to elevations of 1200 meters. It is a highly cross-pollinated species, vegetative propagation methods such as softwood grafting are essential for maintaining varietal integrity. Softwood grafting is considered efficient, cost-effective, and suitable for large-scale propagation, but its success depends significantly on environmental conditions and the quality of scion sticks used.

The success of grafting depends on several factors, especially the season in which grafting is done and the surrounding environmental conditions. Favourable conditions at the time of grafting can affect important growth traits like the number of days taken for sprouting, number of leaves, leaf size and the thickness of the scion and rootstock. These traits directly indicate whether the graft has taken successfully. The monsoon season is generally considered the best time for grafting because the humid weather helps improve graft success.

The method of storing scion sticks is important to identify the most suitable technique for successful softwood grafting. Storage helps in determining the ideal number of days for which scion sticks can be kept without losing their ability to form a healthy graft union. This method is especially useful for transporting scion sticks to different locations where planting material is needed. By adopting proper storage techniques, one can understand the viable period of mango scion sticks and ensure they can be safely sent to distant places. In addition, transporting scion sticks is more economical than transporting whole grafted plants which are not only costly but also more likely to suffer damage during transit. A practical alternative to this issue is to use bud sticks instead of entire plants.

Materials and Methods
The present investigation on 'Influence of scion sticks storage methods on growth parameters of softwood grafting in mango var. Kesar' was conducted during August, 2024 to March, 2025 at Horticultural Research Farm, Department of Horticulture, B.A. College of Agriculture, Anand Agricultural University, Anand, Gujarat.

The experiment was laid out in Completely Randomized Design (Factorial) involving twelve treatment combinations and three replications. The experiment comprised of two factors *viz.*, four levels of wrapping materials [W_1-Moist cotton cloth, W_2-Moist sphagnum moss, W_3-Moist jute bag, and W_4-Control (without wrapping)] and three levels of storage periods [D_1-1 day, D_2-3 days, and D_3-5 days].

The softwood grafts were prepared using 4 to 5 month old uniform mango rootstocks raised in 5×7 inch polythene bags and grafted with healthy, 10-15 cm long defoliated scion sticks from the mango cv. Kesar. Grafting was carried out from 30th August to 3rd September 2024 on alternate days, as per the storage treatments. Observations on various growth parameters *viz.*, number of leaves, number of sprouts, length of sprouted scion shoot, girth of graft, leaf area at 90 and 180 DAG were statistically analyzed using Analysis of Variance (ANOVA) method as described by Panse and Sukhatme (1967) [6].

Results and Discussion

Effect of wrapping materials

The data showed that the moist sphagnum moss (W_2) wrapping material was recorded significantly maximum number of leaves per graft at 90 DAG (8.33) and 180 DAG (13.43). This might be due to excellent water-holding capacity, soft texture and superior aeration which help maintain the scion's viability and metabolic activity, ultimately leading to better sprouting and leaf emergence. These findings are in close agreement with Telalwar (1992) [11] in mango and Karad (2000) [4] in tamarind.

The significantly highest length of sprouted scion shoot at 90 DAG (3.42 cm) and 180 DAG (3.92 cm) were recorded when scion wrapped in moist sphagnum moss (W_2). This may be due to its better moisture retention capacity and provision of favourable microclimate that reduced desiccation, resulting in enhanced cell division and elongation. Similar findings were also reported by Singh and Srivastava (1978) [8] as well as Telalwar (1992) [11] in mango and Karad (2000) [4] in tamarind.

The significantly maximum number of sprouts per graft at 90 DAG (3.13) and 180 DAG (3.33) were recorded in moist sphagnum moss (W_2). This is might be due to its excellent moisture holding capacity, which helps to prevent desiccation and maintain the viability of scion sticks thereby enhancing sprouting. The results of present finding are in confirmation with the findings of Telalwar (1992) [11] in mango.

The significantly highest graft girth at 90 DAG (5.60 mm) and 180 DAG (6.23 mm) were recorded in moist sphagnum moss (W_2). This might be due to its high water retention capacity that provides a favourable microenvironment around the scion preventing desiccation and supporting better graft union formation. These findings are in confirmation with the results reported by Telalwar (1992) [11] in mango and Karad (2000) [4] in tamarind.

The significantly maximum leaf area was observed at 90 DAG (12.04 cm^2) and 180 DAG (18.74 cm^2) in scion sticks wrapped with moist sphagnum moss (W_2). IBA exhibited auxin and cytokinin like activity and increased fresh weight of cuttings. The increase in leaf area in scion sticks wrapped with moist sphagnum moss might be attributed to its moisture retaining properties, better aeration and reduced desiccation stress which promote better physiological conditions for leaf expansion. Similar findings was reported by Phuse *et al.* (2022) [7] in mango.

Effect of Storage period

The significantly maximum number of leaves per graft were recorded when scion sticks stored for 01 day (D_1) at 90 DAG (9.30) and 180 DAG (13.24). This result may be due to the fact that shorter storage periods preserve scion vigour and moisture content, ensuring faster and more effective sprouting and leaf development. The similar findings were conformity with results of Changdeo (2001) [1] and Dhirajlal (2012) [3] in mango as well as Pampanna and Sulikeri (2001) [5] in sapota.

The scions stored for 01 day (D_1) was recorded significantly highest shoot length at 90 DAG (3.71 cm) and 180 DAG (4.16 cm). This may be attributed to the fact that 01 days stored scions have higher physiological activity and cambial viability, which enhances their ability to initiate and support shoot growth post grafting. These results are supported by Pampanna and Sulikeri (2001) [5] in sapota, Chavda *et al.* (2018) [2] in jamun and Tandel *et al.* (2020) [9] in mango.

The scion sticks stored for 01 day (D_1) showed significantly the maximum number of sprouts per graft at 90 DAG (3.20) and 180 DAG (3.31). The difference in number of sprouts per graft might be due to better physiological activity and freshness of the scion when stored for minimum days which maintains higher metabolic activity and cell viability required for successful sprouting. The similar result was also confirmation with the findings of Chavda *et al.* (2018) [2] in jamun.

The scion sticks stored for 01 day was recorded significantly highest girth at 90 DAG (5.57 mm) and 180 DAG (6.01 mm). The decreasing trend of girth of graft during storage period might be due to the rapid decaying of tissues from cut ends of scion sticks as the storage period increasing. These findings of present experiment are in conformity with the results obtained by Telalwar (1992) [11] in mango, Karad (2000) [4] in tamarind, Tandel and Patel (2009) [10] in sapota and Chavda *et al.* (2018) [2] in jamun.

The significantly maximum leaf area at 90 DAG (12.00 cm^2) and 180 DAG (18.66 cm^2) were recorded when scion sticks were stored for 01 day (D_1). The more leaf area per graft recorded in 01 day stored scion might be due to scion sticks (shorter storage) retain higher viability and metabolic activity contributing to better graft take and leaf development. These results are supported by the findings of Thakar and Shah (2013) [12] in mango.

Table 1: Effect of wrapping material and storage period on number of leaves per graft and length of sprouted scion shoot in softwood grafting of mango

Treatments	Number of leaves per graft at 90 DAG	Number of leaves per graft at 180 DAG	Length of sprouted scion shoot (cm) at 90 DAG	Length of sprouted scion shoot (cm) at 180 DAG
Wrapping materials (W)				
W_1: Moist cotton cloth	6.37	11.61	2.90	3.28
W_2: Moist sphagnum moss	8.33	13.43	3.42	3.92
W_3: Moist Jute bag	7.36	12.68	3.02	3.46
W_4: Control (without wrapping)	5.42	10.49	2.23	2.60
S.Em.±	0.16	0.25	0.09	0.11
CD at 5%	0.46	0.72	0.27	0.31
Storage period (D)				
D_1: 01 Days	9.30	13.24	3.71	4.16
D_2: 03 Days	6.22	11.83	2.70	3.07
D_3: 05 Days	5.10	11.08	2.28	2.72
S.Em.±	0.14	0.21	0.08	0.09
CD at 5%	0.40	0.62	0.23	0.27
Interaction effect (WxD)				
Interaction effect	NS	NS	NS	NS
C.V.%	6.87	6.14	9.50	9.51

Table 2: Effect of wrapping material and storage period on number of sprouts per graft, girth of graft and leaf area in softwood grafting of mango

Treatments	Number of sprouts per graft at 90 DAG	Number of sprouts per graft at 180 DAG	Girth of graft (mm) at 90 DAG	Girth of graft (mm) at 180 DAG	Leaf area (cm^2) at 90 DAG	Leaf area (cm^2) at 180 DAG
Wrapping materials (W)						
W_1: Moist cotton cloth	2.67	2.87	5.10	5.61	10.74	17.65
W_2: Moist sphagnum moss	3.13	3.33	5.60	6.23	12.04	18.74
W_3: Moist Jute bag	2.87	3.11	5.48	5.95	11.29	17.95
W_4: Control (without wrapping)	2.27	2.38	4.77	5.36	9.85	16.68
S.Em.±	0.08	0.06	0.12	0.11	0.26	0.42
CD at 5%	0.23	0.17	0.36	0.31	0.75	1.23
Storage period (D)						
D_1: 01 Days	3.20	3.31	5.57	6.01	12.00	18.66
D_2: 03 Days	2.70	2.87	5.27	5.84	10.80	17.56
D_3: 05 Days	2.30	2.59	4.88	5.52	10.13	17.05
S.Em.±	0.07	0.05	0.11	0.09	0.22	0.37
CD at 5%	0.20	0.15	0.31	0.27	0.65	1.07
Interaction effect (WxD)						
Interaction effect	NS	NS	NS	NS	NS	NS
C.V.%	8.61	6.06	7.09	5.51	6.99	7.15

Conclusion

On the basis of results obtained from the investigation, it can be concluded that scion sticks wrapped in moist sphagnum moss and stored for 01 day and used for softwood grafting purpose was recorded higher growth parameters of mango var. Kesar.

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