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OPTIMIZATIONOF SEASON AND GROWING CONDITIONS FOR MAXIMIZING SUCCESS OF TAMARIND SOFTWOOD

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ABSTRACT

Tamarind (*Tamarindus indica* L.) is one of the most important multipurpose tree species. It is consideredone of the minor tree spice crops in India. This study aimed to optimize the season and growing conditions for the successful softwood grafs. The experiment was conducted at the Department of Horticulture, College of Agriculture, University of Agricultural Sciences, Bengaluru. The experiment laid out in split plot design with four replications. The grafting was done using one year old rootstock to optimize the season and growing conditions and observations were recorded which includes days taken for first Sprouting, days taken for first leaf emergence, length of sprout (cm), Success of tamarind graft (%) and Survival of tamarind graft (%). All the observations showed significant differences based on the month of grafting, growing conditions, and their interaction effects. March was found to be the most favorable month for tamarind graft success and survival, showing the shortest time for sprouting and leaf emergence, along with the longest sprout length, particularly under mist chamber conditions. This combination of March and mist chamber which performed better than other months.

***Keywords*:** Tamarind, softwood grafting, season and growing conditions.

Introduction

Tamarind (*Tamarindus indica* L.) is an important multipurpose tree in the Fabaceae (Leguminosae) family, with a somatic chromosome count of 2n=24 (Purseglove *et al.*, 1987). It grows up to 25 meters, with alternately even-pinnate leaves and raceme inflorescence. The oblong, curved fruits have firm, dark brown pulp and are commonly grown in tropical and subtropical regions. Tamarind fruit has diverse industrial and medicinal uses, with the pulp, seeds, trunk, and leaves serving multiple purposes. The ripe fruit comprises 54% pulp, 35% seed, and 11% fiber and shell. Its pulp contains 20.8g moisture, 64.4g carbohydrates, 5.8g fiber, 3.4g protein, 2.9g minerals, and 232–285 kcal per 100g (Muzaffar and Kumar, 2017). It is highly acidic, with tartaric acid content ranging from 12.5% to 24.8% and contains leucoanthocyanidin in brown pulp and anthocyanin in red pulp.

India ranks first among different countries with an area and production of 38855 ha and 151282 MT, respectively. Karnataka accounts for an area and production of 9,560 ha and 33693 MT, respectively (Anon, 2024). India is the only country to tap the potential of tamarind extensively with the annual pulp production of 3 lakh tones, of which 4,000 tonnes is exported to Europe, North America, USA, Australia, African, Sri Lanka, Malaysia and Pakistan after local consumption (El- Siddig *et al.*, 2006).

The success and establishment of grafts in tamarind trees depend on the grafting method and timing. Softwood grafting is commonly used in tamarind cultivation be cause it is very simple and easier method. However, there is limited systematic information on the best practices for softwood grafting, particularly regarding the ideal season for grafting to achieve high success and graft survival.

Seasonality plays a vital role, as the physiological condition of the scion and rootstock affects graft compatibility and healing. To improve grafting success, research is needed to determine the optimal climatic conditions, such as temperature and humidity, and the most suitable time for grafting. Standardizing these factors could help to achieve better graft survival and establishment in tamarind cultivation. Considering the above facts, the present investigation was undertaken to optimize the season for grafting and growing conditions.

Materials and Methods

An investigation was conduct at Department of Horticulture, College of Agriculture, University of Agricultural Sciences, GKVK, Bengaluru. The experiments were carriedout with the objectives to optimize the season and growing conditions for maximizing the success of tamarind grafts and survivability. The experiment was laid out with Split Plot Design consisting of three main treatments *viz*. January 2020, February 2020 and March 2020 and four sub treatments *viz*. Low cost polyho use, Shade net, Poly tunnel and Mist Chamber with four replications. Total Twelve treatments were studied *viz*. T_1 (January + Low cost), T_2 (January + Shadenet), T_3 (January + Polytunnel), T_4 (January + Mist chamber), T_5 (February + Low cost), T_6 (February + Shadenet), T_7 (February + Polytunnel), T_8 (February + Mist chamber), T_9 (March + Low cost), T_{10} (March + Shadenet), T_{11} (March + Polytunnel) and T_{12} (March + Mist chamber).

Locally available Tamarind seeds were used for raising rootstocks and one year old vigorous rootstocks were selected for grafting. Well grown scion of about 15-20 cm length was taken. A long gentle sloping wedge of about 3-4 cm long was prepared towards the basal end of the scion by giving two downward cuts on either sides of the scion. The prepared scion was then inserted into the vertical slit on the rootstock in such a way that the cambium layer of the rootstock and the scion were in close contact with each other.

The different observations namely days taken for first sprouting, days taken for first leaf emergence (No. Days), length of the sprout (cm), Percentage of graft success and Percentage of graft surviv ability were recorded after the successful grafting.

$$\textbf{Graft sucess } (\%) = \frac{\text{Number of successful grafts}}{\text{Total number of Grafts prepared}} \times 100$$

$$\textbf{Graft Suvival } (\%) = \frac{\text{Total successful grafts} - \text{Number of scions died after initial sprouting and growth}}{\text{Total number of successful grafts}} \times 100$$

Results and Discussion

The data on the days taken for the first sprouting of tamarind grafts showed significant differences based on the grafting month, growing conditions, and their interaction effects (Table 1). Grafts prepared in March (M3) took the least time to sprout (13.60 days), while those grafted in January (M1) took the longest (17.33 days). Among the growing structures, the mist chamber (C4) resulted in the quickest sprouting (13.71 days), while the shadenet (C2) took the longest (17.82 days). The fastest sprouting (11.17 days) occurred in March (M3) under the mist chamber (C4) condition, whereas the slowest sprouting (19.78 days) was recorded in January (M1) under the shadenet (C2). It is due to congenial climatic condition prevailing during February and March month, this enhances the early union of two cambium layers of stock and scion. The similar kind of findings

Table 1: Days taken by tamarind grafts for first sprouting, leaf emergence and length of sprout as influenced by months of grafting, growing structures and their interaction effect.

Treatments	Days taken for first Sprouting	Days taken for first leaf emergence	Length of sprout (cm)
MONTHS (M)			
M_1-January	17.33	24.09	0.19
M_2-Feberuray	16.04	22.72	0.20
M_3-March	13.60	19.15	0.23
S.Em±	00.20	00.28	0.02
C.D at 5%	00.81	01.13	0.07
CONDITION(C)			
C_1-Lowcostpolyhouse	14.90	21.12	0.21
C_2-Shadenet	17.82	24.11	0.18
C_3-Polytunnel	16.20	22.45	0.19
C_4–MistChamber	13.71	20.28	0.23
S.Em±	00.17	00.23	0.04
C.D at 5%	00.60	00.80	0.13
INTERACTION (M×C)			
M_1C_1	16.46	23.63	0.20
M_1C_2	19.78	25.30	0.17
M_1C_3	17.28	24.52	0.18
M_1C_4	15.79	22.91	0.20
M_2C_1	15.60	21.13	0.21
M_2C_2	17.80	25.36	0.19
M_2C_3	16.59	23.43	0.19
M_2C_4	14.18	20.98	0.22
M_3C_1	12.64	18.61	0.24
M_3C_2	15.89	21.67	0.19
M_3C_3	14.72	19.40	0.21
M_3C_4	11.17	16.94	0.27
Ftest ($p \leq 0.05$)	*	*	*
S.Em±	00.31	0.41	0.08
C.D at 5%	01.03	1.38	0.25

were recorded by Joshi *et al.*, (2000) on softwood grafting in custard apple. In wood apple, Giri and Lenka (2008) reported the minimum days taken for sprouting (8days) in May.

The data on the days taken for the first leaf emergence of tamarind grafts revealed significant differences (Table 1) based on the month of grafting, growing conditions, and their interaction effects. Grafts prepared in March (M3) had the fastest leaf emergence, taking an average of 19.15 days, while those grafted in January (M1) took the longest, with 24.09 days. Among the growing structures, the mist chamber (C4) led to the quickest leaf emergence (20.28 days), while the shadenet (C2) resulted in the slowest (24.11 days). The fastest leaf emergence (16.94 days) occurred in March (M3) under the mist chamber (C4), while the slowest (25.36 days) was recorded in January (M1) under the shadenet (C2).

The data on the length of sprouts of tamarind grafts revealed significant differences based on the month of grafting, growing conditions, and their interaction effects (Table 1). The longest sprouts (0.23 cm) were observed in March (M3), while the shortest sprouts (0.19 cm) were seen in grafts prepared in January (M1). Among the growing structures, the mist chamber (C4) resulted in the longest sprouts (0.23 cm), while the shadenet (C2) produced the shortest (0.18 cm). The longest sprouts (0.27 cm) were recorded in March (M3) under the mist chamber (C4), while the shortest sprouts (0.17 cm) were observed in January (M1) under the shadenet (C2).

The data on tamarind graft success percentage showed significant differences based on the month of grafting, growing conditions, and their interaction effects (Table 2). The highest graft success (70.12%) was observed in March (M3), while the lowest success (54.13%) occurred in grafts prepared in January (M1). Among the growing structures, the mist chamber (C4) resulted in the highest graft success (72.58%), while the shadenet (C2) condition had the lowest (54.13%). The highest graft success (83.23%) was recorded in March (M3) under the mist chamber (C4), whereas the lowest success (42.47%) occurred in January (M1) under the shadenet (C2). Highest success March it is due to the favorable internal and external conditions like optimum humidity, moderate temperature and biochemical status stated by (Dhutraj *et al.,* 2018).

The data on tamarind graft survival percentage showed significant differences based on the month of grafting, growing conditions, and their interaction effects (Table 2). The highest graft survival (91.70%) was observed in March (M3), while the lowest survival (86.44%) was recorded in grafts prepared in January (M1). Among the growing structures, the mist chamber (C4) achieved the highest graft survival (93.26%), while the shadenet (C2) resulted in the lowest survival (84.61%). The highest graft survival (96.01%) occurred in March (M3) under the mist chamber (C4), whereas the lowest survival (81.83%) was observed in January (M1) under the shadenet (C2). Moderate temperatures and high humidity during the growing period increase graft survival by enhancing cellular metabolic activity and activating cambium development. High relative humidity safeguards thin-walled cambial callus cells from desiccation, ensuring successful graft union (Hartmann *et al.,* 2007).

Table 2: Success of tamarind grafts and Survival of graft (%) as in fluenced by months of grafting, growing structures and their interaction.

Treatments	Success of tamarind graft (%)	Survival of tamarind graft (%)
MONTHS (M)		
M_1-January	54.13	86.44
M_2-Feberuray	63.94	89.66
M_3-March	70.72	91.70
S.Em±	1.053	0.25
C.D at 5%	4.208	1.03
CONDITION (C)		
C_1-Lowcostpolyhouse	65.92	90.71
C_2-Shadenet	52.14	84.61
C_3-Polytunnel	61.08	88.45
C_4–MistChamber	72.58	93.26
S.Em±	0.51	0.40
C.D at 5%	1.61	1.34
INTERACTION (M×C)		
M_1C_1	57.97	86.99
M_1C_2	42.47	81.83
M_1C_3	53.59	86.07
M_1C_4	62.51	90.86
M_2C_1	67.50	91.70
M_2C_2	53.59	84.92
M_2C_3	62.67	89.08
M_2C_4	72.01	92.93
M_3C_1	72.29	93.46
M_3C_2	60.37	87.10
M_3C_3	66.99	90.22
M_3C_4	83.23	96.01
Ftest ($p\leq0.05$)	*	
S.Em±	0.88	0.85
C.D at 5%	2.96	2.19

The month of March proves to be the most favorable for the maximum success and survival of tamarind grafts. It showed the shortest time for first sprouting, leaf emergence, and the longest sprout length, particularly under mist chamber conditions. This result was confirmed through the interaction between March and the mist chamber, which performed better than other months, though February and low-cost polyhouse conditions also showed similar effects.

March month is considered the spring season for many plants, marking a transition between winter and summer. This period provides ideal weather conditions, such as moderate temperatures, high relative humidity, sufficient sunlight, and suitable growing media. These factors contribute to the optimal environment for plant propagation. The mist chamber, with its ability to regulate temperature, humidity, and provide ample sunlight, creates the perfect conditions for graft success and survival. Thus, March, combined with the mist chamber, is a particularly effective combination for tamarind graft propagation, yielding the highest success and survival rates. Similar results were obtained by different researchers in Ber (Mawani and Singh, 1992), Mango (Desai & Patil, 1984; Alkhatabi, 1986) and Sapota (Chatterjee *et al.*, 1989; Pampanna and Sulikeri, 2000).

Conclusion

The findings of this study highlight that the month of March, coupled with mist chamber conditions, provides the most favorable environment for tamarind graft propagation. Grafts prepared in March exhibited the shortest time for first sprouting and leaf emergence, the longest sprout length, and the highest graft success and survival rates. The mist chamber proved to be the most effective growing structure, fostering optimal conditions for graft development with its ability to regulate temperature, humidity, and light. The interaction between March and the mist chamber consistently yielded superior results, demonstrating the importance of combining favorable seasonal conditions with controlled environmental factors for maximizing graft success. Overall, selecting the appropriate month for grafting and growing structure is critical for enhancing the success and survival rates of tamarind grafts, with March and mist chamber conditions proving to be the most efficient combination for optimal outcomes.

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References

Alkhatabi, A.S. (1986). Effect of season and growth regulators on rooting of Alphanso and mallika cultivar of mango (*Mangifera indica*, L.) *M.Sc Thesis*, University of Agricultural Sciences, Bangalore,

Anonymous (2024). Annu. rep. (2022-23), Spices Board of India, India.

Chatterjee, B.K., Ray D.A., Chakladar B.P. and Mukherjee S.K. (1989). Effect of different concentrations of growth regulators, etiolation and invigoration on the rooting of air layers of sapota (*Achras sapota* L.). *Indian J. Hort.*, **40(4)**, 426-429.

Desai, J.B. and Patil V.K. (1984). Success of stone grafting in mango in glasshouse and open condition. *Punjab Hort. J.*, **24(1/4)**, 7-10.

Dhutraj, S.V., Kalalbhandi B. and Damodhar V.P. (2018). Standardization of period for soft wood grafting in custard apple (*Annona squamosa*). *Int. J. Curr. Microbiol. App. Sci.*, **6**, 246-251.

El-Siddig, K., Gunesana H.P.M., Prasad B.A., Pushpukumara D.K.N.G., Ramana K.V.R., Vijayananand P. and Williams J.T. (2006). Fruits for the future 1 – Tamarind (*Tamarindus indica*L.) (Revised). Southampton Centre for Underutilized Crops, Southampton, UK

Giri, B. and Lenka P.C. (2008). Studies on vegetative propagation of wood apple. *Orissa J. Hort.*, **36(1)**, 124-125.

Hartmann, H.T., Kester D.E., Davies F.T. and Geneve R.L. (2007). Plant propagation, principles and practices. 880-881.

Joshi, P.S., Bhalerao P., Mahorkar V.K. and Jadhav B.J. (2000). Studies on vegetative propagation in custard apple. *PKV Res. J.*, **24(2)**, 103-105.

Mawani, P.B. and Singh S.P. (1992). Effect of method and time of budding success in ber (*Zizypusmauritiana* Lamk) cv. Gola, *Horti. J.*, **5(1)**, 31-35.

Muzaffar, K. and Kumar P. (2017). Tamarind - a mini review. *M.O.J. Food Process Technol*, **5(3)**, 296-7.

Pampanna, Y. and Sulikeri G.S. (2000). Effect of season on the success and growth of softwood grafts in sapota on invigorated Rayan rootstock. *Karnataka J. Agric. Sci.*, **13(3)**, 779-782.

Purseglove, J.W. (1987). A book of Tropical crops Dicotyledons. Longria, Science & Technology, 204-206.