Optimization of Desert Rose (*Adeniumobesum*Forssk.) wedge grafted technique to enhance its performance under controlled condition

ABSTRACT

The present Experiment was conducted at College of Horticulture,Dr.B.S.K.K.V.,Dapoli,Dist.Ratnagiri (Maharashtra) during October-November of academic year 2023-2024. The experiment was laid out in Randomized Block Design (RBD) in ten treatmentand three replications. The findings showed that type ADBSsaKKVCOH -3 Pink had the highest leaf area (8.61cm^2), caudex girth (22.33 mm)and survival percentage (86.67 %) also type ADBSKKVCOH-6 Dark Pinkshowed highest graft height (10.90 cm), maximumstem girth (9.46 mm)and number of leaves (17).Thus, type ADBSKKVCOH -3 Pink and ADBSKKVCOH -6 Dark Pinkshowed significant variation in growth parameters among all types**.**

Keywords: Adenium; type; wedge grafting;caudex;girth

1.INTRODUCTION

Adenium is a flowering plant in the family Apocynaceaepopularly known as the Desert rose renowned for its striking appearance and adaptability to arid environments.Adeniums, which are native to the hot, arid parts of Africa and the Arabian Peninsula are valued for their distinctive shape and colourful blossoms.There are few species of Adeniumviz., *Adeniumboehmianum*, *A. multiflorum*, *A. obesum* and *A. swazicum* make good accent plants in a rock garden.

Adenium propagated by seeds, cuttingsand grafting.Propagation by seed is not reliable due to limited seed production as a result of pollination issues and possibly sterile male and female flowers. Graftingis an ancient horticultural technique that is indispensable to modern horticulture as the technique enables us to exploit the various advantages of grafted plants. (Beshir *etal*., 2019).Desert roseused to enhance the development of the caudex, the swollen stem characteristic of Adeniums.Wedge grafting in Adenium aids in the proliferation of desirable characteristics by allowing for the effective union of the scion and rootstock. This approach depends on a concept of vascular cambium compatibility between the scion and rootstock, which ensures effective graft union and subsequent growth.

Several factors contribute to the optimistic outlook for ornamental nursery enterprises in India's Konkan area. The Konkan region's unique climatic and geographical features provide an ideal habitat for the cultivation of a diverse range of attractive plants. With rising urbanization and interest in gardening among homes and companies, there is a greater demand for attractive plants in residential, commercialand public places. The region's tourism business also drives demand for visually appealing landscapes in hotels, resortsand tourist attractions.

2. MATERIAL AND METHODS

The experiment was conducted at Hi-tech unit, College of Horticulture, DapoliDr.BalasahebSawant Konkan KrishiVidyapeeth, Dapoli, Dist.Ratnagiri, India, 415712.The experiment was laid out in Randomized Block Design with Ten treatment viz., T_1 (ADBSKKVCOH- 1 Variegated), T_2 (ADBSKKVCOH - 2 Yellow Throats with Red Corolla), T_3 (ADBSKKVCOH -3 Pink), T_4 (ADBSKKVCOH -4 White), T_5 (ADBSKKVCOH -5 White with Red Strips), T_6 (ADBSKKVCOH-6 Dark Pink), T_7 (ADBSKKVCOH -7 Light Red), T_8 (ADBSKKVCOH -8 White Throats with Red Corolla), T_9 (ADBSKKVCOH -9 Yellow with Pink Strips)andT_{10} (ADBSKKVCOH- 10 Red)withthree replications.

During the experiment observations were recorded such as Number of Leaves(cm), Leaf Area (cm^2), Caudex Girth (mm), Height of Graft (cm), Stem Girth and Survival Percentage. The generated data was subjected tostatistical analysis method as suggested by Panse and Sukhatme (1995).

3. RESULT AND DISCUSSION

3.1 Number of leaves

The highestnumber of leaves per plant observed in ADBSKKVCOH–6Dark Pink(17.00). The lowest number of leaves per plant found in ADBSKKVCOH – 5 White with Red Strips(12.40). Different plant species have varying growth patterns and leaf production rates.More rapid leaf development and faster restoration are often the outcomes of grafting during the active growth phase of the plant.These results confirm the obtained byRani *et al.* (2015)revealed that maximum number of leaves per plant (22.39) produced in wedge grafting during September 15-20in guava, Mayavel*et al.* (2022) recorded maximum number of leaves per grafts (66.6) in tamarind.

3.2 Leaf area (cm^2)

It is observed that highest leaf area in case of type ADBSKKVCOH-3Pink (8.61 cm^2).Lowest leaf area observed in T_{10} (4.66 cm^2).Grafting can impact on leaf area in various ways depending on the plant species and grafting technique. The result is also consistent with the findings ofMutteppa*et al.* (2017) reported maximum leaf area (24.24 cm^2) when grafting performed during month of August with scion variety Lalit followed by var. Shweta in guava.

3.3 Girth of caudex (mm)

The caudex is the expanded and often swollen stem base of the Adenium plant. It acts as a storehouse for nutrients and water, enabling the plant to endure prolonged dry spells.ADBSKKVCOH-3Pinkshowed highest girth of caudex which is 22.33 mm.ADBSKKVCOH- 1 Variegatedshowed minimum caudex girth which is (17.21 mm) among all treatment. This might be due to the integration of scion with the rootstock, the caudex typically thickens due to increased physiological support. However, the ultimate increase in girth depends on the compatibility between the scion and rootstock, the precision of the graft, and subsequent care.

Table1. Response of Adenium types to various growth parameters by wedge grafting

Sr. No	Treatment	Treatment Details	Number of leaves	Leaf area (cm^2)	Girth of Stem (mm)	Girth of Caudex (mm)	Graft height (cm)
1.	T_1	ADBSKKVCOH- 1 (Variegated)	14.21	5.52	8.48	17.21	8.80
2.	T_2	ADBSKKVCOH – 2 (Yellow Throats with Red Corolla)	15.53	6.07	8.23	19.93	8.12
3.	T_3	ADBSKKVCOH-3 (Pink)	16.33	8.61	8.50	22.33	10.57
4.	T_4	ADBSKKVCOH – 4 (White)	13.53	6.08	7.91	18.83	8.20
5.	T_5	ADBSKKVCOH – 5 (White with Red Strips)	12.40	6.06	8.57	19.17	8.83
6.	T_6	ADBSKKVCOH–6 (Dark Pink)	17.00	4.95	9.46	19.41	10.90
7.	T_7	ADBSKKVCOH–7 (Light Red)	12.53	5.24	8.44	18.39	8.57
8.	T_8	ADBSKKVCOH–8 (White Throats withRed Corolla)	14.47	5.40	8.13	18.51	8.42
9.	T_9	ADBSKKVCOH – 9 (Yellow with Pink Strips)	16.33	4.84	8.43	18.83	8.50
10.	T_{10}	ADBSKKVCOH–10 (Red)	13.53	4.66	8.36	19.26	8.93
Mean			14.58	5.74	8.45	19.18	8.98
Range			12.40-17.00	4.66-8.61	7.91-9.46	17.21-22.33	8.12-10.90
'F' test			SIG	SIG	SIG	SIG	SIG
SEm±			0.22	0.55	0.21	0.79	0.17
CD at 5 %			0.65	1.63	0.63	2.36	0.49

Table2. Response of Adenium types to survival percentage by wedge grafting.

Sr. No	Treatment	Treatment Details	Survival percentage
1.	T_1	**ADBSKKVCOH- 1 (Variegated)**	73.33
2.	T_2	**ADBSKKVCOH – 2 (Yellow Throats with Red Corolla)**	81.67
3.	T_3	**ADBSKKVCOH-3 (Pink)**	86.67
4.	T_4	**ADBSKKVCOH – 4 (White)**	78.33
5.	T_5	**ADBSKKVCOH – 5 (White with Red Strips)**	73.33
6.	T_6	**ADBSKKVCOH–6 (Dark Pink)**	75.00
7.	T_7	**ADBSKKVCOH–7 (Light Red)**	70.00
8.	T_8	**ADBSKKVCOH–8 (White Throats withRed Corolla)**	71.67
9.	T_9	**ADBSKKVCOH – 9 (Yellow with Pink Strips)**	70.00
10.	T_{10}	**ADBSKKVCOH–10 (Red)**	71.67
Mean			75.17
Range			70.00-86.67
'F' test			SIG
SEm±			2.53
CD at 5 %			7.53

3.4 Girth of stem (mm)

The girth or diameter of the stem is crucial in wedge grafting because it influences various aspects of the grafting process as well as the graft union's success. The success and quality of wedge grafting are directly influenced by the stem's girth. Highest girth observed in ADBSKKVCOH–6Dark Pink(9.46 mm). The lowest stem girth found in ADBSKKVCOH-4 White) (7.91 mm).A well-integrated graft will encourage strong vascular ties between the rootstock and scion. This integration promotes stronger growth, resulting in a stem that is thicker and more resilient.Type ADBSKKVCOH–6Dark Pinkhas highest number of leaves. Leaves produce plant hormones like auxins and cytokinins that are involved in growth and development. A higher number of leaves can lead to greater hormone production, which can stimulate growth and improve the overall vigour of the grafted plant.These results are in line with the findings ofRoy and Fatmi (2022) concluded that significantly broad stem girth (9.3 mm) was observed in super moon hybrid of Adenium with wedge grafting.

3.4 Height of graft (cm)

ADBSKKVCOH–6Dark Pink(10.90 cm) showed highest height which is at par toADBSKKVCOH-3Pink(10.57 cm). Type ADBSKKVCOH -2 Yellow Throats withRed Corolla(8.12 cm) and ADBSKKVCOH- 4 White (8.20 cm) shows minimum height.Table 1 presents statistical analysis on the graft height by wedge grafting and represented in fig.1.

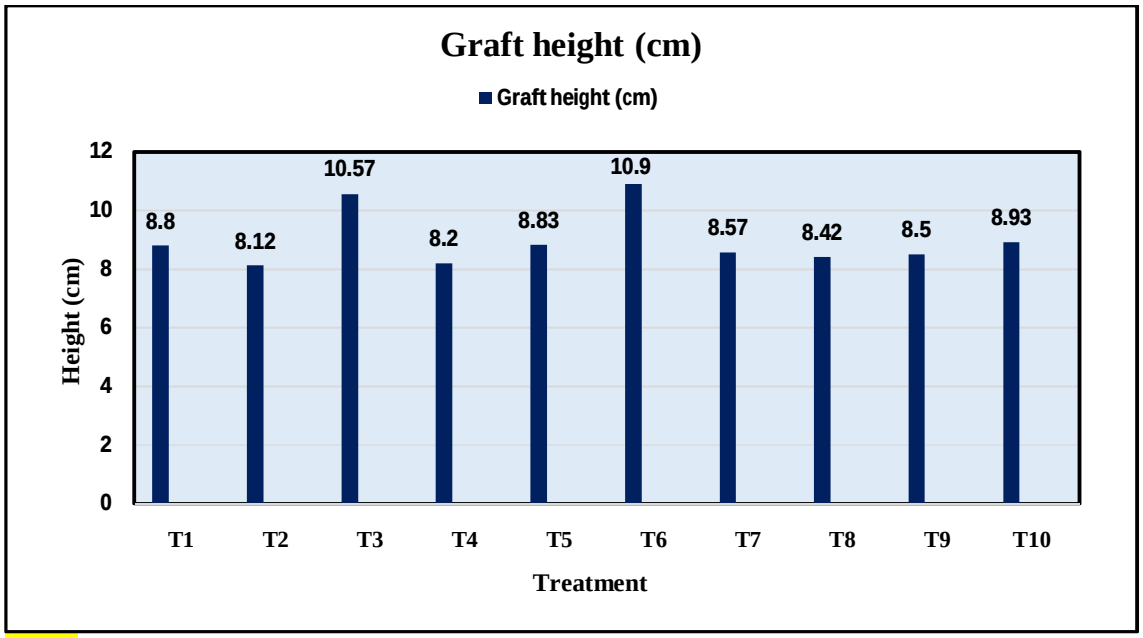

Fig.1. Response of Adenium types to graft height by wedge grafting

The combination of efficient nutrient transport, hormone distribution and healing contributes to the increased height of the grafted plant. The number of leaves maximum in ADBSKKVCOH–6Dark Pink and ADBSKKVCOH-3Pink, more leaves can provide the necessary energy and nutrients for growth, ensuring that the graft union integrates well and strengthens over time.The result is also consistent with the findings ofVerma*et al*. (2012) recorded highest graft height 30 cm in grape by wedge grafting, Dalal *et al*. (2022) discovered, the maximum sapling height was 50.82, 53.36, and 49.22% in treatments D4 (21st January), D3 (6th February), and D1 (8th January) in 2019, 2020, and 2021, respectively in kinnowmandarian.

3.6 survival percentage

The survival percentage is the fraction of grafts that effectively establish and continue to grow after the original grafting procedure. This metric is crucial as it indicates the overall viability and success of the grafting technique.Type ADBSKKVCOH-3Pink (86.67%)showed highest survival percentage among all types.The lowest survival percentage limit in type ADBSKKVCOH– 9 Yellow with Pink Stripswhich is 70.00%.

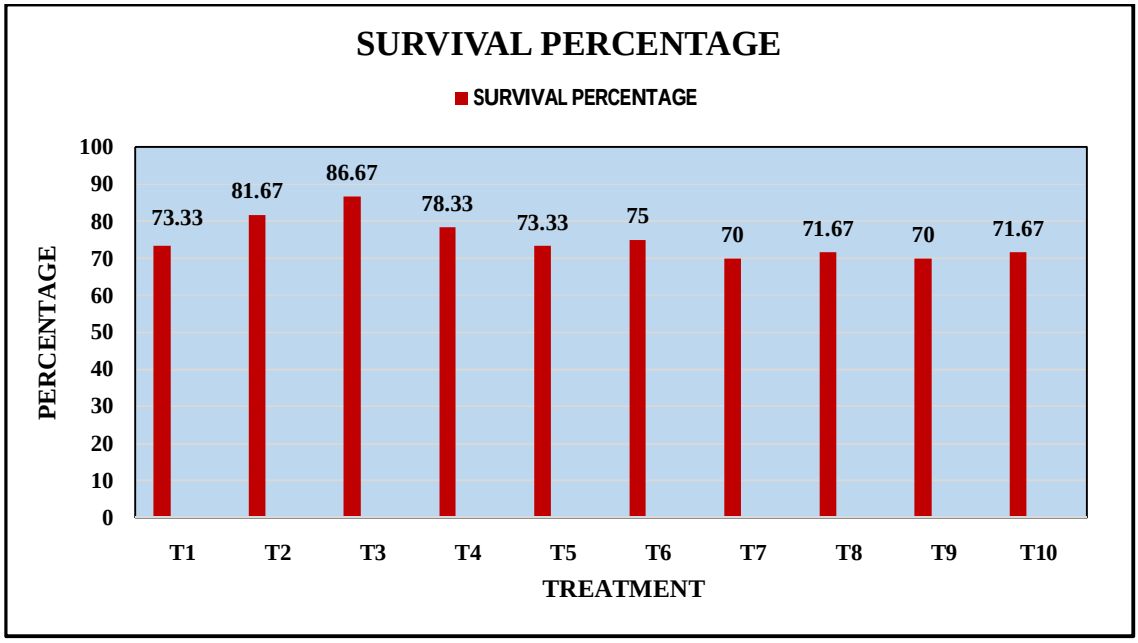

Fig.2. Response of Adenium types to survival percentage by wedge grafting

This might be due to, Adenium latexes have antimicrobial properties (Akhtar *et al*., 2017) that can help prevent pathogens from entering the wound site, thereby reducing the chances of graft failure due to infection.Type ADBSKKVCOH-3Pink have high amount of latex

which is helpful for protection from pathogens. Temperature, humidity, and light can also an impact on the success rate of grafting and subsequent sprouting in different plant species.Patil (2004) revealed that maximum success was achieved in Aonla through wedge grafting (91.6%).Mamta *et al*. (2014) concluded the maximum graft/bud survival (94.85%) in the treatment wedge grafting in guava.

4. CONCLUSION

The current study concludes that among the numerous Adenium kinds, type ADBSKKVCOH-3 Pink propagated via wedge grafting showed best for the various graft characteristics evaluated, such as leaf area (8.61 cm^2), caudex girth (22.33 mm) and survival percentage (86.67%). Also, type ADBSKKVCOH-6 Dark Pink had the maximum leaves (17), stem girth (8.96 mm)and graft height (10.90 cm). The current investigation produced fascinating evidence that necessitates future research to make recommendations.

5.Acknowledgement

The Department of Floriculture and Landscaping at the College of Horticulture, Dr.BalasahebSawant Konkan KrishiVidyapeeth, Dapoli, 415712, District Ratnagiri, Maharashtra (India),is grateful for the assistance and informative suggestions offered throughout the investigation.

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