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EFFECT OF POTTING MEDIA COMPOSITION ON SEEDLING GROWTH AND MORPHOLOGICAL PERFORMANCE OF ADENIUM (*ADENIUM OBESUM* FORSSK. ROEM. & SCHULT.)

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ABSTRACT

An experiment was conducted at the Naturally Ventilated Polyhouse, College of Horticulture, Anand Agricultural University, Anand, Gujarat during May to November 2024 to study the effect of potting media composition on seedling growth and morphological performance of Adenium [*Adenium obesum* (Forssk.) Roem. & Schult.]. The experiment was laid out in Completely Randomized Design (CRD) with ten treatments involving different potting media combinations and three repetitions. Among the treatments, sand + vermicompost (1:1 v/v) significantly exhibited maximum shoot length (44.85 cm), tap root length (16.17 cm), caudex girth (4.10 cm), number of leaves per plant (47.13), number of secondary roots per plant (86.94) and survival percentage (98.17%) at 180 DAS. These results were statistically at par with cocopeat + vermicompost (1:1 v/v), suggesting that sand + vermicompost is the most effective potting medium for seedling growth of adenium.

Key words : Seedling growth, Morphological performance, *Adenium obesum*, Desert rose, Potting media.

Introduction

Adenium (*Adenium obesum* [Forssk.] Roem. & Schult.), commonly known as the desert rose, is a popular succulent ornamental plant native to Sub-Saharan Africa. In recent years, it has gained commercial prominence in tropical and subtropical countries, including India, due to its sculptural caudex, vibrant blooms, and drought resistance. It is particularly admired as a pot plant in urban settings, balconies, rooftop gardens. The unique combination of low maintenance, aesthetic appeal, and adaptability to arid conditions makes adenium a preferred choice among gardeners and landscapers. Adenium belongs to the family Apocynaceae, which includes ornamental genera such as *Nerium*, *Plumeria*, *Catharanthus* and *Allamanda*. It's thickened caudex serves as a reservoir for water and nutrients, enabling it to survive long dry spells. Despite its ornamental value, the success of adenium cultivation largely depends on the use of proper growing media to support healthy seedling development. In commercial nursery practices, inadequate attention is often paid to media selection, which negatively impacts caudex development and seedling vigour. Optimal potting media should possess appropriate physical and chemical properties such as porosity, water retention, nutrient availability, and pH balance to support root and shoot growth. While several substrate combinations such as sand, soil, FYM, cocopeat, and vermicompost are commonly used, their comparative effect on adenium seedling performance remains underexplored. It's slow growth rate and sensitivity to substrate quality, understanding the influence of different potting media is crucial for large-scale production and propagation. This study was therefore undertaken to evaluate the impact of various potting media combinations on growth of adenium. The findings aim to provide practical recommendations for nurserymen and hobbyists to enhance plant quality and reduce the time required for marketable seedling development.

Materials and Methods

The experiment was conducted at the Naturally Ventilated Polyhouse, College of Horticulture, Anand Agricultural University, Anand, Gujarat, during May to November in the year 2024..The experiment was laid out in a Completely Randomized Design (CRD) with three repetition and ten different potting media combinations, namely: T_1 : Soil + FYM (1:1 v/v) (control), T_2: Sand + FYM (1:1 v/v), T_3: Vermiculite + FYM (1:1 v/v), T_4: Cocopeat + FYM (1:1 v/v), T_5: Soil + Vermicompost (1:1 v/v), T_6: Sand + Vermicompost (1:1 v/v), T_7: FYM + Vermicompost (1:1 v/v), T_8: Cocopeat + Vermicompost (1:1 v/v), T_9: Soil + Sand + Cocopeat + FYM (1:1:1:1 v/v), and T_{10}: Soil + Sand + Cocopeat + Vermicompost (1:1:1:1 v/v).

Randomly five plants were selected from each treatment and labelled for the purpose of recording different observations. Mean value of the five selected plants from each treatment was taken to represent the treatment.

Days to initiation of germination

The data on days to germination was recorded daily after sowing till the time further emergence of seedlings. The period from the date of sowing to the emergence of first seedling was considered as the days to initiation of germination.

Days to 50% germination

Number of days required to reach 50% of germination was computedfrom the germination *percentage* calculated for each observation during the course of experiment.

Germination *percentage* at 15 days after sowing

When the plumule appeared on the top layer of soil and the radical reached the seed's 2 mm length, the seeds were considered to have germinated. Radical was measured with a vernier caliper. The number of seeds that germinated out of all the seeds sown at 15 days after sowing was used to calculate the *percentage* of seed germination. The following formula was used to determine the germination percentage at 15 days after sowing:

$$\text{Germination \%} = \frac{\text{No. of seeding germinated at 15 days after sowing}}{\text{Total number of seed sown}} \times 100$$

Shoot length (cm) at 60, 120,180 days after sowing

At intervals of 60, 120 and 180 days after sowing, plant height was measuredusing a measuring scale. It is measured in cm.

Plate 1 : General view of the experiment plot.

Tap root length (cm) at 60, 120, 180 days after sowing

At 60, 120 and 180 days after sowing, the tap root length (cm) wasmeasured. At each interval, five plants were randomly selected and carefully uprooted from the polybags. The roots were gently washed to remove adhering media particles without causing damage. The length of the tap root was measured from the collar region to the root tip using a measuring scale. The average value was calculated and expressed in centimeters.

Caudex girth (cm) at 60, 120, 180 days after sowing

At 60, 120 and 180 days after sowing, the caudex girth (cm) was measured with a vernier caliper just above ground level. For every observation, the mean values were calculated according to treatment.

Number of leaves per plant at 180 days

At 180 days after sowing, number of leaves per plant was noted.

Number of secondary roots per plant at 60, 120, 180 days after sowing

The number of secondary roots per plant was recorded at 60, 120 and 180 days after sowing. At each interval, five plants were carefully uprooted at random from the polybags. The roots were gently washed to remove adhering media particles without causing damage. The secondary roots emerging from the primary root system were counted manually. The average values were then calculated and expressed as the number of secondary roots per plant.

Germination vigour index

Vigour index recorded at 180 days from sowing by using following formula and expressed in cm.

Vigour Index = (Shoot length + Root length) × Standard Germination *Percentage*

Survival percentage at 180 days after sowing

At the end of the experiment, the survival *percentage*

observations were noted using the following formula:

$$\text{Survival percentage} = \frac{\text{Total no. of germinated seedlings} - \text{Total no. of dead}}{\text{Total no of germinated seedling}} \times 100$$

Results and Discussion

Effect of potting media composition on seedling growth and morphological performance of adenium

Shoot length (cm) at 180 days after sowing

The perusal of data indicated that highest seedling height (44.85 cm) was recorded in treatment T_6 [sand + vermicompost (1:1 v/v)] at 180 days after sowing. Though it was statistically at par with treatment T_8 [cocopeat + vermicompost (1:1 v/v)]. However, the minimum shoot length (13.45 cm) was recorded in treatment T_1 [soil + FYM (1:1 v/v)] at 180 days after sowing. It may be because sand and vermicompost are good-quality media for plant growth, as they provide the plant's root zone with essential nutrients and proper aeration. Vermicompost also contains a good amount of organic carbon and essential nutrients, both of which are essential for plant growth, and it also has a good capacity to hold water. This may have led to an increase in shoot length. Similar findings were reported by Khayyat *et al*. (2007) in *Epipremnum aureum* and Sumera *et al*. (2022), in adenium.

Tap root length (cm) at 180 days after sowing

It was found that among the different treatment T_6

Follicle of adenium

Mature follicle

Plate 2 : Collection of seed.

Sand + Vermicompost (1:1 v/v)

Mixture of media

Sowing of seed

Bed preparation

Bag filling

Plate 3 : Preparation of media and seed sowing.

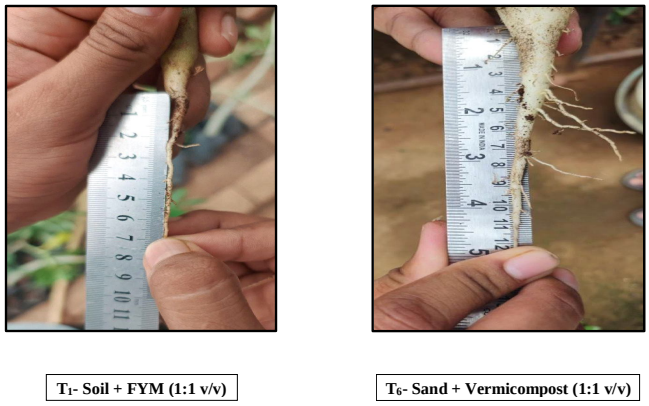


Plate 4 : Comparison between control treatment (T_1) and best treatment (T_6) on tap root length (cm) of adenium at 120 DAS of adenium.

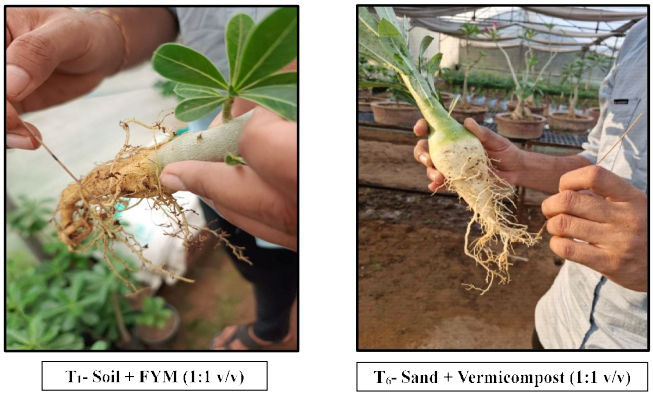


Plate 5 : Comparison between control treatment (T_1) and best treatment (T_6) on number of secondary root per plantat 180 DAS of adenium.

[sand + vermicompost (1:1 v/v)] recorded significantly maximum tap root length (16.17 cm) at 180 days after sowing as compared to rest of the treatments. Though it was statistically at par with treatment T_8 [cocopeat + vermicompost (1:1 v/v)]. On the other hand the minimum length of tap root (6.60 cm) at 180 days after sowing was noted in treatment T_1 [soil + FYM (1:1 v/v)].It might be because the vermicompost and sand enhance the physical and chemical characteristics of rooting media by increasing its waterholding capacity, aeration, mineralizing and solubilizing organic matter, and facilitating gaseous exchange between roots and the atmosphere. Vermicompost is rich in plant growth promoting substances like auxins, cytokinins, and gibberellins. The maximum tap root length might be due to more availability of auxin in growth media (Patel and Kumari, 2023). Similar findings were reported by Patel and Kumari (2023) in adenium.

Caudex girth (cm) at 180 days after sowing

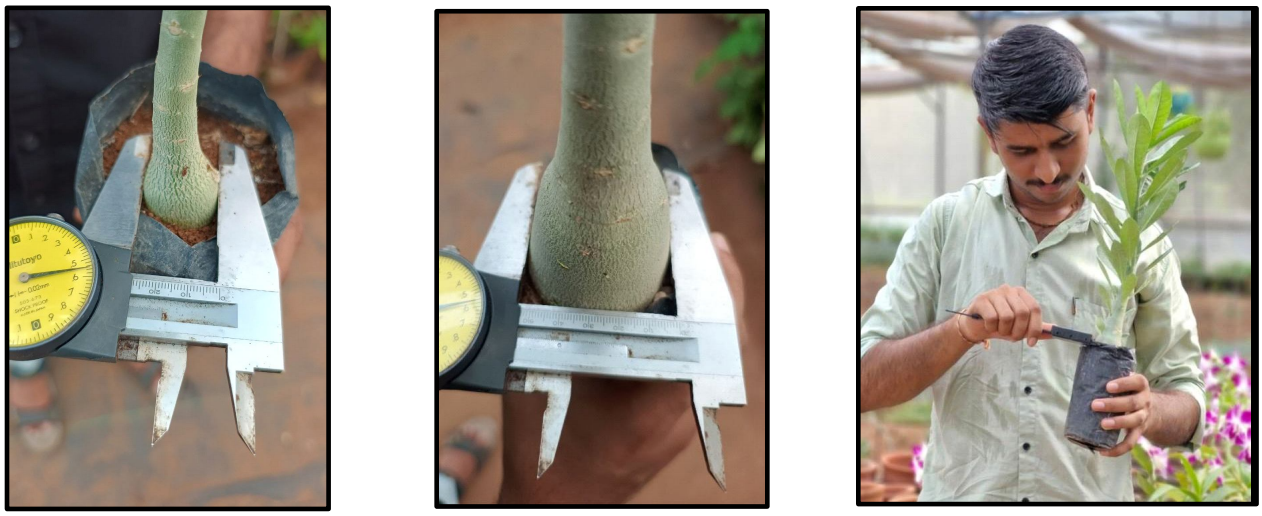
It is apparent from data that among the different media treatment T_6 [sand + vermicompost (1:1 v/v)] recorded significantly highest caudex girth of adenium seedling (4.10 cm) at 180 days after sowing, as compared to rest of treatment, which were statistically at par with treatment T_8 [cocopeat + vermicompost (1:1 v/v)]. While, significantly the lowest caudex girth of adenium seedling (1.62 cm) at 180 days after sowing, was noted in treatment T_1 [soil + FYM (1:1 v/v)]. It may be because

60- DAS **120- DAS** **180- DAS**

Plate 6 : Comparison between control treatment (T_1) and best treatment (T_6) on root parameter at 60, 120 and 180 DAS of adenium.

60- DAS **120- DAS** **180- DAS**

Plate 7 : Comparison between control treatment (T_1) and best treatment (T_6) on growth parameter at 60, 120 and 180 DAS of adenium.



T_1- Soil + FYM (1:1 v/v) **T_6 – Sand + Vermicompost (1:1 v/v)** **Measurement of caudex girth**

Plate 8 : Comparison between control treatment (T_1) and best treatment (T_6) on caudex girth (cm) of adenium at 120 DAS of adenium.

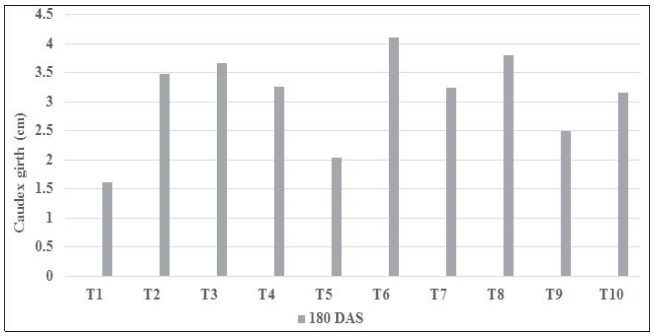


Fig. 1 : Effect of potting media composition on caudex girth (cm) of adenium.

the vermicompost and sand improve the physical and chemical properties of the growing media by enhancing aeration, water-holding capacity, nutrient availability, and microbial activity, which collectively support better metabolic functions and structural development. This favourable environment may have promoted greater photosynthate allocation and radial growth at the stem base, leading to an increase in caudex girth. Similar findings were reported by Colombo *et al.* (2017), Sumera *et al.* (2022), Patel and Kumari (2023) in adenium.

Table 1 : Effect of potting media composition on seedling growth and morphological performance of adenium.

S. no.	Shoot length (cm)	Tap root length (cm)	Caudex girth (cm)	Number of leaves per plant	Number of secondary root per plant	Survival percentage (%)
T_1	13.45	6.60	1.62	18.42	46.73	78.81
T_2	38.04	11.95	3.47	43.30	76.42	89.20
T_3	41.00	13.39	3.66	43.37	78.04	89.98
T_4	37.45	10.84	3.26	42.86	71.83	88.61
T_5	28.64	8.31	2.03	33.62	55.93	86.35
T_6	44.85	16.17	4.10	47.13	86.94	98.17
T_7	37.14	10.27	3.24	41.67	66.72	87.69
T_8	42.67	15.73	3.80	45.03	81.44	93.98
T_9	33.28	9.47	2.50	37.77	61.63	86.68
T_{10}	36.70	9.61	3.15	40.97	64.23	87.24
S.Em ±	0.96	0.30	0.08	1.04	2.02	2.42
CD (P=0.05)	2.85	0.90	0.26	3.08	5.98	7.14
CV%	4.74	4.73	5.05	4.59	5.09	4.73

Number of leaves per plant at 180 days

The perusal data showed that. among the different media treatment T_6 [sand + vermicompost (1:1 v/v)] recorded significantly maximum number of leaves per plant of adenium seedling (47.13) at 180 days after sowing, as compared to rest of treatment, which were statistically at par with treatment T_8 [cocopeat + vermicompost (1:1 v/v)]. While, significantly the minimum number of leaves per plant of adenium seedling (18.42) at 180 days after sowing, was noted in treatment T_1 [soil + FYM (1:1 v/ v)]. It may be due to better nutrient availability and improved root zone conditions, which enhanced the production of photosynthetically active leaves in the growing media. The combination of sand and vermicompost might have provided a balanced environment with adequate aeration, moisture retention, and essential nutrients, supporting vegetative growth. Similar results were also obtained by Sahu *et al.* (2023) in petunia, Chauhan *et al.* (2014) in gerbera Chandrakar *et al.* in(2018) lilium.

Number of secondary root per plant at 180 days after sowing

It is apparent from data that among the different media treatment T_6 [sand + vermicompost (1:1 v/v)] recorded significantly highest number of secondary root of adenium seedling (86.94) at 180 days after sowing, as compared to rest of treatment, which were statistically at par with treatment T_8 [cocopeat + vermicompost (1:1 v/v)]. While, significantly the lowest number of secondary roots of adenium seedling (46.73) at 180 days after sowing, was noted in treatment T_1 [soil + FYM (1:1 v/v)]. It might be due to sand provides excellent drainage and aeration, preventing root suffocation and promoting healthy root respiration, while vermicompost supplies essential macro and micronutrients along with plant growth-promoting substances such as auxins, gibberellins and cytokinins. The combination enhances microbial activity and improves water holding capacity without compromising porosity, may be resulting in better nutrient uptake. physical and chemical improvements in the root zoon may be led to an increased number of secondary root.

Survival percentage at 180 days after sowing

The perusal data showed that. among the media treatment T_6 [sand + vermicompost (1:1 v/v)] recorded significantly maximum survival percentage (98.17%) and it was at par with treatment T_8 [cocopeat + vermicompost (1:1 v/v)]. While, minimum survival percentage (78.81%) was found in treatment T_1 [soil + FYM (1:1 v/v)]. It might be due to Sand ensured improved drainage and root-zone aeration, effectively preventing waterlogging and reducing the risk of root rot conditions to which adenium is particularly susceptible. while vermicompost supplies essential nutrients, beneficial microbes, and organic matter that promote root health and enhance plant resilience. The improved physical and biological environment minimize stress during the critical phase. The balance between moisture retention and aeration likely reduced mortality due to overwatering or desiccation.

Conclusion

On the basis of result obtained from research experiment of adenium, it can be concluded that growing media sand + vermicompost (1:1 v/v) was most effective treatment to increase the growth parameters of adenium

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