Original Research Article

Assessment of Seed Germination and Growth of Seedling in Different Adenium Hybrids (*Adenium arabicum*) Under Prayagraj Agro-climatic Conditions

Abstract

An experiment entitled "Seed germination and seedling growth of different Adenium hybrids (*Adenium arabicum*) under Prayagraj agro-climatic conditions" was carried out during May, 2023 to April, 2024 in naturally ventilated polyhouse in the Department of Horticulture, SHUATS, Prayagraj. The experiment was laid out in completely randomized design with 10 hybrids and each hybrid was replicated thrice. The different hybrids used in the experiment were White Zombie, Green Arabicum, Hulk, Super Dork Dork, RCN, KHZ, PBN, Godji x Red Bangle, Godji F2 and Gc x GT. The experimental results revealed that hybrid PBN reported significantly better performance in parameters like germination percentage (100%), days to 50% germination (4.4), seedling vigour index (1813.33), germination speed index (1.15), survival percentage (100%), seedling height (11.07cm), number of leaves per seedlings (16.67), leaf area (15cm^2) and caudex diameter (3.93cm) which was found to be at par with hybrid RCN. Hence, hybrids PBN and RCN could be recommended for Prayagraj agro-climatic conditions.

Key words: *Adenium, caudex, germination, growth, hybrid, seed*

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1. INTRODUCTION

Adenium has gained prominence in the ornamental and landscape gardening because of its striking caudex forms and flower colour. *Adenium arabicum* is a succulent plant characterized by its broad, swollen trunk and short branches, resembling a miniature baobab tree, often considered a distinct species and is popular among succulent collectors (**Hastuti *et al.*, 2009**).

It is cultivated for its shiny leaves, growth form and flowering characteristics. It is a highly prized ornamental flowering plant suitable for outdoor cultivation and bonsai development. *Adenium arabicum* is also known as desert rose, elephant's foot and Adan bush (**Singh *et al.*, 2017**).

With its succulent nature and distinctive swollen trunk resembling a miniature baobab tree, it has become a popular choice for xeriscaping, contributing significantly to ornamental markets. Growth form is squat and fat, with a definite caudex and without much differentiation between trunk and branches. The plants are primarily regarded for its structure and development of larger caudex (**Sindhuja *et al.*, 2020**). It is the most valuable species because of its larger caudex.

The continuous evolution of new hybrids necessitates evaluating the seed germination and seedling growth performance in different Adenium hybrids. Hence, the aim of this experiment is to evaluate the seed germination and seedling growth of different Adenium hybrids, specifically *Adenium arabicum*, under Prayagraj agro-climatic conditions.

2. MATERIALS AND METHODS

The current experiment was carried out in naturally ventilated polyhouse in the Department of Horticulture, SHUATS, Prayagraj, during May, 2023 to April, 2024. The experiment was laid out in completely randomized design (CRD) with 10 hybrids and each hybrid was replicated thrice. Total number of 150 plants consisting of 10 adenium hybrids *viz.,* White Zombie, Green Arabicum, Hulk, Super Dork Dork, RCN, KHZ, PBN, Godji x Red Bangle, Godji F2 and Gc x GT were taken for the study. The recommended cultural practices was followed for raising the crop. The data recorded during the experiment were subjected to statistical analysis by using analysis of variance (ANOVA).

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3. RESULTS AND DISCUSSION

3.1 Germination Parameters

Significant variations were observed among the 10 adenium hybrids studied across all the germination parameters and the data is presented in Table 1.

The data presented in Table 1 shows significantly higher germination percentage (100%) in hybrids H_7 (PBN) and H_5 (RCN) which was found to be at par with hybrid H_6 (KHZ, 93.33%), while lesser germination percentage (60%) was observed in hybrid H_3 (Hulk). Significantly lesser number of days to 50% germination (4.4) was observed in the hybrid H_7 (PBN) which was found to be at par with H_5 (RCN, 5.4), while more number of days to 50% germination (7.6) was observed in hybrid H_3 (Hulk). Variation in germination percentage and number of days to 50% germination could be influenced by the parental genotypes, their genetic makeup as well as prevailing temperature and other environmental conditions during the growing period. These findings are consistent with findings of **Baskin *et al.* (2004)** in adenium and **Ranchana *et al*. (2016)** and **Raja *et al.* (2003)** in tuberose.

Significantly higher seedling vigour index (1813.33) was observed in the hybrid H_7 (PBN) which was found to be at par with hybrid H_5 (RCN, 1588), while lesser seedling vigour index (520.33) was observed in hybrid H_3 (Hulk). Significantly higher germination speed index (1.15) was observed in the hybrid H_7 (PBN) followed by hybrid H_5 (RCN, 1.01), while lesser germination speed index (0.55) was observed in hybrid H_3 (Hulk). Variation in germination speed index and seedling vigour

index may be due to the inheritant character and genetic makeup of the hybrids and environmental conditions. Similar results was recorded in tuberose by **Raja *et al.* (2003).**

Table 1. Germination parameters of different Adenium hybrids

Hybrids	Germination Percentage (%)	Seedling vigour index	Days to 50% germination	Germination speed index
White Zombie	80.00	909.33	6.2	0.78
Green Arabicum	73.33	758.67	6.8	0.75
Hulk	60.00	520.33	7.6	0.55
Super dork dork	66.67	570.00	7.2	0.67
RCN	100.00	1588.00	5.4	1.01
KHZ	93.33	1446.67	5.6	0.91
PBN	100.00	1813.33	4.4	1.15
Godji x Red bangle	86.67	947.33	5.6	0.89
Godji F2	73.33	566.67	6.47	0.72
Gc x GT	80.00	1096.67	5.8	0.87
F- TEST	**S**	**S**	**S**	**S**
SE(d)±	**8.43**	**201.71**	**0.17**	**0.03**
$CD_{0.05}$	**17.59**	**420.76**	**0.36**	**0.06**
CV (%)	**12.70**	**24.18**	**3.49**	**4.38**

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3.2 Vegetative Parameters

Significant variations were observed among the 10 adenium hybrids studied across all the vegetative parameters and the data is presented in Table 2.

Significantly taller seedlings (11.07cm) were observed in hybrid H_7 (PBN) which was found to be at par with hybrid H_5 (RCN, 10cm), while shorter seedlings (5.8cm) were observed in hybrid H_3 (Hulk). Variation in plant height among the hybrids prevails due to genetic inheritance and growing environmental conditions. Significantly more number of leaves (16.67) was observed in the hybrid H_7 (PBN) which was found to be at par with hybrid H_5 (RCN, 15.33), while minimum number of leaves (5.33) was observed in hybrid H_3 (Hulk). These findings were consistant in adenium by **Varella *et al.* (2015).**

Significantly maximum leaf area (15.60 cm^2) was observed in the hybrid H_7 (PBN) which was found to be at par with hybrid H_5 (RCN, 14.63cm^2), while lesser leaf area (7.67cm^2) was observed in

hybrid H_3 (Hulk). Significantly maximum caudex diameter (3.93cm) was observed in the hybrid H_7 (PBN) which was found to be at par with hybrid H_5 (RCN, 3.27cm), while minimum caudex diameter (0.83cm) was observed in hybrid H_3 (Hulk). Significant variation in leaf area and caudex diameter can be attributed to genetic variability of the hybrids along with environmental conditions which govern the plant growth were recorded in adenium by **Dimmit (1998) and Varella *et al*. (2015).**

Significantly higher survival percentage (100%) was observed in the hybrid H_7 (PBN) which was found to be at par with hybrid H_5 (RCN, 93.33%), while lesser survival percentage (46.67%) was observed in hybrid H_3 (Hulk). A germinated seed is highly vulnerable to lack of moisture for growth, fire, herbivores, burial under litter, being washed away by rain, and heat on bare soil, and hence up to 90% of released seed will not make it past the seedling stage were recorded in adenium by **Vander *et al*. (2017).**

Table 2. Vegetative parameters of different Adenium hybrids

Hybrids	Survival percentage (%)	Seedling height at 360 DAS (cm)	Number of leaves at 360 DAS	leaf area (cm^2)	Caudex diameter (cm)
White Zombie	73.33	7.67	13.33	12.50	2.50
Green Arabicum	66.67	6.57	10.67	11.67	2.00
Hulk	46.67	5.8	5.33	7.67	0.83
Super dork dork	53.33	8.43	11.67	11.07	1.78
RCN	93.33	10	15.33	14.63	3.27
KHZ	66.67	9	14.00	13.93	3.00
PBN	100.00	11.07	16.67	15.60	3.93
Godji x Red bangle	80.00	8.07	12.67	13.50	1.93
Godji F2	73.33	7.27	11.00	11.73	1.53
Gc x GT	60.00	7.53	12.33	13.07	2.23
F- TEST	**S**	**S**	**S**	**S**	**S**
SE(d)±	**7.89**	**0.41**	**0.42**	**0.4**	**0.11**
$CD_{0.05}$	**16.45**	**0.86**	**0.88**	**0.83**	**0.23**
CV (%)	**13.5**	**6.23**	**4.2**	**3.87**	**5.84**

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4. CONCLUSION

It is concluded from the present investigation that the ten adenium hybrids under study showed significant variation in all the parameters observed. Adenium hybrid PBN recorded significantly better performance in parameters like germination percentage, days to 50% germination, seedling vigour index, germination speed index, seedling height, number of leaves per seedling, leaf area, caudex diameter and survival percentage. Hence, hybrid PBN is better performing in terms of germination and seedling growth under Prayagraj agro-climatic conditions.

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REFERENCE

Baskin, J. M. and Baskin, C. C. (2004). A classification system for seed dormancy. *Seed Science Research,* **14**(2): 1–16.

Dimmitt, M. G. (1998). Adenium culture, growing large specimens quickly. *Cactus Succulent Journal,* **63**(5): 59-64.

Hastuti, D., Suranto, P. and Setyono, P. (2009). Variation of morphology, karyotype, and protein band pattern of adenium (*Adenium obesum*) varieties. *Nusantara Bioscience*, **1**(2): 78-83.

Raja, K., Palanisamy, V. and Selvaraj, P. (2003). Evolving sexual seed propagation in tuberose (*Pollianthes tuberosa*). *Programme of Horticulture,* **35**(2): 233-236.

Ranchana, P. and Kannan, M. (2016). Self and cross compatability studies in tuberose (*Pollianthes tuberosa*). *Jounal of Genetics and Plant Breeding,* **11**(1): 33-36.

Sindhuja, M., Singh, A., Kapadiya, C., Bhandari, A. J., Shah, H.P. and Patel, A. I. (2020). Evaluation of *Adenium* genotypes for physio-chemical and flowering characters. *International Journal of Communication System,* **8**(4): 3840-3844.

Singh, A., Bhandari, A. J., Chavan, S., Patel, N. B., Patel, A. I. and Patel, B. N. (2017). Evaluation of *Adenium obesum* for potted ornamentals under soilless growing system. *International Journal of Current Microbiology and Applied Sciences*, **6**(12): 2141-2146.

Van der Walt, K. and Witkowski, E. T. F. (2017). Seed viability, germination and seedling emergence of the critically endangered stem succulent, *Adenium swazicum*, in South Africa. *South African Journal of Botany*, **109**: 237-245.

Varella, T. L., Silva, G. D., Cruz, K. D., Mikovski, A. I., Nunes, J. D. S., Carvalho, I. D. and Silva, M. D. (2015). *In vitro* germination of desert rose varieties. *Ornamental Horticulture*, **21**: 227-234.