“EVALUATION OF SEED GERMINATION, ESTABLISHMENT, AND GROWTH OF DIFFERENT BLACK ADENIUM (*Adenium arabicum*) HYBRIDS UNDER PRAYAGRAJ AGRO CLIMATIC CONDITIONS”

ABSTRACT

The experiment was conducted in the Department of Horticulture, Sam Higginbottom University of Agriculture Technology and Science, Prayagraj, during 2021-2022. The experiment was laid out in Completely Randomized Design (CRD) with 7 hybrids and each hybrid was replicated 3 times. The different hybrids used in the experiment were npy x Golden Crown x Black Hawk, Maung x Red Bracelet, Maung x Black mkmk, Black Hawk, Red Bracelet x Big Flower x Black Hawk, Bb x Black Chadda Petch, Bb(F1) x npy Golden Crown x Black Hawk. The result obtained showed that the hybrid Black Hawk showed significantly better performance in parameters like germination percentage (86 %), seed vigour index (610), seed viability (0.86), germination speed index (1.37), survival percentage (80 %), seedling height, (8.5 cm), no. of leaves per seedlings (12), estimated leaf area (4 sq.cm), stem/caudex diameter (1.56 cm) and taproot length (6.2 cm), which was par with the hybrid npy x Golden Crown x Black Hawk.

Key words**:** *Black adenium, Hybrid, Seed germination*

INTRODUCTION

Adenium is a genus of flowering plants in the family Apocynaceae first described as a genus in 1819. It is native to Africa and the Arabian Peninsula. It is widely used for indoor and outdoor decoration. Currently, it is one of the main ornamental plants cultivated in Brazil, especially in arid regions, with great relevance in the ornamental market due to its sculptural aspect, resistance to drought stress, and very showy flowers.

Adenium arabicum is a remarkable succulent plant with a grotesquely swollen trunk which resembles a miniature baobab tree. It is a pliable variety that develops a beautiful canopy in bonsai form. Bonsais are grown by way of slow and controlled growth. Arabicums are natural bonsais and hence grow relatively quicker in amusing shapes. It is a local or morphological form of *Adenium obesum*, commonly used to be known as a separate species and very popular with 'fat plant' collectors. *Adenium arabicum* also called as Desert rose, Elephant's foot, Adan bush, Mock azalea, Impala lily and Sabi star. They store water in their soft, swollen roots and stems to allow them to survive through periods of drought. Another contingent of taxonomic experts concludes that the subspecies warrant species status and further subdivide these into additional named varieties. A complete list can be found below all are in cultivation and available through nurseries that specialize in cacti and other succulent plants. But the most commonly available plants are grown from seed and are very similar to the true species found in nature. Young plants have an inflated trunk, sometimes called the caudex. From this fattened caudex arise several slender but soft and succulent stems which are sparsely branched in youth. It also has larger thick fleshy leaves shiny on the upper and lower surface. Even young plants 2-3 years old and 6-8 inches tall can put on beautiful floral display. Florists report that the thickening of the stem base can be shaped and thus attain higher market value; however, this characteristic is not manifested when the plant is vegetative propagated (Stegani et al., 2019). The form of the plant varies in habit and most plants in cultivation are hybrids, yet only a few cultivar names have a valid description.

The propagation of the species occurs mainly by seeds, whereas plants from seeds present more developed caudex and main root when compared to the ones propagated by cuttings. However, these are few studies describing the seeds and their germination process, as

well as other elements involved in the process, such as the ideal temperature for germination. In the process of germination, the water regulates the tissues rehydration, with the consequent intensification of respiration, and digestion and translocation metabolic activities, which are essential to supply energy and nutrients for growth resumption of the embryonic axis (Kikuchi *et al.*, 2006). To ensure the propagation of a species; and consequently, its sustainable exploitation, knowledge of its seed germination process is essential.

MATERIALS AND METHODS

The present investigation entitled "Evaluation of seed germination, establishment and growth of different black adenium *(Adenium arabicum)* hybrids under Prayagraj agro climatic conditions" was carried out in the Department of Horticulture, Sam Higginbottom University of Agriculture Technology and Science, Prayagraj, during 2021-2022.

The experimental material consisted of black adenium hybrid seeds of npy x Golden Crown x Black Hawk, Maung x Red Bracelet, Maung x Black mkmk, Black Hawk, Red Bracelet x Big Flower x Black Hawk, Bb x Black Chadda Petch, Bb(F1) x npy Golden Crown x Black Hawk. The experiment was laid out in Completely Randomized Design (CRD) with 7 hybrids and each hybrid was replicated 3 times. Observations like germination percentage (%) of seeds was calculated by divide the number of seeds germinated by the total number of seeds and multiply by 100. It is expressed in percentage. Seed vigour index was calculated using the formula Seed vigour index = germination percentage x seedling height. Seed viability was calculated by divide the number of seeds germinated by 100 seeds. Germination speed index was obtained by daily counts of the number of germinated seeds from the 5^{th} to the 14^{th} days (Maguire, 1962). Survival percentage (%) is the percent of living seedlings against total seedlings was calculated by divide the number of living seedlings by the total number of seedlings and multiply by 100.

The height of the seedlings from the media level to highest level attained by the leaves was measured with the help of centimetre scale. It is expressed in cm. Number of leaves/ seedling is taken by number of leaves in each hybrids was counted. Leaf area was estimated by placing black adenium leaf on grid paper. Outlines of the total leaf and holes within the leaf lamina are drawn by pencil on grid paper. leaf area is measured by counting grids covered by leaf. It is expressed in cm^2. Stem /caudex diameter measured with the help of thread and then it was measured with centimetre scale. The length of the taproots from collet to the end of the primary root was measured with the help of centimetre scale. It is expressed in cm. The data recorded during the experiment were subjected to statistical analysis by using analysis of variance (ANOVA). The significant difference among the hybrids were compared against the critical difference at 5% level of significance ($CD_{0.05}$).

RESULT AND DISCUSSION

Germination Parameters

The data presented in table 1 shows, Significantly, higher germination percentage was observed in the hybrid Black Hawk (86 %), npy x Golden Crown x Black Hawk (86 %), which is found to be at par with Red Bracelet x Big Flower x Black Hawk (66 %), Germination percentage could be influenced by the parental genotypes, their genetic makeup as well as prevailing temperature during the growing period. Similar results are recorded by Baskin and Baskin., (2004) and (Raja *et al*., 2003). Significantly, higher seed vigour index was observed in the hybrid Black Hawk (610), which is found to be at par with npy x Golden Crown x Black Hawk (559)**.** The variation in seed vigour index depends upon the shoot length of the seedlings and influenced by the parental genotypes, their genetic makeup as well as prevailing temperature during the growth period. Similar results recorded by Ranchana and Kannan (2016). Significantly, higher seed viability was observed in the hybrid Black Hawk (0.86) and npy x Golden Crown x Black Hawk (0.86), which is found to be at par with Bb(F1) X npy Golden Crown x Black Hawk (0.80)**.** Seed viability is due to the parental genotype, seed age, inbreeding depression, homozygosity of the seeds. Similar results were recorded in adenium by Vander *et al*., (2017). Significantly, higher germination speed index was observed in the hybrid Black Hawk (1.37), which is found to be at par with npy x Golden Crown x Black Hawk (1.33)**.** Germination speed index may be due to the inheritant character and genetic makeup of the hybrids and environmental conditions. Similar results recorded by (Raja *et al*., 2003)

Vegetative Parameters

The data presented in the table 2**,** Significantly, higher survival percentage was observed in the hybrid Black Hawk (80 %), which is found to be at par with Bb(f1) x npy Golden Crown x Black Hawk (66 %). 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. Similar results were recorded in adenium by Vander et al., (2017). Significantly, taller seedling height was observed in the hybrid Black Hawk (8.5 cm), which is found to be at par with npy x Golden Crown x

Black Hawk (8.2 cm), more number of leaves was observed in the hybrid Black Hawk (12.00),

which is found to be at par with Bb x Black Chadda Petch (11.3), maximum estimated leaf area was observed in the hybrid Black Hawk (4 sq.cm), which is found to be at par with npy x Golden Crown x Black Hawk (3.7 sq.cm), maximum stem/caudex diameter was observed in the hybrid Black Hawk (1.56 cm), which is found to be at par with npy x Golden Crown x Black hawk (1.46 cm), longer taproot length was observed in the hybrid Black Hawk (6.20 cm), which is found to be at par with npy x Golden Crown x Black Hawk (5.6 cm). Variability in plant height, number of leaves, estimated leaf area, stem/caudex diameter, taproot length among the hybrids prevails due to genetic inheritance, growing environmental conditions by

(Dimmit *et al*., 1998) and (Varella *et al*., 2015)

Table 1. Germination Parameters of different black adenium hybrids

Hybrids	**Germination Percentage (%)**	**Seed vigour index**	**Seed viability**	**Germination speed index**
npy x Golden Crown x Black Hawk	86	559	0.86	1.33
Maung x Red Bracelet	33	138	0.33	0.38
Maung x Black mkmk	60	258	0.60	0.76
Black Hawk	86	610	0.86	1.37
Red Bracelet x Big Flower x Black Hawk	66	316	0.65	0.87
Bb x Black Chadda Petch	80	385	0.73	0.78
Bb(F1) x npy Golden Crown x Black Hawk	80	463	0.80	0.75
F- TEST	S	S	S	S
SE(d)±	9.42	4.18	0.01	0.02
$CD_{0.05}$	20.4	9.07	0.03	0.04
CV (%)	16.3	1.31	2.83	2.92

Table 2. Vegetative Parameters of different black adenium hybrids

Hybrids	**Survival percentage (%)**	**Seedling height (cm)**	**Number of leaves**	**Estimated leaf area (sq.cm)**	**Stem/caudex diameter (cm)**	**Taproot length (cm)**
npy x Golden Crown x Black Hawk	66	8.2	11.90	3.7	1.46	5.6
Maung x Red Bracelet	33	6.5	10.4	2	1.16	3.6
Maung x Black mkmk	46	7.2	10.67	2.6	1.43	3.7
Black Hawk	80	8.5	12	4	1.56	6.2
Red Bracelet x Big Flower x Black Hawk	40	7.5	11.13	2.7	1.20	4.5
Bb x Black Chadda Petch	73	7.7	11.39	3.2	1.30	5
Bb(F1) x npy Golden Crown x Black Hawk	73	8.0	11.80	3.4	1.47	5.3
F- TEST	S	S	S	S	S	S
SE(d)±	7.96	0.17	0.29	0.06	0.08	0.33
$CD_{0.05}$	17.25	0.38	0.62	0.13	0.17	0.72
CV (%)	16.5	2.82	3.13	2.41	7.12	8.40

CONCLUSION

It is concluded from the present investigation that the 7 black adenium hybrids under study showed significant variation in all the parameters observed. The hybrid Black Hawk showed significantly better performance in parameters like germination percentage, seed vigour index, seed viability, germination speed index, survival percentage, seedling height, no. of leaves per seedlings, estimated leaf area, stem/caudex diameter and taproot length, the hybrid npy x Golden Crown x Black Hawk which was at par with black Hawk in parameters like seed vigour index, germination speed index, survival percentage, seedling height, estimated leaf area. Hence, hybrid Black hawk could be recommended for Prayagraj agro climatic conditions.

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