

**G.N.Ad 4 (Shobhita): A New Profuse flowering variety of *Adenium obesum***Alka Singh^{1*}, S.K. Chavan², G.D. Patel¹, A.J. Bhandari¹, H.P. Shah¹ and V.B. Patel³¹Department of Floriculture and Landscape Architecture (Gujarat), India.²Hitech Floriculture Project, Agriculture College, Pune (Maharashtra), India.³Department of Basic Science and Humanities, College of Forestry (Gujarat), India.

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ABSTRACT: A new profuse flowering variety G. N. Ad. 4 (Shobhita) derived from a cross of Picottee and Daeng Udam Sap was released in adenium, a popular ornamental plant in Gujarat. Research on *Adenium obesum*, a popular flowering pot plant is being conducted with the basic objective of genetic improvement at Advance Technology Centre of soilless system, department of Floriculture and Landscape Architecture, NAU, Navsari. Hybridization was done involving ten parents (six germplasm as female and three germplasm as male) and their crosses were studied wherein, a cross viz., NAPDUS1 (Picottee × Daeng Udam Sap) showed novel flower trait of profuse flowering habit in cluster with attractive pinkish red coloured petals having sharply pointed tip. Further, NAPDUS1 was evaluated for stability and other flowering characters and tested along with its parents viz., Picottee, Daeng Udam Sap, local germplasm i.e. Local Pink and the earlier released variety, GAd2 as check for three years during 2018 to 2020. NAPDUS1 was significantly superior in terms of number of flowers per cluster (10) and maximum number of opened flowers per cluster (8) and number of flowers per plant per year (245) as compared to parents, Local Pink and GAd2 as inferred from the three years mean data. Further, flower clusters per plant and flowering period were also higher in NAPDUS1 as compared to its parents, local pink and check G Ad.2

In view of the fact that the germplasm NAPDUS1 was found to be novel in flower trait bearing profuse flowers in cluster having pinkish red coloured petals with dark red coloured margin and was superior over check GAd2, local Pink as well as its parents, it was renamed as Gujarat Navsari Adenium 4 i.e., G. N. Ad 4 (Shobhita) and released in SVRC, Gujarat during 2021.

Keywords: Adenium, G Ad2, Shobhita, G. Ad.2, pot plant, germplasm, hybridization.

INTRODUCTION

Adenium obesum (Forssk.) Roem. & Schult, also known as Desert rose and Impala lily is becoming highly popular for pot culture throughout the world owing to its beautiful sculptural caudex, good branching and flowering habit and tolerance to drought stress (Dimmitt, 1998; Chavan *et al.*, 2016; Chavan *et al.*, 2018; Colombo *et al.*, 2016; Sindhuja *et al.*, 2020). It is an excellent plant for xeriscaping and roof top gardens (Chavan *et al.*, 2016; Colombo *et al.*, 2016; Colombo *et al.*, 2018). Belonging to the family Apocynaceae, it is native to Africa, South of the Sahara from Senegal to Sudan and Kenya, and through Saudi Arabia, Oman, and Yemen (Plaizier, 1980; Dimmitt and Hanson 1991). Until recently it was considered a relatively new flowering plant in the flower industry (Hastuti *et al.*, 2009; Singh *et al.*, 2017; Singh *et al.*, 2019), however, it is now in wide cultivation in many tropical countries including India, Philippines and Thailand (Chavan *et al.*, 2016; Colombo *et al.*, 2018; Roy and Fatmi 2022; Singh *et al.*, 2020) with great recognition in the floriculture industry (Wannakrairoj, 2008; Versiani *et al.*, 2014; McBride *et al.*, 2014).

Although, research in *Adenium* towards selecting or breeding superior horticultural forms has been inadequate (Chavan *et al.*, 2017, 2018; Sindhuja *et al.*, 2020, 2022; Singh *et al.*, 2018; Singh *et al.*, 2017; Singh *et al.*, 2019; Singh *et al.*, 2022).

Work on genetic improvement employing hybridization and selection in *Adenium obesum* with the objective to induce profuse flowering, novel flower colour, flower form and long flowering period *etc.*, is being carried out at Advance Technology Centre of soilless system, at ASPEE College of Horticulture, NAU, Navsari. A germplasm NAPDUS1 that was renamed as GNAd4 (Shobhita) derived from cross of Picottee and Daeng Udam Sap showed novel flower trait for flowering profusely in cluster with attractive pinkish red coloured petals with dark red coloured margin and sharply pointed tip. It was further multiplied by grafting and evaluated for its stability and other flowering parameters and its performance was tested over its parents Picottee and Daeng Udam Sap, commonly grown local germplasm collection viz., Local Pink and the earlier released variety G Ad2 as check.

MATERIALS AND METHODS

Breeding work on *Adenium obesum* was conducted at Advance Technology Centre of soilless system, Department of Floriculture and Landscape Architecture, ACH, NAU, Navsari during the year 2014-2021. Hybridization was followed in adenium with six germplasmas female (Line) viz., Sudarshan, Arrogant, Mung Siam, Harry Potter, Picottee, Vithoons White and three germplasm as male (Taster) viz., Daeng Udum Sap, Double Sweet Heart and Morlok Dok (Chavan *et al.*, 2018). Among different crosses obtained, NAPDUS1 derived from Picotte and Daeng Udum Sap was selected and multiplied by grafting on Local Pink root stock as per the standardized method (Singh *et al.*, 2023) and evaluated for stability and other flowering characters along with other germplasm *i.e.* parents G₂-Picottee, G₃-Daeng Udum Sap, G₄-Local Pink and earlier released variety G₅-G.Ad.2 as check. NAPDUS1 was renamed at GNAd4 (Shobhita) for variety release. The experiment was conducted under NV greenhouse units at advanced technology centre (ATC) and Practical Training Centre of Hi-tech horticulture (PTC) at NAU, Navsari under completely randomized design system with four repetitions for three years during 2018 to 2020. The plants were planted in plastic pots of size 13 cm height × 15 cm width and were placed at a spacing of 30 cm × 30 cm on stands in the greenhouse. The recommended package of practices (Singh *et al.*, 2018) was followed for raising the crop. Five plants from each germplasm were selected randomly and were tagged for recording the observations on flowering parameters namely, number of flowers per cluster, maximum opened flowers per cluster, flower clusters per plant, flowers per plant per year, flowering period (days) per year. Morphological characters for flower and leaf of all the germplasm were also noted. Consumer preference was also estimated as display quality based on 5 point visual score for flower colour, flowering behaviour and overall appearance. The data of three years were collected and subjected to the statistical analysis for CRD design, according the procedure described by Panse and Sukhatme (1967) for proper interpretation and significance of difference was tested by (F) test at 5% probability level. Results were used to evaluate the performance of the different germplasm collections for various flowering parameters.

RESULTS AND DISCUSSION

Flower parameters. Flowering trait in terms of clustering or bunching habit, flower colour, number of flowers per plant eventually influence the flowering pot plant value and ultimately the consumer's preference (Sankari *et al.*, 2016; Singh *et al.*, 2020). GNAd4 (Shobhita) *i.e.* NAPDUS1 recorded significantly maximum number of flowers per cluster (10.24) that was 18.26% higher over check GAd2 (Table 1) and

opened flowers per cluster (8.22) that was 136.89% higher over check GAd2 (Table 2 and Fig. 2) as well as flower clusters per plant, (8.22) that showed 16.67% increase over check GAd2 (Table 3) and as per the mean data of three years.

Genetic factor is responsible for morphological differences when different germplasm collections are grown under identical conditions with uniform management practices. Thus, variation among different adenium germplasms is an indicative of differences in the genetic makeup. These results are in agreement with the earlier observations of Dimmitt (1998); Varella *et al.* (2015); Singh *et al.*, 2017, 2020) in Adenium.

Yield in terms of number of flowers per plant per year and flowering period in days are important parameters for flowering pot plants. GNAd4 (Shobhita) recorded significantly maximum flowers per plant (245.19) that was 73.27% higher than the GAd2 check as per the mean data of three years, Table 4. Further, flowering period was also maximum in GNAd4 (224.67 days) that showed 16.56% increase over GAd2 (Table 5). Morphological characters of all the germplasms differed has been shown in Table 6. NAPDUS1 looked attractive owing to novel flower trait for flowering profusely in cluster with attractive pinkish red coloured petals with dark red coloured margin and sharply pointed tip. Consumer preference for GNAd4 (Shobhita) was also found to be highest with maximum score for flower colour (4.4), flower form (4.7) and pot plant (4.6) as shown in Fig. 1. In the classification of cultivars as well as to study taxonomic status, genetic diversity studies based on differences in morphological characters and qualitative traits has been used as a potent tool (Lalitha Kameswari *et al.*, 2014).

Variation in different flower traits in adenium was a result of divergence in these germplasm as opined by earlier work in adenium (Singh *et al.*, 2017; Chavan *et al.*, 2017; Chavan *et al.*, 2018; Singh *et al.*, 2019). Flower variation among different varieties have been earlier known in ornamental pot plants like rose (Shahrin *et al.*, 2015) and Orchids (Sugapriya *et al.*, 2012).

Adenium GNAd4 (Shobhita) assumes significance owing to its superiority and novelty in respect of flower colour and flower morphology with attractive pinkish red coloured petals with dark red coloured margin and pointed tip, as well its superior performance with respect to other flowering parameters, especially number of flowers per cluster, opened flowers per cluster, flower clusters per plant and a greater number of flowers per plant along with flowering period. Hence, GNAd 4 (Shobhita) was released as a variety in the State Variety Release Committee meeting, held at Gandhinagar, Gujarat dated 27th August 2021. The variety Shobhita is recommended to nursery men as well as landscape designers for growing as pot culture as well as for landscaping and roof top gardening.

Table 1: Number of flowers per cluster performance of GNAd 4 (Shobhita) with checks and parents.

Year	Trial	Location	G N Ad4 (Shobhita)	G Ad.2 (Check)	Picottee (Female Parent)	Daeng Udam Sap (Male Parent)	Local Pink (Local Check)	S. Em. \pm	C. D. at 5%	C. V. %
2018	Varietal evaluation	ATC Soilless Navsari	12.22	9	3.44	8.11	4.05	0.23	0.66	6.28
2019	Varietal evaluation	ATC Soilless Navsari	10.44	10.2	3.11	6.33	4.15	0.33	0.97	10.26
	Varietal evaluation	PTC Navsari	8.33	8.11	3.54	6.77	3.41	0.21	0.59	8.57
2020	Varietal evaluation	ATC Soilless Navsari	11.67	9.56	2.78	6.22	4.41	0.31	0.9	9.58
	Varietal evaluation	PTC Navsari	8.56	6.44	3.53	7.22	3.30	0.25	0.73	9.86
Mean			10.244	8.662	3.28	6.93	3.86			
Heterosis % increase over			--	18.26	212.32	47.82	165.39			

Table 2: Maximum opened flowers per cluster performance of GNAd 4 (Shobhita) with checks and parents.

Year	Trial	Location	G N Ad4 (Shobhita)	G Ad.2 (Check)	Picottee (Female Parent)	Daeng Udam Sap (Male Parent)	Local Pink (Local Check)	S. Em. \pm	C. D. at 5%	C. V. %
2018	Varietal evaluation	ATC Soilless Navsari	9.78	4.45	2.33	6.22	2.30	0.17	0.5	7.06
2019	Varietal evaluation	ATC Soilless Navsari	8.55	3.55	2.22	4.33	3.30	0.23	0.68	11.09
	Varietal evaluation	PTC Navsari	6.78	2.89	3.22	5.22	2.30	0.21	0.64	12.82
2020	Varietal evaluation	ATC Soilless Navsari	9.11	3.44	1.89	4.22	2.22	0.31	0.67	11.14
	Varietal evaluation	PTC Navsari	6.89	3.00	2.22	5.33	3.22	0.25	0.75	14.33
Mean			8.22	3.47	2.38	5.06	2.67			
Heterosis % increase over			--	136.89	245.38	62.45	207.87			

Table 3: Flowers per plant per year performance of GNAd 4 (Shobhita) with checks and parents.

Year	Trial	Location	G N Ad4 (Shobhita)	G Ad.2 (Check)	Picottee (Female Parent)	Daeng Udam Sap (Male Parent)	Local Pink (Local Check)	S. Em. \pm	C. D. at 5%	C. V. %
2018	Varietal evaluation	ATC Navsari	313.33	186	81.00	65.00	61.22	4.41	12.72	6.85
2019	Varietal evaluation	ATC Navsari	212.89	125.22	72.11	63.66	60.22	4.59	13.26	10.03
	Varietal evaluation	PTC Navsari	239.89	140.67	70.22	62.16	59.53	1.95	5.63	4.02
2020	Varietal evaluation	ATC Navsari	245.33	120.67	48.67	75.67	61.23	5.95	14.30	9.41
	Varietal evaluation	PTC Navsari	214.50	135	62.23	77.63	64.53	9.4	27.14	18.81
Mean			245.19	141.51	66.80	68.80	61.30			
Heterosis % increase over			--	73.27	267.05	256.38	299.98			

Note : G NAd4 shows 143% increase over G Ad1 and 73% increase over G Ad2 in terms of Flowers per plant per year

Table 4: Flower clusters per plant performance of GNAd 4 (Shobhita) with checks and parents.

Year	Trial	Location	G N Ad4 (Shobhita)	G Ad.2 (Check)	Picottee (Female Parent)	Daeng Udam Sap (Male Parent)	Local Pink (Local Check)	S. Em. ±	C. D. at 5%	C. V. %
2018	Varietal evaluation	ATC Navsari	1.79 (3.22)	1.53 (2.33)	1.15 (1.33)	1.41 (2.00)	1.19	4.41	12.72	6.85
2019	Varietal evaluation	ATC Navsari	1.76 (3.11)	1.56 (2.44)	1.19 (1.44)	1.48 (2.22)	1.15	4.59	13.26	10.03
	Varietal evaluation	PTC Navsari	1.82 (3.33)	1.45 (2.11)	1.10 (1.22)	1.49 (2.22)	1.2	1.95	5.63	4.02
2020	Varietal evaluation	ATC Navsari	1.63 (2.67)	1.37 (1.89)	1.20 (1.44)	1.41 (2.00)	1.19	5.95	14.30	9.41
	Varietal evaluation	PTC Navsari	1.76 (3.11)	1.60 (2.56)	1.29 (1.67)	1.53 (2.33)	1.20	9.4	27.14	18.81
	Mean		1.75 (3.09)	1.50 (2.67)	1.19 (1.42)	1.46 (2.15)	1.186			
	Heterosis % increase over		—	16.67	47.06	19.86	47.55			

Table 5: Flowering period (Days) plant performance of GNAd 4 (Shobhita) with checks and parents.

Year	Trial	Location	G N Ad4 (Shobhita)	G Ad.2 (Check)	Picottee (Female Parent)	Daeng Udam Sap (Male Parent)	Local Pink (Local Check)	S. Em. ±	C. D. at 5%	C. V. %
2018	Varietal evaluation	ATC Navsari	268.33	173.33	205.67	133.33	93.33	4.41	12.72	6.85
2019	Varietal evaluation	ATC Navsari	205.22	197.55	176.33	101.66	86.22	4.59	13.26	10.03
	Varietal evaluation	PTC Navsari	222.78	211.22	184.33	110.67	81.66	1.95	5.63	4.02
2020	Varietal evaluation	ATC Navsari	205.33	195.00	118.67	80.33	79.66	5.95	14.30	9.41
	Varietal evaluation	PTC Navsari	221.67	186.67	136.33	98.67	93.33	9.4	27.14	18.81
	Mean		224.67	192.75	164.27	104.93	86.84			
	Heterosis % increase over		--	16.56	36.77	114.11	158.72			

Table 6: Morphological characters of GNAd 4 (Shobhita) with checks and parents.

Sr. No.	Characteristics	G N Ad4 (Shobhita)	G Ad.2 (Check)	Picottee (Female Parent)	Daeng Udam Sap (Male Parent)	Local Pink (Local Check)
1.	Leaf colour	Green	Green	Green	Green	Green
2.	Leaf type	Small with very wavy leaf margin	Thin and long with smooth incurving margin	Medium with smooth margin	Medium and broad with smooth margin	Medium and narrow with smooth margin
3.	Flower colour	Pinkish Red	Reddish Purple	Pinkish white	Red	Pink
4.	Petal margin colour	Red	Strong Purple	Pink	Red	Pinkish red
5.	Petal tip	Elongated and Sharply Pointed	Broadly pointed petal tip	Pointed	Obtuse	Slightly Pointed
6.	Flower form	Single whorl	Double type	Single whorl	Single whorl	Single whorl
7.	No. of petals	5	10	5	5	5
8.	Corolla tube colour	Yellow	White	Cream	Reddish pink	White
9.	Petal margin character	Smooth	Wavy	Smooth	Slightly Wavy	Slightly Wavy

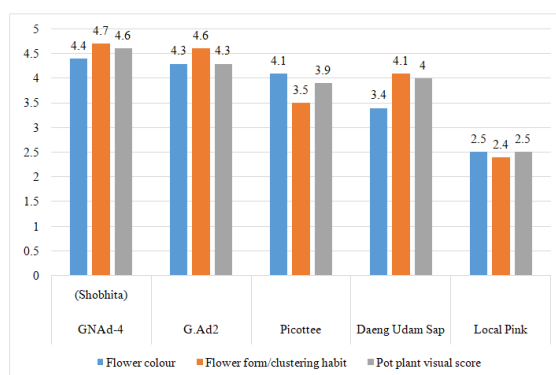


Fig. 1. Scoring for consumer preference on visual basis (5 point scale) for different germplasm in Adenium.



Fig. 2. Photographs of GNAd 4 (Shobhita).

CONCLUSIONS

In conclusion, this research endeavour revealed GNAd4 (Shobhita) as a new superior and novel variety in adenium that is developed from a cross of Picottee × Daeng Udum Sap. It bears profuse flowers in clusters having attractive pinkish-red coloured petals with dark red coloured margins and pointed tips.

FUTURE SCOPE

Adenium is heterozygous in nature and a highly cross pollinated crop. There has been meagre research about breeding in adenium. The present investigation led to the development of a novel germplasm that was further released as a variety at SVRC. There is great scope of exploring breeding work in adenium that can further lead to development of new germplasms having novel flower colour, flower form and long flowering period. The newly developed variety GNAd4 (Shobhita) can be further exploited for commercial application as well as for breeding work in the floriculture industry

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Conflict of Interest. None.

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