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Study On Growth, Floral and Yield Parameters of Crossandra Genotypes Under Coastal Andhra Aradesh Conditions

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ABSTRACT
The present investigation was conducted at College of Horticulture, Venkataramannagudem, West Godavari district of Andhra Pradesh during 2017-18. The experiment was carried out in a Randomized Block Design with ten treatments (ArkaAmbara, Arka Kanaka, ArkaShreeya, ArkaShravya, Nilakottai Local, Bengaluru Local, Ratanaboli, Kadiyam Local 2, ACS-6 and Kadiyam Local 1 as a check) and replicated thrice. The observations were recorded on various vegetative, flowering and yield parameters in which the genotype ArkaShravya exhibited superiority in vegetative parameters like plant height (56.97 cm), plant spread (1407.53 cm2), leaf area (1717.70 cm^2) whereas, Arka Shreeya showed the earliest spike initiation (66.00 days) and 50 per cent flowering (74.33 days) while, Kadiyam Local 2 found to be earliest in number of days for complete flowering (79.67 days) as compared to check and other genotypes. The genotype Arka Shravya recorded maximum rachis length (12.77 cm), number of spikes per plant (86.72), number of florets per spike (53.67) and flower yield per plant (338.27 g) as compared to check and other genotypes.
Key words: Crossandra, Genotypes, Evaluation and Check.

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INTRODUCTION

Crossandra (*Crossandra infundibuliformis* L.) is commonly known as 'Fire cracker plant'. Crossandra is an evergreen shrub belonging to the family Acanthaceae. All species of crossandra are native of the Arabian Peninsula, tropical Africa, Madagascar, India and Sri Lanka. Being an important commercial flower, it is mainly grown in India, tropical Africa and Madagascar. The crop is a major commercial flower in South India and grown in Karnataka, Tamil Nadu and Andhra Pradesh. Though the flowers are not fragrant like jasmine, rose or tuberose, they are priced high for their attractive colour and longer shelf life. The flowers are offered to temple deities and mostly used in making garlands, gajras and venis. Crossandra consists of five coloured forms namely orange, yellow, red, deep orange and bluish flowered forms. The orange type is only variety commercially grown. But it is highly susceptible to wilt, root knot and lesion nematodes [1]. Three other forms of crossandra: Yellow, Deep Orange and Sebacules Red are grown to a small extent [2]. Deep orange red is triploid, similar to Mona Wallhead, the only cultivar of crossandra grown commercially in Denmark [3]. In India there are several genotypes under crossandra, including the IIHR varieties namely, Arka Ambara (IIHR 2004-9), Arka Kanaka (IIHR 2004-11), Arka Shreeya (Local x Arka Ambara) and Arka Shravya (Crossandra nilotica x Mangalore local). There is always a high demand and popularity for traditional flowers in different locations of our country due to its varied heritage and festive cultures. Several released varieties as well as local varieties (types) are used for commercial cultivation. Both the vegetative and reproductive characters of a crop vary among different genotypes. However, the performance of a genotype also varies and is greatly influenced by agro-climatic conditions like temperature, rainfall, soil etc. Thus, the performance of a genotype differs from region to region. Therefore, evaluation of available genotypes will help in identifying the best performing genotypes in a particular region. Further, it is also useful in crop improvement programmes to bring in new colours, forms with good keeping quality and biotic stress resistant varieties in this crop.

MATERIAL AND METHODS

The present study was carried out during the year 2017 to 2018 at College of Horticulture, Dr. Y.S.R Horticultural University, Venkataramannagudem, West Godavari District, Andhra Pradesh. The rooted cuttings of ten genotypes of crossandra were procured from ICAR-IIHR, Bengaluru, Karnataka, TNAU, Coimbatore, Tamil Nadu, HRS, Anantharajupeta and Kadiyam, Andhra Pradesh and planted in plots of 2.9 m x 2.9 m size at a spacing of 45 cm x 45 cm. Well decomposed farm yard manure at the rate of 25 t FYM and the recommended dose of fertilizers viz., Urea, Single Super Phosphate and Muriate of Potash in a ratio of 50: 100: 60 kg per hectare were taken as the sources of N, P_2O_5 and K_2O, respectively. Entire dose of phosphorus and potassium was given as basal application and the nitrogen was applied in two splits at 30 and 60 days after planting. The standard cultural practices were followed throughout the experiment and five plants were selected at random and tagged in each replication of respective treatments for the purpose of recording observations on vegetative parameters, flowering parameters, yield parameters

RESULTS AND DISCUSSION

Plant height

The plant height among different crossandra genotypes varied significantly (Table 1). At 150 DAP the highest plant height (56.97 cm) was recorded by the genotype Arka Shravya, Whereas, the genotype Bengaluru local (29.77 cm) and Nilakottai local (30.60 cm) exhibited the shortest plant height. The variation among different genotypes may be attributed to genetic makeup of the genotypes as observed by Dimri *et al.* [4] in tuberose. The maximum plant height in Arka Shravya may be due to more internodal length. The results are in line with the findings of Priyanka *et al.* [5] in crossandra.

Plant spread (cm^2)

Significant differences were observed among different genotypes of crossandra with respect to plant spread. At 150 DAP, the maximum plant spread was recorded in genotype Arka Shravya (1407.53 cm^2). However, the genotype ACS-6 showed minimum plant spread (674.30 cm^2). The maximum plant spread was exhibited by the genotype Arka Shravya (1407.53 cm^2) as compared to the check (1093.60 cm^2). Similar results were reported by Priyanka *et al.* (2017) in the genotype Arka Shravya. This may be due to peculiar branching and flowering habit of the plant producing spikes only on one side of the branch and also it has shown more internodal length and wider crotch angle between the branches. The differences in plant spread is a varietal trait and is probably governed by the genetic makeup. Varietal differences in plant spread was reported by Kulkarni and Reddy [6] in China aster.

Leaf area (cm^2)

The data related to leaf area per plant depicted significant differences among genotypes of crossandra. The genotype Arka Shravya recorded maximum leaf area (1717.70 cm^2) while, the minimum leaf area was observed in ACS-6 (590.19 cm^2) at 150 DAP. Comparative studies among the genotypes of crossandra revealed that the genotype Arka Shravya (1717.70 cm^2) recorded more leaf area than check (787.16 cm^2). The variation in leaf area among different genotypes of crossandra may be due to difference in plant height, plant spread and number of leaves per plant [7].

Number of days taken for spike initiation

The differences observed in the number of days taken for spike initiation among the genotypes were found significant. The genotype Arka Shreeya (66.00 days) showed earliest spike initiation among all the genotypes but was on par with Arka Ambara (66.67 days), Kadiyam Local 2 (68.00 days), Arka Kanaka (71.67 days) and Arka Shravya (70.33 days) whereas, Bengaluru Local delayed in spike initiation (81.13 days) which was on par with remaining two genotypes. A comparison of the data with check revealed that except Nilakottai Local (80.00 days) and Bengaluru Local (81.13 days), all other genotypes were at par in respect of the number of days taken for spike initiation. Days taken to spike initiation is an important character describing the earliness of flowering which is useful for the selection of precocious varieties. The variation in days taken to spike initiation might be primarily governed by the genetic makeup as observed in the present study and also as evident from the earlier findings of Naresh *et al.* [8] in gladiolus. Chourasia *et al.* [9] also reported that spike initiation might have been primarily dependent on food reserves in plant that could be related to the growth rate of plants regulating accumulation of requisite level of carbohydrates for slipping in tuberose.

Number of days to 50 per cent flowering

The minimum number of days for 50 per cent flowering was recorded in the genotype Arka Shreeya (74.33 days) which was on par with the genotypes Kadiyam Local 2 (75.90 days), Arka Shravya (76.10 days), Arka Ambara (76.80 days) and Arka Kanaka (77.60 days). However, the maximum number of days were taken by the genotype Bengaluru Local (88.30 days). Arka Kanaka (77.60 days), Arka Ambara (76.80 days), Arka Shravya (76.10 days), Kadiyam Local 2 (75.90 days) and Arka Shreeya (74.33 days) showed earliest to 50 per cent flowering than check (86.30 days) whereas, all the other genotyes

recorded on par with it. Zosiamliana *et al.* [10] reported that the differences in flowering might be due to the different time period taken by the different genotypes based on their genetic makeup.

Number of days to complete flowering

Significantly minimum number of days for complete flowering was observed in the genotype Kadiyam Local 2 (79.67 days) which was recorded on par with Arka Ambara (80.33 days), Arka Shreeya (81.67 days), Arka Shravya (83.00 days) and Arka Kanaka (84.33 days) whereas, the genotype Bengaluru Local recorded maximum number of days to complete flowering (104.00 days). All the genotypes except Bengaluru Local (104.00 days) and Nilakottai Local (101.00 days) showed earliness with respect to complete flowering than check (96.67 days).

Rachis length (cm)

There was a significant difference in the rachis length of different crossandra genotypes (Table 2). The longest rachis length was observed in genotype Arka Shravya (12.77 cm) and was significantly superior to all other genotypes which were on par among each other. However, ACS-6 (6.83 cm) recorded minimum rachis length. The longest rachis length was found in the genotype Arka Shravya (12.77 cm) as compared to check (8.13 cm). The superiority in vegetative characters like plant height, number of leaves and leaf area in Arka Shravya might have resulted in supply of more photosynthates to the spike thereby showing superior floral characters. The differences in spike length and rachis length can be attributed to the genetic constitution of the hybrids [11, 8] in gladiolus.

Table 1: Vegetative and flowering parameters in different genotypes of crossandra

S.No.	Treatments	Plant height (cm)	Plant spread (cm^2)	Leaf area (cm^2)	Spike Initiation (Days)	50 per cent Flowering (Days)	Complete Flowering (Days)
1.	Arka Ambara	40.37	1122.33	806.50	66.67	76.80	80.33
2.	Arka Kanaka	42.60	1152.10	910.45	71.67	77.60	84.33
3.	Arka Shreeya	41.80	1039.53	830.30	66.00	74.33	81.67
4.	Arka Shravya	56.97	1407.53	1717.70	70.33	76.10	83.00
5.	Nilakottai Local	30.60	1000.57	704.45	80.00	87.70	101.00
6.	Bengaluru Local	29.77	997.65	735.18	81.13	88.30	104.00
7.	Ratanaboli	36.97	1047.93	811.06	74.00	85.70	90.33
8.	Kadiyam Local 2	33.50	1020.20	782.27	68.00	75.90	79.67
9.	ACS – 6	33.90	674.30	590.19	76.67	84.90	87.33
10.	Kadiyam Local 1 (check)	33.53	1093.60	787.16	78.87	86.30	96.67
	Mean	**38.00**	**1055.57**	**867.53**	**73.33**	**81.36**	**88.83**
	SEm±	1.55	75.45	15.24	1.91	1.98	2.28
	CD at 5%	4.64	225.92	45.63	5.73	5.92	6.82

Table 2: Yield parameters in different genotypes of crossandra

S.No.	Treatments	Rachis length (cm)	Number of spikes per plant	Number of florets per spike	Flower yield per plant (g)
1.	Arka Ambara	7.97	49.21	20.00	98.31
2.	Arka Kanaka	9.13	62.41	27.33	146.60
3.	Arka Shreeya	7.50	62.53	21.67	116.37
4.	Arka Shravya	12.77	86.72	53.67	338.27
5.	Nilakottai Local	8.70	53.42	29.67	88.45
6.	Bengaluru Local	7.33	56.56	25.00	114.10
7.	Ratanaboli	7.73	71.64	26.00	71.52
8.	Kadiyam Local 2	8.53	50.29	25.33	45.76
9.	ACS – 6	6.83	42.52	17.33	21.97
10.	Kadiyam Local 1 (check)	8.13	58.98	26.67	62.34
	Mean	**8.46**	**59.43**	**27.27**	**110.37**
	SEm±	0.57	2.15	1.77	6.17
	CD at 5%	1.69	6.45	5.29	18.46

Number of spikes per plant

Differences were significant among crossandra genotypes studied for number of spikes per plant. The maximum number of spikes per plant was exhibited by the genotype Arka Shravya (86.72) whereas, the genotype ACS-6 showed minimum number of spikes per plant (42.52). Among the genotypes of crossandra studied, Arka Shravya (86.72) and Ratanaboli (71.64) recorded maximum number of spikes per plant than Local check (58.98).

Differences in number of spikes per plant among the various genotypes is might be due to the genetic variation. Similar results were reported by Ranchana *et al.* [12] and Prashantha *et al.* [13] in tuberose.

Number of florets per spike

Significant differences were observed with respect to number of florets per spike among crossandra genotypes. Significant superiority was found in Arka Shravya over all other genotypes as it recorded maximum number of florets per spike (53.67). A comparison of the data with check revealed that Arka Shravya (53.67) recorded maximum number of florets per spike whereas, Arka Ambara (20.00) and ACS-6 (17.33) showed minimum number of florets per spike with check (26.67). The number of florets per spike is closely associated with the length of rachis, as longer the rachis more the number of florets on the spike as well as it can also be attributed to the number of leaves per plant which supplies the carbohydrate assimilates required for flower production. Chourasia *et al.* [9] assessed that the variation in number of spikes per plant might be due to variability in genetic constitution of the varieties in gladiolus.

Flower yield per plant (g)

The data pertaining to flower yield per plant showed significant variations in crossandra genotypes. Superiority in flower yield per plant was exhibited by Arka Shravya (338.27 g) whereas, the genotype ACS-6 recorded less yield per plant (21.97). Among the genotypes of crossandra studied, all the genotypes except Kadiyam Local 2 (45.76 g), Ratanaboli (71.52 g) and ACS-6 (21.97 g) were found to be superior as compared to check (62.34 g). The higher yield might be due to increased morphological parameters like plant height, more number of leaves and leaf area which help in production of more photosynthates resulting in greater accumulation of dry matter which in turn leads to production of more number of flowers per plant. The results are in line with the findings of Priyanka *et al.* [5] and Ramachandrudu and Thangam [14] in Crossandra.

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