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R Tejaswi

Department of Floriculture and
Landscape Architecture, Dr.
Y.S.R. Horticultural University,
COH, Venkataramannagudem,
West Godavari District, Andhra
Pradesh, India

Zehra Salma

Department of Floriculture and
Landscape Architecture, Dr.
Y.S.R. Horticultural University,
COH, Venkataramannagudem,
West Godavari District, Andhra
Pradesh, India

G Aditya

Department of Floriculture and
Landscape Architecture, Dr.
Y.S.R. Horticultural University,
COH, Venkataramannagudem,
West Godavari District, Andhra
Pradesh, India

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Study on the performance of ten genotypes of crossandra for vegetative, yield and quality parameters under coastal region of Andhra Pradesh

R Tejaswi, Zehra Salma and G Aditya

Abstract

The present investigation was carried out during the year 2017-18 at College of Horticulture, Dr. Y.S.R. Horticultural University, Venkataramannagudem, West Godavari district of Andhra Pradesh. The experiment consisted of 10 crossandra genotypes, laid out in randomized block design with three replications under open conditions. The observations were recorded on various vegetative, flowering, yield and quality parameters in which the genotype Arka Shravya exhibited superiority in parameters like plant height (56.97 cm), fresh weight of the plant (80.83 g), number of spikes per plot (3121.92) and number of florets per spike (53.67), whereas, Arka kanaka showed the more number of primary branches (3.62), secondary branches (3.61) and longest shelf life (3.33 days) while, Kadiyam Local 2 found to be earliest in number of days for first flower opening in spike (71.00 days) as compared to check and other genotypes. The genotypes Arka Ambara and Nilakottai local recorded more weight of 100 florets (9.89 g) and more number of days for final flower opening in spike (110.00 days) respectively whereas genotype ACS-2 recorded more number of flowers per 10 g weight (328.00) as compared to check and other genotypes.

Keywords: crossandra, genotypes, evaluation, vegetative and quality.

Introduction

Crossandra (*Crossandra infundibuliformis* L.) is commonly known as 'Fire cracker plant'. The word 'crossandra' was derived from Greek word 'Krossos' meaning 'a fringe' and 'aner' meaning 'a man', the anthers being fringed. All species of crossandra are native of the Arabian Peninsula, tropical Africa, Madagascar, India and Sri Lanka (Brickell, 1996) [3]. Being an important commercial flower, it is mainly grown in India, tropical Africa and Madagascar (Bailey, 1963) [1].

Crossandra is an evergreen shrub belonging to the family Acanthaceae. Its chromosome number is $2n = 40$. The crop is a major commercial flower in South India and commercially 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. It is sturdy, productive ornamental shrub suitable for temples and as garden landscape, grown in beds, borders and potted plants.

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 (Vadivelu and Muthukrishnan, 1980) [15]. Three other forms of crossandra are Yellow, Deep Orange and Sebacules Red are grown to a small extent (Velusamy *et al.*, 1974) [16]. Deep orange red is triploid, similar to Mona Wall head, the only cultivar of crossandra grown commercially in Denmark (Ottosen and Christensen, 1986) [9]. 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

Correspondence**R Tejaswi**

Department of Floriculture and
Landscape Architecture, Dr.
Y.S.R. Horticultural University,
COH, Venkataramannagudem,
West Godavari District, Andhra
Pradesh, India

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 location falls under Agro-climatic zone-10, humid, East Coast Plain and Hills (Krishna-Godavari zone) with an average annual rainfall of 900 mm at an altitude of 34 m (112 feet) above mean sea level. The experimental site is geo-graphically situated at 160 63' 120" N latitude and 810 27' 568" E longitudes. It experiences hot humid summer and mild winter.

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, P₂O₅ and K₂O, 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 genotypes Arka Shravya (56.97 cm), Arka Kanaka (42.60 cm), Arka Shreeya (41.80 cm) and Arka Ambara (40.37 cm) were found significantly superior to the check Kadiyam Local 1 (33.53 cm) with respect to plant height.

The variation among different genotypes may be attributed to genetic makeup of the genotypes as observed by Dimri *et al.* (2017) [6] in tuberose. The maximum plant height in Arkashravya may be due to more internodal length. The results are in line with the findings of Priyanka *et al.* (2017) [12] in crossandra. Similarly, Kumari and Kumar (2015) [8] reported that variation in plant height among all cultivars of gladiolus may be due to hereditary traits or prevailing environmental conditions of the growing location.

Number of primary branches

Significant differences were observed among different

genotypes of crossandra with respect to number of primary branches per plant. At 150 DAP, the genotype Arka Kanaka recorded more number of primary branches (3.62) and it was recorded on par with Arka Ambara (3.49), Arka Shravya (3.49) whereas, less number of primary branches were observed in Nilakottai Local (2.53) at 150 DAP.

Among the genotypes studied, the genotypes Arka Ambara (3.49), Arka kanaka (3.62), Arka Shreeya (3.22) and Arka Shravya (3.49) recorded more number of primary branches than check (2.77) at 150 DAP. The differences in the number of primary branches could be attributed to the genetic makeup of the varieties. The similar results were observed in china aster by Zosiamliana *et al.* (2012) [17] and in marigold (Deepa and Patil, 2016) [5].

Number of secondary branches

The data related to number of secondary branches depicted significant differences among genotypes of crossandra. The superiority in number of secondary branches per plant was observed in the genotype Arka Kanaka (3.61) which was recorded on par with Arka Ambara (3.50), Arka Shravya (3.50) whereas, less number of secondary branches were exhibited by Nilakottai Local (3.14), Kadiyam Local 2 (3.13) and ACS-6 (3.13) at 150 DAP.

The data related to the number of secondary branches showed that the genotypes Arka Kanaka (3.61), Arka Shravya (3.50) and Arka Ambara (3.50) recorded more number of secondary branches than check (3.22) at 150 DAP.

The variation in number of secondary branches per plant among different genotypes might be due to the distinguished varietal inherent genetic makeup of a particular cultivar as a result, wide variations for vegetative characters were observed by Rathore *et al.* (2016) [14]. The variation in vegetative growth parameters were attributed to genetic factors whose performance will be varied over a wide range of environmental conditions as suggested by Poornima *et al.* (2006) [10].

Fresh weight of the plant (g)

The differences observed in the fresh weight of the plant (g) among the genotypes were found significant. The genotype Arka Shravya recorded maximum fresh weight of the plant (80.83 g) which was followed by Arka Kanaka (61.83 g). However, minimum fresh weight was observed in ACS-6 (51.33 g) at 150 DAP. The genotypes Arka Shravya (80.83 g) and Arka Kanaka (61.83 g) exhibited highest fresh weight of the plant than check (54.83 g) at 150 DAP.

Kumar and Polara (2017) [7] reported that fresh weight of different genotypes varies due to their genetical composition. Maximum fresh weight of plant observed might be due to highest plant height, plant spread, leaf area of respective genotypes which in turn would have facilitated more photosynthates to plant.

Number of days to first flower opening in spike

Number of days to first flower opening in spike was significantly influenced by different genotypes of crossandra. The earliness in first flower opening in spike was recorded in the genotype Kadiyam Local 2 (71.00 days) which was on par with the genotypes Arka Ambara (72.00 days), Arka Shreeya (72.33 days) and Arka Shravya (76.33 days). However, the genotype Bengaluru Local (97.00 days) took more number of days for first flower opening in spike and it was on par with Nilakottai Local (94.33 days).

With respect to the number of days taken for first flower

opening in a spike, all the genotypes except Bengaluru Local (97.00 days) showed earliness in first flower opening in a spike as compared to check (90.67).

Number of days to final flower opening in a spike

The data pertaining to number of days to final flower opening in a spike revealed significant differences among genotypes of crossandra. Among the genotypes of crossandra studied, the more number of days for final flower opening in a spike was found in genotype Nilakottai Local (110.00 days) which was on par with genotype Bengaluru Local (108.67 days). However, the genotype Arka Ambara took less number of days (82.00 days) while, the genotypes Kadiyam Local 2 (84.00 days), Arka Shreeya (86.67 days) and ACS-6 (87.00 days) recorded on par with it.

The comparative study on genotypes revealed that Nilakottai Local (110.00 days) took more number of days than check (103.67 days) whereas, the genotypes Bengaluru Local (108.67 days) and Arka Shrivya (102.67 days) recorded on par with check. The variations in floret opening might be due to genetic makeup and environmental interactions on different genotypes of crossandra. It might also depend up on rachis length and number of florets per spike.

Number of spikes per plot

There were significant differences in the number of spikes per plot of different crossandra genotypes. The genotype Arka Shrivya showed significantly maximum number of spikes per plot (3121.92) which was followed by Ratan aboli (2699.16). However, the minimum number of spikes per plot was exhibited by genotype ACS-6 (1530.84).

The number of spikes per plot among genotypes of crossandra revealed that the genotype Arka Shrivya (3121.92) and Ratan aboli (2699.16) were found to be superior to check (2123.16). The variation in the production of spikes per plant and spikes per plot might be due to the genetically controlled factor. Ramachandrudu and Thangam (2009) ^[13] observed similar findings 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 Shrivya 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 Shrivya (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. Bhaskar and Reddy (2017) ^[2] and Prashantha *et al.* (2016) in tuberose. Chourasia *et al.* (2015) ^[4] assessed that the variation in

number of spikes per plant might be due to variability in genetic constitution of the varieties in gladiolus.

Weight of 100 florets (g)

The data pertaining to weight of 100 florets (g) showed significant variations in crossandra genotypes. The highest value with respect to weight of 100 florets was recorded by Arka Ambara (9.89 g) which was followed by Arka Kanaka (8.70 g) whereas, lowest value was recorded by ACS-6 (3.05 g).

Among genotypes of crossandra under comparison except Ratan aboli (3.84 g), Kadiyam Local 2 (3.63 g) and ACS-6 (3.05 g) all the other genotypes showed maximum weight of 100 florets than check (4.14 g). Differences in weight of 100 florets may be due to varied genetic characters and floret size of different genotypes.

Number of fresh flowers for 10 g weight

On the basis of results observed there existed significant differences (ranging from 328.00 to 100.00) among crossandra genotypes with respect to number of fresh flowers for 10g weight. Significantly maximum number of fresh flowers for 10g weight was found in ACS-6 (328.00) which was followed by Kadiyam Local 2 (275.67). However, the minimum number of florets were found to be in Arka Ambara (100.00). The data pertaining to the number of fresh flowers for 10 g weight showed that, the genotypes ACS-6 (328.00), Kadiyam Local 2 (275.67) and Ratan aboli (262.00) found to be more in number than check (247.33) whereas, all the other genotypes recorded less in number compared to it.

As the genotype ACS-6 flowers were lighter in weight and smaller in size as observed from earlier data, more number of flowers accommodated in per unit weight of flowers. Hereditary traits like floret size, sturdiness or petal thickness of different genotypes might have caused variations in number of fresh flowers for 10g weight

Shelf life (days)

The data presented in the Table 2 showed significant variations in different crossandra genotypes studied with respect to shelf life of flowers ranging from 1.00 days to 3.33 days. The data revealed that, the maximum shelf life was observed in Arka Kanaka (3.33 days) which was on par with the genotype Arka Ambara (3.00 days), Arka Shreeya (2.67 days) and Arka Shrivya (2.67 days). While, the minimum shelf life was recorded in genotype ACS-6 (1.00 days).

The shelf life of different crossandra genotypes under comparison showed longer shelf life in the genotypes Arka Kanaka (3.33 days) as compared to check (2.33) while, ACS-6 (1.00 days) showed shorter shelf life. However, the check was on par with all the other genotypes. The varied shelf life of crossandra genotype might be due to influence of environmental conditions. It may also depend on floret size, petal thickness, moisture retentivity and corolla tube thickness of different genotypes

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

S.No.	Treatments	Plant height (cm)	Number of primary branches per plant	Number of secondary branches per plant	Fresh weight of the plant (g)	Number of days for first flower opening in spike	Number of days for final flower opening in spike
1.	ArkaAmbara	40.37	11.24	11.25	55.83	72.00	82.00
2.	Arka Kanaka	42.60	12.09	12.03	61.83	78.67	92.00
3.	ArkaShreeya	41.80	9.39	10.26	57.50	72.33	86.67
4.	ArkaShravya	56.97	11.19	11.28	80.83	76.33	102.67
5.	Nilakottai Local	30.60	5.42	8.83	54.67	94.33	110.00
6.	Bengaluru Local	29.77	5.92	9.36	52.45	97.00	108.67
7.	Ratanaboli	36.97	7.30	10.13	57.35	77.67	89.00
8.	Kadiyam Local 2	33.50	6.33	8.79	56.28	71.00	84.00
9.	ACS – 6	33.90	5.90	8.80	51.33	79.00	87.00
10.	Kadiyam Local 1 (check)	33.53	6.70	9.38	54.83	90.67	103.67
	Mean	38.00	8.15	10.01	58.29	80.90	94.57
	SEm \pm	1.55	0.08	0.06	2.11	2.00	1.96
	CD at 5%	4.64	0.23	0.17	6.32	5.99	5.87

Table 2: Yield and quality parameters in ten genotypes of crossandra

S.No.	Treatments	Number of spikes per plot	Number of florets per spike	Weight of 100 florets (g)	Number of fresh flowers for 10g weight	Shelf life (days)
1.	ArkaAmbara	1,771.44	20.00	9.89	100.00	3.00
2.	Arka Kanaka	2,246.76	27.33	8.70	114.33	3.33
3.	ArkaShreeya	2,250.96	21.67	8.43	118.33	2.67
4.	ArkaShravya	3,121.92	53.67	7.37	132.67	2.67
5.	Nilakottai Local	1,923.00	29.67	5.73	176.33	2.33
6.	Bengaluru Local	2,036.04	25.00	8.08	124.00	2.00
7.	Ratanaboli	2,699.16	26.00	3.84	262.00	2.67
8.	Kadiyam Local 2	1,810.57	25.33	3.63	275.67	2.00
9.	ACS – 6	1,530.84	17.33	3.05	328.00	1.00
10.	Kadiyam Local 1 (check)	2,123.16	26.67	4.14	247.33	2.33
	Mean	2,151.38	27.27	6.29	187.87	2.40
	SEm \pm	85.08	1.77	0.06	1.95	0.26
	CD at 5%	254.76	5.29	0.19	5.84	0.77

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