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The Pharma Innovation

**ISSN (E): 2277-7695**
**ISSN (P): 2349-8242**
**NAAS Rating: 5.23**
TPI 2022; SP-11(6): 2554-2557

www.thepharmajournal.com
Received: 07-03-2022
Accepted: 12-04-2022

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# Evaluation of crossandra genotypes for vegetative, floral and yield parameters for commercial production

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**Abstract**
The experiment was conducted on evaluation of nine crossandra genotypes at Main Horticultural Research and Extension Centre, UHS, Bagalkot during 2018-19. The experiment was laid out in Randomized Block Design with three replications consisting of nine genotypes of local and improved cultivars. Significant results were noticed for all the vegetative, floral and yield parameters. Among the genotypes, Arka kanaka recorded the maximum plant height (75.80 cm) and No. of branches / plant (13.53). Genotype Arka Shravya had the maximum spike length (13.60 cm), No. of spikes / plant (39.93), No. of flowers / spike (31.53), corolla tube length (2.86 cm) and flower yield / plant (61.40 g). Genotype Arka Shreeya had the maximum flower diameter (3.22 cm) and 100 flower weights (6.52 g). This better performance is attributed to both genetic and environmental variables which might have contributed and found suitable for cultivation in Northern dry zone of Karnataka.

**Keywords:** *Crossandra*, genotypes, evaluation

## Introduction
Crossandra (*Crossandra undulaefolia* Salisb) also known as fire cracker plant is a perennial evergreen shrub of Acanthaceae family. Crossandra species are native to Arabian peninsula, tropical Africa and Madagascar. The word crossandra is derived from two Greek words 'krossoi' meaning fringe and 'aner' meaning male, indicating a plant having flowers with fringed stamens. Though the flowers are not fragrant like jasmine, rose or tuberose, they are priced high for their attractive colour, long shelf life and light weight. Commercial cultivars of crossandra are light in weight and have bright orange coloured flowers which make a good contrast with fragrant jasmine flowers for the preparation of flower string or garland. The flowers are used in religious offerings, hair adornments, garland, venis and also suitable for garden display. 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. The plant is also popular as potted ornamental in Sweden, Denmark and Hungary.
Crossandra flowers have five colour forms namely yellow, orange, deep orange, red and bluish hues. Of these the orange type is popular and cultivated on commercial scale. But its cultivation is affected because of its susceptibility to wilt, root knot and lesion nematodes as reported by Vadivelu and Muthukrishnan, 1980 [16]. The other three forms *viz*, Yellow, Deep Orange and Sebacules Red are also grown to a small extent (Velusamy *et al*., 1974). In India several local varieties (Gadag local, Sirsi local and Mandya local) as well as improved varieties (Arka Shreeya, Arka Shravya, Arka Kanaka and Arka Ambara) from IIHR, Hesaraghatta, Bengaluru are grown all over.
It is the second leading loose flower, widely cultivated in rural and semi urban areas by small and marginal farmers in Karnataka. It plays an important role in improving the economic condition as a bread winner in most of the small and marginal farming families. Though the crop is widely grown in Southern parts of Karnataka, its cultivation is yet to gain momentum in northern parts of Karnataka. Hence this study was under taken to evaluate suitable cultivars for commercial cultivation in Northern dry region.

## Material and Methods
The evaluation work was initiated during 2018-19 with nine genotypes at Floriculture block of Main Horticultural Research and Extension Centre, University of Horticultural Sciences, Bagalkot. Five local genotypes from different parts of Karnataka and four varieties from IIHR, Hessarghatta, Bangalore were included in the study (Table 1).

The experiment was laid out in Randomized Complete Block Design (RCBD) with nine genotypes as treatments and three replications. The plants were spaced at 60 X 30 cm and all the standard agricultural practices were followed for general cultivation and maintenance according to the package of practices of the university. During the research trial, the data was recorded on vegetative, floral and yield parameters *viz*, plant height (cm), No. of primary branches/ plant, plant spread (cm), average area of a leaf ($cm^2$), number of spikes/ plant, spike length (cm) and No of flowers/ spike, length of corolla tube (cm), diameter of flower (cm) and flower yield/ plant (g). The data was analyzed with Analysis of Variance (ANOVA).

**Table 1:** List of Genotypes

| Sl. No | Genotypes | Flower Colour | Source of Collection |
|---|---|---|---|
| 1 | Arka Kanaka | Yellow | IIHR, Bengaluru |
| 2 | Arka Ambara | Light orange | |
| 3 | Arka Shreeya | Orange | |
| 4 | Arka Shravya | Orange | |
| 5 | Local 1 | Orange | Bagalkot |
| 6 | Local 2 | Blue | Bagalkot |
| 7 | Local 3 | Light green | Bagalkot |
| 8 | Local 4 | Orange | Sirsi |
| 9 | Local 5 | Orange | Mandya |

## Results and Discussion

The experimental results of the investigation on growth, floral and yield parameters are presented in Table 2. Significant results were noticed with respect to growth, flowering and yield parameters. Among the evaluated genotypes, plant height was highest in Arka Kanaka (75.80 cm) followed by Arka Ambara (74.65 cm) and lowest in the variety Local 5 (37.27 cm). Similar results were reported by Prasanth *et al*., (2020) [11] in crossandra.

Number of branches per plant were more (13.53) in Arka Kanaka and less (4.67) in Local 4 genotype. These findings were confounded by Bhosale *et al*., (2018) [3] in crossandra at 120 DAP.

The genotype Arka Kanaka recorded highest (72.80cm) North-South plant spread and leaf area (8.30 $cm^2$) it was lowest (33.67 cm) in the genotype Local 1. Highest (70.47 cm) East-West plant spread was noticed in Arka Ambara which was on par with Arka Kanaka (69.93 cm) and the least (33.73 cm) North-South spread was noted in the genotype Local 1. Leaf area was more (8.30 $cm^2$) in Arka Shravya and less (4.74 $cm^2$) in Local1 genotype.

These results are similar to the findings of Bhosale *et al.* (2018) [3] in crossandra. The increase in plant spread is mainly due to production of more number of branches and wider angle between primary and secondary branches at the coupling point. This plant spread is due to the production of more number of branches per plant, branching habit and inter nodal length which are specific to the genotype. Similar results also reported by Kulkarni and Reddy (2004) [8] in Chrysanthemum. Further the variation in plant height, stem girth and increased number of branches in some genotypes may be attributed to the genetic makeup of the cultivars.

**Table 2:** Evaluation of crossandra genotypes for vegetative parameters

| Sl. No | Treatments (varieties) | Plant height (cm) | No. of branches/ plant | Plant Spread N-S (cm) | Plant spread E-W (cm) | Av. area of a leaf ($cm^2$) |
|---|---|---|---|---|---|---|
| 1 | Arka Kanaka | 75.80 | 13.53 | 72.80 | 69.93 | 8.30 |
| 2 | Arka Ambara | 74.67 | 12.27 | 71.40 | 70.47 | 7.47 |
| 3 | Arka Shreeya | 53.27 | 9.07 | 61.87 | 65.47 | 7.72 |
| 4 | Arka Shravya | 60.60 | 6.40 | 54.53 | 55.20 | 7.99 |
| 5 | Local 1 | 47.33 | 8.73 | 33.67 | 33.73 | 4.74 |
| 6 | Local 2 | 57.33 | 9.67 | 41.60 | 42.20 | 6.17 |
| 7 | Local 3 | 57.00 | 9.00 | 40.40 | 41.67 | 6.50 |
| 8 | Local 4 | 53.80 | 4.67 | 38.67 | 42.40 | 7.34 |
| 9 | Local 5 | 37.27 | 5.00 | 29.53 | 29.73 | 6.8 |
| S.Em± | | 4.56 | 0.93 | 2.53 | 3.45 | 0.86 |
| CD 5% | | 9.671 | 1.979 | 5.356 | 7.314 | 1.611 |

## Floral and yield parameters

The genotypes of crossandra were also evaluated for floral and yield parameters. Among genotypes, spike length ranged from 6.37 cm to 13.60 cm as furnished in Table 3. The longest (13.60 cm) spike length was noticed in Arka shravya genotype and the smallest (6.37 cm) spike was found in Local-3 genotype. These findings were cofounded by Ramchandrudu and Thangam (2010) [13] and Bhosale *et al.* (2018) [3] in crossandra.

There were significant differences in the number of spikes per plant in crossandra genotypes. The genotype Arka Shravya produced more number of spikes per plant (39.93) followed by Arka Kanaka (36.33) and the genotype Local-1 produced less (14.67) number of spikes per plant. This variation in the production of spikes per plant may be due to the factors controlled by genetical constitution. Similar findings were observed by Ramachandrudu and Thangam (2009) in tuberose and Tejaswi *et al*., (2020) [14] in crossandra.

Significant differences were observed among crossandra genotypes with respect to number of flowers per spike. Significant superiority was found in Arka Shravya over all other genotypes as it recorded maximum number of florets per spike (31.53) and least was observed in Local-1 (14.07). The number of flowers per spike is closely associated with the length of rachis, as longer the rachis more the number of florets on the spike as reported by Bhaskar and Reddy (2017) [2], Prashantha *et al*. (2016) in tuberose and Tejaswi *et al*., (2020) [14] in crossandra.

The longest corolla tube length was recorded in the genotype Arka Shravya (2.86 cm) followed by Local-2 (2.81cm) and the shortest corolla tube length was recorded in Arka shreeya (2.25 cm). Similar results were found by Ramachandrudu and Thangam (2010) [13] and Gowsika *et al*., (2019) [7] in Crossandra.

The flower diameter was maximum in Arka Shreeya (3.22 cm) which was on par with Local 4 (3.21 cm) and the minimum diameter was observed in Local 1 (2.36cm). These results were in line with the findings of Priyanka *et al*. (2017) [12] in crossandra. Similar variation was also reported by Ramachandrudu and Thangam (2010) [13] and Gowsika *et al*.,

(2019) [7] in Crossandra.

Weight of 100 flowers was maximumin the genotype Arka Shreeya (6.52g) and the minimum weight of 100 flowers was recorded in genotype Local 2 (2.34 g). Similar finding was reported by Agale (2010) [1] in Gaillardia, Ramachandrudu and Thangam (2010) [13], Priyanka *et al*. (2017) [12], Gowsika *et al*., (2019) [7] in Crossandra and Tirakannavar *et al*. (2015) [15] in China aster.

The genotype Arka Shravya recorded high yield (61.40g) of flowers per plant. While, minimum flower yield per plant was recorded in the genotype Local 1 (20.83g). The results are in line with Ramchandrudu and Thangam (2010) [13] and Bhosale *et al*., (2018) [3] in crossandra crop. Increased flower diameter, corolla tube length and 100 flower weight might be due to genetic inherent character of the individual genotype.

The higher yield might be due to increased morphological parameters like plant height, more number of leaves and leaf area which help to produce more photosynthates resulting in greater accumulation of dry matter which in turn leads to the production of more number of flowers per plant. The results are in line (Ramachandrudu and Thangam, 2010) [13] in crossandra, (Nandakishor and Raghava, 2001; Deepti and Anil, 2005) [9, 4] in marigold, (Dhiman, 2003; Joshi *et al*., 2009) [6] in chrysanthemum.

**Table 3:** Performance of Crossandra genotypes for floral and yield characters

| Sl. No | Treatments (varieties) | Spike length (cm) | No. of spikes/ plant | No. of flowers/ spike | Corolla tube length (cm) | Flower diameter (cm) | Weight of 100 flowers (g) | Flower yield/ plant (g) |
|---|---|---|---|---|---|---|---|---|
| 1. | Arka Kanaka | 11.23 | 36.33 | 28.87 | 2.28 | 3.07 | 6.41 | 45.99 |
| 2. | Arka Ambara | 8.70 | 21.47 | 19.60 | 2.28 | 3.05 | 5.72 | 24.22 |
| 3. | Arka Shreeya | 7.53 | 18.47 | 19.13 | 2.25 | 3.22 | 6.52 | 23.83 |
| 4. | Arka Shravya | 13.60 | 39.93 | 31.53 | 2.86 | 2.99 | 3.75 | 61.40 |
| 5. | Local 1 | 6.53 | 14.67 | 14.07 | 2.44 | 2.36 | 3.51 | 20.83 |
| 6. | Local 2 | 6.47 | 20.00 | 20.93 | 2.81 | 2.45 | 2.34 | 24.92 |
| 7. | Local 3 | 6.37 | 20.07 | 19.40 | 2.71 | 2.47 | 2.37 | 23.00 |
| 8. | Local 4 | 12.53 | 27.80 | 25.60 | 2.63 | 3.21 | 4.46 | 41.33 |
| 9. | Local 5 | 10.50 | 17.53 | 16.07 | 2.45 | 3.09 | 4.37 | 21.67 |
| S.Em± | | 0.79 | 2.89 | 1.76 | 0.044 | 0.024 | 0.214 | 0.65 |
| CD 5% | | 0.929 | 6.124 | 3.736 | 0.150 | 0.328 | 0.452 | 1.385 |

## Conclusion

From the above study it is noted that the genotype Arka shravya has performed well with respect to vegetative, floral and yield parameters followed by Arka kanaka which was found to be good in respect of flowering and yield characters. This may be due to both genetic and environmental variables which might have contributed and found suitable for better performance of these genotypes in Northern dry zone of Karnataka.

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