

Original Research Article

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Assessing the suitability of *Crossandra* (*Crossandra infundibuliformis* (L.) Nees) as Potted Plant

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ABSTRACT

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Four indigenous *Crossandra* varieties namely Arka Shreeya, Arka Shravya, Arka Ambara and Arka Kanaka were evaluated for three pinching levels and four different potting media combinations at ICAR- Indian Institute of Horticultural Research, Bengaluru. The media comprised of soil, sand, Farm Yard Manure, cocopeat and vermicompost in different proportions were used for the study. Among the four varieties studied, Arka Ambara and Arka Shreeya found to be suitable as potted plant with shorter and compact growth habit. Arka Shravya found to be superior in terms of growth and development but the compactness which is the essential criteria for potted plant was absent. The potting media with soil+ sand + FYM (2:1:1) recorded maximum internodal length of branches (6.55 cm) and number of spikes per plant (15.45). Double pinching was found to be better than other pinching treatments which resulted in maximum number of primary branches (4.11), internodal length of branches (6.43 cm), plant spread E-W (21.13 cm), number of spikes per plant (15.74) and spike length (17.65 cm).

Introduction

Crossandra is commonly known as 'fire cracker plant' is native of India and belongs to the family Acanthaceae. It is extensively cultivated in southern states of India. Plants are hardy and can be grown as pot plants, for flower beds and as loose flowers especially for making *gajras* and *venis* to use as hair adornments. This is also a valuable ornamental pot flower in Sweden, Denmark and Hungary. According to Nell (1993) the quality and longevity of potted plants depends upon the leaf quality and flower longevity. A flowering potted plant with lush green leaves

has huge value. In global floriculture scenario, the second important segment of floriculture after cut flowers is pot plants and the pot plant industry is growing @ 20-25 % per annum. Enhanced urban population due to rapid urbanization and industrialization increased the demand of pot plants production which unwrapped the possibility of plant rental services for interior decoration. The principle market areas for flowering and foliage potted plants are landscaping, interior scaping, under the bridges, traffic islands, gifting, plant rental and maintenance services. The *crossandra* plants bears orange or yellow flowers with glossy green foliage suits well as potted plant

and it can be promoted as potted plant apart from other uses. Pinching is one of the key special horticulture practice followed in flower crops which alters the plant physiology and architecture. The appearance and architecture of the plant plays crucial role for accepting as potted plant in the floriculture industry. The irregular growth habit of crossandra is not suitable as potted plant and physiological alteration by pinching is required to achieve the compact growth. The present experiment was conducted with a aim to develop effective growth substrate for better compact growth and development of potted plants and to develop the suitable pinching techniques to produce dwarf, compact and marketable potted plants.

Materials and Methods

The studies on the influence of different media combination and pinching on pot culture of ICAR-IIHR varieties of Crossandra was conducted in the Division of Floriculture and Medicinal Crops, ICAR- Indian Institute of Horticultural Research, Hesaraghatta, Bengaluru. Crossandra varieties namely Arka Shreeya, Arka Shravya, Arka Ambara and Arka Kanaka were evaluated for pot culture. Uniform rooted cuttings of 45 days old were planted in the centre of the pot. The plants were grown under open condition in black pots of 7.5 inches in size. Standard cultural practices were followed and fertilizer application of 19:19:19 at the rate of 2 gram per litre of water was given at biweekly intervals and micronutrient special (Zinc, Iron, Boron, Copper and Manganese) was sprayed once in a month. The treatments followed are four different media composition *viz.*, soil+ sand + FYM (2:1:1 v/v), soil+ sand + vermicompost (2:1:1 v/v), soil+ sand + cocopeat + vermicompost (2:1:1:1 v/v) and cocopeat + soil + sand + vermicompost (2:1:1:1 v/v) and three pinching levels (single pinch, double pinch and no pinching). The terminal shoot tip of plant was pinched at 6th

node, 30 days after transplanting. The statistical design followed was factorial completely randomized design (FCRD) and variety, media and pinching as factors. The treatments were replicated thrice and each replication consists of five pots. Observations were recorded on days taken for flowering, plant height, number of primary and secondary branches per plant, number of spikes per plant, internodal length, spike length, diameter of flower, plant spread E-W and N-S, root length, root spread and shelf life of flowers on plant. The data was statistically analysed (Gomez and Gomez, 1984) and the results have been presented.

Results and Discussion

Among the four crossandra varieties evaluated days taken for flowering was noticed early in Arka Shravya (46.60 days) and late in Arka Kanaka (56.82 days). Singh *et al.*, (2004) in marigold and Dhiman (2003) in chrysanthemum recorded wide variation in days taken to flowering due to variation in genetic makeup. Tallest plants were observed in Arka Shravya (54.46 cm) and shortest in Arka Shreeya (38.33 cm). Significantly higher number of leaves per plant was observed in Arka Shravya (214.13) followed by Arka Ambara (166.42) and Arka Shreeya (140.90) and lowest in Arka Kanaka (119.83). Primary branches per plant was recorded more in Arka Ambara (3.98) and less in Arka Shravya (3.30). Internodal length of the branches was observed more in Arka Shravya (8.51 cm) and less in Arka Kanaka (5.04 cm). Plant spread (N-S) was more in Arka Shravya (35.24 cm) and plant spread (E-W) was 22.66 cm. Variation in plant height and number of primary and secondary branches per plant is attributed to genetic characters (Jauhari and Singh, 2006 and Singh *et al.*, 2008). Number of spikes per plant was recorded maximum in Arka Shravya (19.67) followed by Arka Ambara (14.80). Diameter of the flower was recorded the highest in Arka Kanaka (4.46

cm) followed by Arka Ambara (4.14 cm) and lowest in Arka Shrivya (3.29 cm). Spike length was noticed maximum in Arka Shrivya (19.33 cm) and minimum in Arka Kanaka (15.92 cm). Shelf life of flowers on plant was noticed the highest in Arka Ambara (22.87 days) and lowest in Arka Shrivya (16.18 days). The variation among the varieties for vegetative characters is due to inherent genetic character and also environmental effect. Among the four varieties studied, Arka Ambara followed by Arka Shreeya with short and compact plants proved to be good potted plant. Though Arka Shrivya performed well in terms of growth and development, maximum plant spread (N-S and E-W) was recorded and compactness which is the essential criteria for potted plant was absent hence, it is concluded that this variety is not suitable as potted plant.

The interaction effect of variety and media showed significant difference for number of leaves per plant and shelf life of flowers on plant. The interaction effect of variety and pinching showed significant differences for days taken for flowering, number of leaves per plant, primary and secondary branches per plant, internodal length of branches, plant spread N-S, plant spread E-W and spike length (Plate 1 and 2).

Arka Shreeya recorded early flowering (46.30 days) and produced maximum number of leaves (171.65 cm) in no pinching treatment. Primary branches (4.30) and secondary branches per plant (3.95), plant spread (E-W) (22.73 cm) and spike length (17.35 cm) were higher with double pinching. Internodal length of branches (6.15 cm), plant spread (N-S) (32.97 cm) were noticed higher in single pinching followed by no pinching (5.16 cm) (Fig. 1). In the variety Arka Shrivya, early flower bud opening and plant spread E-W (25.94 cm) was recorded in the treatment no pinching (39.95 days). Number of leaves per plant (228.35), primary (3.70) and secondary

branches per plant (3.95) and plant spread (N-S) (45.00 cm) were recorded higher in single pinching. Internodal length of branches (10.08 cm) and spike length (20.77) recorded higher in double pinching (Fig. 2). Arka Ambara recorded early days flowering (41.65 days), the highest internodal length of branches (6.34 cm), plant spread N-S (30.95 cm) and spike length (16.81 cm) in the treatment no pinching. Number of leaves per plant (117.80), primary branches per plant (4.55) and plant spread E-W (18.91 cm) were recorded higher in double pinching. Secondary branches per plant (3.80) recorded maximum in single pinching (Fig. 3). In the variety Arka Kanaka, early days to flower bud opening (45.25 days), secondary branches per plant (3.70), plant spread N-S (32.40 cm), plant spread E-W (17.91 cm) and spike length (16.30 cm) were noticed higher in no pinching. Number of leaves per plant (126.0) and primary branches per plant (4.45) noticed the maximum in double pinching. Internodal length (5.15 cm) was noticed higher in single pinching (Fig. 4).

The three way interaction effect of variety, media and pinching showed significant difference for days taken for flowering, number of leaves per plant, internodal length of branches, plant spread N-S and shelf life of flowers on plant.

Among four different media, significant differences were recorded for number of leaves per plant, internodal length of branches, plant spread (N-S), number of spikes per plant and spike length (Table 1). Number of leaves (171.84) and spike length (17.42 cm) was recorded the highest in the media consisting of cocopeat + soil + sand + vermicompost. The moisture and nutrient availability is taken care by cocopeat medium and FYM respectively and aeration provided by sand might have resulted in maximum number of leaves per plant. Enhanced root and shoot growth can be achieved by the

Table.1 Effect of media composition and pinching on performance of crossandra varieties under pot culture

Treatment	Days taken for flowering	Plant height (cm)	Number of leaves per plant	Primary branches per plant	Secondary branches per plant	Internodal length of branches	Plant spread N-S (cm)	Plant spread E-W (cm)	Number of spikes Per plant	Flower size (cm)	Spike length (cm)	Shelf life of flowers on plant (days)
Variety												
Arka Shreeya	52.95	38.33	140.90	3.52	3.57	5.41	27.37	16.97	11.87	4.11	16.04	21.92
Arka Shrayya	46.60	54.46	214.13	3.30	3.47	8.51	35.24	22.66	19.67	3.29	19.33	16.18
Arka Ambara	53.83	50.34	166.42	3.98	3.53	5.80	30.32	16.41	14.80	4.14	16.31	22.87
Arka Kanaka	56.82	42.34	119.83	3.82	3.20	5.04	26.69	15.22	11.73	4.46	15.92	20.22
SEm ±	0.65	3.89	3.23	0.14	0.15	0.18	1.10	0.76	0.49	0.32	0.23	0.29
CD (p=0.05)	1.80	10.86	9.01	0.40	NS	0.50	3.08	2.14	1.37	NS	0.65	0.80
Media*												
M1	51.98	42.85	145.35	3.60	3.53	6.55	31.12	17.37	15.45	3.81	16.50	20.07
M2	52.35	53.97	161.07	3.92	3.45	6.34	33.45	18.57	15.39	4.48	16.77	20.47
M3	52.72	44.30	163.02	3.63	3.57	5.92	28.23	17.32	14.07	3.82	16.91	20.17
M4	53.15	44.36	171.85	3.47	3.23	5.95	26.80	17.99	13.17	3.90	17.42	20.48
SEm ±	0.65	3.89	3.23	0.14	0.15	0.18	1.10	0.76	0.49	0.32	0.23	0.29
CD (p=0.05)	NS	NS	9.01	NS	NS	0.51	3.08	NS	1.37	NS	0.65	NS
Pinching												
Single Pinching	50.85	47.40	154.92	3.56	3.34	6.27	32.08	12.19	14.35	4.34	15.97	19.99
Double Pinching	63.51	42.87	155.05	4.11	3.46	6.43	28.26	21.13	15.74	3.72	17.65	20.36
No Pinching	43.29	48.84	170.99	3.28	3.52	5.86	29.37	20.12	13.46	3.95	17.08	20.54
SEm ±	0.56	3.37	2.80	0.12	0.13	0.16	0.96	0.66	0.43	0.27	0.20	0.25
CD (p=0.05)	1.55	NS	7.81	0.35	NS	0.44	2.67	1.85	1.19	NS	0.57	NS
Variety x Media	NS	NS	18.02	NS	NS	NS	NS	NS	NS	NS	NS	1.57
Variety x Pinching	3.07	NS	15.59	0.72	0.73	0.88	5.33	3.71	NS	NS	1.16	NS
Media x Pinching	NS	NS	15.59	NS	0.73	NS	NS	NS	2.36	NS	NS	NS
Variety x Media x Pinching	6.16	NS	31.21	NS	NS	1.76	10.70	NS	NS	NS	NS	2.73

*M1- Soil+ Sand + FYM (2:1:1 v/v), M2-Soil+ Sand + Vermicompost (2:1:1 v/v), M3-Soil+ Sand + Cocopeat + Vermicompost (2:1:1:1 v/v), M4- Cocopeat + Soil + Sand + Vermicompost (2:1:1:1 v/v)

Plate.1 Crossandra Var. Arka Shravya



a). Single pinch b). Double pinch c). No pinch

Plate.2 Crossandra Var. Arka Ambara



a). Single pinch b). Double pinch c). No pinch

Fig.1 Effect of different pinching levels on growth and flowering parameters of crossandra variety Arka Shreeya

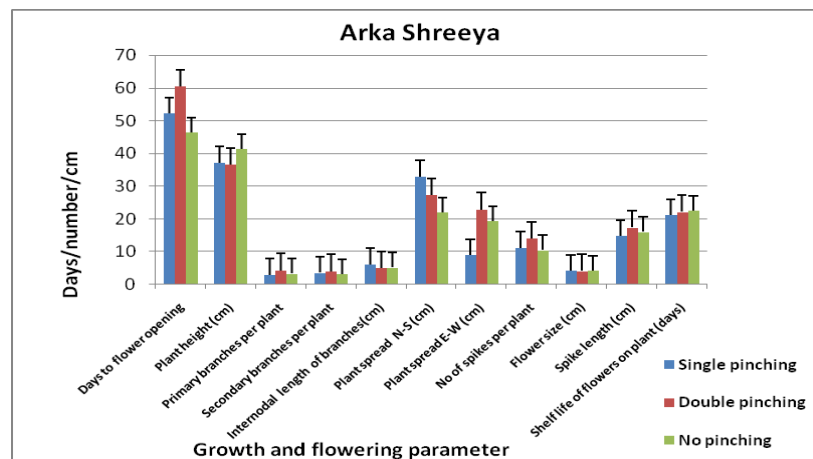


Fig.2 Effect of different pinching levels on growth and flowering parameters of crossandra variety Arka Shrivya

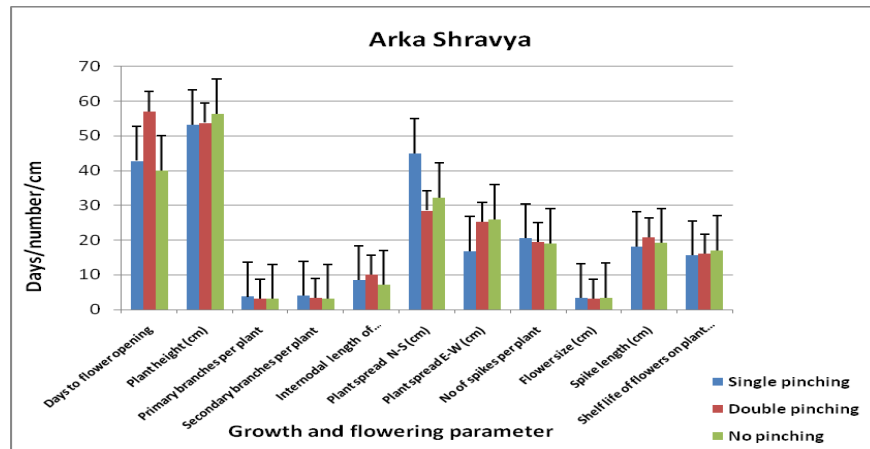


Fig.3 Effect of different pinching levels on growth and flowering parameters of crossandra variety Arka Ambara

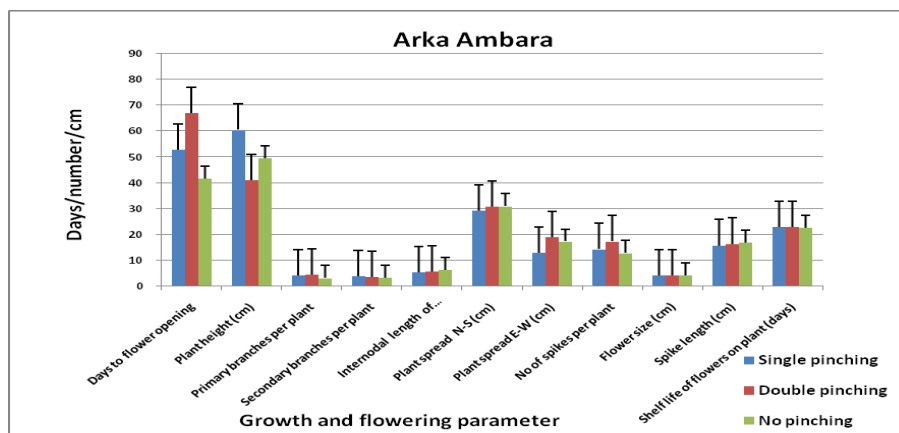
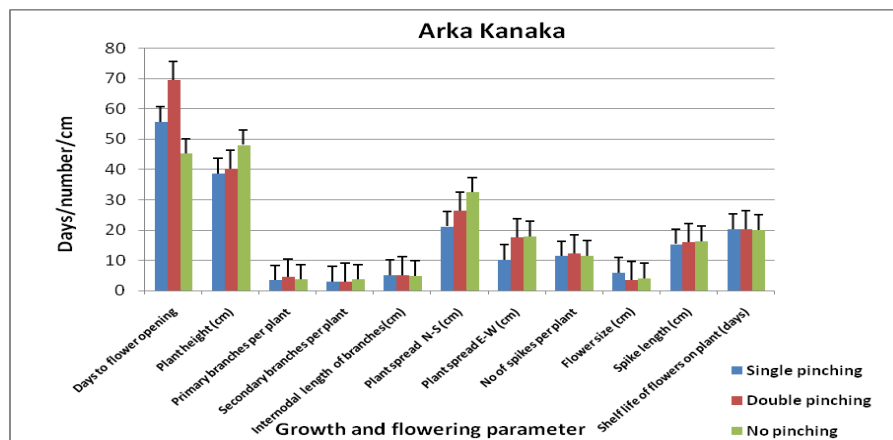


Fig.4 Effect of different pinching levels on growth and flowering parameters of crossandra variety Arka Kanaka



Addition of cocopeat in growing media improves the root and shoot growth of the plants by preventing media compaction and also helps in maintaining the texture of media with higher water holding capacity, better aeration and available organic matter. The results are in accordance with the findings of Awang *et al.*, (2010) in *Celosia cristata*, Mane and Bhosale (2008) in *Arabidopsis thaliana* and Nair and Bharathi (2015) in Chrysanthemum pot mum. Internodal length of the branches (6.55 cm) and number of spikes per plant (15.45) was recorded highest in media consisting of Soil+ Sand + FYM (2:1:1 v/v). Plant spread N-S (33.45 cm) was observed maximum in the media composition of soil+ sand + vermicompost (2:1:1 v/v). Verma *et al.*, (2014) in Fenugreek also reported that inclusion of vermicompost in media significantly increased vegetative growth. Similar results were also obtained by Nair and Bharathi (2015) in Chrysanthemum pot mum. Sangwan *et al.*, (2010) in pot culture experiments on marigold reported that addition of appropriate quantity of vermicompost to the potting media has synergistic effects on plant growth and quality.

Significant differences were recorded among different pinching levels studied (Table 1). Days taken for flowering was early (43.29 days) and number of leaves per plant were more (170.99 days) was noticed in treatment with no pinching and delayed in single and double pinching. This might be due to the fact that by removing apical portion, the plant enters vegetative phase and new shoots takes longer time to mature physiologically which delayed initiation of flower buds and flowering. Similar results were obtained by Ubukata (1999) in carnation and Kour (2009) in chrysanthemum. Primary branches per plant (4.11) were higher in number in double pinching followed by single pinching (3.56). Double pinching recorded the maximum

internodal length of branches (6.43 cm) and plant spread (E-W) (21.13 cm). Number of spikes per plant (15.74) and spike length (17.65 cm) was noticed the maximum in double pinching (15.74 cm) and lowest in no pinching (13.46 cm). This might be due to pinching which increased number of branches per plant and which increased the number of spikes per plant. The results were in conformity with findings of Kour (2009) in chrysanthemum and Rajhansa and Dikshit (2014) in African marigold reported double pinching had significant influence on growth, yield and physiological parameters at harvest. The interaction effect of media and pinching showed significant difference for number of leaves per plant, number of secondary branches per plant and number of spikes per plant.

Different media composition and pinching levels had significant influence on plant architecture, growth and flowering traits and suitability of crossandra varieties as potted plant. The better performing varieties of indigenous crossandra Arka Ambara and Arka Shreeya with compact growth habit are suitable as potted plants. These varieties with double pinching and media composition of soil+ sand + FYM (2:1:1 v/v) can be recommended and promoted for growing crossandra as potted plant.

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