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Growth, flowering and yield characters of some cultivars of China aster (*Callistephus chinensis* Ness.)

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ABSTRACT

The present study was conducted under the AICRP-Floriculture, at the Agricultural Research Institute, Hyderabad during the year 2008-09. The study was conducted to identify suitable China aster cultivars under open conditions of Hyderabad. Among the seven cultivars studied, the results showed a highly significant variation for various growths, floral, and flower yield parameters among the cultivars. The Phule Ganesh Violet produced maximum plant height, number of primary and secondary branches, plant spread and number of leaves at all stage of plant growth. With respect to flowering characters, Phule Ganesh Pink took minimum number of days for first flower bud initiation (57.20), first flowering (66.73), 50 % flowering (85.67), and flowering duration (60.96). Phule Ganesh White showed maximum flowering diameter (7.37 cm), stalk length (34.78 cm) and vase life both as cut (9.13 days) and loose (4.73 days) flower. Phule Ganesh White also produced maximum number of flower per plant (36.73) and yield both per plant (208.81 g) and per hectare (23.20 t / ha). The cv. Local recorded minimum of all these character except flowering duration and days to first flower bud initiation and their opening. Phule Ganesh White can therefore, be recommended for commercial cultivation under Hyderabad conditions.

Key Words: *Callistephus chinensis*, growth, flowering, yield.

INTRODUCTION

China aster (*Callistephus chinensis* L. Ness) belongs to 'Asteraceae' family and is native to China [1]. It is one of the most important annual flower crops grown in most parts of the world. Among annual flowers, it ranks third next only to Chrysanthemum and Marigold [2]. Increased flower quantity and quality with perfection in the form of plants are important objectives to be reckoned in commercial flower production. Although, there are sufficient number of cultivars under cultivation but their performance are region specific and varies from place to place. The cultivars Violet Cushion, Kamini, and Local are being cultivated to a limited extent in and around Hyderabad. However, the Phule Ganesh series, in spite of their superior yield and quality traits, have not been tried under Hyderabad conditions. The quality of flowers is primarily a varietal trait, besides being influenced by nutritional and climatic conditions that prevail during the growing period [3]. It is therefore essential to study the performance of cultivars in a particular place before recommending for commercial cultivation. In view of these, an investigation was conducted to study the growth, flowering and yield characters of some China aster cultivars under Hyderabad conditions.

MATERIALS AND METHODS

The experiment was conducted at All India Coordinated Research Project on Floriculture, Agricultural Research Institute, Rajendranagar, Hyderabad during the year 2008-09. The study consisted of seven cultivars viz; Violet Cushion, Kamini, Phule Ganesh Purple, Phule Ganesh White, Phule Ganesh Violet, Phule Ganesh Pink and Local. Standard cultivation and recommended cultural practices were followed. The observations for vegetative parameters including plant height (cm), plant spread (cm), number of leaves, primary and secondary branches were recorded at 30, 60 and 90 days after transplanting (DAT). The floral characters observed were days taken for first flowering, days taken to 50 per cent flowering, duration of flowering, number of flowers per plant, stalk length, flower diameter, flower yield per plant (g/plant) and per hectare (tones/ha), vase life of cut and loose flower. The experiment was laid out in Randomized Block Design (RBD) with 15 replications and statistical analysis for analysis of variance was followed according to the method described by Panse and Sukhatme [4].

RESULTS AND DISCUSSION

Cultivars variation on vegetative growth of China aster

The data presented in table 1 revealed significant variation in growth characters of China aster cultivars. The 'Phule Ganesh' series were vigorous in growth in terms of plant height. At 30 days after transplanting (DAT), 'Phule Ganesh Violet' recorded the highest plant height (10.47 cm) while the minimum was recorded in Local (6.09 cm). Similarly, 'Phule Ganesh Violet' exhibited maximum plant height at 60 DAT (43.89 cm) and 90 DAT (66.50 cm). While minimum was observed in Local both at 60 DAT (32.56 cm) and 90 DAT (43.13 cm). This variation in the plant height is due to genetically controlled factors which was confirmed by Poornima *et al.* [5] in china aster and Singh *et al.* [6] in marigold, who observed similar variation in plant height among different cultivars.

With respect to number of branches per plant, 'Phule Ganesh Violet' recorded maximum number of primary branches at 30 DAT (4.86), 60 DAT (15.73) and 90 DAT (21.40) while the minimum was observed in Local. As far as secondary branches are concerned, 'Phule Ganesh Violet' recorded the maximum at 60 DAT (33.73) and 90 DAT (32.80) while Phule Ganesh Pink produced the minimum at both 60 DAT (8.67) and 90 DAT (16.80). The difference in branches among the cultivars could be due to influence of the genetical make up of the cultivars. Similar variation for number of branches were also observed previously in China aster [5] and in chrysanthemum [7].

At different stages of plant growth, China aster cultivars differ significantly for plant spread. The maximum plant spread was recorded in 'Phule Ganesh Violet' at 30 DAT (174.53 cm²), 60 DAT (437.73 cm²) and 90 DAT (1294.33 cm²). Interestingly, 'Local' recorded the minimum plant spread at 30 DAT (108.47 cm²) and at 60 DAT (194.40 cm²), while at 90 DAT 'Kamini' recorded the minimum plant spread (458.27 cm²). The difference in plant spread is a varietal trait and similar result was obtained by Kulkarni and Reddy [8] in China aster.

Leaf production was again highest in 'Phule Ganesh Violet' at 30 DAT (15.80), 60 DAT (44.27) and 90 DAT (192.73). The production of more number of leaves in these cultivars may be due to vigorous growth, more number of primary and secondary branches and more plant spread, which in turn facilitates better harvest of sunshine by the plant to produce more number of leaves. The leaves production was minimum in 'Local' and 'Kamini' at all stages of growth. This may due to less number of primary and secondary branches and plant spread, which resulted in less growth and less production of leaves. Similar results were observed in China aster [9], in gerbera [10] and in marigold [11].

Cultivars variation on flower characters of China aster

The data presented in table 2 indicate that 'Phule Ganesh Pink' (57.20) and 'Phule Ganesh White' (61.33) significantly took less number of days for floral bud initiation while 'Local' recorded the longest number of days (65.93). Regarding the days for flower opening, 'Phule Ganesh Pink' (66.73 days) and 'Phule Ganesh White' (69.80 days) were early to initiate the flower opening, while 'Local' (77.13 days) and 'Violet Cushion' (76.13 days) took maximum number of days for flower opening. The early flower bud initiation of 'Phule Ganesh Pink' and 'Phule Ganesh White' might have resulted in early opening of the flower. The variations in flower bud initiation and flower opening may be due to genetic trait. This finding was confounded by [12].

Table 1. Growth characters of some varieties of China aster

Varieties	Plant height (cm)			Number of branches per plant					Plant Spread (cm ²)			Number of leaves per plant		
				Primary		Secondary								
	30 DAT	60 DAT	90 DAT	30 DAT	60 DAT	90 DAT	60 DAT	90 DAT	30 DAT	60 DAT	90 DAT	30 DAT	60 DAT	90 DAT
Violet Cushion	9.21	26.54	58.89	3.60	12.13	16.93	13.87	30.33	145.80	317.73	548.07	12.13	36.47	180.80
Kamini	8.00	28.19	47.35	3.33	11.33	17.20	11.80	22.20	122.37	232.53	458.27	11.73	31.60	149.53
Phule Ganesh Purple	8.69	34.33	62.99	4.33	14.73	18.13	21.93	31.60	124.53	431.60	1019.53	14.47	34.47	185.73
Phule Ganesh White	9.87	38.63	65.75	4.47	15.67	19.47	28.47	32.13	153.47	432.80	1257.60	13.80	42.87	184.67
Phule Ganesh Violet	10.47	43.89	66.50	4.86	15.73	21.40	33.73	32.80	174.53	437.73	1294.33	15.80	44.27	192.73
Phule Ganesh Pink	9.33	32.56	46.73	4.13	13.07	19.07	8.67	16.80	140.20	339.13	791.33	13.27	36.80	179.27
Local	6.09	21.77	43.13	2.60	7.00	15.93	10.07	21.93	108.47	194.40	598.40	10.87	33.53	146.67
S.Em±	0.36	2.02	0.73	0.23	0.28	0.29	0.61	0.35	8.05	19.07	30.34	0.47	1.03	3.67
C.D. (0.05)	1.13	6.24	2.26	0.72	0.87	0.90	1.89	1.09	25.07	59.412	94.52	1.45	3.21	11.44

Table 2. Flowering characters of some varieties of China aster

Varieties	Days for first flower bud initiation	Days for first flowering	Days for 50% flowering	Flowering duration (days)	Flower diameter (cm)	Stalk length (cm)	Vase life (days)	
							Cut flower	Loose flower
Violet Cushion	64.67	76.13	97.00	68.80	6.02	30.88	6.00	2.93
Kamini	62.07	70.07	90.33	71.02	5.71	20.51	6.73	2.60
Phule Ganesh Purple	62.87	70.93	90.67	64.74	6.12	27.41	7.60	3.80
Phule Ganesh White	61.33	69.80	88.00	68.45	7.37	34.78	9.13	4.73
Phule Ganesh Violet	61.87	70.67	91.33	64.41	6.06	32.58	7.27	3.47
Phule Ganesh Pink	57.20	66.73	85.67	60.96	6.90	25.57	5.87	3.06
Local	65.93	77.13	106.33	67.15	4.79	20.45	5.80	2.87
S.Em±	1.42	1.27	1.49	0.87	0.08	0.45	0.14	0.10
C.D. (0.05)	4.43	3.92	4.63	2.71	0.25	1.41	0.46	0.32

With concerned to days taken for 50 % flowering, 'Phule Ganesh Pink' (85.67 days) and 'Phule Ganesh White' (88.00 days) were the earliest to reach 50 % flowering while the latest was observed by 'Local' (106.33 days). Similar variations due to varietal trends were also observed in China aster [14].

As far as flowering duration was concerned, the 'Kamini' recorded maximum (71.02 days) duration of flowering, whereas 'Phule Ganesh Pink' recorded the minimum (60.96 days). This finding of variations in flowering character was coincided with the reports of Poornima *et al.* [5] and Kumar and Yadav [10] in gerbera.

With respect to flower diameter, the variety 'Phule Ganesh White' (7.37 cm) recorded maximum while the 'Local' (4.79 cm) recorded the minimum. This variation may be due to differences in the genetic makeup of cultivars. Similar variations were reported previously in China aster [5], marigold [11] and chrysanthemum [14].

With regard to stalk length, it was observed that 'Phule Ganesh White' (34.78 cm) give maximum stalk length and minimum in 'Local' (20.45 cm). The variations in stalk length among the cultivars had also been reported in China aster [5].

Cultivars variation on flower yield characters of China aster

The flower yield also showed a highly significant difference as indicated in table 3. The maximum numbers of flowers per plant were produced by 'Phule Ganesh White' (36.73) and 'Phule Ganesh Violet' (36.67) which may be due to their more number of branches per plant with good number of developed flower buds on the branch. The minimum number of flowers per plant was observed in 'Phule Ganesh Pink' (28.20) and 'Local' (30.00), because these cultivars recorded significantly less number of branches per plant. This finding was supported by Baskaran *et al.* [7] in chrysanthemum and Poornima *et al.* [5] in China aster who observed similar results.

With respect to flower yield, 'Phule Ganesh White' produced maximum flower yield per plant (208.81 g) and also per hectare (23.20 tonnes). The increased flower yield was because of increase number of flowers per plant. The minimum flower yield per plant (95.15 g) and per hectare (10.53 tonnes) was recorded in 'Local'. This was because of the fact that, it has less number of leaves, branches per plant etc. Variations in flower yield was also observed previously in China aster [8], in marigold [15] and chrysanthemum [7].

Cultivars variation on flower Vase life of China aster

The data presented in table 2 also showed high significant on vase life of cut and loose flower. 'Phule Ganesh White' recorded the maximum vase life, both as cut (9.13 days) and loose flower (4.73 days) which may be due to the inherited trait of better storage of photosynthates as it produces more number of leaves in its growth periods [16].

Table 3. Flower yield in different cultivars of China aster

Varieties	No. of flowers per plant	Flower yield per	
		Plant (g)	Kg / ha
Violet Cushion	35.33	165.62	18.40
Kamini	28.27	127.21	14.13
Phule Ganesh Purple	34.33	175.88	19.54
Phule Ganesh White	36.73	208.81	23.20
Phule Ganesh Violet	36.67	177.96	19.77
Phule Ganesh Pink	28.20	155.82	17.31
Local	30.00	95.15	10.53
S.Em±	0.69	1.72	0.19
C.D. (0.05)	2.16	5.36	0.59

CONCLUSION

According to our experiment, it can be concluded that the Phule Ganesh Series cultivars, particularly variety 'Phule Ganesh White' proved to be the best among the cultivars under study for growth and flowering characters as well for vase life. Hence it is suitable for cultivation under Hyderabad conditions.

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