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## Evaluation of China aster [*Callistephus chinensis* (L.) Nees] genotypes for flower yield and yield attributes

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#### Abstract

The study was conducted on performance of different genotypes of China aster under north eastern semi arid zone of Karnataka. The experiment was carried out at Department of Horticulture, College of Agriculture, UAS, Raichur during the year 2016-17. The experiment was laid out using Randomized Block Design with three replications of twelve genotypes. All the genotypes showed significant difference among themselves for flower yield and quality parameters. Significant variation was observed for flower characters among different genotypes. Early flower bud initiation, minimum number of days to flowering and maximum number of flowers plant<sup>-1</sup> was recorded in Poornima, var. Arka Aadya was noticed minimum days taken to 50% flowering and it was par with var. Poornima, duration of flowering was high in Kamini and it is on par with var. Phule Ganesh White.

**Keywords:** China aster, evaluation, genotypes

#### Introduction

China aster is a free blooming half hardy, easy growing winter annual crop grown for cut flower as well as loose flower. The bloom type depends mainly upon the relative number of the two kinds of florets and their shapes. The most suitable character for the classification of China aster is the shape of ray florets. The present day varieties are available in diverse forms, different types and a wide spectrum of colour ranges viz., pink, primrose, pale blue, mauve, purple, scarlet, creamy white, pure white, violet etc.

Increased flower production and quality of flowers are important objectives to be reckoned in commercial flower production. Although, China aster is being grown in a considerable area, its cultivation is concentrated around big cities and there is a need to popularize it under different agro-climatic conditions. Though the crop has great significance in the market, there are some bottlenecks associated with its cultivation. viz., non availability of planting material, lack of improved varieties, high market fluctuations are some of the problems which are often faced by the farmers. Research pertaining to crop improvement is essential for development of different varieties having different forms, colours, high yielding with quality flowers. According to growth habit, asters are classified in different groups viz., erect growing ones are earlier in flowering whereas spreading and powder puffs are late types.

Though the flower yield and quality are primarily a varietal character, it is also greatly influenced by climatic factors. The climatic factors like photoperiod, temperature, relative humidity and soil moisture influence both vegetative and reproductive phases of the plant, ultimately leading to variation in the performance of the cultivars. Plants have to be exposed to proper climatic factors in order to get optimum and economic flower yields. Hence, there is a need for popularization and evaluation of promising China aster cultivars under semi arid zone of Northern Karnataka.

Fleming (1937) [2] estimated approximately 10 per cent natural crossing in China aster. Strube (1965) [7] described floral biology of China aster and according to him, its flower head consists of both pistillate ray florets and perfect disc florets. The proportion of ray florets and disc florets is a measure of doubleness of the flower. As a rule, the stamens and pistils do not mature simultaneously in the individual flower. The stigma of the individual flower unfolds after the pollen is discharged from the flower. However, sufficient pollen remains in the capitulum. The China aster is therefore, in geitonogamous condition. In some varieties, they mature together leading to self-fertilization. There is a possibility of some amount of cross pollination as well. North (1979) [5] and Watts (1980) [8] grouped China aster under self-pollinated crops.

## Material and methods

The present investigation on “Genetic variability studies in China aster [*Callistephus chinensis* (L.) Nees]” was carried out during the year 2016-17. Details of the materials used and experimental techniques adopted during the course of investigation are presented below.

### Geographical location of the experimental site

The experiment was conducted at Herbal garden of Department of Horticulture, College of Agriculture Raichur, UAS, Raichur which is at an elevation of 389 meters above mean sea level. Raichur lies between 16° 15' N latitude and 77° 21' E longitude in the North Eastern dry zone (Zone 2) of Karnataka.

### Climatic conditions

The meteorological data during the period of investigation as recorded at meteorological observatory, Main Agricultural Research Station, UAS, Raichur is presented in appendix I. During the year of experiment a total rainfall of 628 mm was received through South-West and North-East monsoon. The maximum rainfall of 292.5 mm was received during the month of September. The monthly highest mean maximum temperature of 34.2 °C and lowest of 16.2 °C were recorded during November and January, respectively.

### Soil properties of experimental site

The experiment was laid out in red sandy clay loam soil of Herbal garden of Department of Horticulture, College of Agriculture, Raichur.

### Experimental details

#### Design and experimental layout

The experiment was laid-out in Randomized Complete Block Design (RCBD) with three replications. The treatments in each replication were allotted randomly according to definite laws of probability.

#### Varietal description

A total of 12 China aster varieties were collected and used for present investigation. Kamini, Shashank, Poornima, Arka Aadya, Arka Archana, Phule Ganesh White, Phule Ganesh Pink, Phule Ganesh Purple, Phule Ganesh Violet, Mudigere Local, Namdhari Pink and Namdhari White.

#### Observation on yield

##### Flower bud initiation

The number of days taken for initiation of flower bud in each plot was recorded by counting the days from date of transplanting.

##### Days to flowering

Days taken for the first flowering were recorded by counting the number of days from the date of transplanting to the stage at which the first flower was formed from flower bud initiation in different cultivars.

##### Days to 50 per cent flowering

The number of days taken for 50 per cent of the plants to produce flowers in each plot was recorded from each plot by counting the days from the date of transplanting.

##### Duration of flowering

Number of days taken from the first flowering to the last flowering was recorded as the total duration of flowering in each plot.

##### Number of flowers per plant

Number of flowers produced from the five tagged plants was recorded and the average number of flowers produced per plant was worked out.

##### Flower yield per hectare

Flower yield per hectare was worked out by summing up the flower yield obtained per plot during each harvest and expressed in tonnes.

## Results

### Flowering parameters

Data pertaining to flowering characters like days taken for flower bud initiation, days to flowering, days taken for 50 per cent flowering, days taken for first harvest and duration of flowering in experimental plot are furnished in Table 1.

### Flower bud initiation

Genotypes varied significantly with respect to days to flower bud initiation. The var. Poornima took minimum number of days to flower bud initiation (26.10 days), which was on par with Arka Archana (31.10 days), Arka Aadya (33.80 days) and Shashank (39.10 days), whereas, the var. Phule Ganesh White recorded maximum number of days taken for flower bud initiation (63.33 days) followed by the varieties Phule Ganesh Violet (60.50 days), Phule Ganesh Purple (58.80 days) and Mudigere Local (58.20 days). Total four genotypes were noticed to be significantly superior with respect to number of days for flower bud initiation than the check var. Kamini (51.33 days).

### Days to flowering

Different varieties of China aster had shown significant difference with respect to days to flowering. Var. Poornima recorded minimum number of days for flowering (30.60 days) followed by Arka Archana (36.83 days), Arka Aadya (40.30 days) and Shashank (44.73 days), whereas Phule Ganesh White recorded the maximum number of days to first flowering (73.33 days).

### Days to 50 per cent flowering

The days taken for 50 per cent flowering varied significantly among different China aster genotypes. Var. Arka Aadya (55.33 days) took minimum number of days for 50 per cent flowering followed by Poornima (56.70 days), Arka Archana (57.70 days) and Shashank (60.33 days). Maximum number of days to 50% flowering were taken by Phule Ganesh White (79.00 days), which was on par with varieties Phule Ganesh Violet (77.33 days), Mudigere Local (74.00 days) and Phule Ganesh Purple (73.70 days).

### Duration of the flowering

Significant variation was observed among the varieties of China aster for duration of flowering. Var. Kamini flowered for a maximum period of 36.00 days and the flowering duration was minimum in var. Shashank (26.00 days).

### Yield parameters

The data recorded on yield components viz., number of flowers per plant, flower yield per plant, flower yield per plot and per hectare and seed yield per plant, per plot and per hectare as influenced by different China aster varieties are presented in the Table 2.

### Number of flowers per plant

Maximum numbers of flowers per plant were recorded in var. Poornima (68.53), which was on par with the varieties Arka Archana (66.67), Phule Ganesh Purple (60.15) and Phule Ganesh Violet (60.01). These varieties were significantly superior over check var. Kamini (51.80), whereas, var. Namdhari White had minimum number of flowers per plant (39.00) (Fig. 1).

### Flower yield per hectare

There was significant difference among the varieties with respect to flower yield per hectare. Highest flower yield per hectare was recorded in the var. Phule Ganesh White (23.23 t) followed by varieties Phule Ganesh Violet (21.80 t), Phule Ganesh Pink (21.00 t), Arka Archana (20.60 t), Poornima (19.93 t) and Phule Ganesh Purple (19.54 t) whereas, var. Shashank recorded minimum flower yield per hectare (9.70 t). Six varieties exhibited significantly higher flower yield per hectare over check var. Kamini (13.63 t) Fig 2.

### Discussion

#### Flowering parameters

Flowering parameters including days taken for flower bud initiation, days for flowering, days to 50 per cent flowering and duration of flowering differed significantly among the China aster varieties studied.

The days taken for bud initiation, flowering and 50 per cent flowering were less in vars. Poornima, Arka Archana, Arka Aadya and Shashank. Hence, these varieties were said to be early in flowering. Flowering was late in Phule Ganesh series and Mudigere Local. Variations in flower characters were

expected among China aster varieties as also reported by Munikrishnappa (2011) [4] and Zosiamliana *et al.* (2012) [9].

As far as flowering duration is concerned, var. Kamini flowered for maximum duration, whereas, flowering duration was minimum in var. Shashank. These results are in conformity with the earlier reports on China aster Poornima *et al.* (2006) [6] and Zosiamliana *et al.* (2012) [9].

#### Yield parameters

Maximum number of flowers per plant was produced in the vars. Poornima, Arka Archana, Phule Ganesh Purple and Phule Ganesh Violet, while 'Namdhari White' and 'Namdhari Pink' produced the least number of flowers per plant. The number of flowers produced per plant might be directly related to production of more plant height, number of leaves, plant spread, more number of branches per plant with good number of developed flower buds on the branch, thereby synthesis of more photosynthates resulted in production of good number of developed flower buds on the branches. The similar results were observed in China aster by Munikrishnappa (2011) [4] and Zosiamliana *et al.* (2012) [9].

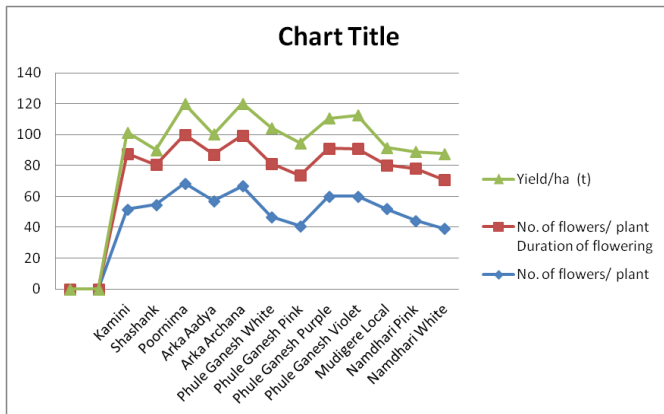
Flower yield per plant, yield per plot and yield per hectare was maximum in var. Phule Ganesh White. The increased flower yield was because of increased weight of flower and number of flowers per plant as in case of var. Phule Ganesh White, Phule Ganesh Pink and Phule Ganesh Violet. The flower yield was less in var. Shashank and Namdhari Pink. Variation in flower yield was also observed previously in China aster (Munikrishnappa, 2011 and Zosiamliana *et al.*, 2012) [4, 9] and chrysanthemum (Chezhiyan *et al.*, 1985 and Laskar and Yadav 1991) [1, 3].

**Table 1:** Variation in days to flower bud initiation, days taken for flowering and days to 50 per cent flowering of China aster varieties

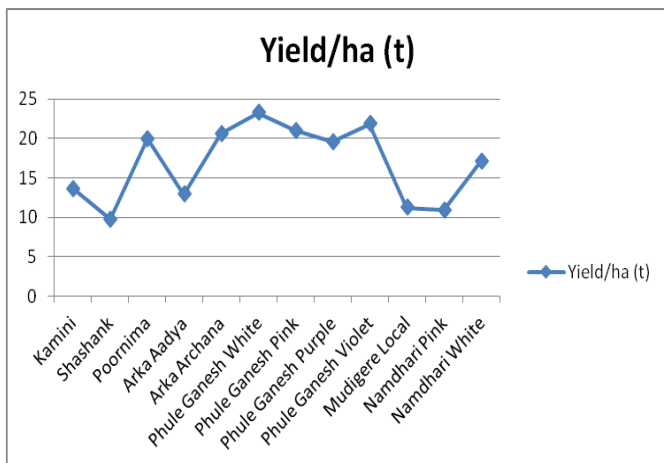
Variety	Days to flower bud initiation	Days taken for flowering	Days to 50% flowering
Kamini	51.33	58.00	69.00
Shashank	39.10	44.73	60.33
Poornima	26.10	30.60	56.70
Arka Aadya	33.80	40.30	55.33
Arka Archana	31.10	36.83	57.70
Phule Ganesh White	63.33	73.33	79.00
Phule Ganesh Pink	45.00	56.27	71.00
Phule Ganesh Purple	58.80	68.13	73.70
Phule Ganesh Violet	60.50	69.43	77.33
Mudigere Local	58.20	65.53	74.00
Namdhari Pink	45.00	49.53	65.33
Namdhari White	46.40	54.90	68.33
Mean	46.55	53.95	67.13
S.Em. $\pm$	1.56	1.88	1.98
CD at 5%	4.57	5.51	5.81

**Table 2:** Variation in number of flowers plant<sup>-1</sup>, duration of flowering and yield ha<sup>-1</sup> of China aster varieties

Variety	No. of flowers/ plant	Duration of flowering	Yield/ha (t)
Kamini	51.80	36.00	13.63
Shashank	54.53	26.00	9.70
Poornima	68.53	31.60	19.93
Arka Aadya	57.00	30.30	12.90
Arka Archana	66.67	32.90	20.60
Phule Ganesh White	46.80	34.44	23.23
Phule Ganesh Pink	40.76	32.75	21.00
Phule Ganesh Purple	60.15	31.00	19.54
Phule Ganesh Violet	60.01	30.90	21.80
Mudigere Local	52.00	28.40	11.20
Namdhari Pink	44.33	33.80	10.87
Namdhari White	39.00	31.60	17.10
Mean	53.45	31.64	16.98
S.Em. $\pm$	1.82	1.39	0.74
CD at 5%	5.3	4.08	2.10



**Fig 1:** Variation in flower bud initiation, days taken for flowering and days to 50 per cent flowering in China aster varieties



**Fig 2:** Variation in flower Yield/ha (t) in China aster varieties

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