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Performance of China aster (*Callistephus chinensis* (L.) Nees) genotypes for flower quality and shelf life traits

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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 quality parameters maximum flower diameter and test weight were recorded in var. Phule Ganesh White. Shelf life for maximum days and minimum physiological loss in weight was noticed in var. Phule Ganesh White.

Keywords: China aster, evaluation, genotypes, shelf life

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 type.

Fleming (1937) ^[1] estimated approximately 10 per cent natural crossing in China aster. Strube (1965) ^[9] 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) ^[11] 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. 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 quality attributes

Flower diameter

Size of the flower was measured at the point of maximum breadth. This was measured by using scale and average diameter in centimeters was computed.

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.

Test weight

After flower harvesting, 10 flowers were randomly selected from each treatment and their total weight was recorded in grams at three different stages of flowering.

Observations on keeping quality parameters

Physiological loss in weight

Five randomly selected flowers in each treatment were kept for calculating physiological loss of weight in China aster flowers. At every alternate day interval, flowers were weighed and the weight loss (%) was worked out at 2nd, 3rd, 4th and 5th day after harvest and finally the physiological loss in weight was calculated by the formula.

$$\text{Percent loss in weight (g)} = \frac{\text{Initial weight} - \text{Weight of flower on the day of observation}}{\text{Initial weight}} \times 100$$

Shelf life (days)

Five randomly selected flowers in each treatment were kept in paper plates under open conditions for the shelf life study.

Daily observations were made for shelf life of flowers. The point of termination of shelf life was decided based on the first sign of wilting or fading of one or two petals.

Results

Flower quality parameters

Different flower quality parameters like flower size (diameter), test weight, shelf life and physiological loss of weight were recorded and the data pertaining to these are presented in Table 2.

Flower diameter

Significant difference was observed among the varieties of China aster with respect to flower diameter. It was maximum in var. Phule Ganesh White (6.35 cm) followed by var. Phule Ganesh Purple (6.10 cm), Phule Ganesh Violet (6.01 cm) and Phule Ganesh Pink (5.55 cm). These varieties were also recorded to be superior over check var. Kamini (4.90 cm), whereas minimum flower diameter (3.77 cm) was observed in var. Shashank. (Table 1 and Fig 1.)

Test weight (10 flowers)

Significant difference was observed for test weight of flowers. Maximum weight of ten flowers (test weight) was recorded in Phule Ganesh Pink (55.33 g) followed by Phule Ganesh White (50.53 g), Namdhari White (46.21 g) and Phule Ganesh Violet (34.46 g), where as it was recorded minimum in Arka Archana (19.51 g). Four varieties had shown significantly superior test weight over Kamini (24.27 g) (Fig 2.).

Shelf life of flowers

Significant difference was observed among the varieties of China aster with respect to shelf life of flowers. It was recorded maximum in Phule Ganesh White (4.00 days) followed by Phule Ganesh Purple (3.60 days), Phule Ganesh Violet (3.40 days), Phule Ganesh Pink (3.00 days) and Arka Archana (3.00 days). These varieties were also noticed to be significantly superior over check var. Kamini (2.50 days). Minimum shelf life was recorded in Namdhari Pink (1.80 days) furnished in Table 1.

Physiological loss in weight of flowers

Significant variation was observed among different genotypes of China aster for physiological loss of weight Table 2. At second and third day, it was maximum in var. Shashank (25.15% and 32.89%, respectively), where as minimum in var. Phule Ganesh Pink (19.40 and 18.98%, respectively). Maximum PLW on fourth and fifth day was recorded in var. Kamini (62.65% and 73.21%, respectively) whereas, minimum in Phule Ganesh White (37.97% and 45.28%, respectively). (Table 2. and Fig 3.)

Discussion

Flower quality parameters

Flower quality parameters decide the significance of suitability of the particular cultivar for commercial cultivation. The important biometric characters deciding the size and nature of flowers are flower weight, flower diameter, and shelf life. Significant differences were observed among the varieties for these flower quality parameters.

Significant difference was observed among different varieties of China aster with respect to flower diameter. Maximum flower diameter was recorded in the var. Phule Ganesh White, whereas, minimum flower diameter was recorded in the vars. Shashank and Mudigere Local. The variation in flower

diameter might be due to the genotypic expression of the varieties. These results are in conformity with the results reported earlier in China aster by Poornima *et al.* (2006) [6] and Zosiamliana *et al.* (2012).

There was significant difference observed with respect to test weight of 10 fresh flowers among the varieties. Average weight of 10 flowers was maximum in the vars. Phule Ganesh Pink and Phule Ganesh White whereas, it was minimum in the vars. Arka Archana and Poornima. The weight of 10 flowers has direct relation with the size of flowers. The greater the size of the flowers, greater would be the weight of flowers. Similar results were also reported in marigold by Mathad (2003) [2], Verma *et al.* (2002) [10], Rao and pratap (2006) [7] and Singh *et al.* (2003) [8] for individual weight of flowers.

Significant difference among varieties of China aster with respect to shelf life at room temperature in open condition was recorded for maximum days in Phule Ganesh White and minimum in Namdhari Pink and Shashank. Fairly more number of leaves might have resulted in increased photosynthetic activity as evidenced by increased accumulation of dry matter and this might have helped in extended shelf life. These results are in conformity with the results reported earlier in China aster (Munikrishnappa, 2011) [3].

Significant variation was observed among the different varieties of China aster for physiological loss of weight at second and third day. It was maximum in var. Shashank and minimum in var. Phule Ganesh Pink. Fourth and fifth day, the maximum physiological loss in weight (PLW) was recorded in var. Kamini, whereas minimum in Phule Ganesh White. The varieties were collected from different Agro-climatic conditions and as such had different genetic makeup and hence, the variation in varieties might be due to genetic and environmental interaction (Narsude *et al.*, 2010) [4].

Conclusion

Test weight and diameter of flower were maximum in var. Phule Ganesh Pink and Phule Ganesh White, respectively. Significant difference was observed among varieties of China aster with respect to shelf life at room temperature in open condition. Maximum shelf life was recorded in Phule Ganesh White and minimum in Namdhari Pink and Shashank.

Significant variation was observed among different China aster varieties for physiological loss of weight at second and third day. It was maximum in var. Shashank and minimum in var. Phule Ganesh Pink. Fourth and fifth day the maximum physiological loss in weight was found in var. Kamini whereas, minimum in Phule Ganesh White.

Table 1: Variation in flower diameter, test weight and shelf life of China aster varieties

Variety	Flower diameter (cm)	Test weight (g)	Shelf life (days)
Kamini	4.90	24.27	2.50
Shashank	3.77	21.01	2.00
Poornima	4.90	20.63	2.20
Arka Aadya	5.00	20.81	2.50
Arka Archana	4.30	19.51	3.00
Phule Ganesh White	6.35	50.53	4.00
Phule Ganesh Pink	5.55	55.33	3.00
Phule Ganesh Purple	6.10	33.59	3.60
Phule Ganesh Violet	6.01	34.46	3.40
Mudigere Local	3.90	22.77	2.90
Namdhari Pink	4.68	21.37	1.80
Namdhari White	4.51	46.21	2.50
Mean	5.00	30.87	2.79
S.Em. \pm	0.15	0.93	0.10
CD at 5%	0.45	2.72	0.30

Table 2: Variation in physiological loss in weight of flowers of China aster

Variety	PLW (%)			
	2 nd day	3 rd day	4 th day	5 th day
Kamini	23.61	31.54	62.65	73.21
Shashank	25.15	32.89	42.76	54.62
Poornima	18.19	25.95	50.92	62.34
Arka Aadya	19.58	26.61	56.78	68.45
Arka Archana	19.85	26.30	59.06	70.41
Phule Ganesh White	19.43	26.01	37.97	45.28
Phule Ganesh Pink	19.40	18.98	40.61	51.33
Phule Ganesh Purple	20.75	27.77	49.33	61.81
Phule Ganesh Violet	20.23	31.35	48.67	59.07
Mudigere Local	20.18	26.97	49.86	63.04
Namdhari Pink	21.26	32.55	55.66	67.22
Namdhari White	23.34	30.68	50.70	60.15
Mean	20.91	37.50	50.41	63.15
S. Em. \pm	1.32	3.20	4.35	5.63
CD at 5%	3.88	9.98	12.76	15.28

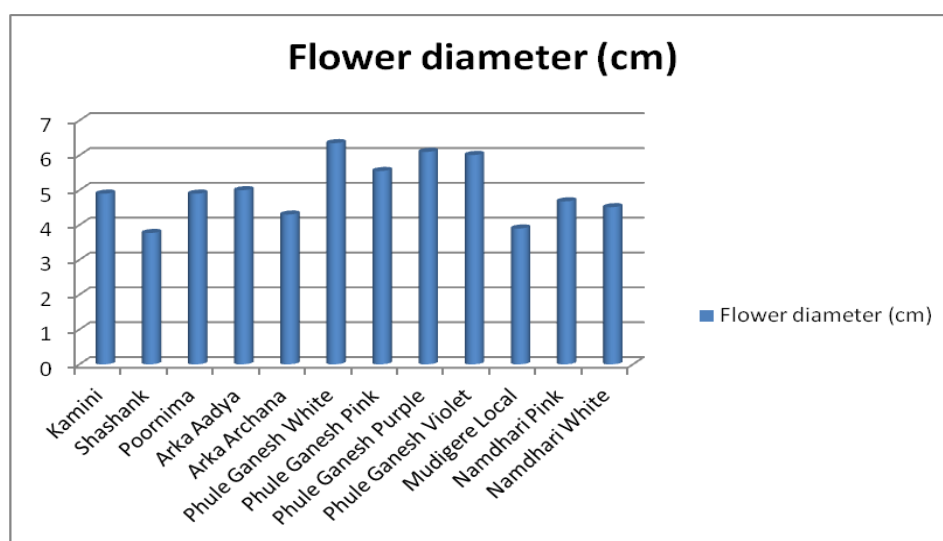


Fig 1: Variation in diameter of flowers in China aster varieties

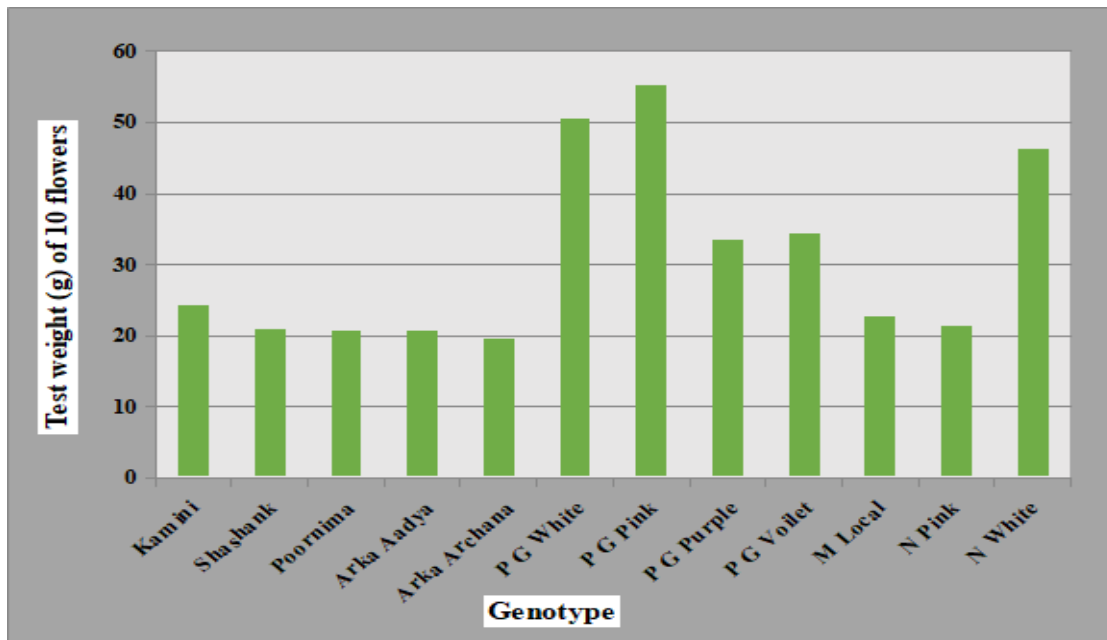


Fig 2: Variation in test weight (10 flowers) of flowers in China aster varieties

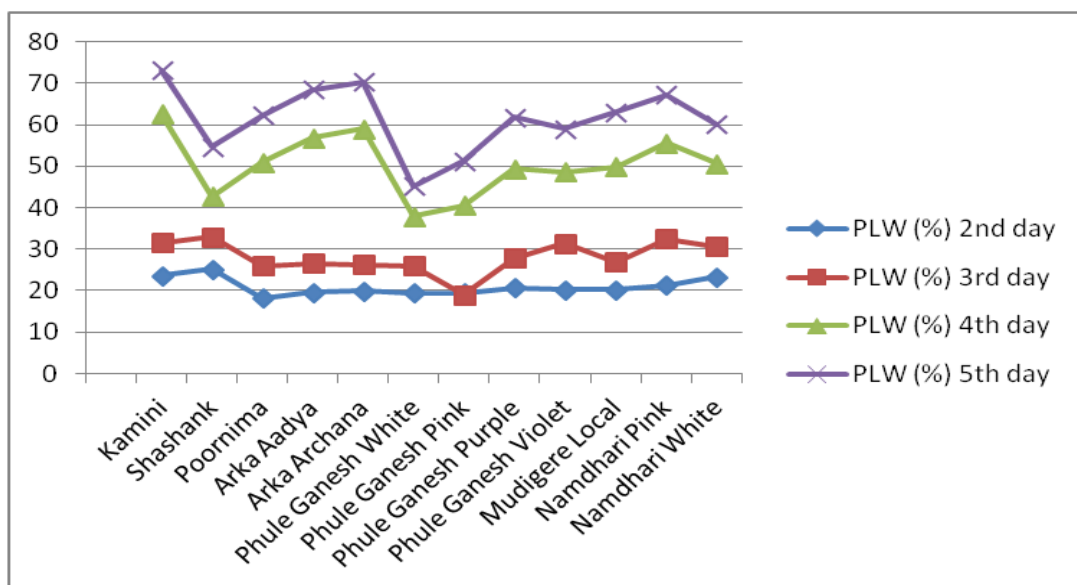


Fig 3: Variation in physiological loss in weight of flowers of China aster

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