

Evaluation of China Aster (*Callistephus chinensis*) Genotypes for Growth and Yield Parameters

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ABSTRACT

China aster is a half hardy annual commercial and ornamental flower crop grown for its flowers. The flowers of aster are used for flower arrangement, interior decoration, garland making and worshipping. The present investigation was conducted during 2015 and 2016 at Citrus Research Station, Tirupati with the objective to evaluate suitable varieties on growth and flower yield of China aster under Seshachalam tracts of Chittoor Dist. Among the varieties, Arka Poornima recorded the highest plant height, plant spread and number of primary branches at different stages of plant growth. While the variety Local recorded the least plant height and plant spread. Arka Archana was found superior for secondary branches per plant. The weight of 100 flowers was maximum (531.5 gm) in variety Arka Poornima, whereas minimum (351.3 g) was noticed in variety Local. The maximum flower yield (20.5 kg) was recorded in Arka Archana and it was lowest Mixed Variety Local (9.9 kg).

Key words: *Asteraceae*, *Cut flower*, *China aster*, *Variety*

China aster (*Callistephus chinensis* Nees.) is a half hardy annual and commercial flower crop belonging to the family Asteraceae. It is an important annual crop of our country and grown throughout the world. The genus *Callistephus* is derived from two Greek words *Kalistos* meaning 'most beautiful' and *Stephus*, 'a crown' referring to the flower head. The present day asters have been developed from a single form of wild species, *Callistephus chinensis*. The evolution of china aster was a history of remarkable variations. The original plant had single flowers with two or four rows of blue, violet or white ray florets. The stature was medium tall, 18 to 24 inches in height. The first change in the flower type had been the prolongation or development of central florets and the production of quilled flowers. In Andhra Pradesh it is cultivated in the Districts of Krishna, West Godavari, Srikakulam, Kadapa, Kuppam dist. on an area of 1194 ha, with a production of 10646 mt and productivity of 6.41 t/ha, respectively during 2009 (Anon., 2009). In importance it ranks next to chrysanthemum and marigold among the traditional flowers. Though the flower yield and quality are primarily varietal characters, they are also greatly influenced by climatic factors. The climatic factors like photoperiod, temperature, relative humidity and also soil moisture influence both vegetative and reproductive phases of the plant, ultimately leading to variation in the performance of genotypes. Hence, plants have to be exposed to proper climatic factors in order to get optimum and economic flower yields. Hence, there is a need to standardize the production technology under

Seshachalam tract of Chittoor dist involving systematic investigation to evaluate suitable varieties.

MATERIAL AND METHODS

The present investigation was carried out at the Citrus Research Station, Tirupati during September to December 2015 and January to April 2016 to study the performance of different varieties of China aster under Seshachalam tracts of Chittoor dist. The experiment was laid out in a Randomized Block Design (RBD) with four replications. This experiment consisted of five varieties viz. Arka Kamini, Arka Aadya, Arka Poornima Arka Archana and Local. Plot size is 2 x 2 mt. Raised nursery beds of size 2.0 m x 1.0 m were first prepared and drenched with Captan (0.01%). Seeds of different varieties were also treated with Captan (2 g / kg seeds) for five minutes and then sown in lines. The nursery beds were watered daily twice for first 10 days and daily once for the remaining period. Hand weeding was done thrice when the seedlings were 15 days, 25 days and 35 days old. The seedlings were ready for transplanting at 35 days after sowing. The land was brought to a fine tilth by repeated ploughing and harrowing. Thirty five days old healthy and uniformly grown seedlings were used for transplanting with a spacing of 45 cm x 30 cm at the rate of one seedling per hill. Fertilizer application, weeding, plant protection etc. were carried out as per package of practice. The observations were recorded on plant height, plant spread, number of primary branches, number of secondary branches, 100 flower weight and flower yield.

Table 1. Plant height in China aster varieties at different growth stages

Varieties	Plant Height (cm)											
	45 DAT			75 DAT			105 DAT			At Harvest		
	2015	2016	Pooled	2015	2016	Pooled	2015	2016	Pooled	2015	2016	Pooled
Arka Poornima	27.2	27.9	27.5	50.1	52.6	51.3	62.1	64.8	63.4	67.5	68.1	67.8
Arka Archana	15.6	16.7	16.2	35.1	38.1	36.6	46.7	49.6	48.1	51.3	52.5	51.9
Arka Kamini	16.8	17.2	17.0	38.9	41.6	40.3	53.8	55.6	54.7	58.1	61.0	59.5
Arka Aadya	17.1	18.1	17.6	40.1	43.1	41.5	55.9	57.7	56.8	60.3	62.4	61.3
Local	15.6	16.7	16.2	35.1	38.1	36.6	46.7	49.6	48.1	51.3	52.5	51.9
S.Em	1.6	1.5	1.1	1.8	2.0	1.4	2.5	2.1	1.8	2.0	2.1	1.3
CD at 5 %	4.7	4.7	3.4	5.5	5.9	4.3	7.5	6.2	5.4	6.2	6.5	3.9

DAT: Days after Transplanting

Table 2. Plant spread in China aster varieties at different growth stages

Varieties	Plant Height (cm)											
	45 DAT			75 DAT			105 DAT			At Harvest		
	2015	2016	Pooled	2015	2016	Pooled	2015	2016	Pooled	2015	2016	Pooled
Arka Poornima	25.6	26.1	25.9	28.3	30.2	29.3	32.7	33.6	33.1	34.8	35.2	35.0
Arka Archana	26.7	27.8	27.3	30.2	31.8	31.0	33.6	34.1	33.9	35.9	36.8	36.3
Arka Kamini	23.7	24.6	24.2	25.8	26.1	25.9	28.7	29.6	29.1	30.6	31.5	31.0
Arka Aadya	24.8	25.2	25.0	27.2	28.4	27.8	30.6	31.7	31.1	32.4	33.2	32.8
Local	21.8	22.6	22.2	24.1	25.8	24.9	36.2	27.8	27.0	28.3	29.1	28.7
S.Em	1.9	1.5	1.2	1.6	1.6	1.0	1.7	1.7	1.2	2.0	1.8	1.2
CD at 5 %	5.7	4.4	3.7	4.9	4.9	3.2	5.0	5.1	3.6	6.0	5.4	3.8

Table 3. Number of primary branches per plant in China aster varieties at different stages of plant growth

Varieties	Plant Height (cm)											
	45 DAT			75 DAT			105 DAT			At Harvest		
	2015	2016	Pooled	2015	2016	Pooled	2015	2016	Pooled	2015	2016	Pooled
Arka Poornima	10.9	11.2	11.1	23.8	24.6	24.2	27.7	28.6	28.1	28.1	28.9	28.5
Arka Archana	6.3	7.6	7	26.7	24.2	25.4	27.1	27.9	27.5	28	29.1	28.5
Arka Kamini	8.2	8.9	8.6	15.7	16.2	16	20.6	21.8	21.2	21.8	22.9	22.4
Arka Aadya	8.6	7.9	8.2	17.2	18.9	18.1	19.2	21.6	20.4	20.6	22.6	21.6
Local	6.2	7.5	6.8	16.2	17.4	16.8	18.9	20.1	19.5	20.1	21.2	20.7
S.Em	0.4	0.7	0.4	1.4	1	0.6	0.9	1.1	0.6	1.5	1.1	0.8
CD at 5 %	1.41	2.2	1.4	4.3	3.1	2	2.8	3.3	1.9	4.5	3.3	2.3

Table 4. Number of secondary branches per plant in China aster varieties at different stages of plant growth

Varieties	Plant Height (cm)								
	75 DAT			105 DAT			At Harvest		
	2015	2016	Pooled	2015	2016	Pooled	2015	2016	Pooled
Arka Poornima	18.8	19.1	18.9	25.6	25.9	25.8	27.1	27.9	27.5
Arka Archana	18.1	18.9	18.5	32.8	31.6	32.2	33.4	34.1	33.7
Arka Kamini	16.8	16.2	16.5	24.6	25.1	24.8	25.3	25.8	25.6
Arka Aadya	15.9	16.2	16.0	22.7	23.6	23.1	23.6	23.7	23.7
Local	16.3	16.8	16.6	27.6	28.9	28.3	28.6	29.6	29.1
S.Em	1.7	1.0	0.8	2.4	2.3	1.8	2.4	2.1	1.4
CD at 5 %	5.1	2.9	2.4	7.1	6.8	5.4	7.2	6.2	4.1

Table 5. Flower yield and its attributes in China aster varieties

Varieties	100 Flower weight (gm)			Flower Yeild (kg)		
	2015	2016	Pooled	2015	2016	Pooled
Arka Poornima	530.4	532.6	531.5	15.1	15.3	15.2
Arka Archana	468.7	470.2	469.4	20.5	20.5	20.5
Arka Kamini	379.8	380.2	380.0	10.8	10.9	10.9
Arka Aadya	442.0	443.5	442.7	18.3	18.3	18.3
Local	350.0	352.2	351.3	9.5	10.3	9.9
S.Em	23.2	22.9	15.3	1.1	1.1	0.8
CD at 5 %	69.0	68.3	45.7	3.1	3.3	2.2

RESULTS AND DISCUSSION

The pooled data of 2015 and 2016 with respect to plant height, plant spread, number of primary branches, number of secondary branches, 100 flower weight, flower yield as influenced by different varieties of China aster are presented in Tables 1- 5.

Plant height varied significantly among the varieties at all the stages of plant growth. Among the varieties, Arka Poornima significantly recorded highest plant height among all treatments. (27.5, 51.3, 63.4, 67.8 cm at 45, 75, 105 DAT and at harvest respectively and lowest was recorded with Archana and Local (16.2 cm) which were on par with remaining treatments at 45 DAT. While the variety Arka Archana, Local recorded the least plant height of 36.6 cm, 48.1 cm and 51.9 cm at 75, 105 DAT and at harvest, respectively (Table 1). Being a genetically controlled factor, plant height varied among the varieties. Similar variation in plant height due to varieties was also observed in marigold (Nalawadi, 1982) and in chrysanthemum (Kanamadi and Patil, 1993).

Plant spread varied significantly in different varieties of China aster at all the stages of plant growth. Among the varieties, Arka Archana was found superior which recorded maximum plant spread of 27.3, 31.0, 33.9 and 36.3 cm at 45, 75, 105 DAT and at harvest, respectively. The performance of Arka Aadya (25.0, 27.8, 31.1 and 32.8 cm and Arka Poornima (25.9, 29.3, 33.1 and 35.0 cm at 45, 75, 105 DAT and at harvest respectively were on par with Arka Archana (Table 2). The difference in plant spread per plant is a varietal trait as it is governed by the genetical makeup. Similar variations in plant spread per plant among varieties were also observed in China aster by Rao and Negi (1990) and Ravikumar (2002).

Number of primary branches varied significantly in different varieties of China aster at all the stages of plant growth (Table 3). Among the varieties, Arka Poornima was found superior which recorded maximum number of primary branches per

plant (11.1 and 28.1) at 45 and 105 DAT respectively). Whereas at 75 DAT and at harvest Arka Archana recorded highest no. of primary branches (25.4 and 28.5) which was found on par with Arka Poornima (24.2 and 28.5) respectively. The performance of Arka Aadya (8.2, 20.4, 21.6) with A Kamini (8.6, 21.2, 22.4) at 45, 105 DAT and at harvest except at 75 DAT (18.1) A. Archana recorded highest number of primary branches (25.4) at 75 DAT which was on par with A. Poornima (24.2). The least number of primary branches was recorded in Local (6.8, 16.8 19.5 and 20.7) at all the stages of plant.

Number of secondary branches per plant varied significantly in different varieties of China aster at all the stages of plant growth (Table 4). At 75 DAT A. Poornima recorded highest number of secondary branches (18.9) and was on par with A. Archana (18.5), Local (16.6) and A. Kamini (16.5) whereas at 105 DAT and at harvest A. Archana was found superior (32.2 and 33.7) but was on par with Local (28.3) at 105 DAT.

The lowest number of secondary branches per plant was recorded in Arka Aadya at 75, 105 and at harvest (16.0, 23.1 and 23.7), respectively. The difference in branches among the varieties could be due to the influence of genetical makeup of the varieties. Similar variations for number of branches was also observed in china aster (Rao and Negi, 1990 and Ravikumar, 2002) and in chrysanthemum (Chezhian *et al.*, 1985a and Kanamadi and Patil, 1993).

Weight of 100 flowers differed significantly among the varieties. The weight of 100 flowers was maximum (531.5 g) in variety Arka Poornima, whereas minimum (351.3 g) was noticed in variety Local. The variation among the varieties with respect to flower yield characters was mainly because of increased flower size with prominent central disc florets and also due to the presence of fairly more number of developed ray florets. Further, being a genetical factor, variations were expected among the varieties of China aster. The

varieties exhibited significant variation for flower yield per plot. The maximum flower yield (20.5 kg) was recorded in Arka Archana and followed by Arka Aadya (18.3 kg). The lowest flower yield per hectare (9.9 kg) was recorded in variety Local. The increased flower yield was due to increased flower size and flower weight as recorded in Arka Archana, Arka Aadya. Further, these varieties had fairly high dry matter accumulation, which might have contributed for the increased flower yield. The flower yield was less in Local. This was because of the fact that it had lesser number of leaves, which resulted in less dry matter accumulation. Variation in flower yield was also observed previously in China aster (Negi and Raghava, 1985) in chrysanthemum (Chezhian *et al.*, 1985b; Laskar and Yadav, 1991) in gerbera (Bhattacharjee, 1981) and marigold (Singh *et al* 2003, Singh and Singh 2006, Howe and Waters, 1991). Among the varieties Arka Archana recorded maximum flower yield 20.5 kg) followed by Arka Aadya (18.3).

CONCLUSION

Among the varieties Arka Archana recorded maximum flower yield 20.5 kg) followed by Arka Aadya (18.3).

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