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EVALUATION OF DIFFERENT CHINA ASTER (*CALLISTEPHUS CHINENSIS* L.) GENOTYPES AT RAIPUR CHHATTISGARH INDIA

Pooja Gupta¹, Menkarani^{1*} and Nandan Mehta²

¹Department of Floriculture and Landscape Architecture IGKV, Raipur (C.G.), India.

Department of Genetics and Plant Breeding, IGKV, Raipur (C.G.)-492012, India

*Corresponding author E-mail: ranimenu81@gmail.com

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ABSTRACT

The present investigation was conducted to evaluate China aster (*Callistephus chinensis* L.) genotypes for key morphological, floral and yield traits. The field experiment was carried out during 2022–23 and 2023–24 at the Horticultural Research cum Instructional Farm, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh. The trial was laid out in a Completely Randomized Design (CRD) with three replications. The findings of the study confirmed significant differences among the evaluated China aster genotypes among all measured traits, thereby facilitating the identification of promising cultivars for specific horticultural objectives. Among the ten genotypes assessed, V-9 Phule Ganesh Pink consistently outperformed others and emerged as the better genotype overall. It recorded the maximum plant spread (30.81 cm), highest number of branches (26.40), maximum number of ray florets per head (221.23), greatest number of flowers per plant (45.93) and the highest flower yield per plant (254.73 g), marking it as a highly suitable genotypes for commercial floriculture due to its vigorous performance among vegetative and floral traits. Similarly, V-3 Phule Ganesh White excelled in plant height (75.07 cm), flower head diameter (7.61 cm), disc diameter (2.74 cm) and demonstrated a longer flowering duration (36.13 days) suggesting its potential for use in ornamental landscaping and extended blooming displays. In contrast, V-4 Local Peach, despite earliest flowering (54.03 days), showed in least traits. Based on pooled mean performance, V-9 Phule Ganesh Pink is recommended as the most promising genotype for maximizing flower yield and quality, closely followed by V-3 Phule Ganesh White for traits related to vegetative attributes and floral attractiveness.

Key words: Varietal Evaluation, China Aster, genotypes.

Introduction

One of the most widely planted annual blooming plants worldwide is the China aster. The Greek terms “kalistos,” which means “most beautiful,” and “stephos,” which means “a crown,” were used to describe the bloom of the genus *Callistephus*. It belongs to the family Asteraceae. The genus *Callistephus* includes only one species *chinensis* and its native to China. China aster is a half hardy annual. A half-hardy annual is the China aster. The plants are upright, with hispid-hairy branches that bear alternating, deeply and irregularly serrated, widely elliptical or triangular-ovate leaves. The main colors of the flowers are indigo-blue, lavender, rose, and white, and they can be solitary, single, semi-double or double. (Navalinskien *et al.*, 2005). A half-hardy annual commercial and decorative flower crop, China asters are

produced for both cut and loose blooms. Aster flowers are used for worship, garland-making, interior decorating and floral arranging. It may be cultivated effectively in a variety of agroclimatic settings, including those in India, France, Germany, the Netherlands, the United Kingdom, Siberia, Russia, Japan, North America, Switzerland and Europe. It has the capacity to respond well to a wide range of soil and climatic circumstances. Farmers in southern Indian states like Karnataka, Tamil Nadu, Andhra Pradesh, Maharashtra and West Bengal are the main producers of China aster on a commercial basis (Kumari *et al.*, 2016). It is commercially grown by marginal and small farmers in the states of Tamil Nadu, Karnataka, Maharashtra, Andhra Pradesh and West Bengal. In Karnataka it is widely cultivated in the districts like Bangalore, Tumkur, Kolar, Chikkaballapur and

Table 1: Average performance of vegetative attributes in China aster genotypes.

Characters	Plant height (cm) [90 DAT]			Number of leaves per plant [90 DAT]			Plant spread [Mean]			Number of branches per plant		
	22-23	23-24	Pooled	22-23	23-24	Pooled	22-23	23-24	Pooled	22-23	23-24	Pooled
V ₁	37.67	38.84	38.26	38.47	39.10	38.78	16.75	16.05	16.40	7.73	7.57	7.65
V ₂	67.40	67.99	67.70	175.00	175.10	175.05	26.35	25.45	25.90	17.80	19.10	18.45
V ₃	74.81	75.34	75.07	182.20	182.63	182.42	25.75	24.94	25.35	20.90	19.67	20.28
V ₄	27.20	27.74	27.47	32.07	30.17	31.12	15.49	15.97	15.73	6.77	5.97	6.37
V ₅	35.29	35.48	35.39	35.60	35.77	35.68	16.66	16.92	16.79	7.27	7.07	7.17
V ₆	27.91	27.65	27.78	35.47	34.77	35.12	19.21	18.69	18.95	7.80	7.83	7.82
V ₇	57.00	56.83	56.92	83.60	84.90	84.25	25.37	25.39	25.38	16.67	16.13	16.40
V ₈	62.69	64.08	63.39	193.27	195.60	194.43	27.40	28.13	27.76	18.87	20.90	19.88
V ₉	70.94	71.62	71.28	204.47	209.23	206.85	30.44	31.18	30.81	25.13	26.40	25.77
V ₁₀	39.07	39.59	39.33	39.47	41.07	40.27	22.10	20.67	21.38	8.53	9.13	8.83
Mean	50.00	50.52	50.26	101.96	102.83	102.40	22.55	22.34	22.44	13.75	13.98	13.86
Min	27.20	27.65	27.47	32.07	30.17	31.12	15.49	15.97	15.73	6.77	5.97	6.37
Max	74.81	75.34	75.07	204.47	209.23	206.85	30.44	31.18	30.81	25.13	26.40	25.77
CV (%)	6.46	8.19	0.64	4.42	5.10	0.71	0.88	2.24	1.26	6.31	6.40	2.70
SE m (±)	1.86	2.39	0.18	2.60	3.03	0.42	0.11	0.29	0.16	0.50	0.52	0.22
CD @ 5%	5.50	7.05	0.55	7.67	8.93	1.25	0.34	0.86	0.48	1.48	1.52	0.64
V ₁ -Local Red; V ₂ -Phule Ganesh Purple; V ₃ -Phule Ganesh White; V ₄ - Local Peach; V ₅ - Local Magenta; V ₆ - Local White; V ₇ - AAC-1; V ₈ - Phule Ganesh Violet; V ₉ - Phule Ganesh Pink; V ₁₀ - Local Violet (Dark)												

Belagavi. It is being cultivated in Karnataka in an area of 207 hectares, with a production of 1,448 metric tons and a productivity of 7.01 tons per hectare, with an annual income of 430 lakhs (Anon., 2021-22). In Chhattisgarh, flower crops are cultivated over an area of 13,638 lakh hectares, with a total production of 3,34,672 metric tonnes (MT). (Directorate of Horticulture, 2022 -23).

Material and Methods

The Field experiment was carried out at Horticultural Research cum Instructional Farm, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh during 2022-23 and 2023-24. The location of experiment i.e., Raipur, is situated in the central part of Chhattisgarh at 21° 16' N latitude, 81° 36' E longitude and at an altitude of 286.56 m from mean sea level. The trial was laid out in a Completely Randomized Design (CRD) with three replications. Totally 10 genotypes were collected from different sources and evaluated for growth and yield parameters. Observations were recorded on various growth parameters, plant height (cm), number of branches and plant spread (cm), floral traits (days to first flower opening, flower head diameter (cm), disc diameter (cm), number of ray florets and yield parameters (number of flowers per plant, duration of flowering (days) and flower yield per plant (g)).

Results and Discussion

Plant height (cm)

In the present study, variation for plant height (Table

1) in China aster was found to be statistically significant at 90 DAT (days after transplanting). The values ranging between 27.47 cm and 75.07 cm. The tallest plants were observed in genotype V-3 Phule Ganesh White (75.07 cm), followed by V-9 Phule Ganesh Pink (71.28 cm) and V-2 Phule Ganesh Purple (67.70 cm). On the other hand, the shortest plant height was recorded in genotype V-4 Local Peach, measuring 27.47 cm at 90 DAT.

Number of leaves per plant

In the present study, variation for Number of leaves per plant (Table 1) in China aster was found to be statistically significant at 90 DAT (days after transplanting). The values ranging from 31.12 to 206.85 leaves. Genotype V-9 Phule Ganesh Pink recorded the highest number of leaves (206.85), followed by V-9 Phule Ganesh Violet (194.43 leaves) and V-3 Phule Ganesh White (182.42 leaves). In contrast, the lowest number of leaves was observed in genotype V-4 Local Peach, with a count of 31.12 leaves per plant at 90 DAT.

Plant spread (cm)

In the present study, significant differences were observed for plant spread (Table 1) at north south (N-S) and east west [E-W] orientation, highlighting the variation in lateral growth patterns among the China aster genotypes assessed. The values ranging between 15.73 cm and 30.81 cm. Genotype V-9 Phule Ganesh Pink exhibited the maximum spread (30.81 cm), followed by V-8 Phule Ganesh Violet (27.76 cm) and V-2 Phule

Ganesh Purple (25.90 cm). In contrast the minimum plant spread (mean) was observed in genotype V-4 Local Peach, which recorded 15.73 cm.

Number of branches per plant

In the present study, significant variation was observed for the number of branches per plant (Table 1), indicating a broad range of branching capacity among the China aster genotypes evaluated. This variation maximizes the potential for selecting genotypes with superior branching traits to enhance yield performance. In the present study, the values ranging from 6.37 to 25.77 branches. Genotype V-9 Phule Ganesh Pink produced the highest number of branches (26.40), followed by V-3 Phule Ganesh White (20.28 branches) and V-8 Phule Ganesh Violet (19.88 branches). Lowest number of branches was observed in genotype V-4 Local Peach, which recorded 6.37 branches per plant.

Days to first flower opening

In the present investigation, significant differences were observed for days to first flower opening (Table 2), indicating considerable variation in flowering time among the China aster genotypes evaluated. This variability offers scope for selecting early flowering genotypes to suit specific growing seasons and market demands. In the current study, the observed values ranging from 54.03 to 80.20 days. Genotype V-4 Local Peach exhibited the earliest flowering (54.03 days), followed by V-1 Local Red (56.53 days) and V-10 Local Violet dark (56.72 days). In contrast, the late flowering was observed in genotype V-8 Phule Ganesh Violet, which took 80.20 days to flower.

Flower head diameter (cm)

In the present investigation, significant variation was recorded for flower head diameter (cm) (Table 2), indicating the presence of considerable diversity among the genotypes evaluated. This variation provides an opportunity to select genotypes with larger and more attractive flower heads to enhance commercial potential. In this study, the values ranging from 4.21 cm to 7.61

cm. Genotype V-3 Phule Ganesh White (7.61 cm) produced the largest flower head diameter followed by V-8 Phule Ganesh Violet (7.48 cm) and V-9 Phule Ganesh Pink (6.98 cm). On the other hand, the smallest flower head diameter was observed in genotype V-4 Local Peach, which recorded 4.21 cm.

Disc diameter (cm)

In the present study, significant differences were observed for disc diameter (Table 2), suggesting considerable variation among the genotypes evaluated. This diversity highlights the potential for selecting genotypes with desirable floral characteristics for ornamental and commercial improvement. The values ranging from 1.45 cm to 2.74 cm. Genotype V-3 Phule Ganesh White exhibited the maximum disc diameter (2.74 cm), followed by V-8 Phule Ganesh Violet (2.55 cm) and V-9 Phule Ganesh Pink (2.23 cm). Conversely, the minimum disc diameter was recorded in genotype V-4 Local Peach measuring 1.45 cm.

Number of ray florets per flower head

In the present study, significant differences were observed for the number of ray florets per flower head (Table 2), The values ranging from 49.45 to 221.23 ray florets. Genotype V-9 Phule Ganesh Pink recorded the highest number of ray florets (221.23 ray florets), followed by V-8 Phule Ganesh Violet (146.40 ray florets) and V-3 Phule Ganesh White (129.10 ray florets). In contrast, the lowest number of ray florets was observed in genotype V-4 Local Peach, which recorded 49.45 ray florets per flower head.

Number of flowers per plant

In the present study, significant variation was observed for the number of flowers per plant (Table 2), This variation suggests strong potential for selecting high-performing genotypes with superior flowering ability. The observed values ranging from 15.70 to 45.93 flowers. Genotype V-9 Phule Ganesh Pink recorded the highest number of flowers per plant (45.93 flowers), followed by V-3 Phule Ganesh White (43.63 flowers) and V-2 Phule

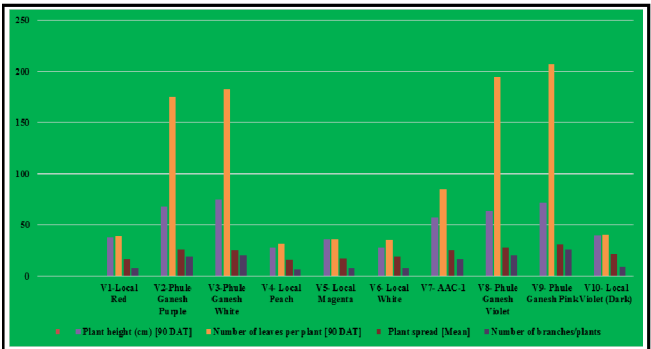


Fig. 1: Average performance of vegetative attributes in China aster genotypes.

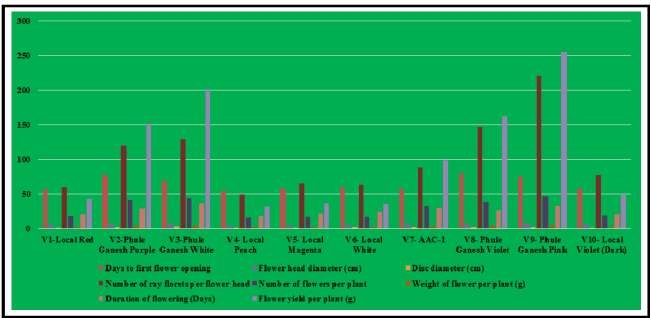


Fig. 2: Average performance of flowering attributes in China aster genotypes.

Table 2: Average performance of flowering attributes in China aster genotypes.

Characters	Days to first flower opening			Flower head diameter (cm)			Disc diameter (cm)			Number of ray florets per flower head		
	22-23	23-24	Pooled	22-23	23-24	Pooled	22-23	23-24	Pooled	22-23	23-24	Pooled
V ₁	57.13	55.93	56.53	5.59	4.76	5.17	1.55	1.78	1.66	57.87	59.77	58.82
V ₂	75.93	77.97	76.95	6.40	7.00	6.70	1.88	1.89	1.89	115.47	123.97	119.72
V ₃	70.47	67.63	69.05	7.21	8.00	7.61	2.69	2.80	2.74	129.13	129.07	129.10
V ₄	53.33	54.73	54.03	4.15	4.27	4.21	1.45	1.44	1.45	48.93	49.97	49.45
V ₅	57.33	58.00	57.67	5.14	5.50	5.32	1.67	1.77	1.72	64.00	65.87	64.93
V ₆	57.93	59.87	58.90	5.44	5.16	5.30	1.85	1.90	1.87	64.20	61.40	62.80
V ₇	56.73	58.13	57.43	6.63	6.81	6.72	2.23	2.26	2.25	90.13	87.27	88.70
V ₈	79.67	80.73	80.20	7.26	7.70	7.48	2.57	2.53	2.55	145.87	146.93	146.40
V ₉	74.07	75.83	74.95	6.91	7.05	6.98	2.11	2.34	2.23	220.40	222.07	221.23
V ₁₀	57.73	55.70	56.72	5.66	5.73	5.70	1.55	1.42	1.48	77.80	75.00	76.40
Mean	64.03	64.45	64.24	6.04	6.20	6.12	1.95	2.01	1.98	101.38	102.13	101.76
Min	53.33	54.73	54.03	4.15	4.27	4.21	1.45	1.42	1.45	48.93	49.97	49.45
Max	79.67	80.73	80.20	7.26	8.00	7.61	2.69	2.80	2.74	220.40	222.07	221.23
CV (%)	8.25	7.59	0.80	7.26	7.70	2.83	6.96	8.53	3.77	7.43	6.30	2.79
SE m (±)	3.05	2.82	0.30	0.25	0.28	0.10	0.08	0.10	0.04	4.35	3.71	1.64
CD @ 5%	9.00	8.33	0.88	0.75	0.81	0.30	0.23	0.29	0.13	12.84	10.95	4.87
Continue ...												
Characters	Number of flowers per plant			Weight of flower per plant (g)			Duration of flowering (Days)			Flower yield per plant (g)		
	22-23	23-24	Pooled	22-23	23-24	Pooled	22-23	23-24	Pooled	22-23	23-24	Pooled
V ₁	18.27	17.87	18.07	2.34	2.25	2.29	20.00	20.97	20.48	44.43	40.14	42.28
V ₂	40.20	41.00	40.60	3.67	3.80	3.73	28.27	29.00	28.63	149.48	153.85	151.66
V ₃	42.67	44.60	43.63	4.61	4.67	4.64	37.20	35.07	36.13	194.40	208.61	201.51
V ₄	16.20	15.20	15.70	1.93	1.96	1.94	18.20	17.33	17.77	33.39	29.78	31.58
V ₅	17.47	17.20	17.33	2.05	2.08	2.07	22.13	21.90	22.02	37.41	35.79	36.60
V ₆	16.73	16.60	16.67	2.11	2.13	2.12	23.73	23.87	23.80	36.16	35.37	35.76
V ₇	31.93	33.60	32.77	2.97	2.99	2.98	30.87	28.97	29.92	96.20	101.47	98.83
V ₈	39.00	37.67	38.33	4.18	4.28	4.23	25.80	25.73	25.77	164.15	161.18	162.66
V ₉	45.67	46.20	45.93	5.53	5.59	5.56	33.73	31.77	32.75	253.05	258.41	255.73
V ₁₀	18.93	18.07	18.50	2.55	2.51	2.53	20.93	20.93	20.93	51.41	45.33	48.37
Mean	28.71	28.80	28.75	3.19	3.23	3.21	26.09	25.55	25.82	106.01	106.99	106.50
Min	16.20	15.20	15.70	1.93	1.96	1.94	18.20	17.33	17.77	33.39	29.78	31.58
Max	45.67	46.20	45.93	5.53	5.59	5.56	37.20	35.07	36.13	253.05	258.41	255.73
CV (%)	8.39	4.97	1.62	5.83	7.63	1.29	6.59	5.02	1.80	4.82	5.33	1.90
SE m (±)	1.39	0.83	0.27	0.11	0.14	0.02	0.99	0.74	0.27	2.95	3.29	1.17
CD @ 5%	4.10	2.44	0.80	0.32	0.42	0.07	2.93	2.18	0.80	8.71	9.71	3.48
V ₁ -Local Red; V ₂ -Phule Ganesh Purple; V ₃ -Phule Ganesh White; V ₄ - Local Peach; V ₅ - Local Magenta; V ₆ - Local White; V ₇ - AAC-1; V ₈ - Phule Ganesh Violet; V ₉ - Phule Ganesh Pink; V ₁₀ - Local Violet (Dark)												

Ganesh Purple (40.60 flowers). Lowest number of flowers per plant was recorded in genotype V-4 Local Peach, which produced only 15.70 flowers per plant.

Weight of flowers per plant (g)

In the present investigation, significant variation was recorded for Weight of flower per plant (g) (Table 2). The values ranging from 1.94 grams to 5.56 grams. Genotype V-9 Phule Ganesh Pink exhibited the maximum flower weight per plant (5.56 g), followed by V-3 Phule

Ganesh White (4.64 g) and V-8 Phule Ganesh Violet (4.23 g). In contrast, the minimum flower weight per plant was recorded in genotype V-4 Local Peach, with a yield of only 1.94 grams per plant.

Duration of flowering (Days)

In the present study, significant variation was observed for Duration of flowering (Days) (Table 2), indicating substantial diversity among the evaluated genotypes. This variation offers potential for selecting

genotypes with prolonged blooming periods to enhance their aesthetic and economic value. The observed values ranging from 17.77 to 36.13 days. Genotype V-3 Phule Ganesh White exhibited the longest flowering duration (36.13 days), followed by V-9 Phule Ganesh Pink (32.75 days) and V-2 Phule Ganesh Purple (28.63 days). In contrast, the shortest flowering duration was observed in genotype V-4 Local Peach, which flowered for only 17.77 days.

Flower yield per plant (g)

In the present investigation, significant variation was recorded for flower yield per plant (Table 2), indicating a wide range of productivity among the evaluated genotypes. This variation highlights the potential for selecting high-yielding genotypes suited for commercial floriculture. The values ranging from 31.58 g to 255.73 g. Genotype V-9 Phule Ganesh Pink produced the highest flower yield per plant (254.73 g), followed by V-3 Phule Ganesh White (201.51 g) and V-8 Phule Ganesh Violet (162.66 g). In contrast, the lowest flower yield was observed in genotype V-4 Local Peach, which recorded only 31.58 g per plant.

Based on the flower yield per plant recorded during Rabi 2022–23 and Rabi 2023–24, genotype V-9 (Phule Ganesh Pink) consistently emerged as the best-performing genotype, producing the highest flower yield in both seasons—253.05 g in 2022–23 and 258.41 g in 2023–24. It was followed by V-3 (Phule Ganesh White) with yields of 194.40 g and 208.61 g and V-8 (Phule Ganesh Violet) with 164.15 g and 161.18 g in respective years. This consistent superior performance may be attributed to the inherent genetic potential of these genotypes for vigorous growth, efficient nutrient utilization and superior floral traits such as larger flower heads and longer flowering duration, contributing to higher cumulative yield, reinforcing the opportunity for further selection and genetic improvement. In contrast, V-4 (Local Peach) recorded the lowest flower yield in both years, indicating comparatively poor genetic potential or adaptability under the prevailing environmental conditions. Savitha *et al.*, (2016), Dharmendra *et al.*, (2019), Santhosh *et al.*, (2021) and Nighut *et al.*, (2023) reported similar findings.

Conclusions

Thus, considering the pooled mean among all characters, V-9 Phule Ganesh Pink can be recommended as the better genotype owing to its superior performance in maximum plant spread (30.81 cm), number of branches (26.40), ray florets (221.23), flowers per plant (45.93) and flower yield (254.73 g). V-9 It is highly suitable for commercial cultivation. V-3 Phule Ganesh White recorded

the tallest plant (75.07 cm), largest flower head (7.61 cm), disc diameter (2.74 cm) and longest flowering duration (36.13 days), showing good ornamental value. V-4 Local Peach was the earliest to flower (54.03 days), although its overall performance was the poor among most traits.

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Conflict of interest: The authors declare that they have no conflict of interest.

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