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Response of various Planting Dates and Varieties on Performance of China Aster under South Gujarat

T. R. Ahir^{1*}, S. L. Chawla², S. T. Bhatt³, Dipal S. Bhatt², G. D. Patel² and R. A. Gurjar⁴

¹Fruit Research Station, Navsari Agricultural University, Gandevi-396 360, Gujarat-India

²Department of Floriculture and Landscape Architecture, ASPEE College of Horticulture and Forestry, NAU, Navsari-396 450, Gujarat-India

³Horticulture Polytechnic, ASPEE College of Horticulture and Forestry, NAU, Navsari-396 450, Gujarat-India

⁴Department of Horticulture, KVK, NAU, Navsari-396 450, Gujarat-India

*Corresponding author

ABSTRACT

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Present investigation was carried out to standardize planting dates and suitable varieties of China aster for quality flower production in South Gujarat. The experiment was laid out in split plot design having four levels of planting dates (main plots) and six levels of varieties (sub plots). The twenty four treatment combinations of different planting dates and varieties were replicated four times. Among different treatments of China aster, var. Phule Ganesh White planted on 15th October (P₁V₃) recorded maximum plant height and stalk length, weight of 10 flowers while planting of Phule Ganesh Violet on 15th October (P₁V₄) recorded maximum plant spread in East-West and North-South directions and number of primary branches. However planting of China aster variety ArkaArchana on 15th October (P₁V₅) gave maximum number of flowers per plant, flower yield per plant, per hectare and water uptake per flower.

Introduction

China aster, *Callistephus chinensis* (L.) Nees belongs to family Asteraceae and native of China and Europe. The genus *Callistephus* derived its name from two greek words 'Kalistos' and 'Stephos' meaning 'most

beautiful' and 'a crown' respectively. Cassini described the China aster as *Callistephus hortensis*. It was first named by Linnaeus as *Aster chinensis* and Nees changed this name to *Callistephus chinensis*. China aster is a very popular annual flower crop and mainly cultivated for production of cut flowers, loose

flowers, pot plant and bedding plant purposes in landscape. It is gaining fast popularity in India because of its easy cultural practices, diversity of colours and varied uses. Evolution of aster flowers brought a new range of colours starting from white, rose, red lavender, magenta and blue to their innumerable variations (Desai, 1967). The plants of China aster are erect and attain a maximum height of 60-80 cm depending upon the genotypes. There is a vast scope of growing China aster for cut flowers and loose flower production in country. But the planting time is vary according to agro climatic conditions. The Kamini variety of China aster has good potential and suitable for loose flower production in Himachal Pradesh (SapnaKaushal *et al.*, 2014). Performance of all varieties is not similar in all climatic conditions. There is no information regarding date of planting and varieties on China aster particularly in South Gujarat conditions hence need was felt to standardize the suitable planting time for cultivation of its varieties in South Gujarat for the commercialization of this crop. Keeping in view the above facts, the present experiment was designed to indentify suitable varieties of China aster and their most favourable planting time for particular variety under agro climatic condition of south Gujarat.

Materials and Methods

The present experiment was carried out at Floriculture Research Farm, ASPEE College of Horticulture & Forestry, Navsari Agricultural University, Navsari during the Rabi season of 2018-19 and 2019-20 from August to April months. The experiment was laid out in split plot design having four main plots of planting dates *viz.*, P₁-15th October, P₂-1st November, P₃-16th November and P₄-1st December and six sub plots of varieties *viz.*, V₁-Phule Ganesh Pink, V₂-Phule Ganesh Purple, V₃-Phule Ganesh White, V₄-Phule

Ganesh Violet, V₅-Arka Archana and V₆-ArkaKamini. The twenty four treatment combinations of different planting dates and varieties were replicated four times. Healthy, disease free seedlings of uniform size having 3-4 true leaves were used for transplanting on four different planting dates. The seedlings were transplanted with the spacing of 30x30 cm to accommodate 28 plants per plot. The transplanting from the nursery to the field was done in the evening hours. Well decomposed farm yard manure (FYM) @ 10 t/ha was added before the transplanting of seedlings and mixed thoroughly in the soil. Nitrogen, phosphorus and potash were applied in the form of urea, single superphosphate and muriate of potash, respectively. Fertilizers were applied at the rate of 200 kg N, 100 kg P and 100 kg K per hectare in China aster with half dose of N and full dose of P and K as a basal dose and remaining N at 30 days after transplanting. The observations were recorded on various vegetative, flowering and yield parameters.

Results and Discussion

Effect of planting dates and varieties on vegetative growth character of China aster

It is evident from the data (Table 1) that maximum plant height (48.83 cm and 64.59 cm) at 60 and 90 DAT, respectively was recorded in China aster variety Phule Ganesh White transplanted on 15th October (P₁V₃). While, maximum plant spread E-W (40.16 cm and 48.95 cm), plant spread N-S (40.61 cm and 52.84 cm) and number of primary branches (13.53 and 13.15) at 60 and 90 DAT, respectively were observed in China aster variety Phule Ganesh Violet transplanted on 15th October (P₁V₄) and minimum plant height (24.76 cm and 27.63 cm), plant spread E-W (10.33 cm and 15.78 cm) and plant spread N-S (11.30 cm and 16.93 cm) at 60 and 90 DAT, respectively were noted in China aster variety

ArkaArchana transplanted on 1st December (P₄V₅). However, minimum number of primary branches (2.83 and 3.95) at 60 and 90 DAT, respectively was found in China aster variety Phule Ganesh Pink transplanted on 1st December (P₄V₁). It might be due to that 15th October planted crop go to maximum time to put up sufficient vegetative growth which was further catalyzed by the superior genotype of variety Phule Ganesh White. These results are in close agreement with the earlier work of Dilta *et al.*, (2007). It may be due to the onset of natural short days which resulted in hastening of reproductive phase. While studying the effect of season on growth and flowering of aster also reported that the plant volume was greatest in the monsoon season.

The variation exhibited by varieties for plant height and spread may be due to differences in their genetic make up and varietal vigor in China aster (Dhemre *et al.*, 1998 and Bajad *et al.*, 2017). This improvement might be due to the reason that 15th October planted crop got maximum time to put up sufficient vegetative growth particularly the more number of branches which was further catalyzed by the genotype of Phule Ganesh Violet. These results are in close agreement with the earlier work of SmitaPakhale *et al.*, (2012) in African marigold and Ismail *et al.*, (2013) in Mexican marigold.

Effect of planting dates and varieties on flowering and quality character of China aster

Data regarding flowering and quality characters, days to first flower opening, 50 *per cent* flower opening, duration of flowering, flower head diameter, weight of 10 flowers and longevity of flowers were found non-significant, except stalk length. The maximum stalk length (33.83 cm) was recorded in China aster variety Phule Ganesh White transplanted on 15th October (P₁V₃) and minimum stalk

length (10.36 cm) was found in China aster variety ArkaArchana transplanted on 1st December (P₄V₅) (Table 2).

This could be ascribed to the genetic makeup of variety and favorable climatic conditions because of proper planting time as well during the blooming growth and flowering period. These findings are in accordance with the work of Swaroop *et al.*, (2004) in China aster and Dilta *et al.*, (2005) in chrysanthemum.

Effect of planting dates and varieties on yield character of China aster

It is clear from the data (Table 3) that maximum number of flowers per plant (62.15), flower yield per plant (189.88 g), yield per plot (3.53 kg) and yield per hectare (138.52 q) were recorded in China aster variety ArkaArchana transplanted on 15th October (P₁V₅) and minimum flowers per plant (21.63), flower yield per plant (49.95 g) and yield per hectare (36.89 q) were recorded in China aster variety ArkaKamini transplanted on 1st December (P₄V₆). The more number of flowers were produced when planting was accomplished in mid of October which may be ascribed to the fact that these plants could get sufficient time for putting up more vegetative growth particularly the production of more number of shoots which later on become reproductive. So, they produced comparatively more flowering stems than the later planted crop.

The results are in confirmation with the findings of Dhatt and Kumar (2010) in larkspur. Similar results were found by Nagaraju *et al.*, (2004), Sreenivasulu *et al.*, (2004), Kumar (2005), Dilta *et al.*, (2007) and Bajad *et al.*, (2017) in China aster; Arora *et al.*, (2002) and Vasanthakumar *et al.*, (2015) in gladiolus; Basoli (2009) in chrysanthemum; SmitaPakhale *et al.*, (2012) in marigold and Kumar and Kaur (2000) in phlox.

Table.1 Effect of different planting dates and varieties of China aster on vegetative parameters at 60 and 90 DAT

Treatments	Plant height (cm)		Plant spread (cm) East-West		Plant spread (cm) North-South		No. of primary branches	
	60 DAT	90 DAT	60 DAT	90 DAT	60 DAT	90 DAT	60 DAT	90 DAT
P₁V₁	45.28	57.14	27.84	34.82	27.10	35.53	8.10	8.80
P₁V₂	42.75	59.10	27.58	37.69	30.30	37.50	10.30	11.20
P₁V₃	48.83	64.59	37.64	48.81	37.04	43.94	8.65	9.75
P₁V₄	47.01	61.54	40.16	48.95	40.61	52.84	13.53	13.15
P₁V₅	31.99	47.56	25.68	34.18	26.31	32.58	12.18	12.58
P₁V₆	36.21	49.98	20.36	25.16	18.89	23.70	10.95	10.83
P₂V₁	41.38	51.75	24.10	30.56	22.81	30.28	7.33	7.43
P₂V₂	39.40	50.84	24.81	33.35	27.25	35.49	9.95	10.85
P₂V₃	44.44	58.98	30.11	42.50	33.91	42.22	8.18	9.13
P₂V₄	39.97	52.45	35.37	45.76	36.22	45.57	11.88	12.38
P₂V₅	27.05	36.88	20.80	29.63	19.84	27.27	10.45	11.00
P₂V₆	33.90	41.60	17.69	22.55	16.83	21.65	9.90	10.08
P₃V₁	31.18	41.38	19.16	25.50	19.40	27.62	4.93	6.10
P₃V₂	34.94	45.70	20.42	27.58	18.60	30.51	8.75	10.08
P₃V₃	36.26	53.88	23.46	35.00	21.24	38.64	7.75	8.05
P₃V₄	34.44	47.34	28.81	37.15	24.08	38.94	10.15	11.53
P₃V₅	25.02	29.50	16.76	21.00	17.79	23.82	8.75	9.68
P₃V₆	26.81	36.69	14.97	19.16	15.35	20.58	9.20	9.65
P₄V₁	27.27	31.03	12.28	22.68	16.56	24.71	2.83	3.95
P₄V₂	28.17	33.71	16.44	21.85	14.54	21.51	5.35	6.68
P₄V₃	30.33	40.65	17.20	24.13	15.15	23.19	6.93	6.45
P₄V₄	28.35	34.05	20.89	28.09	16.11	22.54	8.40	9.83
P₄V₅	24.76	27.63	10.33	15.78	11.30	16.93	8.08	8.98
P₄V₆	29.38	34.63	12.96	18.35	13.09	19.25	8.43	8.88
S.Em. $\pm$	1.57	1.65	0.92	1.04	0.80	1.14	0.43	0.43
C.D. at 5 %	4.39	4.60	2.56	2.91	2.24	3.20	1.19	1.20
C.V. % V	13.38	10.84	11.89	10.04	10.46	11.10	14.51	13.53

Table.2 Effect of different planting dates and varieties of China aster on flowering and quality character

Treatments	Days to first flower opening	50% flower opening (days)	Duration of flowering (days)	Flower head diameter (cm)	Stalk length (cm)	Weight of 10 flowers (g)	Longevity of flowers (days)
P ₁ V ₁	70.45	75.13	31.40	7.13	25.19	40.18	11.43
P ₁ V ₂	71.30	75.88	32.70	7.45	33.51	36.80	10.83
P ₁ V ₃	72.05	76.75	46.80	7.66	33.83	42.23	11.38
P ₁ V ₄	69.38	74.00	38.10	6.77	28.50	33.13	10.08
P ₁ V ₅	66.83	71.63	41.75	6.12	20.83	34.12	11.20
P ₁ V ₆	68.28	72.88	36.49	6.32	24.25	30.98	11.28
P ₂ V ₁	68.33	73.13	28.50	6.54	22.61	38.48	10.78
P ₂ V ₂	69.05	73.88	30.93	6.64	29.96	34.18	10.45
P ₂ V ₃	71.38	76.25	41.75	6.84	30.39	40.83	10.98
P ₂ V ₄	62.83	67.75	35.20	6.43	27.26	31.75	9.83
P ₂ V ₅	59.58	64.38	39.05	5.72	14.11	31.40	11.00
P ₂ V ₆	61.65	66.50	33.93	6.11	19.41	28.46	11.08
P ₃ V ₁	64.10	68.88	24.75	6.12	19.20	37.12	10.20
P ₃ V ₂	65.83	70.63	26.90	6.34	22.01	30.47	9.80
P ₃ V ₃	68.25	73.25	38.18	6.74	25.75	39.17	10.48
P ₃ V ₄	61.30	66.13	31.95	5.82	20.11	30.51	9.38
P ₃ V ₅	57.98	62.88	33.43	5.35	11.34	28.75	9.88
P ₃ V ₆	60.05	64.75	30.93	5.73	14.03	27.19	10.00
P ₄ V ₁	57.45	62.13	21.43	5.79	13.67	38.24	9.85
P ₄ V ₂	59.08	63.88	22.63	5.96	19.73	29.70	9.23
P ₄ V ₃	61.80	66.63	33.85	6.53	23.13	34.29	10.00
P ₄ V ₄	57.15	62.00	30.20	5.57	17.25	29.35	8.90
P ₄ V ₅	47.85	52.50	31.35	5.25	10.36	30.19	9.53
P ₄ V ₆	50.45	55.25	28.45	5.46	13.20	25.56	9.65
S.Em. $\pm$	1.91	1.97	0.88	0.18	0.88	1.25	0.36
C.D. at 5 %	NS	NS	NS	NS	2.46	NS	NS
C.V. % V	9.00	8.66	8.01	8.38	12.12	11.12	10.46

Table.3 Effect of different planting dates and varieties of China aster on yield character

Treatments	No. of flowers/plant	Flower yield/plant (g)	Flower yield/ha (q)
P₁V₁	43.73	155.43	109.78
P₁V₂	35.55	115.09	80.98
P₁V₃	34.08	124.43	86.85
P₁V₄	33.18	95.94	68.13
P₁V₅	62.15	189.88	138.52
P₁V₆	29.15	82.58	60.91
P₂V₁	37.35	128.90	91.20
P₂V₂	33.00	102.99	72.56
P₂V₃	32.18	113.99	79.53
P₂V₄	27.48	77.49	54.99
P₂V₅	52.40	148.60	108.34
P₂V₆	25.05	65.54	48.37
P₃V₁	30.50	100.62	71.14
P₃V₂	29.90	79.62	56.14
P₃V₃	28.33	96.69	67.52
P₃V₄	24.20	65.63	46.59
P₃V₅	43.25	111.57	81.42
P₃V₆	25.40	61.64	45.47
P₄V₁	25.50	87.62	61.85
P₄V₂	24.70	66.06	46.47
P₄V₃	25.13	76.47	53.36
P₄V₄	25.73	66.29	47.01
P₄V₅	35.30	95.80	69.89
P₄V₆	21.63	49.95	36.89
S.Em. $\pm$	1.31	5.64	4.06
C.D. at 5 %	3.65	15.77	11.36
C.V. % V	11.79	17.10	17.26

Table.4 Effect of different planting dates and varieties of China aster on post harvest character

Treatments	Shelf life (days)	Vase life (days)	Water uptake/flower (ml)	Fresh weight retention (g)
P ₁ V ₁	3.68	7.58	4.34	33.15
P ₁ V ₂	2.88	6.88	3.97	29.91
P ₁ V ₃	3.38	7.38	4.17	35.15
P ₁ V ₄	2.73	6.73	3.85	26.72
P ₁ V ₅	3.00	7.00	4.40	27.86
P ₁ V ₆	3.18	7.18	3.82	25.09
P ₂ V ₁	2.83	6.85	4.02	29.71
P ₂ V ₂	2.43	6.43	3.77	25.76
P ₂ V ₃	3.23	7.23	4.05	32.02
P ₂ V ₄	2.38	6.38	3.66	23.74
P ₂ V ₅	2.75	6.75	4.16	23.99
P ₂ V ₆	3.03	7.05	3.67	21.47
P ₃ V ₁	2.40	6.43	3.77	27.15
P ₃ V ₂	2.15	6.15	3.61	21.62
P ₃ V ₃	2.73	6.73	3.85	29.02
P ₃ V ₄	2.05	6.03	3.50	21.41
P ₃ V ₅	2.28	6.28	3.79	20.73
P ₃ V ₆	2.33	6.33	3.53	19.43
P ₄ V ₁	2.23	6.25	3.66	25.13
P ₄ V ₂	1.83	5.80	3.44	18.90
P ₄ V ₃	2.25	6.25	3.60	22.57
P ₄ V ₄	1.48	5.48	3.37	18.46
P ₄ V ₅	1.88	5.90	3.70	19.45
P ₄ V ₆	2.25	6.25	3.38	16.20
S.Em. $\pm$	0.12	0.16	0.05	0.99
C.D. at 5 %	NS	NS	0.13	NS
C.V. % V	13.66	7.19	3.69	11.88

Effect of planting dates and varieties on post harvest character of China aster

In post harvest parameters *viz.*, shelf life, vase life and fresh weight retention were found non-significant, except water uptake per flower (Table 4).

The maximum water uptake per flower (4.40 ml) was observed in China aster variety ArkaArchana transplanted on 15th October

(P₁V₅) and minimum water uptake per flower (3.37 ml) was observed in China aster variety Phule Ganesh Violet transplanted on 1st December (P₄V₄).

It may be due to superiority of genetical make up along with the vigorous vegetative growth has good capacity to higher water uptake. Similar results were found by Chowdhuri *et al.*, (2016), Kumar (2010), Sultan and Nassour (2019) in China aster.

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