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Effect of different varietal performance and various levels of nitrogen on growth and flowering characters on China aster (*Callistephus chinensis* L. Ness) under North Gujarat condition

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Abstract
A field experiment was conducted during *rabi* 2020 to study deals with effect of different varietal performance and various levels of nitrogen on growth and flowering characters on China aster (*Callistephus chinensis* L. Ness) under north Gujarat condition. The experiment was laid out in Randomized Block Design with factorial concept using ten treatments, comprising two varieties (Arka Archana and Arka Kamini) and five levels of nitrogen (140, 180, 220, 260 and 300 kg/ha). The results revealed that among various treatments, The highest plant height (47.12 cm) was recorded in Arka Kamini. While, Arka Archana gave the maximum number of primary branches (15.04 cm), plant spread 48.07 and 40.62 cm in N-S & E-W, respectively. Minimum days for bud initiation (50.40 days), days for flower initiation (59.27 days), flower weight (3.99 g), flower diameter (6.33 cm) and shelf life of flower (6.22 days) were significantly the maximum in Arka Archana. All the vegetative, flowering and yield characters were significantly influenced by nitrogen application 300 kg/ha. The maximum plant height (46.20 cm), number of primary branches per plant (16.77) and plant spread (47.53 and 41.23 cm) in N-S & E-W respectively, weight of flower (4.24 g), flower diameter (6.79 cm) was the highest application at 300 kg N/ha. Flowering parameter such as minimum days taken to bud initiation (57.37 days), minimum days taken to flower initiation (66.77 days) and longest shelf life of flower (6.07 days) were observed with application of nitrogen 140 kg/ha.

Keywords: China aster, different variety, nitrogen levels, growth, flowering

Introduction
China aster is widely grown in tropical and subtropical regions during the winter and spring months. It can be grown in *rabi* season on commercial scale. The flowers of the China aster are in high demand because cultivars are limited to a small scale with low yields as it looks improved cultivation practices. Standardization of ago techniques for high yield and acceptable flower quality is paramount for the benefit of poor farmers who cultivates this crop. China aster is a heavy feeder and hence has larger requirements for nitrogen, phosphorus and potassium. Nitrogen should be prioritized throughout the early stages of vegetative development. During the first seven weeks of plant development, greater nitrogen levels be prioritized. Plants require phosphorus at all times during their growth cycle, and it should be supplied as a basal dosage (Ghormade *et al*., 2018) [3]. Nitrogen plays a vital role in the physiological processes of plant and it is an important component of many structural, genetic and metabolic compounds such as chlorophyll and amino acids in plant cells. The growth and performance of different varieties exhibits wide range of diversity of their growth habit due to prevailing climatic conditions. Despite the fact that Gujarat's climatic conditions are ideal for improved varieties, systematic fertilizer requirement of these varieties are not worked out. It was, therefore, felt deemed important to find out suitable new improved varieties and standardize its nutritional requirement in North Gujarat condition.

Materials and Methods
The present investigation was conducted during *rabi* 2020 at College Farm, College of Horticulture, Sardarkrushinagar Dantewada Agricultural University, Jagudan, Mehsana, Gujarat.

China aster seeds of the both varieties were sown in raised beds using the line sowing method. The beds were 3 meters long, 1 meter width and 0.15 meters high. To promote rapid germination, seeds were sowing 1-2 cm deep in the soil and covered with green shade net for proper germination and when the seedling ready for transplanting green shade net remove carefully. The experiment was laid out in Randomized Block Design with factorial concept using ten treatments, comprising two varieties (Arka Archana and Arka Kamini) and five levels of nitrogen (140, 180, 220, 260 and 300 kg/ha). Phosphorous@ 120 kg/ha in the form of single super phosphate and potassium @ 60 kg/ha in the form of muriate of potash were applied as a basal dose. Nitrogen was applied dose as per the treatment, 40 percent nitrogen was applied as a basal in form of ammonium sulphate and remaining 60 percent nitrogen was given in two equal splits at 25 DAT and 50 DAT in the form of urea. There were total ten treatments *viz*.; T_1 : Arka Archana × 140 kg N/ha; T_2 : Arka Archana × 180 kg N/ha; T_3 : Arka Archana × 220 kg N/ha; T_4 : Arka Archana × 260 kg N/ha; T_5 : Arka Archana × 300 kg N/ha; T_6 : Arka Kamini × 140 kg N/ha; T_7 : Arka Kamini × 180 kg N/ha; T_8 : Arka Kamini × 220 kg N/ha; T_9 : Arka Kamini × 260 kg N/ha; T_{10} : Arka Kamini × 300 kg N/ha. Observations on different growth and flowering parameters.

Results and Discussion

Effect of growth parameters: Significantly highest plant height (47.12 cm) was recorded in variety Arka Kamini. Effect of nitrogen on plant height was found significant. Maximum plant height (46.20 cm) was recorded with 300 nitrogen kg/ha (n_5), which statistically remained at par with 260 kg/ha (n_4). The variation among different genotypes may be attributed to genetic makeup of the genotype and the increase in plant height was associated with rapid meristematic activity probably due to rapid cell division and elongation during the initial vegetative growth period. (Aditya *et al*., 2019) [1]. The maximum number of primary branches (15.04) was found in variety Arka Archana. Effect of nitrogen on number of primary branches per plant at 1st harvesting stage was found significant. Nitrogen at 300 kg/ha (n_5) was recorded maximum primary branches (16.77) per plant. Maximum branches with higher level of nitrogen might be due to nitrogen has major role in vegetative growth of plant. Nitrogen supply to the roots, stimulates the production and export of cytokinin to the shoots (Wagner and Michael, 1971) [8]. This might be due to higher dose of nitrogen which enhances the vegetative growth of plant (Chavan *et al.* 2010) [2]. Plant spread was significantly maximum in Arka Archana (48.07 and 40.62 cm) in (N-S & E-W), respectively. The perusal from the data that maximum plant spread (47.53 and 41.23 cm) in N-S & E-W direction respectively, were recorded with higher dose of nitrogen (300 kg/ha) (n_5). Increase in plant spread might be due to production of higher number of branches and wider angles with point of origin. Greater plant spread shows better vegetative growth of plant. Similar results found in Rai and Chaudhary (2016) [5] and Aditya *et al.* (2019) [1] in China aster.

Effect of flowering parameters: Significantly earlier days to bud initiation were found in variety Arka Archana (53.72 days). Minimum number of days (57.37 days) taken for bud initiation was recorded in 140 kg N/ha (n_1). The earliness in days to bud initiation might be due to the differences in their genetic makeup, genotypic potential, adaptability to soil and climatic conditions among the different varieties. The present findings are in conformity of Tirakannanavar *et al.* (2015) [6] and Atal *et al.* (2019) [7] in China aster. It is evident from the data recorded on days to flower initiation was significantly influenced by different varieties. Minimum days to flower initiation were taken by Arka Archana (63.97 days) and maximum days to flower initiation were taken by Arka Kamini (78.28 days). Significantly minimum number of days (66.77 days) taken for flower initiation was recorded with 140 kg N/ha (n_1). Earliness in flowering of plants could be due to the growing environment as well as varietal character. This might be due to genetic trait and the genetic constituents of the plant. Similar results have also been reported Tirakannanavar *et al.* (2015) [6]. The data indicated that significantly maximum flower weight was found in variety Arka Archana (3.99 g). Maximum flower weight (4.24) was recorded significantly with highest dose of nitrogen (300 kg/ha) followed by 260 kg/ha (n_4). It is governed by the genetic makeup of the plants. The variation among the flower weight in different cultivars is supported by the findings of Tirakannanavar *et al.* (2015) [6]. It can be inferred from the data that among the different varieties, maximum flower diameter (6.33 cm) was observed in variety Arka Archana. It is revealed that nitrogen at all levels had influenced size of flower. Significantly maximum flower diameter (6.79 cm) was recorded with application of 300 kg N/ha (n_5), which was statically at par with application of 260 kg/ha (n_4). Variation in flower diameter among varieties were observed because of the changes in number of petals, ray florets and flower capitulum size. The genetic makeup of the genotypes which might have been further modified by prevailing environmental condition and temperature during the time of experiment. The results were in substantiation with the reports of Rai and Chaudhary (2016) [5] and Aditya *et al.* (2019) [1] in China aster. The data clearly shows that significantly maximum shelf life of flowers was recorded in the variety Arka Archana (6.22 days). Significantly longest shelf life of flowers (6.07 days) was recorded with application of 140 kg N/ha(n_1). Inspection of the data disclosed non-significant influence of different levels of nitrogen and varieties in terms of shelf life of flowers. Variation among varieties for shelf-life characters may be attributed to their genetic makeup. Similar variation has been reported by Pandey and Rao (2014) [4] and Atal *et al.* (2019) [7] in China aster.

Table 4: Effect of varieties and levels of nitrogen on growth and flowering parameters

Treatments	Plant height (cm)	Number of primary branches	plant spread (cm)		Days to bud initiation	Days to flower initiation	flower weight (g)	flower diameter (cm)	Shelf life (Days)
Factor -1: Nitrogen (N) (kg/ha)			N-S	E-W					
N1	33.11	10.77	33.37	26.99	57.37	66.77	3.55	5.46	6.07
N2	36.14	12.23	37.21	30.61	59.63	69.20	3.66	5.58	5.77
N3	39.28	14.03	40.63	33.85	61.17	71.40	3.77	6.35	5.43
N4	43.26	15.20	44.35	37.43	62.80	73.13	3.90	6.59	5.11
N5	46.20	16.77	47.53	41.23	64.23	75.13	4.24	6.79	4.72
Sem.±	1.12	0.32	1.02	1.08	1.17	1.26	0.08	0.15	0.09
C.D. at 5 %	3.34	0.95	3.04	3.20	3.48	3.73	0.24	0.43	0.28
Factor -2: Varieties (V)									
V1	32.08	15.04	48.07	40.62	53.72	63.97	3.99	6.33	6.22
V2	47.12	12.56	33.16	27.42	68.36	78.28	3.65	5.98	4.62
Sem.±	0.71	0.20	0.65	0.68	0.74	0.79	0.05	0.09	0.06
C.D. at 5 %	2.11	0.60	1.92	2.03	2.20	2.36	0.15	0.27	0.18
Interactions (N X V)									
n_1 v_1	25.92	11.87	40.44	33.10	50.40	59.27	3.63	5.48	6.95
n_2 v_1	28.28	13.67	44.89	37.55	52.87	61.33	3.76	5.60	6.67
n_3 v_1	32.54	15.40	48.08	40.74	53.73	64.00	3.85	6.58	6.34
n_4 v_1	35.35	16.40	51.94	44.60	55.13	65.87	4.08	6.90	5.85
n_5 v_1	38.31	17.87	54.99	47.13	56.47	69.40	4.65	7.10	5.29
n_1 v_2	40.31	9.67	26.29	20.87	64.33	74.27	3.47	5.44	5.19
n_2 v_2	44.00	10.80	29.52	23.68	66.40	77.07	3.57	5.55	4.86
n_3 v_2	46.03	12.67	33.18	26.96	68.60	78.80	3.68	6.13	4.52
n_4 v_2	51.18	14.00	36.75	30.25	70.47	80.40	3.72	6.29	4.37
n_5 v_2	54.09	15.67	40.07	35.33	72.00	80.87	3.83	6.48	4.16
S.Em.±	1.59	0.456	1.45	1.53	1.65	1.78	0.12	0.21	0.13
C.D. at 5 %	NS	NS	NS	NS	NS	NS	0.34	NS	NS

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