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Performance of China aster varieties and their response to different levels of nitrogen

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ABSTRACT

A field experiment entitled "Performance of China aster (*Callistephus chinensis* Nees.) varieties and their response to different levels of nitrogen", was conducted during *rabi* seasons of 2005-06. In the experiment there were twenty four treatments, i.e. six varieties viz., Kamini (V_1), Poornima (V_2), Phule Ganesh Pink (V_3), Phule Ganesh White (V_4), Phule Ganesh Violet (V_5) and Phule Ganesh Purple (V_6) and four levels of nitrogen (0, 100, 200 and 300 kg ha^{-1}), each treatments replicated thrice in Factorial Randomized Block Design. It was found that the, variety Phule Ganesh White was found superior in all growth parameters, which produced significantly highest plant height (44.63 cm), and maximum primary branching (15.55), but maximum plant spread (35.66 cm^2) was recorded in variety Phule Ganesh Pink. Highest fresh and dry weight of plant was recorded in Phule Ganesh Purple. Variety Phule Ganesh White was also recorded maximum number of days to open first flower (80.58 days), highest number of flowers per plant (30.54), and highest yield of flowers (151.39 kg ha^{-1}). Highest nitrogen content at final harvest (1.68 %) and highest nitrogen uptake at harvest (117.17 kg ha^{-1}) was recorded in variety Phule Ganesh White. All the vegetative characters were greatly influenced by nitrogen at 300 kg ha^{-1}. It had recorded highest plant height (40.08 cm), plant spread (31.28 cm), number of primary branches per plant (13.93), fresh weight (200.30 g) and dry weight of plants (76.60 g). Highest level of nitrogen (300 kg N ha^{-1}) also significantly influenced the flowering parameters and yield attributes i.e. maximum number of days to open first flower (68.48 days). But, maximum number of flowers per plant (24.02), and yield of flowers (127.42 q ha^{-1}) were recorded with 200 kg N ha^{-1}. Highest nitrogen content of plant at harvest (1.68 %) was recorded at 300 kg N ha^{-1} and uptake of nitrogen at harvest (12.54 kg ha^{-1}) was highest with the N_3 level of nitrogen (200 kg N ha^{-1}).

Key words: China aster, variety, evaluation.

INTRODUCTION

China aster is one of the most popular of all garden annuals grown throughout the world. The cut flowers last long and are used in vases and floral decoration. The vase life of China aster cut flowers, in general, is more than other annuals grown as cut flowers. As little work has been done on standardization of cultural practices and fertilizer requirement of this crop, the farmers are growing this crop by conventional method. Standardization of agro techniques for high yield with good quality of flower is of prime importance for the benefits of the marginal farmers, who are involved in the cultivation of this crop. Proper nutrition through optimum dose of fertilizers and variety selection is much important for better yield and quality of flowers.

MATERIALS AND METHODS

The present experiment was carried out at Horticulture Instructional Farm, Junagadh Agricultural University, Junagadh (Gujarat) during the *Rabi* season of the year 2005-06, in a randomized block design with factorial concept with, three replications. Farmyard manure was incorporated in the soil during preparation of soil at the rate of 10 t per ha, whereas, nitrogen was applied to the plots according to the treatments, phosphorus and potash were applied to the plots according to the recommendation, in which half dose of nitrogen in the form of urea and full dose of phosphorus and potash in the form of single super phosphate and muraite of potash, respectively, were applied as basal application before transplanting and well mixed in the soil. The remaining half dose of nitrogen was given after 30 days of transplanting as soil application.

RESULTS AND DISCUSSION

It is revealed from data presented in Table 1 and in that irrespective of nitrogen, variety Phule Ganesh White produced significantly highest plant height (44.63 cm),

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Table 1. Effect of nitrogen on plant height (cm), plant spread (cm), number of primary branches per plant and days taken to open first flower (days) of China aster varieties.

Treatments	Plant height (cm)	Plant spread (cm)	Number of primary branches per plant	Days taken to open first flower (days)
Varieties (V)				
V_1= Kamini	28.55	19.28	8.80	65.08
V_2= Poornima	27.91	16.07	7.49	55.34
V_3= Phule Ganesh Pink	30.42	35.66	9.01	57.08
V_4= Phule Ganesh White	44.63	28.13	15.55	80.58
V_5= Phule Ganesh Violet	41.46	29.79	13.32	63.28
V_6= Phule Ganesh Purple	38.01	31.27	13.67	61.58
CD at 5%	3.31	2.29	0.85	4.98
Nitrogen (kg ha^{-1})				
N_1= 0	29.29	22.92	9.08	60.68
N_2= 100	34.08	25.07	10.43	60.48
N_3= 200	37.20	27.54	11.77	65.72
N_4= 300	40.08	31.28	13.93	68.40
CD at 5%	2.70	1.87	0.69	4.06
CV (%)	11.46	10.44	9.20	9.49
Interaction (V x N)	NS	NS	Sign.	NS

NS= Non-significant

which was at par with Phule Ganesh Violet (41.46 cm). Variety Phule Ganesh Pink produced significantly highest plant spread (35.66 cm), followed by Phule Ganesh Purple (31.27 cm). This might be due to genetic makeup and genetic difference in the varieties. These results are found similar with in agreement with Kishanswaroop *et al*. (2004). Variety Phule Ganesh White showed maximum primary branches (15.55). Where the varities Phule Ganesh Purple (13.67) and Phule Ganesh Violet (13.32) were found par to each other. This result is in agreement with Raghava *et al.* (1988), who reported highest number of main branches and laterals per plant in hybrids P-5 x P-9, P-2 x P-9 and P-2 x P-7 of China aster. Variety Phule Ganesh Purple gave highest fresh weight of plant at harvest (219.83 g), and dry weight of plant (76.39 g), which was at par with Phule Ganesh Violet (219.70 g) and (63.92 g) respectively (Table 2). This might be due to as Phule Ganesh Purple has vigorous growth so ultimate fresh and dry weight was increased. The difference in vegetative growth of the varieties would be due to their genetical composition. This is in accordance with those, reported in tuberose by Yadav *et al*. (9). The variety Poornima brought about earliest flowering (55.34 days), which was statistically at par with Phule Ganesh Pink (57.08 days). The flowering characters in different varieties are dependent on proper amounts of stored carbohydrates, which are necessary for inducing the plant from vegetative phase to flowering (Kosegarten and Mengel, 4)

The variety Phule Ganesh White produced significantly maximum number of flowers per plant (30.54), where variety Phule Ganesh Purple (16.15) was statistically at par with Phule Ganesh Pink (14.02). The highest yield of flowers was recorded in variety Phule Ganesh White (151.39 q ha^{-1}), while lowest yield of flowers was recorded in variety Poornima (47.88 q ha^{-1}). Phule Ganesh White has vigorous growth, so more photosynthates produced at the source (leaves) and used in the sink (flower), this might have been increased the weight of flowers. The results are in full conformity with the results of Mishra (6) in chrysanthemum.

Maximum nitrogen content of plants was recorded in Phule Ganesh in (Table 3) White (1.53 %), which was at par with Phule Ganesh Pink (1.48 %), and Phule Ganesh Violet (1.46 %), but minimum nitrogen content of plants was recorded in variety Kamini (1.25 %), and Variety Phule Ganesh White recorded highest nitrogen uptake at harvest (117.17 kg ha^{-1}), which was at par with Phule Ganesh Purple (112.62 kg ha^{-1}) and Phule Ganesh Violet (105.30 kg ha^{-1}). This might be due to higher dry

Table 2. Effect of nitrogen on fresh weight of plant (g), dry weight of plant (g), number of flower per plant, and yield of flower (q ha) of China aster varieties.

Treatments	Fresh weight of plant (g)	Dry weight of plant (g)	Number of flowers per plant	Yield of flowers (q ha^{-1})
Varieties (V)				
V_1= Kamini	99.70	52.07	18.88	54.49
V_2= Poornima	78.89	40.25	7.78	47.88
V_3= Phule Ganesh Pink	141.10	58.90	14.02	123.67
V_4= Phule Ganesh White	191.78	67.53	30.54	151.39
V_5= Phule Ganesh Violet	219.70	63.92	23.66	124.14
V_6= Phule Ganesh Purple	219.83	76.39	16.15	115.81
CD at 5%	21.29	4.70	2.41	11.42
Nitrogen (kg ha^{-1})				
N_1= 0	120.67	44.19	13.38	71.81
N_2= 100	143.45	54.02	18.32	93.84
N_3= 200	169.56	76.60	24.02	127.42
N_4= 300	200.30	64.56	18.31	118.51
CD at 5%	17.38	3.84	1.97	9.32
CV (%)	16.33	9.56	15.88	13.49
Interaction (V x N)	NS	NS	NS	Sign.

NS= Non-significant

matter production of Phule Ganesh Purple variety so ultimately higher uptake of nitrogen was noted. The results are in conformity with Pilanali and Kaplan (7), they observed that variety Yellow Delta had noted higher N (14.86 kg ha^{-1}) uptake as compared to variety Cerise Delta (12.84 kg ha^{-1}) in chrysanthemum.

Increased level of N (N_4 i.e. 300 kg ha^{-1}) significantly improved the plant growth parameters such as plant height (40.08 cm), plant spread (31.28 cm^2), and number of primary branches per plant (13.93). Nitrogen is implicated in all enzyme reactions taking place in the cells and, thus, plays an active role in energy metabolism (Bergmann, 1992). The results obtained are in agreement with those of Maheshwar (4), who reported that plant height, plant spread and number of primary branches was maximum with the application of 180 kg N ha^{-1} in China aster. The fresh weight of plant at harvest was significantly influenced by each level of nitrogen and significantly highest (200.30 g) was recorded with application of 300 kg ha^{-1} (N_4). Nitrogen application gave significantly increased dry weight with increasing level of nitrogen and it was highest (76.60 g) at 200 kg N ha^{-1} and after that it was decreased at 300 kg ha^{-1} (N_4) level of nitrogen (64.56 g). The N 300 kg ha^{-1} had taken maximum days to open first flower (68.40 days), which was also found at par with 200 kg N ha^{-1} (65.72 days). The role of nitrogen in influencing the flowering can be

Table 3. Effect of nitrogen on nitrogen content of plant at final harvest (%) and nitrogen uptake at harvest (kg ha^{-1}) of China aster varieties.

Treatments	Nitrogen content of plant at final harvest (%)	Nitrogen uptake at harvest (kg ha^{-1})
Varieties (V)		
V_1= Kamini	1.25	74.10
V_2= Poornima	1.39	62.96
V_3= Phule Ganesh Pink	1.48	99.82
V_4= Phule Ganesh White	1.53	117.17
V_5= Phule Ganesh Violet	1.46	105.30
V_6= Phule Ganesh Purple	1.29	112.62
CD at 5%	0.15	13.14
Nitrogen (kg ha^{-1})		
N_1= 0	1.14	55.65
N_2= 100	1.30	78.39
N_3= 200	1.48	126.54
N_4= 300	1.68	120.73
CD at 5%	0.12	10.73
CV (%)	12.76	16.76
Interaction (V x N)	NS	NS

NS= Non-significant

explained on the basis of the concept that proper amounts of stored carbohydrates are necessary for inducing the plants from vegetative phase to flowering, (Kosegarten and Mengel, 4). The maximum number of flowers per plant (24.02), and the maximum yield of flowers (127.42 q ha^{-1}) were recorded at 200 kg ha^{-1}, which was statistically at par with 300 kg $ha^{-1.}$ In determining plant yield produced per unit area, photosynthesis is the most important prerequisite. The results are also in agreement with Ingawale (2), who reported that application of higher dose 150 kg N ha^{-1} gave maximum flower yield in marigold. The highest nitrogen content of plant at final harvest was recorded at 300 kg N ha^{-1} (1.68 %), and nitrogen at 200 kg ha^{-1} gave highest nitrogen uptake at harvest (126.54 kg ha^{-1}). This might be due to favourable effect of nitrogen on growth and yield attributes. This was reflected in more nitrogen content and nitrogen uptake at harvest by plants.

The interaction effect between six varieties of China aster and N levels was found to be significant in respect to number of primary branches per plant and yield of flowers (q ha^{-1}). But all the remaining parameters shows non significant result. Significantly maximum number of primary branches per plant (19.47) and highest fresh weight of flowers (181.66 g) was recorded in variety Phule Ganesh White with 300 kg ha^{-1} ($V_4N_{4)}$ treatment combination. In variety Phule Ganesh White with 200 kg N ha^{-1} (V_4N_3) the yields of flowers was significantly highest (201.85 q ha^{-1}).

REFERENCES

1. Bergmann, W. 1992. Nutritional Disorders of Plants-development, Visual and Analytical Diagnosis. Gustav Fischer, Jena and New York, 741 p.
2. Ingawale, R.B. 1979. Studies on the response of different levels of N and P on growth and flower production. M.Sc. (Agri.) thesis submitted to University of Agricultural Sciences, Bangalore.
3. Kishanswaroop, Singh, Kanwar P., Saxena, N.K. and Singh Krishan. P. 2004. Evaluation of China aster varieties. *J. Ornamental Hort*. **7**: 127-28.
4. Kosegarten, H. and Mengel, K. 1995. Carbohydrate metabolism and portioning in crop production. In: Plant Physiology and Bio-chemistry (B.B Singh and Kanrad Mengel eds.). *Panima Publishing Corporation*, New Delhi, pp. 1-49.
5. Maheswar, D.L. 1978. Influence of nitrogen phosphorous on growth and flower production of China aster *(Callistephus chinensis). Mysore Agril. Sci*. **12**: 528.
6. Mishra, H.P. 1999. Evaluation of small flowered varieties of chrysanthemum for calcareous belt of North Bihar. *Indian J. Hort*. **56**: 184-88.
7. Pilanali, N. and Kaplan, M. 1999. Investigation of macronutrients absorption in two chrysanthemum cultivars (Yellow Delta and Cerise Delta) grown under greenhouse conditions. *Turkish J. Agric. Forestry* **23**: 721-27.
8. Raghava, S.P.S., Negi, S.A. and Ramachander, P.R. 1988. Heterobeltiosis in China aster (*Callistephus chinensis* (L.) Nees). *Indian J. Hort.* **45**: 336-43.
9. Yadav, B.S., Singh Sukhbir., Ahlawat, V.P and Mallik, A.S. 2002. Studies on removal of macro and micro nutrients by tuberose (*Pollianthus tuberosa* Linn.). *Haryana J. Hort. Sci.* **31**: 44-46.

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