Research Article

Impact of Planting Geometry on Seed Quality of China aster Genotypes under Mid Hill Conditions of Uttarakhand

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Abstract

The present investigation was carried out to evaluate performance of three genotypes of china aster (Phule Ganesh Violet, Phule Ganesh Purple, Phule Ganesh Pink), planted at different geometry (30 cm x 30 cm, 40 cm x 40 cm, 50 cm x 50 cm) in a Factorial Randomized Complete Block Design. Results indicated that all seed quality characters were significantly influenced by treatment variables. Phule Ganesh Violet recorded higher germination (84.22%) which differed significantly from Phule Ganesh Purple and Phule Ganesh Pink. Other seed characters like test weight, seedling length, seedling dry weight and vigour index were also higher in the Phule Ganesh Violet genotype. Among planting geometries, 50 cm x 50 cm showed significant result in above seed quality characters.

Keywords: China aster, germination, vigour index, genotype, spacing

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Introduction

Flowers have always fascinated and dazzled man from being an object of beauty and splendor. Blooms are now rapidly emerging as a money spinning commodity in the global trade. Fresh flowers are one of the main components in floriculture trade as well as in our lives [7, 11]. China aster (Callistephus chinensis (L.) Nees.) belongs to family Asteraceae, is one of the important commercial flower crops of our country and is native to China. It is one of the most important annual flower crops. Among annual flowers, it ranks third next only to Chrysanthemum and Marigold [8]. Its cultivation has become popular around the cities for its extensive use as cut flower. It is used in making bouquets, buttonholes and garlands. In ornamental gardening, it finds use as a bedding plant, pot plant and herbaceous border. The plants of China aster are erect with a maximum height of 60-80 cm depending upon the genotypes. Crop management involves decision making on several cultural practices aimed to maximize seed yield, like planting geometry. The practice of spacing varies with the habit of the cultivars and also regions. High plant density brings out various modifications in the growth of plants. Though, quality of cut flowers is primarily a varietal trait, it is greatly influenced by climatic, geographical, nutritional and plant density factors. There is a vast scope of growing China aster in Uttarakhand throughout the year except in severe winters and scorching summer months for the purpose of cut flowers and loose flower production. Since there is scanty information on the effect of various geometries and genotypes on China aster particularly in North Indian conditions hence need was felt to standardize the suitable planting geometry for cultivation of its genotypes in the mid hill conditions of Uttarakhand for the commercialization of this crop owing to the reason that planting geometry and genotypes play a vital role in obtaining the better growth, flowering and seed yield. Keeping in view the above facts the present study was planned with the objective to find out optimum geometry of planting for better seed quality of China aster.

Materials and Methods

Field experiment was conducted at Research Block of Department of Horticulture, College of Forestry and Hill Agriculture, G.B. Pant University of Agriculture and Technology, Hill Campus, Ranichauri, Tehri Garhwal, Uttarakhand to ascertain the response of China aster genotypes at different spacing levels during 2011. The experiment consisted of three plant geometries and three varieties with nine treatment combinations and three replications under Randomized Block Design (factorial).The experimental site is located at 30˚ 151 N latitude, 78˚ 501 E longitude and at an altitude of 1843 m above the mean sea level. Three China aster genotypes (G1-Phule Ganesh Violet, G2- Phule Ganesh Pink, G3- Phule Ganesh Purple) were grown using three spacing levels (S1- 30 cm × 30 cm, S2- 40 cm × 40 cm, S3- 50 cm × 50 cm). The varieties were procured from Zonal Agricultural Research

Station, Ganeshkhind, Pune, Maharashtra. Observations were recorded on seed quality characters like, germination (%), test weight (g), seedling length(cm), seedling dry weight (mg) and vigour index. For recording observations five plants were randomly selected and tagged from each plot and their mean was calculated. To raise a successful China aster crop all the standard cultural practices were followed.

Results and Discussion

Increased flower production, seed quality and perfection in the form of plants are the important objectives for commercial flower production. Though the seed quality of cut flowers is primarily a varietal trait, it is greatly influenced by climatic, geographical, nutritional and plant density factors. The data on test weight (1000 seed weight) as influenced by genotypes and plant geometry are presented in **Table 1**. It was noticed that test weight was positively correlated with genotypes and spacing. Phule Ganesh Violet (G1) recorded significantly higher 1000 seed weight (2.05 g) over G2 (1.84 g) and was at par with G3 (2.03 g) genotype. It was due to different plant density.

Significantly higher 1000 seed weight (2.02 g) was noticed in low density (S_3) than medium (1.98 g) and high (1.92 g) density planting. Interaction effect was non significant between genotypes and plant geometry with respect to 1000 seed weight. The increase in 1000 seed weight might be due to increase in seed size at wider spacing, also the plants get more nutrition and light at low density than high density. In low density there is better source sink relationship due to which yield contributing parameters get influenced. These results are in conformity with the findings of several workers [1] in fennel and [4] in fenugreek Kasurimethi.

Table 1 Seed Quality Characters of China aster Genotypes Influenced by Planting Geometry

Spacing Geno types	Seed germination (%)				Seedling dry weight (mg)				Seedling vigour index				Seedling length (cm)				1000 seed weight (g)			
	S_1	S_2	S_3	Mean	S_1	S_2	S_3	Mean	S_1	S_2	S_3	Mean	S_1	S_2	S_3	Mean	S_1	S_2	S_3	Mean
G_1	83.00	84.33	85.33	84.22	11.24	11.38	11.42	11.34	405.30	439.80	462.10	435.80	4.88	5.26	5.41	5.18	2.02	2.05	2.07	2.05
G_2	82.33	83.67	85.67	83.89	11.11	11.12	11.14	11.12	360.60	372.00	393.90	375.50	4.38	4.44	4.59	4.47	1.76	1.87	1.90	1.84
G_3	75.00	76.00	77.33	76.11	11.15	11.22	11.36	11.24	360.50	370.40	380.50	370.50	4.80	4.87	4.92	4.86	1.97	2.03	2.10	2.03
Mean	80.11	81.33	82.78		11.16	11.24	11.31		375.50	394.10	412.20		4.69	4.86	4.97		1.92	1.98	2.02	
	V	S	VXS		V	S	VXS		V	S	VXS		V	S	VXS		V	S	VXS	
SEm±	0.31	0.31	0.54		0.009	0.07	0.01		4.03	4.03	6.9		0.04	0.04	0.07		0.10	0.10	0.19	
CD (P=0.05)	0.94	0.94	NS		0.02	0.23	0.04		12.10	12.10	NS		0.13	0.13	NS		0.32	0.32	NS	

Data on germination per cent as influenced by genotypes and spacing levels in China aster are presented in Table 1. Higher seed germination was recorded in genotypes G1 (84.22 %) followed by G2 (83.89 %) and G3 (76.11 %) genotype. Seed germination was differed significantly due to different plant geometry. Significantly higher seed germination (82.78 %) was noticed in low plant density than high plant density. [2] Reported higher germination (65.70%) due to wider spacing of 45 cm x 45 cm compared to closer spacing of 30 cm x 30 cm (63.70%) in ageratum. The variation in germination per cent might be due to genetic makeup and variation in the environmental factors during production. Interaction effect due to genotypes and geometry on seed germination was not significant. [10] also not observed any significant effect of spacing on seed quality parameters like germination percentage and vigour index in sunflower.

Seedling length was significantly influenced by genotypes. The genotypes G1 recorded significantly higher seedling length (5.18 cm) compared to genotype G3 (4.86 cm) followed by G2 (4.47 cm). Seedling length differed significantly due to different plant geometry. Significantly higher seedling length (4.97) was noticed in low density (50 cm x 50 cm) than medium density (S_2) plants.Interaction effect between genotypes and geometry with respect to seedling length was non significant. High value of seedling length in phule ganesh violet might be attributed due to its more vigorous nature of the seeds [9]. Lowest seedling length was observed in phule ganesh pink genotype which might be due to genetic difference.

Seedling dry weight was significantly affected by genotypes and plant densities. It was significantly higher in G1 (11.34 mg) over G2 (11.12 mg) and was at par with G3 (11.24 mg) genotypes. Seedling dry weight also differed significantly due to different plant density. Significantly higher seedling dry weight (11.31 mg) was observed in plants with low density than high density (S_1). Interaction effect was found to be significant between genotypes and geometry with respect to seedling dry weight. Significantly higher seedling dry weight (11.42 mg) was noticed in $G1S_3$ treatment compared to $G1S_2$. Spacing levels have significant influence on seed quality attributes. Numerically higher values for seed quality parameters (viz., germination, seedling length, seedling dry weight and seedling vigour index) were recorded in wider spacing of 50 cm x 50 cm compared closer spacing of 30 cm x 30 cm. These higher values at wider spacing might be attributed to the numerically higher 1000 seed weight at wider spacing. These results are in conformity with the findings of [5] reported that plant population of 55,555 plants per hectare gave higher seed quality parameters i.e., 1000 seed weight (3.63 g), germination percentage (93.00 %), seedling vigour index (2673), dry weight of five seedlings(72 mg) in sunflower.

Seedling vigour index was positively correlated with spacing and variety. Vigour index was significantly influenced by genotypes. G1 recorded significantly higher vigour index (435.80) over G2 (375.50) followed by G3 (370.50). Vigour index differed significantly due to different plant geometry. Significantly higher vigour index was observed in low plant density (412.20) than medium (394.10) and high (375.50) plant densities. The increase in the seedling vigour index might be due to higher germination, root length and shoot length values. The higher seed quality parameters in phule ganesh violet genotypes might be due to inherent genotypic variation, which expressed suitably under favourable environmental condition. So, there is a variation existing in the seed quality parameters as reported by [3, 6] in china aster.Interaction effect was non-significant between genotypes and geometry with respect to vigour index.

Higher seed quality of individual plant is achieved when sown at wider spacing, for the reason when sown densely, competition among plants is more for growth factors resulting in reduction in size and yield of the plant and ultimately the seed quality was affected.

Conclusion

Concussively it emerged that Phule Ganesh violet genotype in the planting geometry of 50 cm x 50 cm can be most suitable for commercial cultivation and also for quality seed production of China aster under mid hill conditions of Uttarakhand

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