

RESPONSE OF HIGH DENSITY PLANTING TO GROWTH AND FLOWERING PARAMETERS OF CUT FLOWER CHRYSANTHEMUM VARIETIES

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ABSTRACT

An experiment was laid out to study the growth and flowering to response of Chrysanthemum varieties and spacing during July, 2015 to February, 2016 at the Maharaj Bag garden, Horticulture Section, College of Agriculture, Nagpur. The experiment was laid out in Factorial Completely Randomized Block Design (FRBD) comparing two factors with twelve treatment combinations. Factor A consist of four varieties of Chrysanthemum i.e. Maghi, Red queen, Shyamal and Tamra. The factor B consists of three spacing treatments i.e. 45 cm x 15 cm, 45 cm x 22.5 cm and 45 cm x 30 cm. The entire treatments were replicated thrice. The results obtained from the present investigation in respect of the growth characters, regarding different varietal treatments, the plant height was recorded maximum in the variety Tamra (72.77 cm), the variety Maghi had recorded maximum number of branches plant⁻¹ (17.92), whereas, maximum spread of plant (33.62 cm) and stem diameter (0.60 cm) was recorded with the variety Shyamal. However, regarding the different spacing treatments, the spacing of 45 cm x 15 cm (72.42 cm) was recorded maximum plant height, the spacing of 45 cm x 30 cm (19.65) recorded maximum number of branches plant⁻¹ and maximum spread of plant (34.11 cm), whereas, maximum stem diameter (0.57 cm) was recorded with the spacing of 45 cm x 22.5 cm and 45 cm x 30 cm.

As regards flowering parameters, regarding different varietal treatments, the minimum days required to first flower bud initiation (69.74 days), minimum days required to fully opened flower from bud initiation (17.53 days) and minimum days required to 50 % flowering (96.27 days) from transplanting was found with the variety Shyamal. However, the variety Tamra had recorded maximum duration of flowering span (48.21 days). Whereas, the different spacing treatments, the spacing of 45 cm x 30 cm had recorded maximum days to flowering span (44.34 days).

(Key words: Chrysanthemum, varieties, spacing, growth and flowering)

INTRODUCTION

Chrysanthemum is one of the most versatile flowers commonly known as “Glory of East” or “Queen of East” or “MUM” in USA. Chrysanthemum flowers are the second most popular, the first being Roses in the world having various types, size and colors. It is said that Chrysanthemum (*Dendranthema morifolium*) is native to Northern hemisphere, chiefly Europe and Asia with few in other areas, Chrysanthemum belongs to ‘*Asteraceae*’ family having more than hundred species. It is the perennial plant, dwarf to medium in height, vigorous and attractive colors, it blooms fast over the period of almost one to two months.

Among the flowers used for domestic market, Chrysanthemum is considered as one of the important commercial flower. “Chryos” means “Golden”, “Anthos” means “flower” meaning golden colored flower. It is generally tall up to 100-120 cm with large size flower. Because of its size, shape and color, reasons Chrysanthemum is popular among the people.

There is a great scope of increasing area under this crop. Increasing flower yield with quality flowers,

extending vase life and duration of flower production are the prime importance in the cultivation of Chrysanthemum. This can be achieved under high density of planting of suitable cultivars.

In cultural practice the suitable plant density and spacing play important role in respect to the greater competition among the plant growth and thus, flower yield and size may be impaired. It may also result in the production of small size due to greater competition among the plant, wider spacing may result in low flower yield.

Recently, Chrysanthemum is used as cut flower in preparation of flower bouquets. Bunch of Chrysanthemum flowers are mostly use in flower bouquets with spray flower rather than the single cut flower. To produce cut flowers and spray along with bunch of flower is possible in high density planting to which we can fulfil the demand of the market. Different varieties of different colors are required for flower bouquet preparation. Also successful cultivation of Chrysanthemum is depending upon proper selection of varieties.

In recent years, several new cultivars of Chrysanthemum with wide range of color have entered in

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the market, but all the cultivar cannot grow everywhere successfully. Hence, it is necessary to identify the suitable cultivar for commercial cultivation. However, the research work, on this aspect in *Chrysanthemum* is lacking. Hence, it is felt necessary to conduct experiment entitled: "Response of chrysanthemum varieties to high density planting for cut flower production".

MATERIALS AND METHODS

The experiment was conducted under open field condition at commercial floriculture unit of Maharaj Bag Garden, Horticulture Section, College of Agriculture, Nagpur during the year 2015-2016. The experiment was laid out in a Factorial Randomized Block Design comparing two factors with twelve treatment combinations. Factor A consist of four varieties of *Chrysanthemum* i.e. Maghi, Red queen, Shyamal and Tamra. The factor B consists of three spacing treatments i.e. 45cm x 15cm, 45cm x 22.5cm and 45cm x 30cm. The entire treatments were replicated thrice. The healthy uniform suckers were collected from *Chrysanthemum* mostly raised by using of suckers and shoot tip cuttings. Shoot tip cuttings of *Chrysanthemum* cv. Maghi, Red Queen, Shyamal, and Tamra were collected from Telankhedi Garden, College of Agriculture, Nagpur. These collected cuttings were first treated with 0.2 % Bavistin at the rate of 2 g L⁻¹ in water for 5 min. and then planted in sand media on June 20, 2015. An experimental land was ploughed once, and two times harrowing were given to bring the soil to the fine tilth. After loosening of soil raised beds were prepared with the dimension of 1.80 m x 2.40 m.

An application of FYM @ 25 t ha⁻¹ was done at the time of last harrowing in the field prior to application of chemical fertilizers. A recommended dose of NPK at the rate of 125 kg N, 50 kg P and 50 kg K ha⁻¹ was applied through Urea, Single Super Phosphate and Murete of Potash. The basal dose of 50 kg of N and full dose of P and K was applied at the time of transplanting and remaining 75 kg N was applied as top dressing after 30 days, 50 days, and 75 days interval after transplanting. All inter cultural operations like pinching, stacking, weeding, watering, application of Humic acid and plant protection measures were carried out as when required.

Observations on plant height, branches plant⁻¹, plant spread and stem diameter were recorded at 15 days after transplanting. Days required to first flower bud initiation, Days required to fully opened flower from bud emergence, Days to 50 per cent flowering and flowering span were also recorded.. The data was statistically analyzed as per method suggested by Panse and Sukhatme (1967).

RESULTS AND DISCUSSION

There were significant difference among the different *Chrysanthemum* varieties and spacing combinations regarding plant height, number of branches plant⁻¹, plant spread and stem diameter (Table1).

The data in table 1 revealed that, in respect of growth parameters, as regards the varietal treatments, significantly maximum plant height was recorded with the variety Tamra (72.77 cm) which was found to be at par with the variety Maghi (70.50 cm). However, significantly minimum plant height was recorded in the variety Shyamal (65.30 cm). As regards different spacing combinations the spacing of 45cm x 15 cm registered significantly maximum plant height (72.42 cm) and it was statistically at par with the spacing of 45 cm x 22.5 cm (69.80 cm), whereas, significantly minimum plant height (68.05 cm) was recorded with the spacing of 45 cm x 30 cm. The interaction effect due to different varieties and spacing treatments on height of plant in *chrysanthemum* was found to be non-significant.

As regards the varietal treatments, significantly maximum number of branches plant⁻¹ was counted in the variety Maghi (17.92) and it was found statistically at par with the varieties Tamra (17.73) and Red Queen (17.15). However, the variety Shyamal had recorded minimum number of branches plant⁻¹ (16.53). As regards spacing treatments, the spacing of 45 cm x 30 cm noted significantly maximum number of branches plant⁻¹ (19.65) and it was found to be statistically at par with the spacing of 45 cm x 22.5 cm (17.04). However, significantly minimum number of branches plant⁻¹ (15.29) was recorded with the spacing of 45 cm x 15 cm. The interaction effect due to different varieties and spacing treatments on number of branches plant⁻¹ in *Chrysanthemum* was found to be non-significant.

As regards the varietal treatments, significantly maximum spread of *chrysanthemum* plant was noticed in the variety Shyamal (33.62 cm), it was statistically found to be at par variety Red Queen (32.19 cm), whereas, significantly minimum spread of plant was recorded in the variety Maghi (30.98 cm). As regards spacing treatments, the spacing of 45 cm x 30 cm was recorded significantly maximum plant spread (34.11 cm) and it was followed by the spacing of 45 cm x 22.5 cm (32.0 cm). However, significantly minimum plant spread (30.33 cm) was recorded with the spacing of 45 cm x 15 cm. The interaction effect due to different varieties and spacing treatments on number of branches plant⁻¹ in *chrysanthemum* was found to be non-significant.

As regards the varietal treatments, significantly maximum stem diameter of *chrysanthemum* plant was recorded with the variety Shyamal (0.60 cm) which was followed by the variety Red Queen (0.57 cm), whereas, significantly minimum plant height was recorded in the varieties Maghi (0.56 cm) and Tamra (0.56 cm). As regards spacing treatments, the spacing of 45 cm x 30 cm (0.57 cm) and 45 cm x 22.5 cm (0.57 cm) was recorded significantly maximum stem diameter of plant, which was found to be at par with the spacing of 45 cm x 15 cm (0.55 cm). The interaction effect due to different varieties and spacing treatments on number of branches plant⁻¹ in *Chrysanthemum* was found to be non-significant.

The marked variation in vegetative characters may be due to differential characters of individual varieties and

Table 1. Growth and flowering parameters as influenced by varieties and spacing in chrysanthemum

Treatments	Plant height (cm)	Branches plant ⁻¹	Plant spread (cm)	Stem diameter (cm)	Days required to first flower bud initiation (days)	Days required to fully opened flower from bud emergence (days)	Days to 50 per cent flowering (days)	Flowering span (days)
Factor A. Varieties (V)								
V ₁ – Maghi	70.50	17.92	30.98	0.56	82.41	19.42	112.43	40.56
V ₂ - Red Queen	69.48	17.15	32.19	0.57	73.42	18.19	103.43	40.80
V ₃ – Shyamal	65.30	16.53	33.62	0.60	69.74	17.53	96.27	37.94
V ₄ – Tamra	72.77	17.73	31.79	0.56	88.38	18.72	115.21	48.21
SE(m) ±	1.18	0.32	0.56	0.010	1.34	0.33	1.89	0.86
CD at 5%	3.46	0.94	1.67	0.029	3.95	0.98	5.55	2.54
Factor B. Spacing (S)								
S ₁ – 45 x 15 cm	72.42	15.29	30.33	0.55	78.89	16.94	107.36	40.27
S ₂ – 45 x 22.5 cm	69.80	17.04	32.00	0.57	78.89	16.94	107.36	40.27
S ₃ – 45 x 30 cm	68.05	19.65	34.11	0.57	78.89	16.94	107.36	40.27
SE(m) ±	1.02	0.27	0.49	0.008	1.16	0.29	1.64	0.75
CD at 5%	2.99	0.81	1.44	0.025	-	-	-	2.20
Interaction V X S								
SE(m) ±	2.04	0.55	0.96	0.017	2.33	0.58	3.28	1.50
CD at 5%	-	-	-	-	-	-	-	-

spacing that expressed their genetic characters. These results were close conformity of findings of Peddi Laxmi *et al.* (2008) evaluated, seven yellow coloured Chrysanthemum cultivars for their growth, flowering and yield attributes. Among the evaluated cultivars *cv.* Basanthi had recorded maximum plant spread as compared to all the other cultivars. Chavan *et al.* (2010) evaluated six varieties of China aster during *rabi* season of 2006-2007 and found that, the variety Phule Ganesh White produced significantly maximum plant height as compared to other varieties. Taweesak *et al.* (2014) studied, the influence of plant density on growth and cut flower of chrysanthemum in soilless culture under root restricted condition. In that, 'New Yellow' had significantly more number of internodes than 'New White'. Belgaonkar *et al.* (1996) reported that, the spacing of 60 cm x 45 cm found to be fewest days for first flower bud opening after the bud emergence in Chrysanthemum.

The data in table 1 revealed that, as regards the varietal treatments, significantly minimum days required to first flower bud initiation (69.74 days) were noticed in the variety Shyamal which was at par with the variety Red Queen (73.42 days). However, significantly maximum days were required to first flower bud initiation (88.38 days) in the variety Tamra. As regards spacing treatments and interaction effect due to different varieties and spacing treatments on days required to fully opened flowers from bud initiation in Chrysanthemum was found to be non-significant.

As regards the varietal treatments, Significantly minimum days required to fully opened flowers from bud initiation (17.53 days) was noticed with the variety Shyamal which was followed by varieties Red Queen (18.19 days) and Tamra (18.72 days) whereas, significantly maximum days were required to fully opened flowers from bud initiation in the variety Maghi (19.42 days). As regards spacing treatments and interaction effect due to different varieties and spacing treatments on minimum days required to first flower bud initiation in Chrysanthemum was found to be non-significant.

As regards the varietal treatments, significantly a minimum days required to 50 per cent flowering from transplanting (96.27 days) was noticed in the variety Shyamal which was significantly superior to other varieties. It was followed by the variety Red Queen (103.43 days). However, significantly maximum days were required to first flower bud initiation in the variety Tamra (115.21 days). As regards spacing treatments and interaction effect due to different varieties and spacing treatments on minimum days required to 50 per cent flowering in Chrysanthemum was found to be non-significant.

As regards the varietal treatments, significantly maximum flowering span was noticed in the variety Tamra (48.21 days) which was significantly superior over other varieties. It was followed by varieties Red Queen (40.80 days) and Maghi (40.56 days). However, significantly minimum days were required to first flower bud initiation in the variety Shyamal (37.94 days). As regards spacing treatments, the spacing of 45 cm x 30 cm was found

significantly superior over all other treatments and noticed maximum flowering span (44.34 days) which was followed by the spacing of 45 cm x 22.5 cm (41.02 days), whereas, the spacing of 45 cm x 15 cm had recorded minimum flowering span (40.27 days). The interaction effect due to different varieties and spacing treatments on number of branches plant⁻¹ in Chrysanthemum was found to be non-significant.

The marked variation in flowering characters may be due to differential characters of individual varieties and spacing that expressed their genetic characters. These results are close conformity with the findings of Baskaran *et al.* (2004). They studied the performance of chrysanthemum cultivars viz., Ravikiran, Chandrika, Yellow Star, Red Gold, Nilima, Kasturi, Shaventigae, Cassa, Arka Swarna, Arka Ravi and Button Type Local under the open field condition, in that, the duration of flowering was longest in *cv.* Yellow Star and shortest in *cv.* Chandrika. Joshi *et al.* (2008) revealed that, among the seven varieties of chrysanthemum, the variety Mayur had recorded minimum days to first flower bud initiation. Chavan *et al.* (2010) revealed that, the variety Phule Ganesh White was recorded the maximum number of days to opening of first flower bud as compared to the varieties Phule Ganesh Pink and Phule Ganesh Purple. The cultivar Acc 4 and Acc 6 were the highest yield in respect to the number of cut flowers plant⁻¹, number of cut flowers plot⁻¹ and number of cut flowers hectare⁻¹. Dhemre *et al.* (1997) found that, the closer spacing of 45 x 15 cm was recorded minimum number of days for emergence of first flower bud, number of days to flower opening from bud emergence and number of days required for first flower opening in China aster.

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