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RESPONSE OF HIGH DENSITY PLANTING TO YIELD AND QUALITY PARAMETERS OF CUT FLOWER CHRYSANTHEMUM VARIETIES

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ABSTRACT

An experiment was laid out to Study the yield and quality 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. 45cm x 15cm, 45cm x 22.5cm and 45 x 30cm. The entire treatments were replicated thrice.The results obtained from the present investigation in respect of the yield characters, regarding different varietal treatments, the number of sprays plant^{-1} (4.7), number of sprays plot^{-1} (232.9), number of sprays hectare^{-1} (4.30 lakh) and number of flowers spray^{-1} (27.92) were recorded maximum in the variety Tamra. However, regarding the different spacing treatments, maximum number of sprays plant^{-1} (5.3) and flowers spray^{-1} (22.09) were noticed with wider spacing of 45 cm x 30 cm. Whereas, maximum number of sprays plot^{-1} (245.2) and sprays ha^{-1} (4.35 lakh) were recorded with the closer spacing of 45 cm x 15 cm.

As regards quality parameters, regarding different varietal treatments, weight of single flower (2.93 g), weight of single spray (45.0 g), stalk length of spray (25.05 cm), diameter of cut flower stalk (0.28 cm) were noted maximum with the variety Tamra and maximum vase life of spray (11.15 days) was recorded in the variety Maghi. However, regarding spacing treatments, maximum weight of single flower (2.22 g), stalk length of single spray (21.44 cm), diameter of cut flower stalk (0.22 cm) and maximum vase life of spray (12.41 days) were registered with the wider spacing of 45cm x 30cm.

(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, these reasons are Chrysanthemums 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, to 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 the market, but all the cultivar cannot grow everywhere successfully. Hence, it is necessary to identify the suitable

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cultivar for commercial cultivation. However, the research work, 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 lit^{-1} in water for 5 min. and then 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 number of sprays $plant^{-1}$, number of sprays $plot^{-1}$, number of sprays $hactare^{-1}$, number of flowers $spray^{-1}$, weight of single flower, weight of single spray, stalk length of spray, diameter of flower and vase life of spray 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 number of sprays $plant^{-1}$, number of sprays $plot^{-1}$, number of sprays $hactare^{-1}$, number of flowers $spray^{-1}$(Table1).

The data in table 1 revealed that, significantly maximum number of sprays $plant^{-1}$ was recorded in the variety Tamra (5.2) which was statistically at par with the variety Maghi (4.7), whereas, significantly minimum number of sprays $plant^{-1}$ was produced by the variety Red Queen (3.7). As regards different spacing combinations, the spacing of 45cm x 30 cm was found significantly superior over all other spacing treatments and produced maximum number of sprays $plant^{-1}$ (5.3), which was followed by the spacing of 45cm x 22.5cm (4.2). Whereas, the spacing of 45cm x 15cm had recorded minimum number of sprays $plant^{-1}$ (3.8). The interaction effect due to different varieties and spacing treatments, the treatment combination of the variety Tamra planted at spacing of 45cm x 30cm (V_4 S_3) was found to be significantly superior over all other treatment combinations and produced the maximum number of sprays $plant^{-1}$ (6.0) and it was at par with the treatment combination of variety Maghi (5.6) planted at spacing 45cm x 30cm (V_1 S_3). Whereas, the treatment combination of the variety Red Queen with spacing of 45cm x 15cm (V_2 S_1) cm had recorded minimum number of sprays $plant^{-1}$ (3.0). This might be due to combined effect of varieties and spacing on number of sprays produced $plant^{-1}$.

As regards the varietal treatments, significantly maximum number of sprays $plot^{-1}$ was recorded with the variety Tamra (232.9) which was statistically at par with the variety Maghi (208.0), whereas, significantly minimum number of sprays $plot^{-1}$ was counted with the variety Red Queen (162.6). As regards spacing treatments, the spacing of 45cm x 15 cm was found significantly superior over all other treatments and produced maximum number of sprays $plot^{-1}$ (245.2) which was followed by the spacing of 45cm x 30cm (173.3). Whereas, the spacing of 45cm x 22.5cm had recorded the minimum number of sprays $plot^{-1}$(172.7).The interaction effect due to different varieties and spacing treatments, the treatment combination of variety Tamra planted at spacing of 45cm x 15cm (V_4 S_1) was found to be significantly superior over all other treatment combinations and produced the maximum number of sprays $plot^{-1}$ (320.0) which was followed by the treatment combination of variety Maghi (256.0) plant at spacing of 45cm x 15cm (V_1 S_1). Whereas, the treatment combination of variety Red Queen planted at spacing of 45cm x 22.5cm had recorded the minimum number of sprays $plot^{-1}$ (146.7).

As regards the varietal treatments, significantly maximum number of sprays ha^{-1} was obtained with the variety Tamra (4.30 lakh) which was found at par with the variety Maghi (3.84 lakh), whereas, significantly minimum number of sprays ha^{-1} was noted with the variety Red Queen (3.0 lakh). As regards spacing treatments, the spacing of 45cm x 15cm was found significantly superior over all other spacing treatments and produced maximum number of sprays ha^{-1} (4.35 lakh), whereas, the spacing of 45cm x 22.5cm and 45cm x 30cm had recorded minimum number of sprays ha^{-1} (3.20 lakh).The interaction effect due to different varieties and spacing treatments, the treatment combination of variety Tamra planted at spacing of 45 x 15 cm (V_4 S_1) was

found significantly superior over all other treatment combinations and produced the maximum number of sprays ha^{-1} (5.92 lakh) which was followed by the treatment combination of variety Maghi (4.74 lakh) planted at spacing of 45cm x 15cm ($V_1 S_1$). Whereas, the treatment combination of variety Red Queen (2.71 lakh) planted at spacing of 45cm x 22.5cm had recorded the minimum number of sprays ha^1.

As regards the varietal treatments, significantly maximum number of flowers $spray^{-1}$ (27.92) was recorded with the variety Tamra which was followed by the varieties Maghi (20.96) and Red Queen (20.82). Whereas, significantly minimum number of flowers $spray^{-1}$ (16.15) was recorded with the variety Shyamal. The spacing of 45cm x 30cm was found significantly superior over all other treatments and produced the maximum number of flowers $spray^{-1}$ (22.09) which was statistically at par with the spacing of 45cm x 22.5cm (21.71), whereas, significantly minimum number of flowers $spray^{-1}$ (20.63) was recorded with the spacing of 45cm x 15cm.As regards interaction effect due to different varieties and spacing treatments on number of flowers $spray^{-1}$ in Chrysanthemum was found to be non-significant.

The marked variation in vegetative characters might be due to differential characters of individual variety that expressed their genetic characters. These results were close conformity with the findings of Baskaran *et al.* (2004).They conducted an experiment under open field condition at Banglore to evaluate the performance of chrysanthemum cultivars viz. Ravikiran, Chandrika, Yellow star, Red Gold, Nilima, Kasturi, Shaventigae, Cassa, Arka ravi, and Button Type Local. In that, the *cv*. Red Gold, Nilima and yellow Star had recorded the maximum flower yield. Joshi *et al.* (2008) revealed that, among the seven cultivars of chrysanthemum varieties, Nilima had recorded maximum yield of flower $plant^{-1}$ and maximum yield of flower $hectare^{-1}$.

Munikrishnappa *et al.* (2013) conducted an experiment with the objective to evaluate the suitable varieties on growth and flower yield of China aster under traditional tract of northern Karnataka. The maximum number of cut flowers (40.76 lakh ha^{-1}) was recorded in Phule Ganesh Violet and minimum number of cut flower (31.64 lakh ha^{-1}) was recorded in variety Kamini.

The data in quality parameters viz., weight of single flower, weight of single spray, stalk length of spray, diameter of flower and vase life of spray are given in table1.

As regards the varietal treatments, significantly maximum weight of single flower was recorded with the variety Tamra (2.93 g) which was followed by the varieties Maghi (2.08 g) and Red Queen (2.03 g), whereas, the variety Shyamal (1.61 g) had recorded the minimum weight of single flower. The spacing of 45 cm x 30 cm was found significantly superior over all other treatments and produced maximum weight of single flowers (2.22 g) which was statistically at par with the spacing of 45 cm x 22.5 cm (2.18 g). Whereas, the spacing of 45 cm x 15 cm recorded minimum weight of single flower (2.09 g).

As regards the varietal treatments, significantly maximum weight of single spray was recorded in the variety Tamra (45.0 g) which was found to be at par with the variety Shyamal (44.6 g), whereas, the variety Red Queen (37.3 g) had recorded minimum weight of single spray.The effect due to different spacing levels on weight of single spray in chrysanthemum was found to be non-significant.

As regards the varietal treatments, significantly maximum stalk length of spray was recorded with the variety Tamra (25.05 cm) followed by the variety Maghi (21.84 cm), whereas, the variety Shyamal (15.92 cm) had recorded significantly minimum stalk length of spray. The wider spacing of 45 cm x 30 cm was found significantly superior over all other treatments and produced significantly maximum stalk length of spray (21.44 cm) which was at par with the spacing of 45 cm x 22.5 cm (20.58 cm), whereas, significantly minimum stalk length of spray (19.62 cm) was recorded with the closer spacing of 45cm x 15cm.

As regards the varietal treatments, significantly maximum diameter of flower stalk (0.28 cm) was recorded with variety Tamra, which was followed by varieties Maghi (0.20 cm) and Red Queen (0.20 cm). Whereas, significantly minimum diameter of cut flower stalk (0.16 cm) was recorded in the variety Shyamal. Significantly maximum diameter of flower stalk (0.22 cm) was recorded with the spacing of 45 x 30 cm, which was at par with the spacing of 45 x 22.5cm (0.21 cm). Whereas, significantly minimum diameter of the cut flower stalk (0.20 cm) was recorded with spacing 45cm x 15 cm.

As regards the varietal treatments, significantly maximum vase life of spray was recorded with the variety Maghi (11.15 days) which was statistically at par with varieties Tamra (10.83 days) and Red Queen (10.63 days). However, the variety Shyamal had recorded significantly minimum vase life (10.17 days) of spray. The spacing of 45 cm x 30 cm was found significantly superior over all other treatments and showed maximum vase life of spray (12.41 days) which was followed by the spacing of 45 cm x 22.5 cm (10.44 days), whereas, the spacing of 45 cm x 15 cm had recorded minimum vase life of spray (9.23 days).

As regards interaction effect due to different varieties and spacing treatments on weight of single flower, weight of single spray, stalk length of spray, diameter of flower and vase life of sprayin chrysanthemum was found to be non-significant.

Results, obtained in the present investigation are in consonance with the findings of Belgaonkar *et al.* (1997). They conducted an experiment on Annual Chrysanthemum and reported that, the spacing of 30 x 40 cm, produced cut flowers with the longest vase life (7.33 days). The highest weight of flowers $plant^{-1}$ was recorded with 45 x 45 cm spacing. Deepa Isac and Chezhiyan (2002) evaluated forty cultivars of chrysanthemum in that the genotype Acc 95 had recorded the maximum length of cut flower stalk. Gaikwad *et al.* (2002) found that, *cv.* Indira had recorded the maximum vase life of flowers while *cv*. Spray Purple showed

Table 1. Yield and quality parameters as influenced by varieties and spacing in chrysanthemum

Treatments	Number of sprays plant^{-1}	Number of sprays plot^{-1}	Number of sprays ha^{-1}(lakh)	Number of flower spray^{-1}	Weight of single flower (g)	Weight of single spray (g)	Stalk length of spray (cm)	Diameter of flower (cm)	Vase life of spray (days)
Factor A. Varieties (V)									
V_1 – Maghi	4.7	208.0	3.84	20.96	2.08	43.3	21.84	0.20	11.15
V_2 - Red Queen	3.7	162.6	3.00	20.82	2.03	37.3	19.38	0.20	10.63
V_3 – Shyamal	4.3	185.7	3.43	16.15	1.61	44.6	15.92	0.16	10.17
V_4 – Tamra	5.2	232.9	4.30	27.92	2.93	45.0	25.05	0.28	10.83
SE(m) ±	0.18	8.6	0.16	0.45	0.03	0.61	0.41	0.003	0.22
CD at 5%	0.53	25.3	0.46	1.34	0.11	1.81	1.22	0.010	0.67
Factor B. Spacing (S)									
S_1 – 45cm x 15 cm	3.8	245.2	4.35	20.63	2.09	43.5	19.62	0.20	9.23
S_2 – 45cm x 22.5 cm	4.2	172.7	3.20	21.71	2.18	42.5	20.58	0.21	10.44
S_3 – 45cm x 30 cm	5.3	173.3	3.20	22.09	2.22	42.1	21.44	0.22	12.41
SE(m) ±	0.15	7.4	0.13	0.39	0.03	0.53	0.36	0.003	0.19
CD at 5%	0.46	21.9	0.40	1.16	0.10	-	1.05	0.010	0.58
Interaction V X S									
SE(m) ±	0.31	14.9	0.27	0.79	0.06	1.06	0.72	0.006	0.39
CD at 5%	0.92	43.9	0.81	-	-	-	-	-	-

that shortest vase life in chrysanthemum. Maximum stalk length of flowers was recorded with *cv.* Solu local. Baskaran *et al.* (2004) conducted experiment in open field conditions at Banglore to evaluate the performance of chrysanthemum cultivars Viz. Ravikiran, Chandrika, Yellow Star, Red Gold, Nilima, Kasturi, Shaventigae, Cassa, Arka Ravi and Button Type Local. In that, the highest flower diameter was recorded in *cv.* Ravikiran. However, the lowest was recorded in *cv.* Button Type Local.

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