

*Full Length Research Paper*

## **Effect of planting dates and spacing on growth and flowering of French marigold Sel. 'FM – 786'**

**Pratibha, C. \*, Gupta, Y. C., Dhiman, S. R. and Gupta, R. K.**

Department of Floriculture and Landscaping, Dr. Y S Parmar University of Horticulture and forestry, Nauni, Solan-173230, India.

Received 1 August, 2015; Accepted 17 February, 2016.

The present study was carried out in an experimental farm in the Department of Floriculture and Landscaping, Dr. Y. S. Parmar University of Horticulture and Forestry, Nauni, Solan (H.P.) during March to December, 2010. The experiment was laid out in split plot design, comprising of eight different planting dates and two spacing, (viz., 30 × 20 cm and 30 × 30 cm) as sub-plot treatment at monthly intervals from, mid-March to October, 2010. Maximum flower size was recorded for April planting date crop, whereas, June planting date gave the best results for plant height and plant spread. However, maximum number of flowers and maximum yield per plant were recorded in March planted crop. Plant height, plant spread flower size and yield per plant were at maximum in a wider spacing S<sub>2</sub> (30 × 30 cm). Maximum number of flowers per plant as well as maximum yield per plant was recorded in March planting at closer spacing S<sub>2</sub> (30 × 20 cm).

**Key words:** Horticulture, floriculture, flowering, plant.

### **INTRODUCTION**

French marigold (*Tagetes patula*), belonging to family Asteraceae, is a native of Central and South America, especially Mexico. They are compact, dwarf (about 35 to 40 cm in height) and bushy in habit. This is popular among the grower because of its wide spectrum of attractive colours, shape, size and good keeping quality. Flowers are small, either single or double, borne on proportionately long peduncles, its colour varies from deep scarlet, mahogany and rusty red, primrose, yellow, golden yellow, orange and combination of these colours. The recent dwarf types (15 cm in height), which look like cushions and remain fully covered with blooms. The flowers in this group may be self-coloured, striped

spotted and blotched. It is highly suitable as bedding plant to provide colours to fill the space. It is used as loose flower, pot plant and also in great demand for making garlands, religious and social functions. French marigold is also ideal for edging, hanging baskets and window boxes. Growth and flowering in marigold is generally governed by the day length and temperature. To meet out the increasing demand of flowers throughout the year, its staggered planting is required. Therefore, this experiment was undertaken to evaluate the effect of planting dates and spacing on growth and flowering parameters of French marigold Sel. 'FM-786' is used in order to regulate the continuous flowering with the help of

\*Corresponding author. E-mail: pratibha\_nohra@yahoo.com

planting dates and to identify the most suitable planting time and spacing of marigold in the mid hill conditions of H.P.

## MATERIALS AND METHODS

The present study was undertaken at the experimental farm in the Department of Floriculture and Landscaping, Dr. Y S Parmar University of Horticulture and Forestry, Nauni, Solan, Himachal Pradesh during 2010. The experiment was laid out in split plot design with eight main plot treatments as planting dates and two sub-plot treatments as spacing, with three replications. The main plot treatments includes eight planting dates, viz., 16th March, 16th April, 16th May, 16th June, 16th July, 16th August, 16th September and 16th October, whereas, sub-plot treatments include two spacing, viz., 30 × 20 cm (S<sub>1</sub>) and 30 × 30 cm (S<sub>2</sub>). Observations on various growth and flowering parameters viz., plant height, plant spread, days taken to bud formation, days taken to flowering, duration of flowering, number of flowers per plant, yield per plant and yield per square meter were recorded on five randomly selected plants per replication for each treatment.

## RESULTS AND DISCUSSION

Planting dates and spacing showed a significant effect on the plant height, plant spread and days taken to bud formation of French marigold Sel. 'FM – 786'. Maximum plant height (64.50 cm) was recorded in June planting followed by May planting (63.43 cm). The plants of May and June plantings got exposure to considerably longer day lengths and higher temperatures and hence, higher temperature cause elongation of internodes and this led to the growth of the plant. These results are in close conformity with the findings of Raju et al. (2006), where shorter plants were produced when planting was done in the month of October. This may be ascribed to the season that, October planted crop could not get the requisite temperature for its vegetative growth, and has resulted in the stunted growth. In case of spacing, more plant height (42.11 cm) was obtained with the wider spacing S<sub>2</sub> (30 × 30 cm).

Among the interactions between planting dates and spacing, maximum plant height (65.19 cm) was recorded with spacing S<sub>2</sub> (30 × 30 cm) in May planting and the spread (47.90 cm) was also recorded in June planting followed by April planting (45.39 cm). This may be due to congenial growing environment that led to more vegetative growth besides the delay in bud initiation and flowering as well. Therefore, higher temperature promotes vegetative growth and delay flowering in marigold. The results are in conformity with the findings of Raju et al. (2006).

May planting took maximum time for flower bud initiation, whereas, minimum number of days for bud initiation was recorded in October planting. This might be due to the occurrence of long days available for May

planted crop and shortening in day length, when planting was commenced in October that results in early bud initiation. These results are in accordance with the findings of Raju et al. (2006). More time for bud formation (52.65 days) was observed at wider spacing S<sub>2</sub> than spacing S<sub>1</sub>. Among interactions, May planted crop took maximum number of days for bud formation (104.73 days) with spacing S<sub>1</sub> (30 × 20 cm). October planting (59.87 days) had taken minimum number of days for flowering. Shortening in day length during October has resulted in early flowering (Raju et al., 2006). May planting has recorded maximum number (115.93 days) of days for flowering. This might be due to the occurrence of long days during May to June which delayed flowering.

Maximum duration of flowering (31.41 days) was recorded in April planting. This might be due to the optimal climatic conditions during its vegetative as well as flowering stage, which is available for crop planted in April. Chanda and Roychoudhary (1991) also reported similar findings where, interactions between spacing and planting dates showed none significant effect. Maximum number of flowers per plant (63.57) was recorded in March planting date this might be due wider spacing. Plants grew more luxuriantly by taking up nutrients which could spread largely as compared to the plants grown at closer spacing, where there was less availability of nutrients and space. Therefore, the maximum number of flowers per plant could be attributed to an increase in plant spread and number of branches. It was also observed that with an increase in plant density, the number of flowers per plant decreased significantly. Chanda and Roychoudhary (1991) reported similar results for marigold.

Maximum flower weight per plant was observed in March planting (151.73 g) and minimum weight of flower per plant was recorded in May planting (20.33 g). This could be attributed to the existence of congenial climatic conditions during the crop growth period, which enabled them to produce an increased amount of photosynthates and intern resulted in more dry matter accumulation. It was observed that, unfavorable climatic conditions exist for optimum vegetative growth and better flowering, during the July to September planted crops. Similar variation was also observed by Guruprasad (1999) and Nagaraju et al. (2004).

In French marigold Sel. 'FM 786', maximum flower which yield per square meter was observed in March planting (2172.00 g) with closer spacing of 30 × 20 cm and minimum flower yield per sq. meter, which was recorded in May planting (221.97 g) when the crop was planted at a wider spacing S<sub>2</sub> (30 × 30 cm). The reason for maximum yield per sq. meter might be due to more number of plants. These results are in close conformity with the findings of Ravindran et al. (1986), Bhati and Chitkara (1987) and Mohanty et al. (1993).

This may conclude that, March planting date is

**Table 1.** Effect of planting dates and spacing on growth and flowering of French marigold Sel. 'FM- 786'.

Planting dates	Plant height (cm)	Plant spread (cm)	Days for bud formation (days)	Days for flowering (days)	Duration of flowering (days)	No. of flowers /plant	Yield/plant (g)	Yield/sq. m (g)
March,16	45.92	41.08	29.47	46.00	24.60	63.57	151.73	1999.55
April,16	51.99	45.39	42.80	62.10	31.41	36.67	93.17	1116.37
May,16	63.43	35.31	104.07	115.93	24.85	12.53	20.33	244.07
June,16	64.50	47.90	54.73	81.43	21.80	25.35	59.97	815.57
July,16	36.70	25.43	69.12	86.93	19.10	17.77	30.80	348.30
August,16	28.33	24.73	52.57	65.70	24.17	25.83	43.50	526.90
September,16	22.98	22.28	43.03	59.87	20.57	17.53	31.80	339.20
October,16	17.66	15.65	23.00	41.20	29.20	12.53	23.70	279.68
CD <sub>(0.05)</sub>	1.27	1.91	1.90	1.10	1.54	4.16	15.33	218.47
<b>Spacing</b>								
S <sub>1</sub>	40.77	31.99	52.05	69.58	24.54	26.07	55.51	843.25
S <sub>2</sub>	42.11	32.46	52.65	70.21	24.38	26.88	58.24	574.16
CD <sub>(0.05)</sub>	0.80	NS	0.39	0.39	NS	NS	NS	80.33
<b>Planting dates × Spacing</b>								
PD <sub>1</sub> × S <sub>1</sub>	44.91	38.97	29.80	46.27	24.60	62.73	144.80	2172.00
PD <sub>2</sub> × S <sub>1</sub>	53.38	45.81	40.73	61.33	31.02	36.93	94.27	1414.00
PD <sub>3</sub> × S <sub>1</sub>	61.66	34.24	104.73	114.67	25.47	12.27	20.80	312.00
PD <sub>4</sub> × S <sub>1</sub>	64.73	50.88	53.67	81.13	22.13	24.97	59.73	1076.00
PD <sub>5</sub> × S <sub>1</sub>	34.59	23.96	69.93	87.13	18.73	16.40	29.13	404.40
PD <sub>6</sub> × S <sub>1</sub>	26.87	24.09	52.07	64.67	24.13	27.80	45.13	677.00
PD <sub>7</sub> × S <sub>1</sub>	22.70	21.53	43.00	60.27	20.40	15.93	27.47	353.20
PD <sub>8</sub> × S <sub>1</sub>	17.31	16.40	22.47	41.20	29.87	11.53	22.73	337.40
PD <sub>1</sub> × S <sub>2</sub>	46.94	43.20	29.13	45.73	24.60	64.40	158.65	1827.10
PD <sub>2</sub> × S <sub>2</sub>	50.59	44.97	44.87	62.87	31.80	36.40	92.07	818.73
PD <sub>3</sub> × S <sub>2</sub>	65.19	36.37	103.4	117.20	24.23	12.80	19.87	176.13
PD <sub>4</sub> × S <sub>2</sub>	64.27	44.91	55.80	81.73	21.47	25.73	60.20	555.13
PD <sub>5</sub> × S <sub>2</sub>	38.82	26.89	68.30	86.73	19.47	19.13	32.47	292.20
PD <sub>6</sub> × S <sub>2</sub>	29.79	25.37	53.07	66.73	24.20	23.87	41.87	376.80
PD <sub>7</sub> × S <sub>2</sub>	23.27	23.03	43.07	59.47	20.73	19.13	36.13	325.20
PD <sub>8</sub> × S <sub>2</sub>	18.01	14.90	23.53	41.20	28.53	13.53	24.67	221.97
CD <sub>(0.05)</sub>	2.28	1.69	1.10	0.96	NS	NS	NS	227.20

optimum for maximum flower production, whereas, May and June planting dates are not suitable for continuous flowering. In case of

spacing, closer spacing (30 × 20 cm) is found to be more suitable for different flowering characters (Table 1).

#### CONFLICT OF INTERESTS

The authors have not declared any conflict of

interests.

#### REFERENCES

- Bhati RS, Chitkara SD (1987). Effect of pinching and planting distance on the growth and yield of marigold (*Tagetes erecta*). Research and Development Reporter 4(2):159-164.
- Chanda S, Roychaudhary N (1991). The effect of planting dates and spacing on growth, flowering and yield of African marigold (*Tagetes erecta* L.) cv. 'Siracole'. Horticultural Journal 4(2):53-56.
- Guruprasad G (1999). Effect of time of planting on growth flowering and vase life studies in China aster (*Callistephus chinensis* Nees). M.Sc. (Agri.) Thesis, University of Agricultural Sciences, Dharwad.
- Mohanty CR, Behera TK, Samantaray D (1993). Effect of planting time and spacing on growth and flower yield of marigold cv. African Yellow. South Indian Horticulture 45(1/2):41-44.
- Nagaraju D, Reddy BS, Patil RT, Gangadharappa PM, Kulkarni BS (2004). Effect of dates of planting on flowering and flower quality of China aster (*Callistephus chinensis* Nees.) cv. Kamini. Journal of Ornamental Horticulture 7(3-4):132-134.
- Raju DVS, Singh KP, Swaroop K (2006). Performance of French marigold (*Tagetes patula* L.) in different planting months under Delhi conditions. Journal of Ornamental Horticulture 9(3):215-217.
- Ravindran DVL, Rao RR, Reddy EN (1986). Effect of spacing and nitrogen levels on growth, flowering and yield of African marigold (*Tagetes erecta* L.). South Indian Horticulture 34:320-322.