

Short communication

## Effect of spacing and flower picking on flower and seed yield in marigold

S.C. RANA\*, V.K. PANDITA, S. SIROHI AND SATISH K. YADAV<sup>1</sup>

IARI Regional Station, Karnal-132001 (Haryana)  
sureshiariknl@gmail.com

Amongst the crop production technology optimum plant spacing and pinching of flowers are essential to obtain better plant spread and flower yield per unit area. The indicated that optimum plant spacing provided favorable conditions for higher flower yield [1]. Similarly, pinching at appropriate stages help attaining better growth and promote flowering [2]. Selection of suitable cultivars and adoption of improved agronomic practices is important for realizing the optimum flower and seed yields. However, information on effect of spacing and flower pickings on flower and seed yield is meagre in marigold. Therefore, a field experiment was carried out to study the effects of spacing and flower picking on seed yield in African marigold (*Tagetes erecta* L.) cv. Pusa Narangi Gaiinda.

A field trial was conducted at Indian Agricultural Research Institute Regional Station, Karnal, Haryana during rabi 2008-09. The experiment was laid out in a split plot design with three replications to study the effects of spacing and flower picking on flower and seed yield of African marigold cv. Pusa Narangi Gaiinda. The treatments comprised of four spacing viz. 45 x 45 cm ( $S_1$ ), 60 x 45 cm ( $S_2$ ), 60 x 60 cm ( $S_3$ ) and 75 x 60 cm ( $S_4$ ) in main plot and four flower pickings viz. none ( $P_0$ ), one ( $P_1$ ), two ( $P_2$ ) and three ( $P_3$ ) in sub plots. The transplanting of 30 days old seedlings was done on 15 October, 2008. The soil of the experimental plot was clay loam

having 8.2 pH with low in nitrogen, moderate in phosphorous, high in potash and good water holding capacity. The recommended package of practices was followed for cultivation of crop. All the plots were given uniform cultural practices.

In one picking, sub plot treatments ( $P_1$ ), flowers were harvested at 75 day after transplanting (DAT). In case of two picking treatments ( $P_2$ ), flowers were harvested at 75 and 90 DAT; and in case of three picking treatments ( $P_3$ ), flowers were harvested at 75, 90 and 105 DAT. The observations on plant height, branches per plant, flower yield, seed yield and 1000 seed weight were recorded by adopting the standard procedure and the results were statistically analyzed. The processing of seed was done on seed cleaner cum-grader using standard sieves. Cost of cultivation was worked out in all treatments and cost benefit ratio was calculated.

### *Effect of spacing on seed yield*

The perusal of data presented in table-1 revealed that row and plant spacing significantly affected plant height, branches per plant, flower yield and seed yield. With the increase in spacing, there was significant reduction in plant height. The plant height was maximum (63.2 cm) at 45 x 45 cm spacing followed by 60 x 45 cm (59.6 cm) and 60 x 60 cm (58.2 cm) spacing, respectively. The increase in plant height at closer spacing might be due to competition among plants for

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\*Corresponding author

<sup>1</sup>GEX Unit, NBPGR, New Delhi-110012

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**Table1. Effect of spacing and flower picking on flower and seed yield in marigold cv. Pusa Narangi**

Treatments	Plant height (cm)	Branches/plant	Flower yield (q/ha)	Seed yield (kg/ha)	Test weight (g)	Net Income (Lac Rs./ha)	B:C ratio
<b>Spacing (S)</b>							
45X45cm (S <sub>1</sub> )	63.2	33.9	46.7	115.4	2.93	1.34	2.52
60X45cm (S <sub>2</sub> )	59.6	37.0	33.8	132.7	2.96	1.46	2.84
60X60cm (S <sub>3</sub> )	58.2	38.7	32.0	161.2	2.98	1.74	3.57
75X60cm (S <sub>4</sub> )	57.5	41.7	28.9	143.8	3.01	1.55	3.08
CD (p=0.05)	0.93	1.44	0.85	1.85	0.01		
<b>Flower picking (P)</b>							
None (P <sub>0</sub> )	58.4	35.1	0	139.4	3.14	1.39	2.66
One (P <sub>1</sub> )	58.8	37.3	23	134.2	3.05	1.43	2.77
Two (P <sub>2</sub> )	60.0	39.3	34.1	177.1	2.90	1.90	4.01
Three (P <sub>3</sub> )	61.5	39.6	48.9	102.2	2.79	1.21	2.20
CD (p=0.05)	0.45	0.66	0.52	1.32	0.08		
<b>Interactions (SXP)</b>							
S <sub>1</sub> P <sub>0</sub>	61.6	30.4	0	117	3.12	1.17	2.07
S <sub>1</sub> P <sub>1</sub>	61.6	33.6	32.3	118.1	3.01	1.31	2.44
S <sub>1</sub> P <sub>2</sub>	64.3	36.5	46.1	148.4	2.84	1.66	3.39
S <sub>1</sub> P <sub>3</sub>	65.3	35.2	61.6	78	2.76	1.02	1.70
S <sub>2</sub> P <sub>0</sub>	58.6	34	0	136.6	3.13	1.36	2.59
S <sub>2</sub> P <sub>1</sub>	58.3	37.0	20.3	127.2	3.03	1.35	2.56
S <sub>2</sub> P <sub>2</sub>	60.3	38.3	33	171	2.90	1.84	1.21
S <sub>2</sub> P <sub>3</sub>	61.3	38.9	48	96	2.78	1.15	2.03
S <sub>3</sub> P <sub>0</sub>	57.0	35.9	0	163	3.15	1.63	3.28
S <sub>3</sub> P <sub>1</sub>	58.0	37.6	24.8	157.8	3.05	1.67	3.41
S <sub>3</sub> P <sub>2</sub>	57.6	40.2	28.9	203	2.91	2.14	4.64
S <sub>3</sub> P <sub>3</sub>	60.3	41.1	42.4	120.9	2.79	1.37	2.62
S <sub>4</sub> P <sub>0</sub>	56.3	40.3	0	141.2	3.18	1.41	2.71
S <sub>4</sub> P <sub>1</sub>	57.3	41.1	14.6	134	3.09	1.39	2.68
S <sub>4</sub> P <sub>2</sub>	57.6	42.2	28.5	186	2.96	1.97	4.19
S <sub>4</sub> P <sub>3</sub>	59.0	43.4	43.5	114	2.81	1.31	2.45
CD (p=0.05)	0.9	1.32	1.04	2.65	NS		

light, water, space and aeration. Similar observations were reported by Anju and Pandey [3] in African marigold.

Wider spacing of 75 x 60 cm recorded maximum number of branches per plant (40.7). These results are in conformity with the findings of Srivastava *et al.* [4] in marigold. All the spacing treatments viz. 45 x 45 cm (S<sub>1</sub>), 60 x 45 cm (S<sub>2</sub>), 60 x 60 cm (S<sub>3</sub>) and 75 x 60 cm (S<sub>4</sub>) differed significantly with each other w.r.t. flower yield. Maximum flower yield (46.7 q/ha) was recorded at 45 x 45 cm spacing

followed by 60 x 45 cm (33.8 q ha<sup>-1</sup>) and 60 x 60 cm (32 q ha<sup>-1</sup>) spacing, respectively. Lowest flower yield (28.9 q ha<sup>-1</sup>) was obtained in 75 x 60 cm spacing. The results are in line with those reported by Ahirwar *et al.* [5] in marigold cv. Pusa Narangi Gaiinda.

All the spacing treatments differed significantly with each other with respect to seed yield also. Among different spacing, maximum seed yield (161.2 kg ha<sup>-1</sup>) was recorded at 60 x 60 cm followed by 75 x 60 cm (143.8 kg ha<sup>-1</sup>). The lowest seed yield was

obtained at 45 x 45 cm spacing (115.4 kg ha<sup>-1</sup>). Wider spacing resulted in significantly more test weight than the closer spacing. Maximum test weight (3.01g) was recorded at 75 x 60 cm spacing followed by 60 x 60 cm spacing (2.98g). The lowest test weight (2.93g) was obtained at 45 x 45 cm spacing. Higher 1000 seed weight at wider spacing might be attributed to better seed filling than those recorded at closer spacing.

Higher seed yield at wider spacing might be due to higher test weight, more branches and flowers per plant and also owing to less competition among the plants for nutrients and light. Significantly higher seed yield under 60 x 60 cm spacing in comparison to 60 x 45 cm and 75 x 60 cm spacing might have resulted from optimization of resources such as nutrients, light and plant density through higher flowers per plant and more 1000 seed weight. The results are in conformity with the findings in *Tagetes erecta* [6] who recorded maximum seed yield under 60 x 45 cm spacing. Sunitha *et al.* [7] also reported more seed yield per hectare in *T. erecta* from wider spacing of 60x60 cm than from closer spacing of 60 x 40 cm. Among the four spacing evaluated, highest gross returns (Rs. 1.74 L/ha) and BC ratio (3.57) was recorded under 60 x 60 cm spacing (S<sub>3</sub>) followed by 60 x 45 cm spacing (S<sub>2</sub>).

#### *Effect of flower picking on seed yield*

Flower picking treatments also significantly influenced plant height, branches per plant, flower yield and seed yield. With the increase in number of pickings, there was increase in plant height. The maximum plant height (61.5 cm) was recorded under three pickings (P<sub>3</sub>) followed by two (60 cm) and one picking (58.8 cm), respectively. Flower yield increased with the increase in number of pickings. Flower picking three times (P<sub>3</sub>) recorded highest flower yield (48.9 q ha<sup>-1</sup>) followed flower picking two times (34.1 q ha<sup>-1</sup>). Among different flower picking treatments, seed yield was highest (177.1 kg ha<sup>-1</sup>) under two

flower pickings (P<sub>2</sub>) followed by seed yield (139.4 kg ha<sup>-1</sup>) with no flower picking (P<sub>0</sub>) and (134.2 kg ha<sup>-1</sup>) under one flower picking (P<sub>1</sub>), respectively. Lowest seed yield (102.2 kg ha<sup>-1</sup>) was recorded from flower pickings three times (P<sub>3</sub>). The increase in seed yield with two flower pickings might be due to checking of apical dominance and diversion of additional energy for production of more branches and flowers on the plant.

The number of picking (P<sub>0</sub>) recorded significantly higher test weight (3.14g) than one (3.05g), two (2.90 g) and three flower pickings (2.79g), respectively. Reduction in test weight with increase in number of pickings might be due to limited availability of time for seed setting and seed development.

#### *Interaction effects*

The interaction effects indicated that maximum seed yield (203 kg ha<sup>-1</sup>) was obtained at 60 x 60 cm spacing with two flower picking (S<sub>3</sub>P<sub>2</sub>) followed by seed yield (186 kg/ha) under 75 x 60 cm spacing with two flower picking (S<sub>4</sub>P<sub>2</sub>), respectively. Besides higher seed yield, the treatments comprising S<sub>3</sub>P<sub>2</sub> (60 x 60 cm spacing & two flower picking) and S<sub>4</sub>P<sub>2</sub> (75 x 60 cm & two flower picking) recorded higher gross returns (Rs. 2.14 L and Rs. 1.97 L/ha) and BC ratio (4.64 and 4.19) respectively, than the remaining treatments. Thus, it could be concluded that a spacing of 60 x 60 cm with two picking of flowers is economical for marigold seed production under northern Haryana conditions.

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