

Effect of planting dates and pinching on seed traits in African Marigold cv. Sirakole

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ABSTRACT

A field experiment on the effect of planting dates and pinching on seed production in African marigold cv. Sirakole was carried out during November, 2007 to June, 2008 with four planting dates and three levels of pinching. November planting gave more number of seeds (191.89) and weight of seed per head (0.32g), seed yield per plot (272.24 g), 1000 seed weight (1.65g) as well as seed yield (1008.29 kg) per hectare. In addition to these quality traits like germination percentage of seed, root and shoot length of seedlings and vigour index also witnessed significant improvement under this date of planting. Shoot pinching at 30 days after planting was effective in bringing significant improvement in number (173.01) and weight (0.25g) of seeds per head as well as seed yield (309.77 kg) per hectare. Interaction effect of November planting and single pinching improved germination percentage (90.44) and seed vigour index (2098).

Key words: Germination percentage, Pinching and Planting date, Root length, Shoot length, Vigour index.

INTRODUCTION

Marigold is native of United States of America which belongs to the Family *Asteraceae* and genus *Tagetes*. Among the flower crops because of its merits and favourable agro climatic conditions of the state, marigold occupied a prominent place. These are commonly grown in garden both in rural and urban areas and cultivated commercially for use as loose flowers throughout the year. It has been observed that demand for these flowers has been shown a steady increase during recent year. Conventional method of vegetative propagation is a slow process of multiplication of planting material as compared to seed propagation. In the present context "Sirakole" variety assumes greater significance, since this variety not only produce attractive orange colour flowers throughout the year but also produce viable seed giving a scope for generating sufficient planting material within short span of time, thus playing the vital role in formulating a year round production programme of marigold in the state. Among the factors, influencing yield and quality of seeds in annual flowers including marigold, optimum time of planting is of utmost importance which plays a significant role in seed programme.

MATERIALS AND METHODS

The present investigation on the response of marigold variety "Sirakole" to date of planting and pinching was undertaken in the form of a field experiment at the Department of Horticulture, College of Agriculture, Orissa University of Agriculture and Technology, Bhubaneswar during 2007-2008. With all nursery management practices, seeds were sown in nursery bed to raise healthy seedlings. Twenty one days old seedlings were transplanted in the main

field at the experiment site. The design followed was factorial experiment in randomized block design. The experiment consisted of two factors viz., different dates of planting and levels of pinching. Number of replications were three. A spacing of 30 cm X 30 cm was maintained and all the agronomic package of practices along with plant protection measures were followed. There were four main plots corresponding to four dates of planting, that is D1 – 15th November 2007; D2 – 15th December 2007; D3 – 15th January 2008 ; D4 -15th February 2008. Three subplots under each main plot, corresponding to three levels of Pinching that is P0 – control, P1 – Single Pinching, P2 – Double Pinching. The observations were recorded on five randomly selected plants per treatments and replication after discarding the border plants at both ends for each treatment on eleven traits: number of seeds per head, weight of seeds per head (g), number of seeds per plant, weight of seeds per plant, 1000 seed weight (g), Seed yield per plot (g), Seed yield per hectare (kg), germination percentage of seeds, root length of seedlings (cm), shoot length of seedlings (cm) and vigour index.

RESULTS AND DISCUSSION

The data recorded on seed parameters were presented in Table 1 revealed that number of seeds per head was significantly higher under November planting (191.89) which was followed by December (170.84), February (158.55) and January (158.11) planting. However it was statistically comparable under these three planting dates and almost identical under January and February planting. Production of more number of seeds per head might be attributed to production of flowers with greater diameter and weight due to congenial atmospheric condition, which might

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TABLE 1: Effect of planting dates and pinching on seed characters

Treatments	Number of seeds per head	Weight of seeds per head (g)	Number of seeds per plant	Weight of seeds per plant (g)	1000 seed weight (g)	Seed yield per plot (g)	Seed yield per ha (kg)	Germination (% of seeds)	Root length (cm)	Shoot length (cm)	Vigour index
Main Plot, Date of Planting (D)											
15 th November, 2007 (D1)	191.89	0.32	8134	13.61	1.65	272.24	1008.29	85.77	12.15	10.83	1971
15 th December, 2007 (D2)	170.84	0.22	6352	9.06	1.39	181.35	671.66	84.00	11.68	11.05	1921
15 th January, 2008 (D3)	158.11	0.21	6402	7.87	1.37	157.40	582.96	79.03	10.56	9.83	1612
15 th February, 2008, (D4)	158.55	0.17	5127	5.64	1.35	112.93	418.25	75.32	9.52	8.90	1390
F- Test	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	-	Sig.	Sig.	Sig.	Sig.
S.E (m) + -	6.00	0.01	274	0.57	0.02	11.56	-	0.37	0.13	0.17	19
C.D (5 %)	17.59	0.03	803	1.69	0.07	33.90	-	1.08	0.38	0.49	55
Sub Plot, Pinching (P)											
No Pinching (P0)	176.24	0.24	5891	9.47	1.46	189.56	299.48	80.86	10.74	9.96	1679
Single Pinching (P1)	173.01	0.25	6867	10.13	1.50	202.73	309.77	83.64	11.70	10.46	1861
Double Pinching (P2)	160.30	0.20	6754	7.53	1.36	150.65	291.03	78.58	10.49	10.04	1623
F- Test	N.S.	Sig.	Sig.	Sig.	Sig.	Sig.	-	Sig.	Sig.	N.S.	Sig.
S.E (m) + -	5.19	0.01	237	0.50	0.02	10.01	-	0.32	0.11	0.14	16
C.D (5 %)		0.03	695	1.46	0.06	29.36	-	0.94	0.33		48

Sig. = Significant at 5 percent level, N.S = Not significant

have contained more number of florets with higher percentage of seed setting. The same also reported by Dubey *et al.* (2002) in August planting followed by May, June and July planting due to prevalence of congenial atmospheric condition during the period.

Weight of seeds per head was significantly higher under November planting (0.32 g) followed by December, (0.22 g) January (0.21g) and February (0.17g) planting. Production of bigger size of flower with more number of florets and higher percentage of seed set and bold seeds for their proper development due to prevalence of congenial atmospheric condition during flowering and seed setting under November planting might have contributed for higher seed weight per head as observed in the present study. On the other hand, due to unfavorable weather condition with higher temperature and rate of evaporation during the crop period under February planting the flower size was reduced which ultimately resulted in smaller heads and seeds with less filling.

It has been observed that number and weight of seed per plant was significantly higher in November planting (8134.99, 13.61g) Product and the lowest was recorded in February planting (5127.51, 5.64g)). Seed yield per plant under December and January planting (on number and weight basis) were statistically comparable with each other. Prevalence of congenial atmospheric condition might have favoured production of significantly more number and weight of flower per plant along with higher percentage of seed set in each flower head in turn might have contributed more seed yield per plant in November planting.

All these factors might have resulted more weight of one thousand seed weight and is significantly higher under November planting (1.65 g) which decreased with further delay in planting and found minimum under February planting (1.35 g).

Significantly higher seed yield per plot was obtained under November planting (272.24 g) followed by December (181.35 g), January (157.40 g) planting and it was statistically comparable under these two planting dates. Seed yield was minimum under February (112.93 g) planting. Similar results have also been reported by Kumar and Kaur (2001), Dutt and Kumar (2007) in *Coreopsis* as maximum seed yield / m² in November planting. Seed yield per hectare was maximum under November planting (1008.29 kg) minimum under February planting (412.25 kg).

Seed of November planting exhibited higher percentage of germination capacity (85.77) followed by seed of December planting (84.00) and the lowest germination was in February planting (75.32) (Fig. 1). It might be due to the better quality seed and bold with higher 1000 seed weight. Dubey *et al.* (2002) reported higher percentage of seed germination in 15th August planting as compared to 15th May, June and July planting.

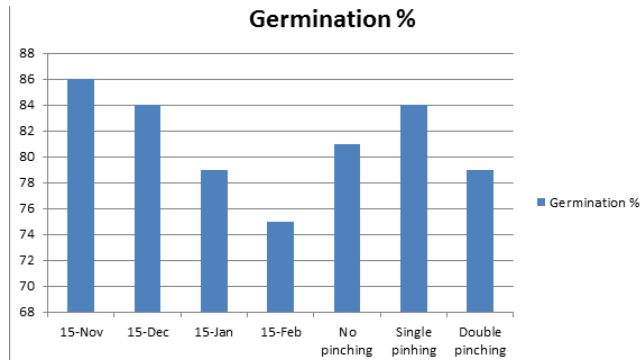


FIG-1. Effect of planting dates and pinching on germination percentage

Maximum root length was observed in November planting (12.15 cm) followed by December planting (11.68 cm). Maximum number of shoot length was observed in December planting (11.05 cm) followed by November planting (10.83 cm). On the other hand, the lowest value for all these traits in February planting (9.52 cm, 8.90 cm) and it is due to unfavorable condition with higher temperature. However the vigour index was observed to be maximum in November planting (1971) followed by December planting (1912) and lowest in February planting (1390) (Fig.3). Production of better quality seeds in November planting due to congenial atmospheric condition might have resulted in production of quality seedling with high higher root, shoot length and vigour index while unfavourable condition with high temperature might have become a limiting factor for obtaining seedling with greater vigour in February planting.

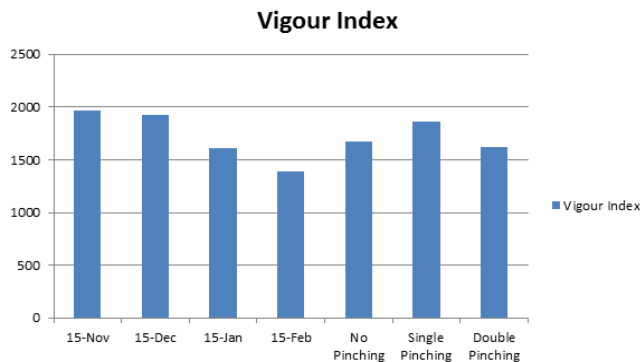


FIG-3. Effect of planting dates and pinching on Vigour Index

Various pinching treatments reduced the number of seeds per flower head as compared to no pinching (176.24) and more reduction was observed under double pinching (160.30). However, the number of seeds produced per head due to single and double pinching were statistically comparable with those recorded in unpinched plants. Since the size and weight of individual flowers were more in unpinched plants it might have contained more number of florets producing more number of seeds per head.

Weight of seeds per head was maximum in single pinching (0.25g) followed by no pinching (0.24g) and was almost identical. Significantly lower weight of seed per head was observed in double pinching (0.20g) and it might be due to small size of flower and same number of seeds.

Significantly more number of seed per plant was recorded in single pinching (6867) followed by double pinching (6754) whereas the lowest was recorded with unpinched plants (5891). But it has been reported by Tomar *et al.* (2004) in Pusa Narangi and Pusa Basanti that Double pinching at (30 days and again at 45 days) is better than single pinching at 30 days after planting. However, the seed yield in single and double pinching was statistically comparable with each other. Production of more weight of flowers per plant and seeds per flower head under single pinching might have brought marked improvement in seed yield per plant on weight basis (10.13g) as compared to double pinching (7.53g). Although weight of seeds per plant under no pinching (9.47g) was lower than single pinching yet both were comparable with each other.

Thousand seed weight was slightly higher in single pinching (1.50g) yet it was on par with no pinching treatment (1.46g). On the other hand double pinching (1.36g) significantly reduced the thousand seed weight as compared to other treatments. Sunitha *et al.* (2007) observed the seed weight was higher in pinching treatment compared to no pinching. However, other workers (Tomar *et al.* (2004), Bhat and Shepherd (2007) observed significant reduction in thousand seed weight due to pinching treatment and double pinching brought more reduction than single pinching. Reduction in individual flower size and weight under double pinching as observed in present study might have produced smaller seeds which in turn might have reduced the thousand seed weight in this treatment.

Seed yield per plot was maximum in single pinching (202.73g) and was more than no pinching (189.56g) without showing any significant variation. It might be due to the fact that single pinching at juvenile stage was more effective in improving the vegetative growth, flower production and seed yield per plant as well per plot as compared to other pinching treatment.

Similarly, the seed yield per hectare was maximum in single pinching (309.77 kg) followed by no pinching (299.48 kg) and the lowest in double pinching (291.03 kg).

The quality traits like germination percentage, root length and seed vigour index were significantly higher in single pinching (83.64%, 11.70cm, 10.46 cm, 1861) followed by no pinching (80.86%, 10.74cm, 9.96cm, 1679.78) and double pinching (78.58%, 10.49 cm, 10.04cm, 1623) treatment (Fig.1, Fig.3). There is no negative effect of pinching on seed quality traits. This result is in conformity with the findings of Tomar *et al.* (2004), Bhat and Shepherd (2007) and Sunitha *et al.* (2007).

The data recorded on Seed traits were presented in Table 2. revealed that various combinations of planting dates and pinching could not influence different seed traits except some quality traits like percentage germination, root length and seed vigour index. Seeds produced from November planted crop with single pinching recorded higher percentage of germination (90.44) and vigour index (2098) (Fig.2 and Fig.4) while root length under December planting with single pinching recorded the maximum value (12.76cm) followed by the same in November planting with double pinching (12.50cm) and single pinching (12.33 cm) without showing any significant variation from each other. Similarly, seed vigour index in November (2098) and December planting (2085) with single pinching was almost identical. It has been observed that significantly more number and weight of seeds per plant (9004.10, 16.19 g) was produced in the plants in November planting with single pinching.

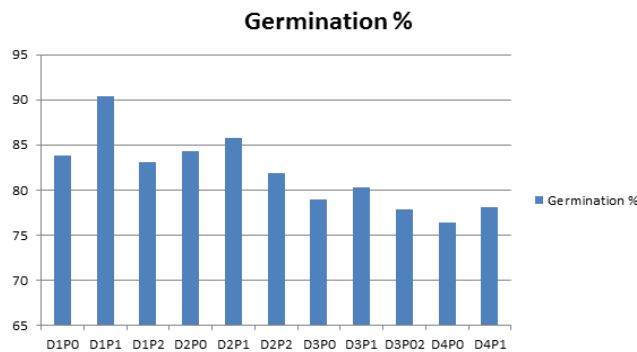


FIG-2. Interaction effect of planting dates and pinching on Germination percentage

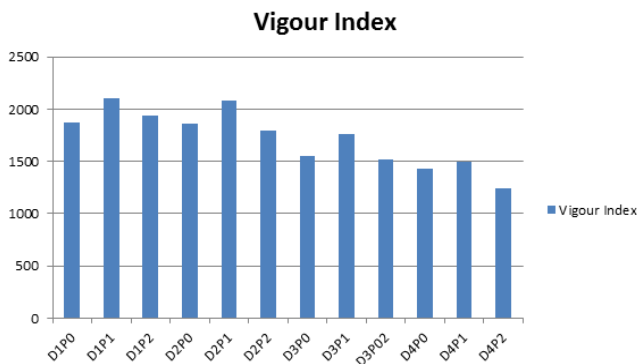


FIG-4. Interaction effect of planting dates and pinching on Vigour Index

Seed produced from February planting and double pinching resulted the lowest value for all the above characters like germination percentage(71.50) root length (8.99cm), shoot length (8.40cm) and seed vigour index (1243), no significant variation from each other. It was seen that combined effect of November planting and single pinching had almost favorable effect on germination percentage and vigour index of seeds.

TABLE – 2. Interaction effect of planting dates and pinching on seed characters

Treatments	Number of seeds per head	Weight of seeds per head (g)	Number of seeds per plant	Weight of seeds per plant (g)	1000 seed weight (g)	Seed yield per plot (g)	Seed per yield hectare (kg)	Germination percentage of seeds	Root length of seedlings (cm)	Shoot length of seedlings (cm)	Vigour index
D1P0	201.43	0.34	7056.77	14.05	1.80	323.80	1041.22	83.77	11.63	10.80	1876.44
D1P1	198.41	0.35	9004.10	16.19	1.50	211.80	1199.25	90.44	12.33	10.87	2098.33
D1P2	175.83	0.26	8344.10	10.59	1.41	200.33	784.55	83.10	12.50	10.84	1939.34
D2P0	179.76	0.24	5938.10	10.01	1.41	189.93	741.96	84.31	11.37	10.65	1857.72
D2P1	169.38	0.23	6547.70	9.49	1.34	153.80	703.44	85.77	12.76	11.55	2085.62
D2P2	163.38	0.19	6571.25	7.69	1.38	158.53	569.62	81.92	0.91	10.97	1792.97
D3P0	161.86	0.21	5919.46	7.92	1.38	171.53	587.16	78.95	10.29	9.39	1554.75
D3P1	160.71	0.22	6505.49	8.57	1.41	142.13	635.29	80.32	11.83	10.14	1765.52
D3P02	151.76	0.19	6783.17	7.10	1.33	118.26	526.40	77.81	9.55	9.96	1518.35
D4P0	161.91	0.18	4649.48	5.91	1.37	125.66	438.00	76.42	9.68	9.02	1430.20
D4P1	163.54	0.19	5413.70	6.28	1.37	94.86	465.40	78.04	9.89	9.29	1497.24
D4P2	150.22	0.15	5319.35	4.74	1.30	N.S.	351.33	71.50	8.99	8.40	1243.78
F- Test	N.S.	N.S.	N.S.	-	N.S.	N.S.	-	Sig.	Sig.	N.S.	Sig.
S.E (m) +	10.39	0.02	474.58	1.00	0.04	20.02	-	0.64	0.22	0.29	33.01
-	-	-	-	-	-	-	-	1.88	0.67	-	96.81

Sig. = Significant at 5 percent level N.S= Not significant
 D1 = 15 th November, 2007; D2 = 15 th December, 2007; D3 = 15 th January, 2008; D4 = 15 th February, 2008
 P0 = No Pinching, P1 = Single Pinching, P2 = Double Pinching

Based on the results of the present study it was concluded that among the four planting dates, November planting improved several seed traits like number and weight of seeds per flower head, thousand seed weight as well as yield of seeds per plot and hectare. In addition to this, the quality traits of seeds such as germination percentage root length and vigour index also recorded significant improvement in this date of planting.

Shoot pinching in marigold once at 30 days after planting proved to be beneficial in improving the seed characters such as weight of seeds per flower head and 1000 seed weight in addition to seed yield per plot and hectare. Interaction effect of November planting with single pinching at 30 days after planting was found to be beneficial in improving the germination percentage and vigour index of seeds.

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