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## Effect of plug seedling age and pinching methods on flower yield and seed yield of African marigold (*Tagetes erecta* L.) cv. Local

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### Abstract

An investigation on “Effect of plug seedling age and pinching methods on flower yield and seed yield of African marigold (*Tagetes erecta* L.) cv. Local” was carried out at the Floriculture Farm, Jambuvadi, Department of Horticulture, Junagadh Agricultural University, Junagadh (Gujarat) during the year 2021-2022. The treatments comprised of three level of plug seedling age *i.e.* two week old plug seedling (A<sub>1</sub>), three week old plug seedling (A<sub>2</sub>), four week old plug seedling (A<sub>3</sub>) and four pinching methods *i.e.* no pinching (P<sub>1</sub>), single pinching (P<sub>2</sub>), single and a half pinching (P<sub>3</sub>) and double pinching (P<sub>4</sub>). The treatments were repeated three times. The experiment was laid out in Randomized Block Design (RBD) with factorial concept comprising twelve treatment combinations with three replications. The results indicated that the four week old plug seedling improved the yield of marigold flowers. Similarly, single pinching improved the yield of marigold flowers. Thus, the treatment of four week old plug seedling with single pinching improved yield and yield attributing characters of marigold flower.

**Keywords:** Marigold, age of plug seedling, time of transplanting, pinching

### Introduction

Flowers are important for their economic use as well as aesthetic value. Among the flowers grown by farmers, marigold (*Tagetes erecta* L.) has its own importance. Marigold is an important commercial flower of India, belongs to family Asteraceae (earlier Compositae). The origin of marigold is Central and South America especially Mexico (Kaplan, 1960) [6]. During the early 16th century it spreads various parts of Mexico. The marigold has two main popularly grown species *Tagetes erecta* (2n=24) and *Tagetes patula* (2n=48). *Tagetes erecta* is popularly known as “African marigold”, which are erect, hardy, annual, tall about 90 cm and branched. Leaf is pinnate, divided and leaflets are lanceolate and serrated.

Marigold is commercially grown for loose flowers to make garlands and wreath for exclusive use in religious and ceremonial functions, besides its use in landscape gardening. Apart, it has been valued for other purposes too. The aromatic oil extracted from marigold is called as “tagetis oil” used in preparation of high grade perfumes. Marigold acts as a trap crop to control fruit-borer in tomato and suppresses the nematode population in soil. It is also one of the most important natural sources of xanthophylls used as natural food additive to brighten egg yolks and poultry skin (Bosma *et al.*, 2003) [4]. Different parts of this plant are used widely in traditional medicine for curing various diseases like ulcers, laxation, fevers, epileptic fits, astringent, carminative, stomachic, scabies, liver complaints and in the treatment of eye diseases.

Marigold has higher returns in terms of flower yield and seed yield, but quality is low, necessitating the selection of the proper stage of seedlings for transplantation. This is included in the horticulture package of practices for open nurseries (3-4 weeks), but not for plug plant production. The plug plants grown in the greenhouse, on the other hand, grew faster and were more susceptible to harm when planted later. As a result, the current study intended to find the best plug plants at the optimum period for planting, which will increase flower and seed yields due to their undisturbed root system and proper nutrition in enriched media. Pinching is the process of pinching or nipping off new growth on a plant in order to encourage branching and boost bloom production. Because of apical dominance, a plant grows straight up, but if the growth tips are pinched out, assimilates are diverted into lateral buds, and branching develops. single pinch is done once at 30 days after transplanting by retaining 4-5 shoots for obtaining early crops.

In India, marigold cultivated on an area of 324 thousand hectares with a production of 1962 thousand tonnes (Anon., 2018)<sup>[1]</sup>.

### Material and Methods

The experiment was conducted at the Floriculture Farm, Jambuvadi, Department of Horticulture, Junagadh Agricultural University, Junagadh (Gujarat). The experiment was conducted in Randomized Block Design with factorial concept with twelve treatment combinations, consisting three levels of plug seedling age *i.e.* two week old plug seedling (A<sub>1</sub>), three week old plug seedling (A<sub>2</sub>), four week old plug seedling (A<sub>3</sub>) and four pinching methods *i.e.* no pinching (P<sub>1</sub>), single pinching (P<sub>2</sub>), single and a half pinching (P<sub>3</sub>) and double pinching (P<sub>4</sub>).

The seeds were sowed in the portrays three times at weekly intervals as part of a study on the planting age of plug plants for planting, *i.e.*, two, three, and four weeks old plug plants. Seeds were sowed after portrays were filled with a mixture of coco peat and vermicompost. Morning hours were used for transplanting, with rows 60 cm apart and plants 40 cm apart. A light irrigation was given soon after transplanting. Removal of the terminal portion or new growth of the plants is called pinching. This approach promotes the growth of side shoots and increases the plant's floriferousness. Single pinching was done at 30 DAT, single and a half pinching 20 after single pinching was done and double pinching 20 after single pinching was done depending upon the treatment.

### Result and Discussion

Among plug seedling age, A<sub>3</sub> four week old plug seedling gave minimum days to first flower initiation (43.30 days) and 50 per cent flowering (51.50 days), maximum number of flowers per plant (42.51), maximum diameter of flower (4.39 cm), weight of 10 flowers (41.50 g), flower yield per plant (0.17 kg), flower yield per plot (1.04 kg), flower yield per hectare (4841.82 kg). The more number of flower per plant at four week old plug plants might be due to the improvement in growth parameters *viz.*, stem girth, number of branches, leaf area per plant and leaf area index. These result is in close approximately with the finding of (Pavitra, 2018)<sup>[9]</sup> in

marigold and (Shukla *et al.*, 2011)<sup>[12]</sup>. The high yielding plant ability with four week old plug seedling was due to the production of more number of branches per plant with more number of flower per plant as well as flower weight and flower size. Besides the influence of these yield components, the higher yield might be due to the production of more leaf area. Among the growth componenets, plant height, stem girth and branching habit had positive influence with flower yield as indicated by correlation values. Similar results finding have been reported by (Kanton *et al.*, 2003)<sup>[5]</sup>. These result is in close approximately with the finding of (Pavitra, 2018)<sup>[9]</sup> in marigold and (Pena-Lomeli *et al.*, 1991)<sup>[10]</sup> in tomato.

Among pinching methods, P<sub>1</sub> no pinching gave minimum days required to first flower initiation (41.61 days), minimum days to 50 per cent flowering (46.45 days) and maximum number of flowers per plant (43.28), flower yield per plant (0.16 kg), flower yield per plot (1.04 kg), flower yield per hectare (4840.53 kg/ha) was observed in P<sub>2</sub> (single pinching). While, there was no significant effect on diameter of flower and weight of 10 flowers. Delay in appearance of flower bud and flowering due to pinching might be attributed to the fact that new shoots which emerged after pinching enter into vegetative phase and look time to become physiologically mature to bear buds and flowers. Similar result found (Sehrawat *et al.*, 2003 and Srivastava *et al.*, 2005)<sup>[11, 15]</sup>. Moreover, the axillary shoot has slower development than apical (Arora and khana, 1986)<sup>[2]</sup>, Mohanty *et al.* (2015)<sup>[7]</sup>. The increased number of flowers could be attributrd to the breaking of the apical dominance by pinching and as a result of which the production of more number of branches in apical portion of plant. Similar results were reported by mohanty *et al.* (2015)<sup>[7]</sup>, Srivastva *et al.* (2002), Tomar *et al.* (2004)<sup>[17]</sup> and Sunitha *et al.* (2007)<sup>[16]</sup> in marigold. However, flower yield per plant, plot and hectare under single and double pinching was statistically comparable. Similar findings have been reported by Singh *et al.* (2005)<sup>[13]</sup> who observed that single pinching was more effective than other pinching methods in improving weight of flowers per plant, plot and hectare as compared to unpinched plants. Similar results finding have been reported by Mohanty *et al.* (2015)<sup>[7]</sup>.

**Table 1:** Effect of plug seedling age and pinching methods on flower yield of African marigold (*Tagetes erecta* L.) cv. Local

Treatments	Days to first flower initiation	Days to 50 per cent flowering	Number of flowers per plant	Diameter of flower (cm)	Weight of 10 flowers (g)	Flower yield per plant (kg)	Flower yield per plot (kg)	Flower yield (kg/ha)
<b>Factor (A): Age of plug seedling</b>								
A <sub>1</sub>	50.23	56.90	33.56	3.11	31.12	0.10	0.65	3028.54
A <sub>2</sub>	45.23	53.18	39.25	3.72	38.44	0.13	0.79	3688.27
A <sub>3</sub>	43.30	51.50	42.51	4.39	41.50	0.17	1.04	4841.82
S.Em. ±	0.61	0.79	0.51	0.08	0.87	0.004	0.02	94.06
C.D at 5%	1.75	2.27	1.46	0.25	2.48	0.01	0.05	267.64
<b>Factor (B): Methods of pinching</b>								
P <sub>1</sub>	41.61	46.45	33.77	3.92	39.19	0.10	0.63	2937.24
P <sub>2</sub>	45.56	53.67	43.28	3.77	37.48	0.16	1.04	4840.53
P <sub>3</sub>	46.34	54.66	37.71	3.70	36.80	0.12	0.78	3652.26
P <sub>4</sub>	51.50	60.66	39.00	3.58	34.62	0.14	0.86	3981.48
S.Em. ±	0.79	1.03	0.66	0.11	1.13	0.004	0.02	121.43
C.D at 5%	2.26	2.93	1.89	NS	NS	0.01	0.07	345.53
<b>Interaction (A X P)</b>								
S.Em. ±	1.37	1.78	1.15	0.19	1.95	0.005	0.04	210.33
C.D at 5%	NS	NS	3.27	NS	NS	0.01	0.12	598.48
C.V. %	5.15	5.74	5.18	9.12	9.15	10.25	9.46	9.46

Among plug seedling age, A<sub>3</sub> four week old plug seedling gave maximum number of seeds per capsule (129.18), seed yield from 100 capsules (17.59 g) and seed yield per plant. Thus, the higher seed yield per plant (g), per plot (g) and per hectare (kg/ha) under four week old plug seedling might be due to higher capsule yield per plant as contributed by the beneficial effect of age of plug seedling from the selection of right stage seedlings. These result is in close approximately with the finding of (Pavitra, 2018)<sup>[9]</sup> in marigold. These result is in close approximately with the finding of Mohanty *et al.* (2015)<sup>[7]</sup> in marigold.

Among pinching methods, P<sub>1</sub> no pinching gave maximum number of seeds per capsule (108.84) While, maximum seed yield from 100 capsules (15.49 g) and seed yield per plant (6.87 g) was observed in P<sub>2</sub> (single pinching). Similar results finding have been reported by Sunitha *et al.* (2007)<sup>[16]</sup> and Mohanty *et al.* (2015)<sup>[7]</sup> who observed no adverse effect of single pinching over no pinching, rather the seed weight was higher under pinching methods compared to no pinching. However, other workers (Tomar *et al.*, 2004, Bhat and Shepherd, 2007)<sup>[17, 3]</sup> observed significant reduction in seed weight from 100 capsules due to pinching methods and single and a half pinching is brought more reduction than double pinching. Production of higher seed yield per plant obtained with single pinching might be due to the fact the single pinching at juvenile growth stage was more effective in improvement the vegetative growth, flower production and seed yield per plant, per plot as well as per hectare as compared to other pinching methods. Similar results finding have been reported by Mohanty *et al.* (2015)<sup>[7]</sup>.

**Table 2:** Effect of plug seedling age and pinching methods on seed yield of African marigold (*Tagetes erecta* L.) cv. Local

Treatments	Number of seeds per capsules	Seed yield from 100 capsules	Seed yield per plant (g)
<b>Factor (A): Age of plug seedling</b>			
A <sub>1</sub>	67.40	9.42	3.27
A <sub>2</sub>	103.55	14.34	5.91
A <sub>3</sub>	129.18	17.59	7.86
S.Em. ±	2.24	0.31	0.14
C.D at 5%	6.38	0.90	0.40
<b>Factor (B): Methods of pinching</b>			
P <sub>1</sub>	108.84	14.74	6.11
P <sub>2</sub>	102.4	15.49	6.87
P <sub>3</sub>	91.44	11.54	4.44
P <sub>4</sub>	97.48	13.37	5.30
S.Em. ±	2.89	0.41	0.18
C.D at 5%	8.24	1.16	0.51
<b>Interaction (A X P)</b>			
S.Em. ±	5.01	0.71	0.31
C.D at 5%	NS	NS	NS
C.V. %	8.68	8.94	9.62

The interaction effect of plug seedling age and pinching methods on yield and yield attributing parameters was found significant. Maximum number of flowers per plant (50.13), flower yield per plant (0.22 kg), flower yield per plot (1.41 kg) and flower yield (6527.77 kg/ha) were recorded in A<sub>3</sub>P<sub>2</sub> (four week old plug seedling + single pinching). The higher flower yield per plant and plot in above interaction might be due to optimum age of plug plants (Shukla *et al.*, 2011 in capsicum)<sup>[12]</sup> and pinching methods (Mohanty *et al.*, 2015 in marigold)<sup>[7]</sup>. Thus, the higher flower yield in above

combinations might be due to the production of more number of flowers per plant. The higher flower yield per hectare in above interaction might be due to optimum age of plug plants (Pena-Lomeli *et al.*, 1991<sup>[10]</sup> in tomato and pinching methods (Mohanty *et al.*, 2015 in marigold)<sup>[7]</sup>. thus, the higher flower yield could be related to their flower yield per plant.

**Table 3:** Interaction effect of plug seedling age and pinching methods on flower yield of African marigold (*Tagetes erecta* L.) cv. Local

Treatments	Number of flowers per plant	Flower yield per plant (kg)	Flower yield per plot (kg)	Flower yield (kg/ha)
A <sub>1</sub> P <sub>1</sub>	30.33	0.08	0.48	2222.21
A <sub>1</sub> P <sub>2</sub>	36.20	0.13	0.82	3811.72
A <sub>1</sub> P <sub>3</sub>	33.26	0.10	0.61	2824.07
A <sub>1</sub> P <sub>4</sub>	34.46	0.11	0.70	32.56.17
A <sub>2</sub> P <sub>1</sub>	33.60	0.10	0.64	2993.82
A <sub>2</sub> P <sub>2</sub>	43.53	0.14	0.90	4182.09
A <sub>2</sub> P <sub>3</sub>	39.26	0.12	0.79	3688.27
A <sub>2</sub> P <sub>4</sub>	40.60	0.14	0.84	3888.88
A <sub>3</sub> P <sub>1</sub>	37.40	0.13	0.77	3595.67
A <sub>3</sub> P <sub>2</sub>	50.13	0.22	1.41	6527.77
A <sub>3</sub> P <sub>3</sub>	40.60	0.16	0.96	4444.44
A <sub>3</sub> P <sub>4</sub>	41.93	0.17	1.03	4799.38
S.Em. ±	1.15	0.008	0.04	210.33
C.D at 5%	3.27	0.02	0.12	598.48
C.V. %	5.18	10.25	9.46	9.46

## Conclusion

The experiment on plug seedling age and pinching methods of four week old plug seedling was found the most effective for yield and yield attributing parameters. Similarly, treatments of single pinching improved yield of marigold flowers. Thus, the treatment of four week old plug seedling with single pinching improved yield and yield attributing characters of marigold flower.

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