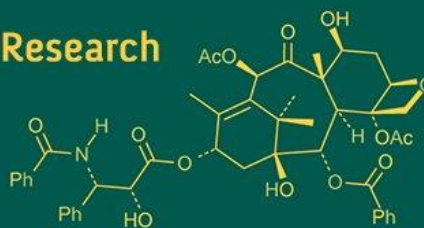


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Effect of varieties and spacing on growth and yield of African marigold

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Abstract

The present investigation entitled “Effect of varieties and spacing on growth and yield of African marigold”, conducted during the kharif season of 2025-26 at the Experimental Unit, Horticultural Section, College of Agriculture, Nagpur. evaluated eighteen treatment combinations comprising six varieties and three plant spacings laid out in a Factorial Randomized Block Design with two replications.

The result of the present investigation on growth parameters indicated that the maximum vegetative growth in respect of number of branches plant⁻¹, diameter of stem, plant spread (E-W) and (N-S), fresh and dry weight of plant were recorded in the variety Arka Bhanu under wider spacing whereas Arka Bhanu grown under closer spacing shown maximum plant height. With respect to yield parameters, Arka Bhanu grown under wider spacing of 60 cm × 45 cm recorded maximum number of flowers plant⁻¹ and flower yield plant⁻¹. However, Arka Bhanu grown under closer spacing of 45 cm × 45 cm significantly recorded maximum flower yield hectare⁻¹.

Keywords: African marigold, varieties, spacing

Introduction

African marigold (*Tagetes erecta*. Linn.) is a resilient annual ornamental crop of the Asteraceae family that possesses a hardy herbaceous growth habit with erect branching and dark green, pinnately divided leaves. Its flowers vary from single to fully double globular heads displaying rich color range from lemon-yellow to deep orange. This also attributes to its commercial marketability, providing floriculturists with rapid floral turnover and fast economic returns.

Among different cultivation techniques, selecting proper varieties plays a major role in driving significant improvements in floral quality, growth, and overall yield parameters. Choosing proper varieties directly enhances field yield per hectare to maximize commercial market value.

Furthermore, plant spacing is a critical cultural practice that actively regulates competition for solar radiation, soil nutrients, and moisture. By altering the microclimate and inter-plant competition, spacing directly determines structural growth alongside overall yield. Ultimately, combining proper varietal selection with ideal plant spacing drives maximum productivity. Together, these practices help floriculturists maximize total yield per hectare while maintaining premium flower quality. Thus, the present investigation have been made to select the proper variety and spacing for increasing the flower production.

Materials and Methods

The present investigation entitled “Effect of varieties and spacing on growth and yield of African marigold” was carried out during kharif season of the year 2025-26 at Experimental Unit, Horticultural Section, College of Agriculture, Nagpur. The experiment was laid out in Factorial Randomized Block Design with factor (A) having six different varieties (Arka Bhanu, Pusa Narangi Gaiinda, Arka Shubha, Pusa Basanti Gaiinda, Arka Abhi, Pusa Bahar) and Factor (B) having three levels of spacing (60 cm X 45 cm, 45 cm X 45 cm, 45 cm X 30 cm) with eighteen treatment combinations replicated twice.

The experiment was carried out on a flat bed with a gross plot size of 3.60 m × 2.25 m. Seedlings were raised in a nursery bed and transferred into the main field. i.e., Second week

of July. A recommended dose of inorganic fertilizer NPK ha^{-1} i.e., 100:50:50 ha^{-1} NPK was uniformly applied to all experimental plots to supply essential nutrients. The observations in respect of growth parameters i.e., plant height, number of branches plant^{-1} , diameter of stem, plant spread at 50 percent flowering, fresh weight of plant and dry weight of plant and with respect to yield parameters i.e., number of flowers plant^{-1} , yield plant^{-1} and yield ha^{-1} were recorded. The data was analyzed statistically as per the methods described by Panse and Sukhatme (1967) [15]

Results

1 Growth parameters

1.1 Effect of varieties on growth parameters

The data from Table 1 exhibited the significant difference among the varieties on growth parameters. Significantly maximum plant height (89.50 cm), number of primary branches plant^{-1} (19.58), number of secondary branches plant^{-1} (38.72), diameter of stem (1.55 cm), plant spread at 50 percent flowering i.e., East-west (45.56 cm) and North-south (40.69 cm), Fresh weight of plant at 50 percent flowering stage (476.40 g) and dry weight of plant at 50 percent flowering stage (149.72 g) were recorded in the variety Arka Bhanu followed by Arka Shubha while the minimum was recorded in variety Pusa Narangi Gaiinda. This marked variation in plant across growth stages is primarily attributed to the inherent genetic makeup, vigour branching behavior, and canopy architecture characteristic of each specific variety. These findings are in close conformity with the observations of Narsude *et al.* (2010) [12], Gobade *et al.* (2017) [4], Khatri *et al.* (2019) [6] and Thirumalmurugan *et al.* (2020) [14] in African marigold.

1.2 Effect of spacing on growth parameters

The data from Table 1 exhibited the significant difference among the spacings on growth parameters. Significantly maximum number of primary branches plant^{-1} (17.13), number of secondary branches plant^{-1} (36.93), diameter of stem (1.43 cm), plant spread at 50 percent flowering i.e., East-west (46.43 cm) and North-south (37.93 cm), Fresh weight of plant at 50 percent flowering stage (433.88 g) and dry weight of plant at 50 percent flowering stage (129.73 g) were recorded under wider spacing (60 cm $\times$ 45 cm) followed by intermediate spacing (45 cm $\times$ 45 cm) while the minimum was recorded under closer spacing (45 cm $\times$ 30 cm). However, closer spacing (45 cm $\times$ 30 cm) recorded maximum plant height (89.50 cm) which was followed by intermediate spacing (45 cm $\times$ 45 cm) while the minimum plant height was recorded under wider spacing (60 cm $\times$ 45 cm). The progressive increase in plant height observed within the closer planting might be a direct physiological adaptation to restricted spatial limits per unit area while for other growth parameters it is attributed to response to reduced crop population pressure per unit area. These experimental findings are in close conformity with the findings described by Beniwal *et al.* (2005) [2], Karuppaiah and Krishna (2005) [5] and Meena *et al.* (2015) [11] and in African marigold.

1.3 Interaction effect of varieties and spacing on growth parameters

The data from Table 2 revealed that the interaction effect between different marigold varieties and spacings was found non-significant in respect of plant height, number of primary

branches, stem diameter, fresh weight of plant and dry weight of plant except for number of secondary branches plant^{-1} . Number of secondary branches plant^{-1} , at 90 days after transplanting, the treatment combination of the variety Arka Bhanu planted under the wider spacing of 60 cm $\times$ 45 cm showed the maximum number of secondary branches plant^{-1} (44.25) which was at par with the combination of the variety Arka Shubha planted under the wider spacing of 60 cm $\times$ 45 cm. However, the minimum number of secondary branches plant^{-1} was observed in the variety Pusa Narangi Gaiinda planted under closer spacing of 45 cm $\times$ 30 cm.

2. Yield parameters

2.1 Effect of varieties on yield parameters

The data from Table 1 exhibited the significant difference among the varieties on yield parameters. Significantly maximum number of flower plant^{-1} (53.53), flower yield plant^{-1} (306.13 g) and flower yield ha^{-1} (15.88 t) was recorded in the variety Arka Bhanu followed by the variety Arka Shubha. However, Pusa Narangi gaiinda recorded the minimum values in above mentioned parameters. This variation in yield of different varieties can be attributed to a higher production of lateral branches and distinct genotypic traits. These findings are in close agreement with the experimental results reported by Narsude *et al.* (2010) [12], Markam *et al.* (2017) [10] and Mahanta *et al.* (2020) [9] in marigold.

2.2 Effect of spacing on yield parameters

The data from Table 1 exhibited the significant differences among the spacing on yield parameters. Significantly maximum number of flower plant^{-1} (52.64) and flower yield plant^{-1} (287.45 g) was recorded under wider spacing of 60 cm $\times$ 45 cm followed by intermediate spacing of 45 cm $\times$ 45 cm. However, closer spacing of 45 cm $\times$ 30 cm recorded the minimum values in above mentioned parameters. However, flower yield ha^{-1} (15.57 t) was recorded maximum under closer spacing of 45 cm $\times$ 30 cm whereas flower yield ha^{-1} was recorded minimum under wider spacing of 60 cm $\times$ 45 cm. The notable increase in yield plant^{-1} under wider spacings can be attributed to the increased development of lateral branches plant^{-1} whereas increase in yield ha^{-1} is due to increase in plant population per unit area. These results align with previous observations by Ahirwar (2012) [1], Lakshmi *et al.*, (2014) [7], Rolaniya *et al.*, (2017) [13] and Dhruw (2021) [3] in African marigold.

2.3 Interaction effect of varieties and spacing on yield parameters

The data from Table 2 revealed that the interaction effect between marigold varieties and spacings was found statistically significant for number of flower plant^{-1} , flower yield ha^{-1} and petal meal plant^{-1} .

With respect to number of flowers plant^{-1} , treatment combination of variety Arka Bhanu planted under the wider spacing of 60 cm $\times$ 45 cm recorded the maximum number of flowers plant^{-1} (57.74), which was found to be statistically at par with Arka Abhi planted under wider spacing of 60 cm $\times$ 45 cm (57.30) and Arka Shubha under wider spacing of 60 cm $\times$ 45 cm (54.90). Whereas, the minimum number of flowers plant^{-1} was recorded in Pusa Narangi Gaiinda grown under closer spacing of 45 cm $\times$ 30 cm (39.62).

With respect to flower yield plant^{-1} , treatment combination of variety Arka Bhanu grown under the wider spacing of 60

cm × 45 cm recorded the maximum flower yield plant⁻¹ (349.28 g), which was found to be statistically at par with Arka Shubha grown under wider spacing of 60 cm × 45 cm, Arka Bhanu grown under intermediate spacing of 45 cm × 45 cm and Arka Abhi grown under wider spacing of 60 cm × 45 cm. Whereas, the minimum flower yield plant⁻¹ was recorded in Pusa Narangi Gaiinda grown under closer spacing of 45 cm × 30 cm.

Whereas in respect of treatment combination of variety Arka Bhanu planted under the closer spacing of 45 cm × 30 cm (19.79 t) recorded maximum flower yield hectare⁻¹ which

was found to be at par with variety Arka Shubha planted under closer spacing of 45 cm × 30 cm (17.58 t). The minimum flower yield hectare⁻¹ was obtained under variety Pusa Narangi Gaiinda planted under the wider spacing of 60 cm × 45 cm (7.75 t). This might be attributed to the higher total plant population per unit area alongside the variation in each variety's genetic potential to efficiently convert resources into total floral biomass. These results align with previous observations by Lambe (2012)^[8] and Dhruw (2021)^[13] in African marigold.

Table 1: Effect of varieties and spacing on growth and yield of African marigold.

Treatments	Plant height at 90 DAT (cm)	Number of primary branches plant ⁻¹	Number of secondary branches plant ⁻¹	Stem diameter (cm)	Plant spread		Fresh weight of plant (g)	Dry weight of plant (g)	Number of flowers plant ⁻¹	Yield plant ⁻¹ (g)	Yield ha ⁻¹ (t)
					E-W	N-S					
Factor A: Varieties (V)											
V1: Arka Bhanu	89.50	19.58	38.72	1.55	45.56	40.69	476.40	149.72	53.53	306.13	15.88
V2: Pusa Narangi Gaiinda	71.33	11.95	28.15	1.17	35.78	30.92	208.72	80.13	44.45	178.55	9.16
V3: Arka Shubha	83.15	17.78	34.66	1.40	42.12	38.11	406.80	139.70	50.52	279.04	14.39
V4: Pusa Basanti Gaiinda	73.33	13.17	31.89	1.26	39.62	35.73	324.35	104.48	45.55	216.49	11.49
V5: Arka Abhi	78.50	16.20	34.25	1.33	41.59	34.27	356.63	119.57	49.77	262.74	13.58
V6: Pusa Bahar	78.33	15.85	28.62	1.27	40.35	33.56	348.92	105.93	45.95	231.5	11.59
‘F’ test	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
SE (m)±	1.78	0.40	0.96	0.03	1.15	1.06	18.55	2.82	1.27	7.90	0.45
CD at 5%	5.33	1.22	2.87	0.10	3.45	3.17	55.37	8.44	3.80	23.69	1.34
Factor B: Spacing (S)											
S1: 60 cm × 45 cm	75.74	17.13	36.93	1.43	46.43	37.93	433.88	129.73	52.64	287.45	10.64
S2: 45 cm × 45 cm	77.92	15.37	32.45	1.32	40.8	35.11	331.88	116.78	46.84	239.65	11.83
S3: 45 cm × 30 cm	83.42	14.78	28.76	1.24	38.79	33.61	295.16	103.50	45.4	210.13	15.57
‘F’ test	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
SE (m)±	1.26	0.28	0.68	0.02	0.81	0.75	13.12	2.00	0.90	5.61	0.31
CD at 5%	3.77	0.86	2.03	0.07	2.44	2.24	39.15	5.97	2.69	16.75	0.95
Factor C: Interaction effect (V × S)											
‘F’ test	N.S.	N.S.	Sig.	N.S.	N.S.	N.S.	N.S.	N.S.	Sig.	Sig.	Sig.
SE (m)±	3.09	0.70	1.66	0.05	2.00	1.84	32.14	4.90	2.21	13.75	0.78
CD at 5%	-	-	4.97	-	-	-	-	-	6.59	41.04	2.33

Table 2: Interaction effect of varieties and spacing on growth and yield of African marigold.

Treatments	Number of secondary branches plant ⁻¹	Number of flowers plant ⁻¹	Yield plant ⁻¹ (g)	Yield ha ⁻¹ (t)
V1S1	44.25	57.74	349.28	12.94
V1S2	36.85	53.85	316.93	14.91
V1S3	35.05	49.00	252.19	19.79
V2S1	30.22	50.23	209.11	7.75
V2S2	28.06	43.50	180.39	8.91
V2S3	26.17	39.62	176.15	10.83
V3S1	43.61	54.90	326.53	12.09
V3S2	35	49.69	273.36	13.5
V3S3	26.8	46.96	237.25	17.58
V4S1	35.2	44.79	239.35	8.86
V4S2	32.23	41.50	222.71	9.52
V4S3	28.25	50.36	217.42	11.11
V5S1	37.45	57.30	312.91	11.59
V5S2	36.8	47.36	245.67	12.13
V5S3	28.5	44.65	241.83	17.01
V6S1	29.85	50.90	287.51	10.65
V6S2	28.2	45.17	243.84	12.04
V6S3	27.8	41.78	183.16	12.09
'F' test	Sig.	Sig.	Sig.	Sig.
SE (m)±	1.66	2.21	13.75	0.78
CD at 5%	4.97	6.59	41.04	2.33

Conclusion

Based on the experimental findings, it is concluded that the performance of African marigold in terms of growth and yield was significantly influenced by the evaluated varieties and plant spacing treatments. In respect of growth parameters, variety Arka Bhanu under wider spacing has shown better results except for plant height. With respect to yield i.e., number of flower plant⁻¹ and total yield plant⁻¹ were recorded maximum in the variety Arka Bhanu under wider spacing. While, flower yield hectare⁻¹ was found maximum in variety Arka Bhanu under closer spacing.

References

1. Ahirwar MK, Ahirwar K, Shukla M. Effect of plant densities, nitrogen and phosphorus levels on growth, yield and quality of African marigold. *Ann Plant Soil Res.* 2012;14(2):153-155.
2. Beniwal BS, Ahlawat VP, Rakesh, Dahiya SS. Effect of spacing and pinching on flower production of *Chrysanthemum* cv. Flirt. *Haryana J Hortic Sci.* 2005;34(1-2):97-98.
3. Dhruw C. Studies on effect of various planting geometry and cultivars on growth and yield of African marigold (*Tagetes erecta* L.) under northern Bastar of Chhattisgarh [master's thesis]. Raipur, Chhattisgarh: Indira Gandhi Krishi Vishwavidyalaya; 2021.
4. Gobade N, Badge S, Patil S, Gormade G. Genetic variability studies for various quantitative traits in marigold. *Int J Pure Appl Biosci.* 2017;5(2):751-757.
5. Karuppaiah P, Krishna G. Response of spacings and nitrogen levels on growth, flowering and yield characters of French marigold (*Tagetes patula* Linn.). *J Ornam Hortic.* 2005;8(2):96-99.
6. Khatri S. Performance of different African marigold (*Tagetes erecta* L.) cultivars under Malwa Plateau of Madhya Pradesh [doctoral dissertation]. Gwalior, Madhya Pradesh: Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya; 2019.
7. Lakshmi, Pandey RK, Dogra S, Laishram N, Bhat D, Singh A, *et al.* Studies on effects of planting dates and spacing in African marigold (*Tagetes erecta* L.). *Prog Hortic.* 2014;46(1):149-152.
8. Lambe KM. Response of different African marigold genotypes to spacing for growth, flower yield and quality [master's thesis]. Akola, Maharashtra: Dr. Panjabrao Deshmukh Krishi Vidyapeeth; 2012.
9. Mahanta S, Talukdar MC, Talukdar P. Evaluation of marigold varieties for growth, flowering, yield and carotenoid content under Assam condition. *J Soils Crops.* 2020;30(2):231-235.
10. Markam PS, Shukla N, Sharma G, Ram DS, Pali GP. Effect of plant growth regulators and cultivars on flowering and yield of African marigold (*Tagetes erecta* L.) in Chhattisgarh plains. *J Plant Dev Sci.* 2017;9(4):353-357.
11. Meena Y, Sirohi HS, Tomar BS, Kumar S. Effect of planting time, spacing and pinching on growth and seed yield traits in African marigold (*Tagetes erecta*) cv. Pusa Narangi Gaiinda. *Indian J Agric Sci.* 2015;85(6):797-801.
12. Narsude PB, Kadam AS, Patil VK. Studies on the growth and yield attributes of different African marigold (*Tagetes erecta* L.) genotypes under Marathwada condition. *Asian J Hortic.* 2010;5(2):284-286.
13. Rolaniya MK, Khandelwal SK, Choudhary A, Jat PK. Response of African marigold to NPK, biofertilizers and spacings. *J Appl Nat Sci.* 2017;9(1):593-597.
14. Thirumalmurugan V, Manivannan K, Nanthakumar S. Genotypic evaluation of African marigold (*Tagetes erecta* L.) for flower yield and xanthophyll content under Vellore conditions. *Plant Arch.* 2020;20(2):3902-3904.
15. Panse VG, Shukhatme PV. Statistical methods for agricultural workers. 2nd ed. New Delhi: ICAR Publications; 1967.