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Regulation of commercial flower production of marigold in Bundelkhand region by manipulating planting time

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ABSTRACT

A study was conducted in the Bundelkhand region to examine if there was a link between planting dates and flowering time regulation in the African marigold cultivars 'Pusa Narangi Gainda' and 'Pusa Basanti Gainda' for commercial production. Seedlings were transplanted on the 6th of November, the 21st of November, the 6th of December, and the 21st of December, at fortnightly intervals. According to the study, planting on December 21st resulted in the shortest number of days for visible flower bud production and flowering. The longest period of blossoming was reported when planting was done on November 6th. When African marigold was planted on November 21st, it produced the tallest plants with widest plant spread, and maximum number of shoots, as compared to other planting dates. The maximum number of flowers per plant and flower yield/plant were obtained when planting took place on November 21st. The maximum flower weight was reported on November 6th, and it was comparable to November 21st planting. 'Pusa Narangi Gainda' performed better than 'Pusa Basanti Gainda' among cultivars and can be used for commercial production in the Bundelkhand region.

***Keywords*:** African marigold, Bundelkhand, cultivars, flower regulation, planting time, *Tagetes erecta,* Gainda**.**

Tagetes (marigold) is a native of America, although it is now grown in Africa, Asia, and Europe. Many species in this genus, including *T. minuta, T. erecta, T. patula,* and *T. tenuifolia,* are grown as decorative plants and examined for their therapeutic characteristics based on traditional medicine. Various components of the *Tagetes* species are used as medicines all over the world to cure a variety of health problems, including dental, gastrointestinal, intestinal, emotional, and mental illnesses, as well as muscular discomfort. Furthermore, the fungicidal, bactericidal, and insecticidal properties of these plants are explored in agriculture (Salehi *et al.*, 2018).

The marigold (*Tagetes* spp.) is one of the most important and widely used plants for the production of loose flowers in India. This flower has been associated with practically all of India's rites and rituals from ancient times. Furthermore, it is grown on 66.10 thousand hectares in India, with Karnataka, Madhya Pradesh, Gujarat, Andhra Pradesh, and Chhattisgarh being major producers (Anonymous, 2016). In Madhya Pradesh and Uttar Pradesh, this is the most common flower crop. The most common marigold species are African marigold (*Tagetes erecta* L.) and French marigold (*T. patula* L.). Purified trans- xanthophyll esters i.e. lutein can be obtained from dried corollas of fully developed marigold flowers (Hencken, 1992). It is grown as a bedding plant and a pot plant for landscaping, in addition to being used as a loose flower. The petals of marigold flowers are also used to extract xanthophyll, or lutein, which is used as a food coloring agent and a supplement in chicken feed. With increased vitamin-A concentration, it improves the intensity of egg yolk color as well as skin pigmentation in broiler chickens as a poultry feed additive (Levy, 2001).

Of the several potentially bioactive compounds produced by marigold, α-therthienyl has been found to be the most effective molecule with nematocidal activity (Wang *et al.*, 2007). This is a sulfur-containing chemical found in the tissues of marigolds, particularly the roots. α-therthienyl has the potential to be a non-residual environment friendly pesticide (Nivsarkar *et al*., 2001; Wang *et al*., 2007). According to Hamaguchi *et al*. (2019), when used under dark conditions, á-therthienyl enters the hypodermis of worms and produces nematocidal activity, indicating that it has a great potential for application as a practical nematode control agent in agriculture.

In a nutshell, due to its numerous applications, African marigold (*Tagetes erecta* L.) and French marigold (*Tagetes patula* L.) may also be cultivated for commercial purpose on a large scale. Hence, this study was designed to examine the link between planting dates

Short Communication

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and flowering time regulation in the African marigold cultivars 'Pusa Narangi Gainda' and 'Pusa Basanti Gainda' in Bundelkhand region, as marigold flowers are highly utilized in this region for various traditional functions and auspicious occasions.

The experiment took place on the Experimental Farm of Rani Lakshmi Bai Central Agricultural University, Jhansi, which is located between 25^{0}30'48.04" N Latitude and 78^{0}32'32.85" E Longitude. Seeds were obtained from the IARI's Seed Production Unit in New Delhi, and nursery raising was done 45 days prior to planting. Before planting, the field was fertilized with FYM @ 5 kg m^{-2} and various fertilizer doses of nitrogen, phosphorous, and potassium @ 30 gm^{-2} each. Urea and DAP were used to apply nitrogen, DAP was used to apply phosphorus, and Muriate of Potash was used to apply potassium. Planting dates served as the main plot and cultivars served as the sub plot in five replications of the split plot design experiment. Two African marigold cultivars, 'Pusa Narangi Gainda' (V_1) and 'Pusa Basanti Gainda' (V_2), were planted on four different dates: November 6th (D_1), November 21st (D_2), December 6th (D_3), and December 21st, 2018 (D_4). At a spacing of 45 x 45 cm, one-month-old seedlings with at least four leaves were transplanted in the well-prepared field. Before planting, full dosages of FYM, phosphorus, and potassium, as well as a half dose of nitrogen, were applied to the field. After approximately a month of seedling transplantation in the field, the remaining half dose of nitrogen was applied, followed by manual weeding and soil hoeing. After one month of planting, transplanted seedlings were pinched to promote the growth of lateral shoots. The measurements were taken at the peak of flowering, when 50-75 per cent of the flowers were fully open. The Agrometeorological Observatory of the ICAR-Indian Grassland and Fodder Research Institute in Jhansi provided weather parameter data. Data was subjected to analysis using SPSS software (USA).

Early bud growth and flowering were observed in both cultivars when planting dates were delayed, as shown in Fig. 1. The minimal number of days necessary for observable flower bud formation and flowering were 48.64 days and 76.54 days, respectively, when the plants were planted on December 21st (D4). Between cultivars, earlier flower bud formation (56.63 days) and flowering (79.72 days) was recorded in cv. 'Pusa Basanti Gainda' (V_2) as compared to cv. 'Pusa Narangi Gainda' (V_1) (61.02 days and 85.05 days, respectively). Duration of flowering was recorded maximum (49.45 days) when planting was done on 6th November. In terms of flowering duration, however, both cultivars gave equal results. The low temperatures in December and January may have caused a delay in bud formation and flowering

Table 1: Effect of planting dates on growth and flowering of African marigold cultivars

	Plant height (cm)			Plant spread (cm)			Number of side shoots plant^{-1}			Number of flowers plant^{-1}			Flower weight (g)			Flower size (cm)			Flower yield plant^{-1} (g)		
	V_1	V_2	Mean	V_1	V_2	Mean	V_1	V_2	Mean	V_1	V_2	Mean	V_1	V_2	Mean	V_1	V_2	Mean	V_1	V_2	Mean
D_1	70.00	67.36	68.68	60.20	54.34	56.33	10.12	9.96	9.85	69.50	57.24	63.37	9.97	10.51	10.24	6.76	6.89	6.83	692.71	601.24	646.98
D_2	70.24	73.44	73.44	60.60	60.98	60.79	10.36	9.67	9.90	70.24	64.88	67.56	9.49	10.47	9.98	6.61	6.67	6.64	666.70	679.35	673.03
D_3	68.36	68.84	68.84	59.10	52.32	55.71	9.73	8.12	9.24	66.24	68.70	67.47	9.74	9.19	9.46	6.38	6.16	6.27	645.05	634.73	639.89
D_4	55.40	54.06	54.06	58.32	53.26	56.73	8.30	8.44	8.37	48.61	53.32	50.96	8.09	7.72	7.91	6.16	6.23	6.19	392.81	412.97	402.89
Mean	**66.00**	**65.92**	**-**	**59.55**	**55.23**	**-**	**9.62**	**9.05**	**-**	**63.65**	**61.03**	**-**	**9.32**	**9.47**	**-**	**6.48**	**6.49**	**-**	**599.32**	**582.07**	**-**
$CD_{0.05}$	Varieties (V): NS			Varieties (V): 1.69			Varieties (V): 0.35			Varieties (V): 2.16			Varieties (V): NS			Varieties (V): NS			Varieties (V): NS		
	Planting date (D): 2.07			Planting date (D): 2.39			Planting date (D): 0.49			Planting date (D): 3.06			Planting date (D): 0.54			Planting date (D): 0.10			Planting date (D): 46.96		
	VxD: 2.92			VxD: 3.38			VxD: 0.70			VxD: 4.32			VxD: 0.76			VxD: 1.14			VxD: NS		

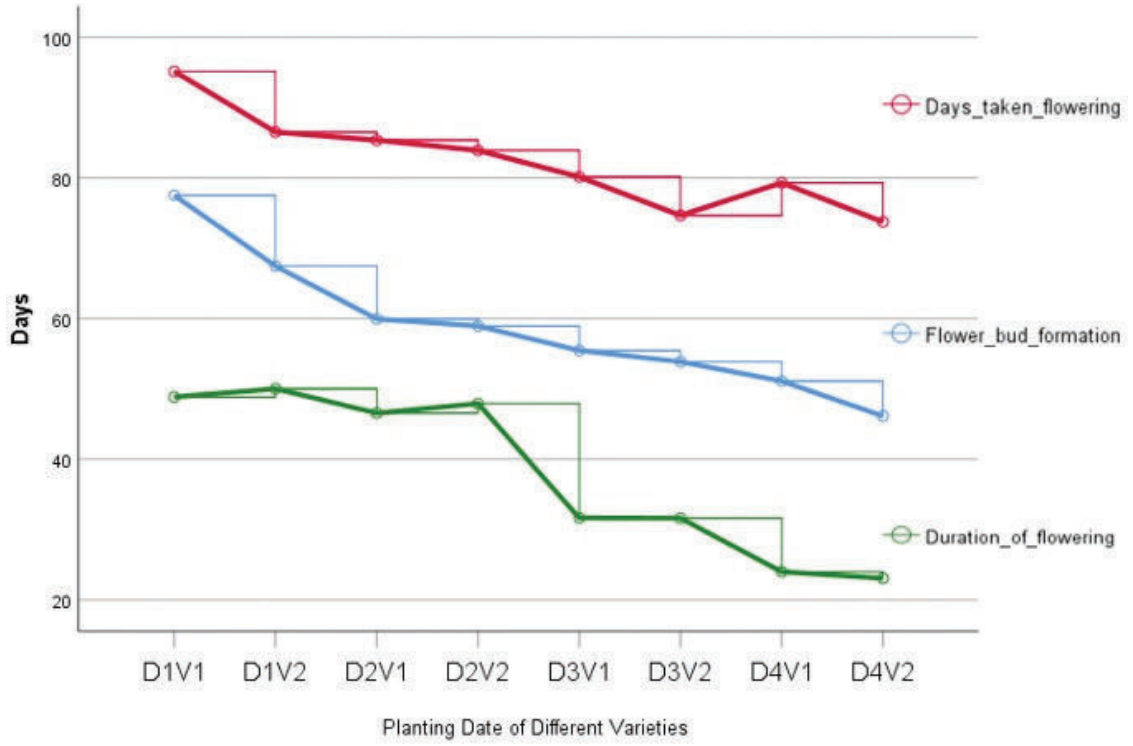

Fig. 1: Effect of planting dates on number of days taken for visible flower bud formation, flowering and duration of flowering in African marigold cultivars

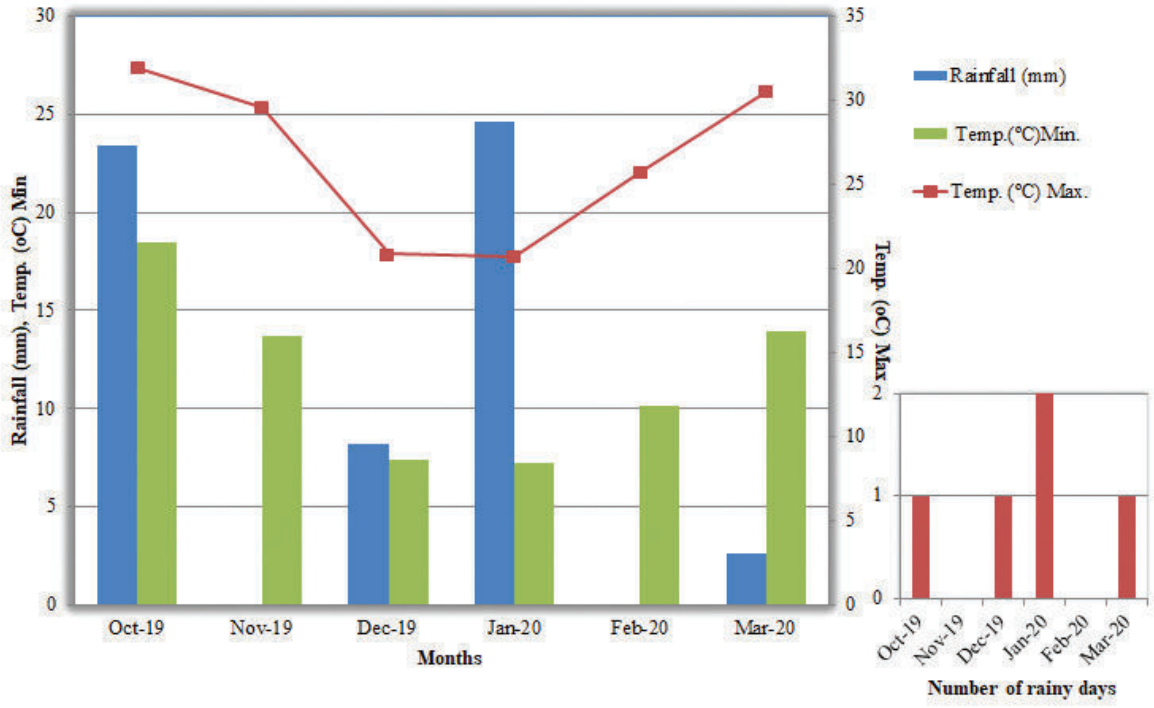

Fig. 2: Weather parameters recorded during the course of study in research area

in November planting (Fig. 2). According to certain studies, high-temperature conditions cause marigold to flower early. It has been reported by Moccaldi and Runkle (2007) that if day length integral (DLI) is increased from 10 mol m^{-2} d^{-1} to 20 mol m^{-2} d^{-1}; the number of days to flowering is decreased by 6 days at 15 p C and 4 days at 25 p C. Blanchard and Runkle (2009) also observed that in African and French marigold cultivars as temperature and DLI was increased, time to flower development decreased. Similar findings of maximum days to flowering in November planted marigold cv. 'Bidhan-1' crops compared to other plantation months of the year have also been observed by various authors (Devi, 2007). In comparison to the previous planted crop of marigold cv. 'Arka Agni,' the November planted crop of marigold cv. 'Arka Agni' had delayed bud formation and flowering (Jyothi *et al.*, 2018).

In comparison to other planting dates, tallest plants (73.44 cm), maximum plant spread (60.79 cm), and number of shoots per plant (9.90) were recorded when African marigold was planted on November 21st. While, when planting took place on December 21st, all parameters were at their lowest (54.06 cm, 56.73 cm, and 8.37 cm, respectively). The number of side shoots, maximum plant height, and plant spread were all higher in the November planting. This could be attributed to the plants having additional time for vegetative growth due to the delayed flowering compared to other late planting dates. In November planted marigolds, plant height, plant spread, and the number of side shoots per plant were all higher than in December planted marigolds (Singh *et al.,* 2015).

Maximum flower size in diameter (6.83 cm) was recorded on 1st planting date i.e. 6th November and minimum (6.19 cm) on last planting date i.e. 21st December. The 21st of November produced the most blooms per plant (67.56) and the highest flower yield per plant (673.03 g) of all the planting dates (Table 1). In November planted crops, there are more flowers per plant because there are more branches than in December planted crops. However, the maximum flower weight (10.24 g) was observed when planting took place on November 6th, and the least flower weight (7.91 g) was reported when planting took place on December 21st. When cultivars were compared, cv. 'Pusa Narangi Gainda' (63.65) had more flowers per plant than cv. 'Pusa Basanti Gainda' (61.03). Flower characters were also recorded more in November planted crop. This might have occurred because of luxuriant vegetative growth in November planted crop producing more photosynthates. Thus, photosynthates produced were directed towards sink i.e flowers resulting in increased size and yield per plant. Similar findings of more flower size, flower weight and flower yield in November planted crop of marigold as compared to December planted crop have been reported by Meena *et al.* (2015) and Sreekanth *et al.* (2007). Earlier research findings also reveal that among different planting dates, November planting resulted in more number and weight of flowers per plant and yield of flowers per hectare [Levy (2001) and Parhi *et al.,* (2016)].

In terms of cultivars, the cv. 'Pusa Narangi Gainda' produced more flowers than the cv. 'Pusa Basanti Gainda'. Among the various planting dates, the highest bloom yield was reported when planting was done on November 21st. However, flower yield was recorded significantly at par when planting was done on 6th November and 21st November. Hence, it can be concluded that marigold can be planted from first week of November to third week of November under agro-climatic conditions of Bundelkhand region and the grower can fetch a better price for their produce during winter season.

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REFERENCES

Anonymous. 2016. 2015-16 (Final Est.)_0.xlsx (live.com)

Blanchard, M. and Runkle, E. 2009. Energy-efficient annuals: Timing marigolds. *Greenhouse Growers,* May 59-61 https://www.canr.msu.edu/uploads/resources/pdfs/3-marigolds.pdf

Devi, M.P., Hemanta, A.C., Chakraborty, A. and Chakrabarty, S. 2017. Agrometeorological indices: effect on growth and flowering behaviour in marigold. *J. Crop Weed*, **13**(3):82-85.

Hamaguchi, T., Sato, K., Vicente, C.S. and Hasegawa, K. 2019. Nematicidal actions of the marigold exudate α-terthienyl: oxidative stress-inducing compound penetrates nematode hypodermis. *Biology Open*, **8**(4), p.bio038646.

Hencken, H., 1992. Chemical and physiological behaviour of feed carotenoids and their effects on pigmentation. *Poult. Sci*., **71**:711-717.

Jyothi, K., Goud, C.R., Girwani, A. and Kumar, T.S. 2018. Studies on the effect of planting dates and levels of pinching on growth, flowering and yield in marigold (*Tagetes erecta*) cv. Arka Agni. *Int. J Curr. Microbiol. App. Sci.*, **7**(11):2705-2713.

Levy, L.W. 2001. Trans-xanthophyll ester concentrates of enhanced purity and methods of making same. *United States Patent*, **6**, 191,293 B1: 1-10.

Meena, Y., Sirohi, H.S., Tomar, B.S. and Kumar, S. 2015. Effect of planting time, spacing and pinching on growth and seed yield traits in African marigold (*Tagetes erecta*) cv. Pusa Narangi Gainda. *Indian J. Agric. Sci.*, **85**(6): 797-801.

Moccaldi, L.A. and Runkle, E.S. 2007. Modeling the effects of temperature and photosynthetic daily light integral on growth and flowering of *Salvia splendens* and *Tagetes patula. J. Am. Soc. Hortic. Sci.,* **132** (3): 283-288.

Nivsarkar, M., Cherian, B. and Padh, H. 2001. Alpha-terthienyl: a plant-derived new generation insecticide. *Curr. Sci.,* **81**: 667-672.

Parhi, R., Mohanty, A. and Harichandan, S. 2016. Performance of various characters in African marigold due to different in pinching levels and planting dates. *Ann. Agri Bio Res*., **21**(1):44-48.

Salehi, B., Valussi, M. and Morais-Braga, M.F.B. 2018. *Tagetes* spp. essential oils and other extracts: chemical characterization and biological activity. *Molecules*., **23**(11):2847.

Singh, A.K., Kumar, U. and Kumar, A. 2015. Effect of planting date and spacing on performance of marigold (*Tagetes erecta* Linn.) cv. Pusa Narangi under North Bihar agro-ecological conditions. *Int. J. Forestry Crop Improv.*, **6**(1):16-20.

Sreekanth, P., Padma, M., Chandrasekhar, R. and Madhulety, T.Y. 2007. Effect of planting time, spacing and nitrogen levels on flowering of African marigold (*Tagetes erecta* L.) cv. Sierra orange. *J. Res.-ANGRAU*, **35**(1): 15–21.

Wang, K. H., Hooks, C. R. and Ploeg. 2007. Protecting crops from nematode pests: using marigold as an alternative to chemical nematicides. University of Hawaii at Manoa, College of Tropical Agriculture and Human Resources, Manoa, Hawaii, *Plant Disease Publication* PD, **35**: 1-6 https://www.ctahr.hawaii.edu/oc/freepubs/pdf/pd-35.pdf