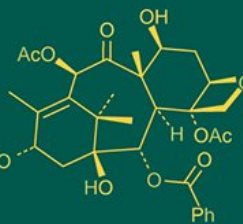
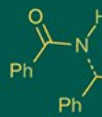
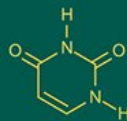
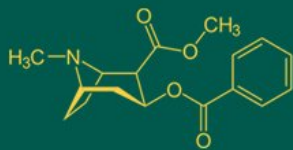


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Nutan Bhardwaj
Research Scholar, Department of Floriculture and Landscaping, Pt. K.L.S. College of Horticulture and Research Station, MGUVV, Durg, Rajnandgaon, Chhattisgarh, India

Rajeshwari Sahu
Assistant Professor, Department of Floriculture and Landscape Architecture, College of Horticulture and Research Station, Arjunda, Balod, MGUVV, Durg, Chhattisgarh, India

Medha Saha
Assistant Professor, Department of Floriculture and Landscape Architecture, Pt. KLS, CHRS, Rajnandgaon, Chhattisgarh, India

MS Paikra
Professor, Department of Fruit Science, MGUVV, Durg Chhattisgarh, India

Dikeshwar Nishad
Assistant Professor, Department of Agricultural Statistics and Social Science (L.), Pt. S.K.S. CARS, Rajnandgaon Chhattisgarh, India

Corresponding Author:
Nutan Bhardwaj
Research Scholar, Department of Floriculture and Landscaping, Pt. K.L.S. College of Horticulture and Research Station, MGUVV, Durg, Rajnandgaon, Chhattisgarh, India

Varietal evaluation of African marigold (*Tagetes erecta* L.) under Chhattisgarh plain

Nutan Bhardwaj, Rajeshwari Sahu, Medha Saha MS Paikra, Dikeshwar Nishad

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Abstract

The present investigation entitled “Varietal evaluation of African marigold (*Tagetes erecta*) under Chhattisgarh plain” was conducted for field observation at Pt. KLS College of Horticulture and Research Station, Rajnandgaon (C.G.) during the summer year of 2024-25. The investigation was carried out in Randomized Block Design with eight Varieties with three replications. Majority of the varieties showed significant positive variation for growth, flowering, yield and quality parameter. The plant height was recorded maximum in T₄- Pusa Basanti at 30, 60 and 90 DAT (48.00 cm, 76.07 cm and 81.60 cm) respectively. The plant canopy spread was recorded maximum in T₆- Calcutta Gaiinda at 30, 60 and 90 DAT (E-W) (N-S), (20.67cm, 37.30cm and 45.17cm), (19.87cm, 39.07cm and 45.66cm) respectively. The number of leaves per plant was recorded maximum in T₆- Calcutta Gaiinda at 30, 60 and 90 DAT, (21.26, 57.97 and 118.60) respectively. The number of primary branch at 30 DAT was recorded T₅- Arka Bhanu- F1 (3.20), While at 90 DAT was recorded maximum in T₆- Calcutta Gaiinda (11.87) whereas secondary branch was recorded maximum in T₆- Calcutta Gaiinda at 60 and 90 DAT (14.63 and 37.34).

The stem diameter was recorded maximum in T₆- Calcutta Gaiinda (1.50cm). Earliest days taken to first bud appearance was recorded in the T₃- Orange bunch (52.90). Days taken to 50 percent flowering was recorded in the T₃- Orange bunch (75.23). Maximum flower diameter (cm), fresh flower weight (g) and dry flower weight (g) was recorded by T₅- Arka Bhanu-F1 (6.18cm, 5.79g and 1.49g) respectively. The number of flower per plant were recorded maximum by T₆- Calcutta Gaiinda (53.98). Maximum weight of flower per plant (g) was recorded by T₅- Arka Bhanu-F1 (281.85g). Maximum weight of flower per plot (kg) was recorded by T₅- Arka Bhanu-F1 (13.78kg). Maximum flower yield per hectare (tonne) was recorded by T₅- Arka Bhanu-F1 (23.47t). Maximum chlorophyll pigment was recorded in variety T₆-Calcutta Gaiinda (5.89mg).

Keywords: Marigold, growth and yield performance, quality parameters, agro climate zone

Introduction

Floriculture has emerged as a promising agri-business by boosting land productivity, creating vast employment opportunities from cultivation to retail, and thereby uplifting the economic condition of farmers as well as entrepreneurs. Commercial flower cultivation has strengthened its role in agricultural diversification and established itself as a potential source of foreign exchange in India. The Indian subcontinent, with its varied agro-climatic conditions, offers abundant scope for cultivating a wide range of loose flowers such as marigold, chrysanthemum, jasmine, rose, crossandra, china aster, tuberose, and others.

Marigold (*Tagetes* spp L.) is one of the maximum normally grown loose flower, which belongs to circle of relatives Asteraceae. Marigold is local of vital and South the usa, specifically Mexico. it is one of the maximum important flower crop grown commercially in specific elements of the united states of america as a result of its smooth cultural practices and extensive adoptability. because of its short duration to produce marketable vegetation, wide spectrum of appealing coloration, shape, size and precise preserving exceptional attracted the eye of flower growers. they are in great call for as loose flowers, potted vegetation, bedding and border plants. loose plants are appreciably used for garland making, decorative functions, non-secular and social features.

It consists of medicinal and nematocidal residences and recommended for developing as a trap crop with the tomato and onion to reduce the menace of fruit borer in IPM machine (Meena *et al.* 2015)^[15],

There are about 50 species of the genus *Tagetes*. among those, *T. erecta* L. (African marigold), *T. patula* L. (French marigold) and *T. tenuifolia* Bartl. syn. *T. signata* (Bush marigold) are maximum popular species and used for commercial cultivation. among these *T. erecta* L. and *T. patula* L are the most essential species and used for industrial cultivation (Arora, 1989)^[3]. Therefore, in India, marigold accounts for more than half of the nation's loose flower production. It is grown in 66.10 thousand hectare area with production of 603.18 MT (Anonymous, 2016)^[1], In Chhattisgarh state, marigold production is 43.460 thousand MT from the area of 5.486 thousand ha. In Rajnandgaon district marigold production is around 0.468 thousand MT, in the area of 0.050 thousand ha. (Anonymous, 2024)^[2].

Flower extract is a good blood purifier, a cure for blood piles, ulcers and eye diseases. The leaves of marigold plants are characterized by the presence of distinct odoriferous oil. Some species of marigold have industrial potential also and frequently used to extract essential oil and carotenoid pigments. Essential oil of marigold has a great use in perfumery industries. The oil has bronchodilatory, tranquilizing anti-inflammatory effect and juvenile hormone with insect repellent properties against flies, ants and mosquitoes. The world demand for its oil is about 10 tonnes annually (Naik *et al.*, 2004)^[16].

Marigold possesses antinematode property. It produces aromatic sulphur containing compound known as thiophenes mainly in roots, which is known to be toxic to nematode (*Meloidogynespp.*).

The vinegar from marigold is used as a salad dressing, for its distinct flavors and its vibrant colour. The dried petals are used for a hot drink. The petals also make a delightful citrus tea when paired with a touch of orange and honey. It is rich in lutein pigment, which is known as the eye vitamin. Marigold can be used as a substitute for saffron. Flowers and leaves for adding to salads, sandwiches and seafood dishes.

There are several varieties and nearby cultivars are grown traditionally because long time in exceptional locality of u.s. which has substantial diversity in account of boom, yield and great. The extent of improvement relies upon upon the quantity of variability in one-of-a-kind characters gift within the crops that is an imperative prerequisite for successful breeding programmes. The better yield of flower is the final aim in most of the flowering plants. The interaction of a number of factor characters can also bring about boosting the yield of crop. keeping in view the above, gift research changed into achieved to evaluate suitable variety/genotype with admire to increase and yield below sub-tropical condition of Rajnandgaon (India).

Materials and Methods

The present investigation "Varietal evaluation of African marigold (*Tagetes erecta*) under Chhattisgarh plain" was conducted in the" Department of Floriculture & Landscaping Pt. KLS College of Horticulture and Research Station, Rajnandgaon (C.G.) during the *summer* season of 2024-25. This experiment was laid out to evaluate different African marigold varieties collected from various sources

for growth, flowering, yield and quality attributes under Chhattisgarh plains. The experiment comprised of eight varieties of African marigold i.e. Pusa Bahar, Pusa Narangi, Orange Bunch, Pusa Basanti, Arka Bhanu-F1, Calcutta Gaiinda, Local-1 and Local-2. Observation were taken on sixteen important characters viz. plant height, plant spread, number of leaves per plant, number of primary branches, number of secondary branches, stem diameter (cm), days taken to first bud appearance, days taken to 50 percent flowering, flower diameter, fresh flower weight, dry flower weight, number of flower per plant, weight of flower per plant (g), flower yield per plot (kg), flower yield per hectare (tonne) and chlorophyll content (mg/g). The investigation was carried out in the field in a randomized block design with 3 replications. The parameters which were considered during the observations were growth, flowering yield quality.

Result and Discussion

The findings of evaluated genotypes for growth, flower in, yield and quality parameters obtained from the analysis were interpreted with following sub headings.

Growth attributes: The observations on growth attributes are given in Table 1. The plant height was recorded maximum in T₄-Pusa Basanti (81.60 cm) which was at par with T₅ - Arka Bhanu-F1 (78.47 cm) but significantly superior to the other varieties, while the minimum was recorded in T₃ Orange Bunch (52.00 cm). The plant height are the varietal trait and variation among the varieties is attributed to the genetic makeup of the plant and variations in different variety-environmental interaction also affects on plant height Kanamadi and Patil (1993)^[8] in chrysanthemum. Similar variations in Plant height due to genotypes was also cited by Bharathi and Jawaharlal (2014)^[4], Manik and Sharma (2016)^[14] and Mahanta *et al* (2020)^[11] in marigold.

The plant spread (East-West) it was found maximum in T₆-Calcutta Gaiinda (45.17cm) which was at par with T₇ - Local-1 (43.93cm) but significantly higher than other varieties. while the plant spread was recorded minimum in the T₂-Pusa Narangi (32.40cm). At (North-South), it was found maximum in T₆-Calcutta Gaiinda (45.66cm) which was at par with T₇ -Local-1 (44.46cm) but significantly higher than other varieties. However it was reported minimum in the T₂-Pusa Narangi (32.93cm). Variation in plant spread has been attributed to the additive gene effects. Taller varieties tend to have more plant spread than shorter cultivar Poonam and Kumar (2007). Similar variations in plant spread have also been observed by earlier workers Raghuvanshi and Sharma (2011)^[21], Choudhary *et al.* (2014)^[5] and Mahanta *et al.* (2020)^[11] in marigold.

Number of leaves per plant were found maximum in T₆-Calcutta Gaiinda (118.60) which was at par with T₇- Local-1 (115.80). While it was found minimum in T₃- Orange Bunch (49.15). The production of more number of branches per plant might be due to the production of more number of leaves in that branch Verma *et al.* (2004)^[28]. Similar observations were given by Singh and Mishra (2008)^[24], Narsude *et al.* (2010)^[17], Mahanta *et al.* (2020)^[11] and Kumari *et al.* (2025)^[10] in marigold.

The observations on number of branch are given in Table 2. The number of primary branches was recorded maximum in T₆- Calcutta Gaiinda (11.87) which was found at par with T₇-

Local-1 (11.76) but significantly superior to the other varieties. While number of primary branches was recorded minimum T₂-Pusa Narangi (5.12) and number of secondary branch was recorded maximum in T₆- Calcutta Gaiinda (37.34) which was found at par with T₇- Local-1 (36.28) but significantly higher than other varieties, whereas the minimum secondary branch was recorded in T₂- Pusa Narangi (19.48). Plant spread is governed by genetic behaviour of the genotypes of different genetic composition which might be the reason responsible for the variations found in number of primary branches per plant Narsude *et al.* (2010) [17]. Environmental conditions may also have influenced the individual genetic makeup of the different varieties. Similar variations were also noted by, Rao *et al.* (2005) [22], Singh and Singh (2006) [25], Raghuvanshi and Sharma, (2011) [21], Bharathi and Jawaharlal (2014) [4], Manik and Sharma (2016) [14] and Mahanta *et al.* (2020) [11] in marigold.

The observations on stem diameter (cm) are given in Table 2. The stem diameter (cm) was recorded maximum in T₆- Calcutta Gaiinda (1.50cm) which was at par with T₇- Local-1 (1.46) but significantly higher than other tested varieties. However, minimum stem diameter was recorded in T₂- Pusa Narangi (0.90cm). Hence, variation in stem diameter of the studied in marigold genotypes could have resulted due to their genetic makeup and environmental conditions prevailed during experimentation. The findings of the present investigation confirm well with results reported by Singh and Singh (2006) [25] in marigold.

Flowering attributes: The data depicting number of days taken to first bud appearance is shown in Table 2. The days taken to first bud appearance was recorded minimum in T₃- Orange Bunch (52.90 days) which was at par with T₁- Pusa Bahar (55.11 days) which was showed lesser than all other varieties whereas, it was maximum in T₈- Local-2 (68.47 days). The variation for early or late flowering is an important varietal character in marigold that might be directly governed by the genetic makeup of the varieties leading to varying growth rate Mahantesh *et al.* (2016) [12]. The similar observations were also made by Khanvilkar *et al.* (2003) [9], Rao *et al.* (2005) [22] and Gowda *et al.* in marigold.

Days taken to 50 percent flowering was recorded minimum in T₃-Orange Bunch (75.23 days) which was at par with T₁-Pusa Bahar (78.04 days) which was showed lesser than all other varieties whereas, it was maximum in T₈- Local-2 (112.53days). The differences in 50 percent flowering might be because of different time period taken by the different varieties based on their genetic constitution. The findings also relates with the findings of Singh and Singh (2006) [25] and Singh and Mishra (2008) [24] in marigold.

The maximum flower diameter (cm) was recorded in T₅- Arka Bhanu-F1 (6.18 cm) which was found superior over rest of the treatments and followed by T₈- Local-2 (4.32). However, minimum flower diameter was recorded by T₇- Local-1 (2.96 cm). The genetic makeup of the varieties and more number of leaves may attribute to more accumulation of photosynthates that may have contributed to the production of bigger size flower Verma and Beniwal (2006) [27]. Similar results have been reported by Narsude *et al.* (2010) [17], Panwar *et al.* (2013) [18] and Kumari *et al.* (2025) [10] in African marigold.

The maximum fresh flower weight (g) was recorded in T₅-

Arka Bhanu-F1 (5.79 g) which was found superior over rest of the treatments and followed by T₈- Local-2 (4.27 g). However, minimum fresh flower weight was recorded by T₇- Local-1 (2.49 g). The average flower weight per plant may have been dependent on the individual flower weight as well as number of flowers per plant resulting in the variation in fresh weight of flowers among the varieties Shivakumar *et al.* (2014) [6]. The average flower weight was higher in Arka Bhanu-F1 and it might be due to higher diameter of flower was recorded in this variety. The results are in line with Rao *et al.* (2005) [22], Singh and Mishra (2008) [24], Narsude *et al.* (2010) [17] and Manik and Sharma (2016) [14] in marigold.

The maximum dry flower weight (g) was recorded in T₅- Arka Bhanu-F1 (1.49 g) which was found superior over rest of the treatments and followed by T₈- Local-2 (1.41 g). However, minimum dry flower weight was recorded by T₇- Local-1 (0.56 g). Such variations in dry weight of single flower among the different genotypes might be due to genetic factor. The result of the this experiment confirm well with results reported by Singh *et al.* (2008) [24], Singh and Singh (2006) [25] and Mahantesh *et al.* (2016) [12] in marigold.

Yield attributes: Various varieties showed a significant difference for the yield attributes recorded in Table 2. The number of flower per plant was recorded maximum in T₆- Calcutta Gaiinda (53.98) which was found at par with T₇- Local-1 (51.40) but significantly superior to the other varieties. The number of flower per plant was recorded minimum in T₂- Pusa Narangi (33.10). Different photosynthesis efficiency of varieties may have enhanced food accumulation resulting in better plant growth and subsequently higher number of flowers per plant Mahanta *et al.* (2020). Similar findings have been also reported by Narsude *et al.* (2010) [17] and Kumari *et al.* (2025) [10] in marigold.

The maximum weight of flower per plant (g) was recorded in T₅- Arka Bhanu-F1 (281.85g) and followed by T₆- Calcutta gaiinda (230.23g.) whereas, the minimum weight of flower per plant was recorded in T₃- Orange Bunch (95.81g.).

The flower yield per plant might be dependent on individual flower weight and number of flowers per plant leading to variation in flower yield per plant among the varieties Shivakumar *et al.* (2014) [6]. Similar variation in flower yield per plant was also observed by Manik and Sharma (2016) [14] and Kumari *et al.* (2025) [10] in marigold.

The maximum weight of flower per plot (kg) was recorded in T₅- Arka Bhanu-F1 (13.78kg) which was significantly superior to rest of the varieties and followed by T₆- Calcutta gaiinda (12.91kg). The minimum weight of flower per plot was recorded in Orange Bunch (3.50kg). Data recorded on flower yield per plot might have differed due to inherent capacity of varieties to yield flowers Raghuvansi and Sharma (2011) [21]. Similar result was reported by Behera *et al.* Rao *et al.* (2005) [22] and Narsude *et al.* in marigold.

The maximum flower yield per hectare (tonne) was recorded in T₅-Arka Bhanu-F1 (23.47t) and followed by T₆- Calcutta Gaiinda (19.68t) whereas, the minimum flower yield per hectare was recorded in T₃- Orange Bunch (7.58t). The increase in flower yield per ha is might be due to increased flower weight and number of flowers per plant of specific variety. Similar variation in flower yield of varieties was also reported by Howe and Waters (1991) [29] and Kumari *et al.* (2025) [10] in marigold.

Table 1: Growth parameter of African marigold

	Plant height (cm)					Plant spread (cm)					Number of leaves	
Variety	30 DAT	60 DAT	90 DAT	30 DAT (E-W)	60 DAT (E-W)	90 DAT (E-W)	30 DAT (N-S)	60 DAT (N-S)	90 DAT (N-S)	30 DAT	60 DAT	90 DAT
Pusa Bahar	39.60	54.23	64.87	16.73	29.50	35.50	18.27	31.97	38.96	14.53	37.52	58.40
Pusa Narangi	41.87	69.20	75.40	14.13	27.47	32.40	13.53	27.83	32.93	11.60	38.41	64.63
Orange Bunch	25.43	45.93	52.00	14.67	31.70	42.17	14.73	29.27	35.87	11.00	31.33	49.15
Pusa Basanti	48.00	76.07	81.60	17.13	33.10	40.43	17.47	34.40	39.78	12.29	35.41	74.87
Arka Bhanu-F1	46.46	72.90	78.47	17.83	30.33	42.47	15.83	31.90	37.40	18.87	45.81	98.77
Calcutta Gaiinda	26.47	68.20	73.70	20.67	37.30	45.17	19.87	39.07	45.66	21.26	57.97	118.60
Local-1	25.47	52.00	72.30	19.66	35.83	43.93	18.74	37.46	44.46	20.73	56.43	115.80
Local-2	37.28	53.37	69.40	16.13	28.17	39.07	17.97	35.73	38.77	12.56	42.00	92.84
	1.84	3.42	3.57	1.02	1.85	1.35	1.22	1.66	1.51	0.94	1.61	3.42
	0.61	1.13	1.18	0.34	0.61	0.44	0.40	0.55	0.50	0.31	0.53	1.13

Table 2: Growth, flowering, yield and quality parameter of African marigold

	Primary branch		Secondary branch		Stem diameter	Days taken to first bud appearance	Days taken to 50 percent flowering	Flower diameter (cm)	Fresh flower weight (g)	Dry flower weight (g)	Number of flower per plant	Weight of flower per plant (g)	Weight of per plot (kg)	Flower yield per hectare (tonne)	Chlorophyll content (mg/g)
Variety	30 DAT	90 DAT	60 DAT	90 DAT											
Pusa Bahar	2.70	7.67	13.27	27.07	1.15	55.11	78.04	4.05	3.98	1.12	36.51	145.33	5.74	12.47	3.13
Pusa Narangi	2.33	5.12	10.07	19.48	0.90	57.33	87.97	3.62	3.38	1.28	33.10	111.91	4.63	9.47	4.36
Orange Bunch	2.43	6.04	11.77	25.97	1.30	52.90	75.23	3.00	2.59	0.82	36.92	95.81	3.50	7.58	1.60
Pusa Basanti	3.00	8.10	11.41	26.87	1.05	59.50	92.83	4.09	3.65	1.30	37.77	140.02	5.29	11.71	3.30
Arka Bhanu-F1	3.20	11.33	12.13	32.14	1.25	57.23	103.10	6.18	5.79	1.49	48.61	281.85	13.78	23.47	5.70
Calcutta Gaiinda	2.40	11.87	14.63	37.34	1.50	61.57	97.67	3.78	4.26	1.36	53.98	230.23	12.91	19.68	5.89
Local-1	3.13	11.76	13.90	36.28	1.46	64.30	108.63	2.96	2.49	0.56	51.40	127.79	6.80	10.59	2.86
Local-2	2.78	9.43	10.46	29.37	0.95	68.47	112.53	4.32	4.27	1.41	43.94	187.93	8.79	15.56	2.23
	NS	0.37	0.78	1.07	0.05	2.25	2.88	0.20	0.17	0.05	2.71	3.79	0.67	0.61	0.21
	0.03	0.12	0.26	0.35	0.02	0.77	0.95	0.06	0.05	0.01	0.89	1.25	0.22	0.20	0.07

Quality attributes: Various varieties showed a significant difference for the chlorophyll content recorded in Table 2. The maximum chlorophyll content was recorded in T₆- Calcutta Gaiinda (5.89 mg) which was found at par with T₅- Arka Bhanu-F-1 (5.70 mg) whereas, the minimum chlorophyll content was recorded in T₃- Orange Bunch (1.60 mg). The variation in chlorophyll pigment might be due to hereditary traits of the varieties, environmental influence and other management factors. The total chlorophyll content variation in the leaf due to different genetic makeup of varieties. The similar variations in chlorophyll was observed by Srivakumar and Srinivasa (2017) ^[23] and Kumari *et al.* (2025) ^[10] in marigold. Patil *et al.* (2017) ^[19] and Sultan and Nassour (2019) ^[26] in chrysanthemum.

Conclusion

Based on the observations recorded during the study, significant variation was found among the different treatments for various growth, flowering, yield and quality parameters. The maximum plant height was observed in T₄ - Pusa Basanti, while the maximum plant spread (both E-W and N-S directions) was recorded in T₆ - Calcutta Gaiinda. The highest number of primary branches in T₆ - Calcutta

Gaiinda. Similarly, T₆ - Calcutta Gaiinda also showed the highest number of secondary branches, leaves per plant, and stem diameter across the observation periods. The earliest bud appearance and 50% flowering were recorded in T₃ - Orange Bunch. In terms of floral characteristics, T₅ - Arka Bhanu F1 produced the largest flower diameter, the highest fresh and dry flower weights, as well as the greatest flower weight per plant and per plot. The maximum number of flowers per plant was found in T₆ - Calcutta Gaiinda, while the highest flower yield per hectare was obtained in T₅ - Arka Bhanu F1 and T₆ - Calcutta Gaiinda. Additionally, T₆ - Calcutta Gaiinda exhibited the highest chlorophyll pigment content. Overall, T₅ - Arka Bhanu F1 and T₆ - Calcutta Gaiinda performed superiorly across most growth and yield parameters, indicating their potential suitability for higher productivity.

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