Journal of Ornamental Plants
Available online on: www.jornamental.iaurasht.ac.ir
ISSN (Print): 2251-6433 ISSN (Online): 2251-6441
Research Paper

A Comparative Study of Marigold (*Tagetes erecta*) Varieties for Growth Habit and Flowering Quality in Lahore Conditions

Malik Abid Mehmood, Ghazal Rahim* and Abdul Wahid

Directorate of Floriculture (T&R) Punjab, 21-Davis Road, Lahore, Pakistan

Received: 03 October 2019 Accepted: 13 September 2020
*Corresponding author's email: ghazalrahim@gmail.com

Abstract

Eight African marigold varieties including 'Nari' (orange), 'Bindi' (orange), 'Bali' (orange), 'Little Duck' (orange), 'Bali' (yellow), 'Bali' (gold), 'Little Duck' (yellow), and 'Eagle' (yellow) were comparatively studied for growth habit and flowering quality in open field conditions at the Training Centre for Floriculture and Landscaping, Directorate of Floriculture, Lahore during 2018-2019. Among the varietal study, highly significant variations were recorded for growth habit and flowering parameters. Maximum seed germination percentage (94.5 %) was observed in 'Bindi' (orange) followed by 'Little Duck' (yellow) with 82.75% germination. 'Bali' (orange) took minimum days to 1st bud initiation (21.75 days), which was not significantly different from that of 'Bindi' (24 days). Results showed that growth parameters like plant height (11.675 cm), number of buds (22.825), number of branches (34.6), flower diameter (7.9 cm), root length (14.9 cm), and number of roots (30.575) were maximum in 'Bindi' whereas 'Nari' (orange) showed maximum number of flowers (6.65). Hence, it can be concluded that variety 'Bindi' was superior to the other varieties in terms of growth behavior and flower quality in Lahore conditions.

Keywords: Field condition, Growth, Marigold, Varieties.

INTRODUCTION

Flowers give the feeling of peace, pleasure, and harmony, alleviate stress, and enhance the sense of esteem. Marigold (*Tagetes erecta* L.) an aesthetically significant and important flower from the family Asteraceae and the genus *Tagetes*. Marigolds are considered important in controlling plant parasitic nematodes. They are native to an area stretching from the southwestern United States to Mexico and throughout South America. Marigold flowers have special importance from a decoration point of view, especially on marriages and floral exhibitions. Marigold is grown as an ornamental plant for its loose flowers as well as in landscaping. Also, in landscape design, marigold is used due to its beautiful colors and height variety (1-3 feet) and to give solid mass impact in flower beds. They have pinnate green leaves, and white, golden, orange, yellow, and red floret heads approximately 1.0 to 4.6 cm in diameter (Edward, 1999). Marigold is important as an herbaceous plant whose oil is used for medicinal purposes and in the perfumery industry.

Farmers grow local varieties without knowing the yield potential and quality. There are several varieties released in different states with many desirable characteristics, high yield potential, and better quality parameters. Obvious varietal differences are found in marigold given that orange marigold has emerged as a rich source of carotenoid pigments including xanthophyll, which is widely used as a dietary supplement in the poultry industry to enhance chicken skin color and egg yolk pigmentation (Naik *et al*., 2004) whereas the flowers of African marigolds can be used to extract 1-lemoene, ecomene, 1-linylaetate, and 1-linauol (Narsude *et al*., 2010a). Moreover, information on the suitability of varieties in the region is very scanty. By considering all these points, the present investigation was planned at Bagh-e-Jinnah in Lahore conditions to evaluate the potential of eight different varieties, i.e., 'Nari' (orange extra tall), 'Bindi' (orange extra tall), 'Bali' (orange medium tall), 'Little Duck' (orange natural dwarf), 'Bali' (yellow medium tall), 'Bali' (gold medium tall), 'Little duck' (yellow natural dwarf), and 'Eagle' (Yellow medium tall).

MATERIALS AND METHODS

A field experiment was conducted at the Training Center for Floriculture and Landscaping, Bagh-e-Jinnah, Lahore during 2018-2019. The experiment was designed in a randomized complete block design (RCBD) with eight varieties used as treatment where T1 = 'Nari' (orange extra tall), T2 = 'Bindi' (orange extra tall), T3 = 'Bali' (orange medium tall), T4 = 'Little Duck' (orange natural dwarf), T5 = 'Bali' (yellow medium tall), T6 = 'Bali' (gold medium tall), T7 = 'Little Duck' (yellow natural dwarf), and T8 = 'Eagle' (yellow medium tall) replicated four times.

Varieties of African marigolds were collected from different seed suppliers of Lahore. The seeds were sown in 14" pots whose medium had been prepared thoroughly by mixing silt loam with leaf manure at a 1:1 ratio. For healthy growth of the seedlings, the seeds were treated with a fungicide and sown in lines 10 cm apart and 2-3 cm deep in the soil. The seeds were gently covered with peat moss. After about 3 to 4 days, they started to germinate and the potential germination was completed within ten days. The seedlings were watered regularly and the weeding operation was carried out.

The seedlings of eight marigold varieties were properly procured and transplanted to the experimental area by maintaining row to row and plant to plant distance of 36 cm × 36 cm. All other field practices were properly maintained including fertigation and cleanliness of the area.

Data were recorded on germination percentage, number of days to 1st bud initiation, plant height (inches), number of buds per plant, number of branches, number of flowers per plant, flower diameter (cm), number of roots, and root length (cm). Germination percentage was recorded after sowing. After the seedlings were transplanted, observations were made on the number of days taken for 1st bud initiation. Plant height was recorded as the distance from the point of plant emergence to the point just below the flower head, and the average plant height was recorded in inches.

The number of branches/plant and buds/plant were counted on the selected plants and their mean was recorded. Flower diameter was measured at the full bloom stage of the selected plants and their mean was calculated and illustrated in centimeters. The number of roots/plant and root length (cm) were recorded after uprooting tagged plants and their means were calculated. The data were put through an analysis of variance (ANOVA) by using a statistical software package, and LSD was also examined in the statistical software for the differentiation of results.

The climatic data were daily recorded on average temperature and relative humidity throughout the experimental period (Fig. 1).

The physiological elements of the soil were also evaluated. The pH, electrical conductivity, and organic matter of soil were 7.9, 1.8 dS m^{-1}, and 0.84%, respectively. The available phosphorus content was 3.3 mg kg^{-1} and the potassium content was 158.3 mg kg^{-1} of dry soil. The soil was 42% saturated.

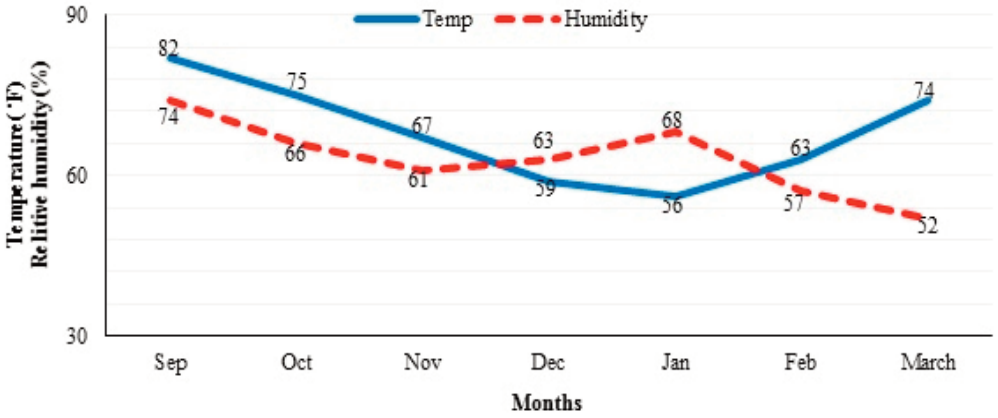

Fig.1. Average temperature (°F) and relative humidity (%) of Lahore during September 2018 to March 2019**.**

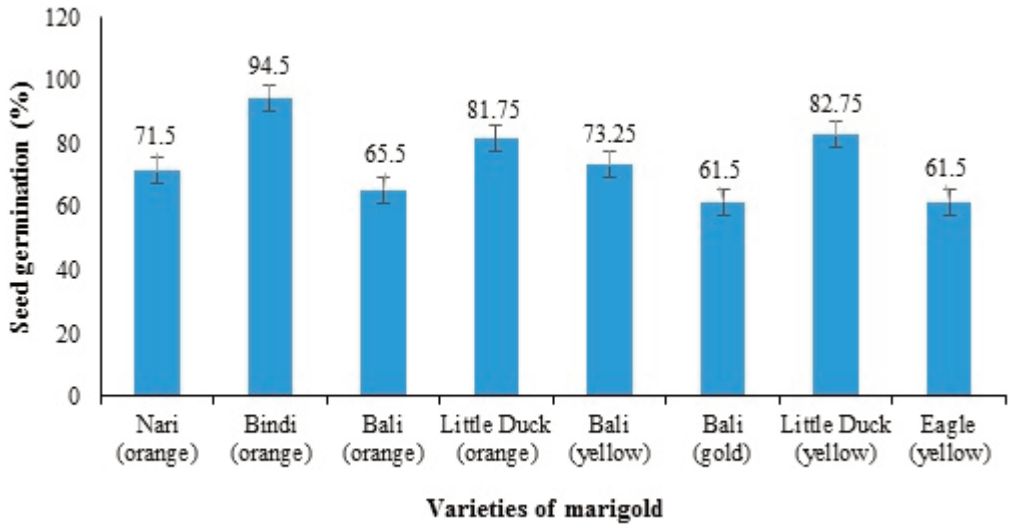

Fig. 2. Seed germination percentage of eight varieties of marigold grown under Lahore conditions.

RESULTS AND DISCUSSION

Seed germination and days to 1st bud initiation

The analysis of data revealed significant differences in yield parameters among the African marigold varieties. The maximum germination percentage (94.5 %) was noticed in T2 'Bindi' (orange), but it was not significantly different from T7 'Little Duck' (yellow) (82.75 %). The minimum germination percentage (51.5 %) was recorded in T6 'Bali' (gold) (Fig. 2).

The significantly minimum time to 1st bud initiation (21.75 days) was observed in T3 'Bali' (orange), not differing from T2 'Bindi orange' (24 days) significantly. In contrast, the maximum time taken (29.75 days) was recorded in T8 'Eagle' (yellow) (Fig. 3). Early bud initiation in T3 'Bali' (orange) variety is a genetic characteristic. Similar findings were already reported by Beniwal and Dahiya (2012). Our results for bud initiation are also in agreement with the findings of Lohar *et al*. (2018) who reported early flower induction in marigold variety 'Inca Orange'.

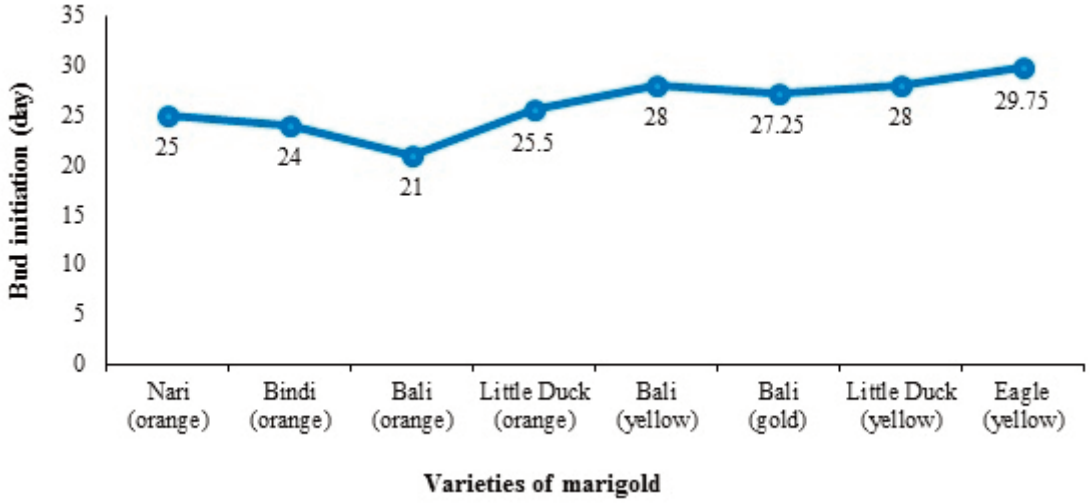

Fig. 3. The number of days to 1st bud initiation of eight varieties of marigold grown under Lahore conditions.

Plant height and number of branches

The maximum plant height (11.975 cm) was observed in T2 'Bindi' (orange) which did not have a significant difference with T1 'Nari' (orange) (11.525 cm). The minimum plant height (1.47 cm) was recorded in T4 Little Duck (orange). Meanwhile, the maximum number of branches (34.60) was observed in T2 'Bindi' (orange) variety which did not have a significant difference with T1 'Nari' (orange) (27.65). The minimum number of branches (6.1) was recorded in T7 Little Duck (yellow). These genetic variations show the superiority of some varieties over others. Similar results were also obtained by Vetrivel and Jawaharlal (2014) and Dahiya *et al*. (2007) in chrysanthemum. Previously, Bharathi and Jawaharlal (2014) reported the highest plant height in marigold cv. 'Dharampuri'. The variation in the number of primary branches per plant might be due to the difference in their genetic characteristic and the difference in growth rate among the marigold genotypes (Narsude *et al*., 2010a).

Number of buds and number of flowers

The maximum number of buds (22.82) was observed in T2 'Bindi' (orange), not differing from T3 'Bali' (orange) significantly. Also, the maximum number of flowers (6.65) was observed in T1 'Nari' (orange), which was in the same statistical rank with T2 'Bindi' (6.27). The differences

in the number of buds and flowers could be the varietal character of the evaluated marigold varieties influenced by cell elongation and rapid cell stimulation. Similar results were also noticed by Choudhary *et al*. (2014) and Bharathi and Jawaharlal (2014) in African marigolds. Our results are consistent with the findings of Deepa *et al*. (2016) while Lohar *et al*. (2018) reported a higher number of flowers in 'Seracole' marigold. Likewise, differences in the number of marigold branches were recorded by Rao *et al*. (2005) and Singh and Singh (2006).

Flower diameter, root length, and number of roots

Regarding the diameter of fully opened flowers, T2 'Bindi' (orange) recorded the significantly maximum value (7.9 cm) whereas the minimum (1.15 cm) was recorded in T4 'Little Duck' (orange). The variation in the diameter of fully opened flowers might be due to the differences in the genetic makeup of different investigated varieties. Similar results were observed by Narsude *et al*. (2010b) and Deepa *et al*. (2016) in marigold. Significantly, the maximum root length (14.90 cm) was noticed in T2 'Bindi' (orange) which was found to be statistically the same as that of T3 Bali orange (13.50 cm). The minimum root length (9.25 cm) was recorded in T7 'Little Duck' (yellow). While that maximum number of roots was observed in T2 'Bindi' (orange), which was found not to be statistically different from T3 'Bali' (orange) (29.15 cm), the minimum (23.75 cm) was recorded in T4 'Little Duck' (orange).

CONCLUSIONS

The results showed that 'Bindi' performed the best in the open field conditions of Lahore, exhibiting the maximum germination percentage, the longest stalk and roots, more number of buds, branches, and roots, and the maximum flower diameter, followed by 'Nari' that can also be grown under field conditions. 'Little Duck' (orange) and 'Little Duck' (yellow) are not recommended as they cannot survive under the same field conditions. Hence, 'Bindi' and 'Nari', which outperformed the other varieties in terms of growth habit and flower quality, can be recommended for cultivation in open field conditions.

Table 1. The evaluation of the morphological traits of eight different marigold verities.

Treatments	Plant height (Inches)	Bud no.	Branch no.	Flower no.	Flower diameter (cm)	Root length (cm)	Root no.
T1-Nari (orange)	11.5 a	12.4 bc	27.6 b	6.7 a	7.4 ab	13.0 ab	28.6 a
T2-Bindi (orange)	11.7 a	22.8 a	34.6 a	6.3 ab	7.9 a	14.9 a	30.6 a
T3-Bali (orange)	8.6 b	14.4 b	25.6 bc	3.9 cd	6.4 bc	13.5 ab	29.2 a
T4-Little Duck (yellow)	1.5 e	1.6 d	10.2 d	0.8 e	1.2 d	10.2 c	23.8 a
T5-Bali (yellow)	7.7 c	13.1 bc	24.3 bc	4.9 bc	5.5 c	12.9 ab	27.0 bc
T6-Bali (gold)	7.8 c	12.0 c	21.8 c	3.2 d	6.3 bc	11.4 bc	27.5 ab
T7-Little Duck (yellow)	2.3 d	2.2 d	6.1 d	0.7 e	2.1 d	9.3 c	28.5 ab
T8-Eagle (yellow)	11.5 a	11.9 c	25.2 bc	6.2 ab	6.3 bc	13.1 ab	28.6 a

*In each column, means with similar letters are not significantly different ($P < 0.05$) using the LSD test.

ACKNOWLEDGMENT

We are so grateful to the Training Centre for Floriculture and Landscaping, Directorate of Floriculture, Lahore.

Literature Cited

Beniwal, B.S. and Dahiya, S.S. 2012. Variability studies in marigold (*Tagetes* spp.). *In*: Abstracts of National Seminar on Sustainable Agriculture and Food Security: Challenges in Changing Climate, held at CCS Haryana Agricultural University, Hisar, Haryana, March 27-28, p. 298.

Bharathi, T.U. and Jawaharlal, M. 2014. Evaluation of African marigold (*Tagetes erecta* L.) genotypes for growth and flower yield under Coimbatore condition. Bioscience Trends, 7 (16): 2197-2201.

Choudhary, M., Beniwal, B.S. and Kumari, A. 2014. Characterization of marigold genotypes using morphological characters. Research on Crops, 15 (4): 839-845.

Dahiya, D.S., Sehrawat, S.K. and Rana, G.S. 2007. Evaluation of spray chrysanthemum under semi-arid climatic conditions. Haryana Journal of Horticultural Sciences, 36 (1-2): 76-77.

Deepa, V.P., Patil, V.S., Venugopal, C.K., Biradar, M.S. and Shridhar, K. 2016. Study on the growth and yield attributes of marigold (*Tagetes* spp.) hybrids under Dharwad condition. HortFlora Research Spectrum, 5 (1): 43-47.

Edward, F.G. 1999. Fact Sheet FPS-569, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida.

Lohar, A., Jayoti, M., Aritra, S. and Bishal, R. 2018. Evaluation of African marigold (*Tagetes erecta* L.) varieties for morphological and biochemical characters under west bengal condition. International Journal of Current Microbiology and Applied Sciences, 7: 241-248.

Naik, B.H., Patil, A.A., Basavaraj, N. and Patil, V.S. 2004. Correlation studies in African marigold (*Tagetes erecta* L.). Journal of Ornamental Horticulture, 7 (3-4): 81-86.

Narsude, P.B., Kadam, A.S. and Patil, V.K. 2010a. Studies on the growth and yield attributes of different African marigold (*Tagetes erecta* L.) genotypes under Marathwada conditions. Asian Journal of Horticulture, 5 (2): 284-286.

Narsude, P.B., Kadam, A.S. and Patil, V. K. 2010b. Studies on the growth and quality attributes of African marigold (*Tagetes erecta* L.) genotypes under Marathwada condition. Asian Journal of Horticulture, 5(2): 407- 410.

Rao, C.C., Goud, P.V., Reddy, K.M. and Padmaja, G. 2005. Screening of African marigold (*Tagetes erecta* L.) cultivars for flower yield and carotenoid pigments. Indian Journal of Horticulture, 62(3): 276-279.

Singh, D. and Singh, A.K. 2006. Characterization of African marigold (*Tagetes erecta* Linn.). Journal of Ornamental Horticulture, 9 (1): 40-42.

Vetrivel, T. and Jawaharlal, M. 2014. Evaluation of chrysanthemum (*Dendranthema grandiflora* Tzelev.) varieties for yield and quality under subtropical hills. Bioscience Trends, 7 (14): 1812-1815.

How to cite this article:
Mehmood, M.A., Rahim, G., and Wahid, A. 2020. A comparative study of Marigold (*Tagetes erecta*) varieties for growth habit and flowering quality in lahore conditions. *Journal of Ornamental Plants,* 10(4), 247-252.
URL: http://jornamental.iaurasht.ac.ir/article_678554_e9f050345a305ccf67ba2b29fb4e8c4d.pdf