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# Evaluation of Commercially Viable African Marigold (*Tagetes erecta* L.) Cultivars in Odisha's Coastal Plains

***Banani Priyadarshini Samantaray[1*], Siddharth Kumar Palai[1], Banaja Prakashini Samantaray[2], Manas Ranjan Nath[1], Kaberi Maharana[1] and Deepali Kaushal[1]***
*[1]Department of Floriculture and Landscaping, College of Agriculture, Odisha University of Agriculture and Technology, Bhubaneswar (Odisha), India.*
*[2]Department of Environmental Science, School of Earth, Biological and Environmental Sciences, Central University of South Bihar, Gaya (Bihar), India.*

*(Corresponding author: Banani Priyadarshini Samantaray*)*
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**ABSTRACT: The present study was conducted on 14 quantitative parameters of 8 African marigold genotypes to identify the most suitable variety for commercial cultivation in Odisha. Among the vegetative parameters, Pusa Narangi Gainda exhibited the highest values for plant height, plant spread (both north-south and east-west), number of primary branches, number of secondary branches, and stem diameter. Bidhan Marigold-3 showed the lowest plant height, while Bidhan Marigold-2 had the lowest north-south plant spread. Arka Alankar had the smallest east-west plant spread and the fewest primary branches, while Arka Agni had the fewest secondary branches. Bidhan Marigold-1 showed the smallest stem diameter. Arka Bangara had the earliest flower bud appearance and opening, while Pusa Basanti Gainda had the latest. The largest blooms were observed in Arka Bangara, and the smallest in Bidhan Marigold-3. Arka Agni produced the heaviest flowers, while Bidhan Marigold-3 had the lightest. Arka Agni also had the highest flower count, while Pusa Basanti Gainda had the lowest. Bidhan Marigold-2 flowers stayed fresh the longest, while those of Pusa Basanti Gainda remained fresh for the shortest duration. The highest yield was obtained from Arka Agni, followed by Bidhan Marigold-2, while Pusa Basanti Gainda yielded the least.**

**Keywords:** African Marigold, genotype evaluation.

## INTRODUCTION

Marigold (*Tagetes* spp.), a member of the Asteraceae family, is a significant loose flower cultivated commercially in numerous regions worldwide. The name Tagetes is derived from Tages, an Etruscan demigod born from the plowing of the earth. The Tagetes genus includes 33 species, with *Tagetes erecta* L., known as African marigold, and *Tagetes patula* L., commonly called French marigold, being of considerable horticultural value and widely grown. Marigold is indigenous to Central and South America, especially Mexico, but in the early 16th century it spread to other regions of the world (Kaplan, 1960). The Portuguese brought marigold to India, where it immediately became well-liked because of its capacity to grow in a variety of soil and climate conditions. Marigolds are widely utilized as loose flowers, potted plants, and bedding plants. Loose flowers are in high demand for making garlands and are frequently used in religious and social functions. Both the flowers and leaves of the plant are valuable for medicinal purposes. The oil from marigold leaves paste is reported to have bronchodilator, tranquilizing and anti-inflammatory properties (Chandhoke and Ghatak 1969).

Marigold cultivation controls the nematode population in soil and is used for making mosquito repellent products (Gupta *et al.,* 2001). The chicken industry relies heavily on carotenoids derived from marigold petals to enhance the yellow hue of broiler skin and egg yolks (Kaul and Bedi 2006; Narsude *et al.*, 2010). Food products are also colored with lutein, a key component of xanthophyll (Singh and Singh 2006).

Marigold is widely grown to meet market demands because it is one of the most popular loose flower crops in Odisha. Marigold is among the popular flowers that demand high prices in the local market in Odisha as well. The contribution to loose-flower production in Odisha is 72.88 thousand tonnes from an area of 6.57 thousand hectares (NHB Database, 2017).

Despite the enormous potential and demand for marigold in the coastal region, one of the main obstacles to its commercial production to date has been low productivity. This is why the current study was conducted to assess several African marigold germplasms for phenotypic performance and floral output in the coastal environment of Odisha.

## MATERIALS AND METHODS

The study was carried out at Department of Floriculture and Landscaping, College of Agriculture, OUAT, Bhubaneswar, Odisha. Eight genotypes were chosen for the experiment, which was conducted using a Randomized Block Design (RBD) with three replications.

African marigold is typically propagated from stem cuttings, though a few varieties are grown from seeds. For the varieties, Bidhan Marigold-1 (BM-1), Bidhan Marigold-2(BM-2), Bidhan Marigold-3 (BM-3), Arka Bangara, Arka Agni, and Arka Alankar, herbaceous shoot cuttings, 8-10 cm in length, were planted in seed pans with sterilized sand for rooting. To encourage consistent roots, Rootex powder was applied to the cuttings' basal ends. In general, rooted took 15 days, and light watering was given. Before being placed in the field, the cuttings were moved to polybags and stored for roughly 20 days after they had taken root. The seeds of Pusa Basanti Gainda and Pusa Narangi Gainda were sourced from IARI. Debris like weeds, agricultural residues, and other foreign items was removed once the trial field was completely ploughed. During land preparation, neem cake and well-decomposed FYM (20 t/ha) were mixed into the soil. After that, established plants in polybags were moved, with rows of plants 40 cm apart. The experimental plot received a fertilizer dose of N: $P_2O_5$: $K_2O$ at 200:200:200 kg/ha, and 2 kg of well-decomposed FYM per square meter was administered at the time of soil preparation.

Five randomly chosen plants from each genotype—aside from the boundary rows—were tagged for observation to examine different characteristics. The parameters that were monitored included the height of plant, plant spread, number of primary and secondary branches per plant, the diameter of the stem, flower bud appearance and opening, weight of individual flower, flower shelf life, duration of flowering, and flower yield per plant.

## RESULT AND DISCUSSION

The variance (mean square values) for the 14 characters observed across the 8 genotypes are presented in Table 1. Significant differences were found among the 8 varieties for 12 characters, while 2 characters showed no significant difference. Similar results were reported by Namita *et al*. (2008); Singh and Misra (2008); Raghuvanshi and Sharma (2011); Panwar *et al.* (2013). The performance for all the characters is presented in Table 2.

**Vegetative Parameters**: The plants of the variety Pusa Narangi Gainda were the tallest (73.77 cm) with the highest north-south spread (52.07 cm), east-west spread (54.38 cm), the highest number of primary branches (17.93), secondary branches (83.60), stem diameter (20.15 mm). The smallest plants in Pusa Basanti Gainda (55.70 cm), lowest north-south spread in BM-2 (44.99 cm), lowest east-west spread Arka Alankar (44.91 cm), the lowest number of primary branches Arka Alankar (6.87), the lowest number of secondary branches Arka Agni (30.60) and smallest stem diameter in Bidhan Marigold-1 (15.55 mm).

One significant varietal characteristic that is dependent on the genetic makeup is the vegetative characters. According to Bharathi and Jawaharlal (2014), the variance in plant height across the different genotypes may be caused by differences in the phenotypic expression of plant height as well as variations in the effects of numerous genotype-environmental interactions on plant height. Rao *et al.* (2005); Kumar *et al*. (2020); Suvija *et al*. (2020) also showed similar genotype-based variation in plant height in marigold.

**Floral Parameters**: The earliest flower bud appearance and opening was recorded in the variety Arka Bangara (54.33, 42.67 days respectively,) while the latest appearance was observed in Pusa Basanti Gainda (78.67, 61 days respectively). BM-3 had the smallest flowers, with the narrowest diameter (6.21 cm), whereas Arka Bangara had the largest, with the broadest bloom diameter (7.65 cm). Arka Agni had the largest individual blossom weight (8.64 g), while BM-3 weighed the least (5.68 g). Additionally, Arka Agni produced the most flowers (185.33), while Pusa Basanti Gainda produced the fewest (114.8). Arka Bangara had the greatest flowering period (90.33 days), while Pusa Narangi Gainda had the lowest (72.67 days). Pusa Basanti Gainda had the shortest shelf life (1.67 days), whereas the blooms of the cultivar BM-2 had the longest (6.33 days). Arka Agni had the maximum yield (1.60 kg), followed by BM-2 (1.09 kg), while Pusa Basanti Gainda had the lowest yield (0.71 kg).

Early or late flowering is a significant marigold varietal characteristic that may be directly controlled by the genetic composition of the varieties, resulting in different rates of growth (Mahantesh *et al.*, 2018). Beniwal and Dahiya (2012) have noted the same thing about marigold. The varying times needed for marigold genotypes to flower after planting may be caused by the genotypes' genetic composition and varying rates of growth (Srinivas and Rajasekhram 2020).

Variations in 50% flowering may result from the time it takes for each variety to flower, depending on its genetic makeup. These results were also consistent with those of Singh and Mishra (2008) in marigold. In African marigold, Patokar *et al.* (2018); Gupta *et al.* (2017); Kumar *et al.* (2020); Suvija *et al*. (2020) have all observed similar findings. The fresh weight of flowers varied among the genotypes, possibly due to the floral weight being dependent on the weight of each individual bloom (Kumar *et al.*, 2014). The findings are consistent with those of Manik and Sharma (2016) in marigold.

Quality Parameters: Visual inspection of the flower types revealed that all of the assessed cultivars had carnation-type blooms. The RHS color guide was used to determine the color of the flowers. BM-2, BM-3, and Arka Agni flowers were identified as Orange 25A, whilst BM-1 and Pusa Basanti Gainda blossoms were classed as Yellow 9A. Yellow Orange 14A was the blossom color of BM-3 and Pusa Narangi Gainda. The BM-1, BM-2, and BM-3 cultivars were found to be more compact than the other cultivars studied when flower compactness was measured by pressing with the palm.

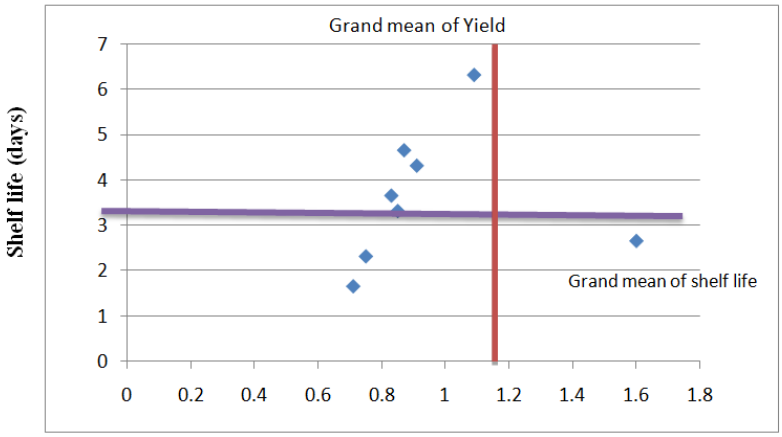


**Fig. 1.** Graph between Yield and Shelf life.

**Table 1: Analysis of Variance (ANOVA) of quantitative characters studied in 8 genotypes of African marigold.**

| Sr. No. | Characters | Mean Squares | | |
|---|---|---|---|---|
| | | Replication | Genotypes | Error |
| | Df | 2 | 7 | 14 |
| 1. | Plant height | 0.922 | 103.298** | 4.787 |
| 2. | Plant spread (N-S) | 4.613 | 15.917 | 10.9001 |
| 3. | Plant spread (E-W) | 54.627 | 28.632 | 16.545 |
| 4. | Primary Branches | 1.061 | 43.737** | 1.904 |
| 5. | Secondary Branches | 5.0293 | 1339.526** | 5.203 |
| 6. | Stem diameter | 0.296 | 6.383** | 0.805 |
| 7. | Days to first flower bud appearance | 26.293 | 209.375** | 2.0536 |
| 8. | Days to first flower bud opening | 39.125 | 106.857** | 1.696 |
| 9. | Flower diameter | 0.0112 | 0.818** | 0.0296 |
| 10. | Flower weight | 0.00616 | 2.431** | 0.0180 |
| 11. | Number of flowers per plant | 33.203 | 1738.723** | 27.116 |
| 12. | Duration of flowering | 0.5 | 110.833** | 2.119 |
| 13. | Shelf life | 0.5 | 6.613** | 0.309 |
| 14. | Weight (yield) of flowers per plant | 0.00168 | 0.246** | 0.00151 |

* Significant at 5% level; **Significant at 1% level

**Table 2: Mean values of 14 characters in 8 genotypes of African marigold.**

| Genotypes | Characters | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CH1 | CH2 | CH3 | CH4 | CH5 | CH6 | CH7 | CH8 | CH9 | CH10 | CH11 | CH12 | CH13 | CH14 |
| BM-1 | 63.16 | 48.17 | 48.81 | 15.06 | 47.20 | 15.55 | 65.33 | 49.33 | 6.78 | 6.22 | 134.00 | 84.33 | 3.67 | 0.83 |
| BM-2 | 62.43 | 44.99 | 48.95 | 12.80 | 35.47 | 17.65 | 63.67 | 49.67 | 7.35 | 6.51 | 168.33 | 88.33 | **6.33** | 1.09 |
| BM-3 | 60.24 | 46.23 | 47.73 | 17.27 | 83.47 | 16.85 | 70.00 | 54.33 | 6.21 | 5.68 | 153.67 | 81.00 | 4.67 | 0.87 |
| Arka Bangara | 69.41 | 45.09 | 45.86 | 10.80 | 33.13 | 17.39 | **54.33** | **42.67** | **7.65** | 6.84 | 133.27 | **90.33** | 4.33 | 0.91 |
| Arka Agni | 67.45 | 46.67 | 46.17 | 9.40 | 30.60 | 18.62 | 60.00 | 48.33 | 6.72 | **8.64** | **185.33** | 85.33 | 2.67 | **1.60** |
| Arka Alankar | 69.46 | 47.43 | 44.91 | 6.87 | 55.80 | 19.18 | 58.67 | 46.00 | 6.23 | 6.46 | 131.47 | 87.33 | 3.33 | 0.85 |
| Pusa Narangigainda | **73.77** | **52.07** | **54.38** | **17.93** | **83.60** | **20.15** | 75.00 | 56.67 | 6.47 | 6.15 | 122.87 | 72.67 | 2.33 | 0.75 |
| Pusa Basanti gainda | 55.70 | 45.79 | 45.26 | 13.67 | 48.47 | 17.01 | 78.67 | 61.00 | 6.43 | 6.14 | 114.80 | 76.67 | 1.67 | 0.71 |
| CV | 3.36 | 7.02 | 8.52 | 10.64 | 4.37 | 5.04 | 2.18 | 2.55 | 2.56 | 2.04 | 3.64 | 1.75 | 15.35 | 4.09 |
| CD | 3.82 | NS | NS | 2.410 | 3.985 | 1.568 | 2.504 | 2.275 | 0.3 | 0.235 | 9.097 | 2.543 | 0.972 | 0.068 |

CH1- Height of (cm)
CH2 -N-S Plant spread(cm)
CH3- E-W Plant spread (cm)
CH4 - Primary branches
CH5- Secondary branches
CH6- Stem diameter (mm)
CH7- Days to flower bud appearance
CH8-Days to flower bud opening
CH9- Flower diameter (cm)
CH10- Individual Flower weight (g)
CH11- Flowers per plant
CH12- Duration of flowering (days)
CH13- Shelf life of flowers (days)
CH14- Yield per plant (kg)

## CONCLUSIONS

When choosing a variety for commercial production of any flower crop, qualitative factors are more important than quantitative ones. Any flower harvest that looks better yields more revenue for the farmer than higher yield. A consumer will accept a more appealing flower with a longer shelf life than a less appealing one, and a farmer's profit will rise as a result. The Arka Agni yield was the highest. Customers would choose the BM-2 variety, which has the second-highest yield but better appearance, eye-catching blossoms, and a long shelf life, because quality is the main consideration when growing flowers.

The most promising cultivar for commercial agriculture in Odisha was identified by plotting a graph using the two most significant economic characteristics, yield and shelf life. The graph showed that the cultivar BM-2 is

above the point where the grand mean values of yield and shelf life meet (Fig. 1). Because of its compact Orange 25A RHS color chart flowers, which yield 1.09 kg of flowers per plant and have a 6.33-day shelf life, the Bidhan Marigold-2 variety is therefore the most suitable for marigold farming in Odisha's coastal districts.

## FUTURE SCOPE

With sustainable agricultural methods, technology, and research developments, marigold agriculture appears to have a bright future. Marigold farming can help the floriculture business expand while giving farmers sustainable and profitable production options by utilizing its ecological, medical, and economic advantages. The growing demand for marigold flowers in religious ceremonies, garland-making, and celebratory decorations presents opportunities for large-scale commercial production. It raises farmer incomes through integration with floriculture-based agribusiness.

Among all the cultivable marigold varieties in Odisha, Bidhan Marigold-2 (BM-2) stands out for its highest yield and excellent shelf life. These key attributes ensure profitability for flower farmers. Given its superior adaptability to Odisha's climatic conditions, cultivating this variety results in significantly higher productivity compared to other marigold varieties. This will inevitably lead to an increase in farmers' income.

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**Conflict of Interest.** None.

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