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## Evaluation of marigold genotypes for flowering and quality parameters under upper Krishna project command area in Karnataka State

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### Abstract

Flowering parameters including days to flower bud initiation and days to 50 per cent flowering early flowering was observed in cv. Arka Bangara-2 (39.54 and 51.76 days) followed by cv. Arka Bangara (40.03 and 52.22 days), cv. Arka Agni (41.53 days) and cv. Raichur local (52.92 days). Further, Arka Bangara-2 and Arka Bangara were early to produce 50 per cent flowering so they can be termed as early type. The findings also reveal that, in case of flower diameter, significantly maximum flower diameter was recorded in cv. Maxima yellow (7.20 cm), followed by cv. Arka Bangara-2 (6.17 cm) whereas, minimum flower diameter was recorded in the cv. Shahapur local (3.42 cm) in both the seasons. The study also reveals that, the longest flowering duration (77.29 days) was observed in cv. Arka Bangara-2, which was followed by the genotype Arka Agni (74.11 days) whereas, the flowering duration (39.53 days) was shortest in cv. Shahapur local and maximum shelf life (6.24 days.) of flowers was recorded in genotype Arka Bangara-2, followed by cv. Arka Agni (5.53days) whereas, var. In dam yellow (3.26 days) shorter shelf life was noticed under room condition in both seasons.

**Keywords:** Marigold, flowering, early flowering, flower diameter and flower duration, shelf life

### 1. Introduction

In India, marigold is being cultivated in almost all the states with an area of 66.13 thousand ha with a production of 603.18 thousand MT as loose flower. In India, Karnataka is second largest growing state with an area of 12.10 thousand ha with the production of 87.34 thousand MT after Madhya Pradesh (14 thousand ha and 94 thousand MT) and followed by Gujarat, Andhra Pradesh, Haryana, West Bengal, Maharashtra, and where it is also grown on commercial scale (Anon, 2018) [1].

It is cultivated commercially in most parts of India for pigment extraction Karnataka has 3000 ha under its cultivation for xanthophyll extraction. Presently, in India, the commercial extraction of marigold for carotenoids is done in Cochin (Kerala) Hyderabad (Telangana), near Satyamangalam forest (Tamil Nadu) and Telagi near Harihar and Bangalore (Karnataka), it is being regularly exported to Mexico, Peru, USA, Japan, Spain, Romania, Netherlands, Turkey, Poland, Italy, Australia, Canada, Africa etc. Therefore, large area in Karnataka, Telangana and Maharashtra are under contract farming of marigold for xanthophyll extraction. Performance of cultivars varies with region, season and other growing conditions (Tomar *et al.*, 1972) [18]. As a result, a promising cultivar and performing well in one region, may fail to perform well in another region of varying climatic conditions. The quest for selecting suitable high yielding variety/hybrid for the region leads to the requirement of collection and evaluation of available genotypes.

Moreover, susceptibility of existing varieties to different biotic stresses augments the need of promising genotypes. The ultimate yield and production of quality flowers, pigment contents in flower and resistance to biotic factors depend upon the selection of suitable cultivars for a particular locality. However, the growers are unaware of varieties suitable for their location and selecting the varieties based on fellow farmer recommendation and rely completely on seed shops. Under given agro-climatic conditions, it is important to study the performance of existing varieties available in market and also to identify the best genotype with desirable characteristics and yield which will fetch remunerative profit to farmers of the state.

## 2. Methodology

The present investigation on “Evaluation and commercialization of African marigold (*Tagetes erecta* L.) genotype for UKP command area of Karnataka” was carried out for four seasons during *Kharif* (2015-16) and *Summer* (2016-17) in farmer’s field at Chamanala village, of Shahapur taluk, Yadgir district. Further, Five plants were selected at random and tagged in each treatment using Randomized Completely Block Design (RCBD) and replication for the purpose of recording observations on various parameters of flowering and flower quality parameters were taken during the study period, the first parameter was to assess the number of days taken from the date of transplanting to the date of appearance of first flower bud was counted as days to flower bud initiation. Secondly, the number of days required for 50 per cent of the plants to produce first flower in each plot was recorded by counting the days from the date of transplanting. Thirdly, the diameter of the five flowers was measured at the point of maximum breadth at full bloom stage, this was measured by Vernier Callipers and average diameter was expressed in centimeter and duration of flowering were recorded when the plots were ready for first picking of flowers and treatment wise values were worked out last parameter shelf life of flowers from each treatment were kept in ambient conditions and their shelf life was recorded at room temperature and was expressed in days. These parameters are most important for remunerative more income per unit area.

## 3. Flowering, flower quality parameters

### 3.1 Flowering parameters

#### 3.1.1 Days to flower bud initiation and days to 50 per cent of flowering

Flowering parameters including days to flower bud initiation and days to 50 Per cent flowering. significantly differed among the marigold genotypes studied. Days to flower bud initiation and days to fifty per cent flowering were significantly differed among all the varieties of marigold studied. The genotype Arka Bangara-2 (39.54 and 51.76 days). The next genotypes in the order was Arka Bangara (40.03 and 52.22 days), Arka Agni (41.53 days) and Raichur local (52.92 days) where took minimum number of days to produce visible flower bud and fifty per cent flowering in both season respectively among the genotypes tested. Whereas, cv. Ashoka yellow (45.01) and Marigold African Giant (62.16) took maximum number of days to produce visible flower buds appearance and fifty per cent flowering in kharif and summer season respectively. Arka Bangara-2 and Arka Bangara were early to produce 50 per cent flowering so they can be termed as early type. These results are in accordance with the work of Mehta *et al.* (1995)<sup>[7]</sup>; Singh *et al.* (2003)<sup>[17]</sup> and Mahantesh (2017)<sup>[5]</sup> in marigold.

### 3.2 Flower quality parameters

Flower quality parameters decide the significance of suitability of the particular genotypes for commercial

cultivation. The important biometric characters deciding the size and nature of flowers are flower diameter, weight of flower, shelf life, duration of flowering, consumer acceptance, petal meal yield and xanthophyll content. Significant differences were observed among the genotypes for these flower quality parameters.

#### 3.2.1 Flower head diameter (cm)

Significant differences were observed among different genotypes of marigold with respect to flower diameter. Maximum flower diameter was recorded in the genotype Maxima yellow (7.20 cm), followed by Arka Bangara-2 (6.17 cm) whereas, minimum flower diameter was recorded in the genotype Shahapur local (3.42 cm) in both seasons. The variation in flower diameter might be due to the genotypic character or genotypic expression of the genotypes. These results are in conformity with the results reported earlier in marigold by Bhanupratap *et al.* (1999)<sup>[3]</sup>; Nandkishor and Raghava (2001)<sup>[11]</sup>; Verma *et al.* (2004)<sup>[19]</sup>; Naik *et al.* (2005)<sup>[10]</sup> and Singh and Kumar (2008)<sup>[15]</sup> in marigold.

#### 3.2.2 Flower duration (Days)

The duration of flowering varied from 39.53 to 77.29 days. The longest flowering duration of 77.29 was observed in var. Arka Bangara-2, which was followed by the treatment Arka Agni (74.11) whereas, flowering duration was shortest (39.53) cv. Shahapur local in both the seasons. This might be due to genetic control of these character and modification in their expression due to environmental conditions *viz.* high temperature and low humidity and less rainy days during crop period might be the possible causes of observed variation. Similar findings have been reported by Khanvilkar *et al.* (2003)<sup>[4]</sup>; Rao *et al.* (2005)<sup>[14]</sup> and Raghuvanshi and Sharma (2011)<sup>[13]</sup> in marigold.

#### 3.2.3 Shelf life of flowers (Days)

There was significant difference in shelf life of flowers as influenced by different varieties and environmental condition. The maximum shelf life (6.24 days.) of flowers was recorded in genotype Arka Bangara-2, followed by cv. Arka Agni (5.53 days). Increased shelf life of marigold flower might be due to the higher retention of water in the cells of flowers and lower desiccation, whereas, var. Indam yellow (3.26 days) shorter shelf life was noticed under room condition. Differences in shelf life might be due to inherent characters of the individual cultivars and prevailing environmental condition. These findings is confirmed with the work of Anuradha *et al.* (1990)<sup>[2]</sup> and Mashaldi (2000)<sup>[6]</sup> in marigold and increase in longevity of flower might also be due to maintenance of chlorophyll, protein and RNA content in leaves at a higher level for longer duration which suppresses the senescence. The variation in shelf life among the cultivars was also reported previously in marigold by Patil *et al.* (2011)<sup>[12]</sup>, Raghuvanshi and Sharma (2011)<sup>[13]</sup> and Mahantesh (2017)<sup>[5]</sup> in marigold.

**Table 1:** Days to first flower bud initiation and days to 50 per cent flowering (cm) in Marigold (*Tagetes erecta* L.) as influenced by genotypes and planting seasons

Genotypes	Flowering characters					
	Days to first flower bud initiation			Days to 50 per cent of flowering		
	Kharif	Summer	Grand Mean	Kharif	Summer	Grand Mean
T <sub>1</sub> - Arka Bangara	40.40	39.65	40.03	51.23	52.28	52.22
T <sub>2</sub> - Arka Agni	42.33	40.73	41.53	54.17	54.40	54.29
T <sub>3</sub> - Arka Bangara 2	39.77	39.31	39.54	52.13	52.30	51.76

T4- Pusa Basanthi Gianda	45.07	43.23	44.15	52.17	55.35	53.76
T5- Pusa Narangi Gianda	45.20	42.28	43.74	55.10	56.17	55.64
T6- Dharwad local	46.80	44.34	45.57	58.73	54.30	56.52
T7- Raichur local	44.73	44.97	44.85	52.30	53.54	52.92
T8- Shahapur local	44.80	44.31	44.56	53.53	53.58	53.56
T9- Ashoka orange	45.17	43.93	44.55	56.77	54.81	55.79
T10- Ashoka yellow	45.30	44.72	45.01	53.63	56.87	55.25
T11- Bhuvan Orange	43.67	43.50	43.59	52.80	53.33	53.07
T12- Maxima yellow	43.10	43.03	43.07	63.13	62.20	62.67
T13- Yellow gold	44.93	43.46	44.20	54.00	59.03	56.52
T14- Indam yellow	42.57	41.72	42.15	61.43	52.69	57.06
T15- Vigro Hybrid Orange	42.43	44.27	43.35	61.67	59.73	60.70
T16- Marigold African Giant	44.23	45.44	44.84	62.89	61.43	62.16
Mean	43.78	43.05	43.42	55.98	55.64	55.81
S.Em±	1.20	0.96	0.62	1.94	1.69	1.94
C.D (P=0.05)	3.48	2.77	1.86	5.60	4.89	5.84

Significant at  $p = 0.05$  level of significance, DAP: Day after planting

**Table 2:** Flower Diameter (cm), flowering duration (days) and Shelf life (days) of flowers in Marigold (*Tagetes erecta* L.) as influenced by genotypes and planting seasons

Genotypes	Quality attributes								
	Flower diameter (cm)			Flower duration (days)			Shelf life of flowers (days)		
	Kharif	Summer	Grand mean	Kharif	Summer	Grand mean	Kharif	Summer	Grand mean
T1- Arka Bangara	4.83	4.23	4.53	66.32	39.29	52.81	4.25	3.84	4.05
T2- Arka Agni	5.98	5.07	5.54	80.78	67.45	74.11	6.13	5.53	5.53
T3- Arka Bangara 2	6.33	6.01	6.17	83.64	70.94	77.29	6.77	5.70	6.24
T4- Pusa Basanthi Gianda	5.67	4.73	5.20	60.84	55.82	58.83	4.15	4.10	4.13
T5- Pusa Narangi Gianda	5.14	4.77	4.96	60.53	52.18	56.36	4.06	4.00	4.03
T6- Dharwad local	4.23	3.80	4.02	55.91	46.38	51.15	3.77	3.27	3.52
T7- Raichur local	4.00	3.60	3.73	42.12	39.78	40.95	4.60	2.74	3.67
T8- Shahapur local	3.63	3.20	3.42	39.13	39.92	39.53	4.53	3.63	4.08
T9- Ashoka orange	4.93	4.73	4.83	54.92	53.44	56.49	3.38	3.51	3.45
T10- Ashoka yellow	4.47	4.43	4.45	61.53	56.62	59.08	4.52	4.70	4.61
T11- Bhuvan Orange	5.80	4.83	5.32	55.21	48.45	51.83	3.61	3.31	3.46
T12- Maxima yellow	8.07	6.33	7.20	67.84	57.21	56.07	5.53	4.75	5.44
T13- Yellow gold	5.73	5.33	5.53	59.54	49.06	54.95	4.22	4.00	4.11
T14- Indam yellow	5.10	5.00	5.05	50.06	48.72	49.39	3.29	3.22	3.26
T15- Vigro Hybrid Orange	5.27	4.37	4.82	45.03	44.30	44.67	4.11	4.11	4.11
T16- Marigold African Giant	5.98	4.88	5.43	52.59	46.75	49.67	6.11	3.88	5.01
Mean	5.26	4.70	5.00	58.50	51.02	54.57	4.56	4.01	4.29
S.Em±	0.36	0.24	0.25	3.17	2.67	3.54	0.23	0.27	1.37
C.D (P=0.05)	1.05	0.70	0.76	9.13	7.73	10.67	0.68	0.78	1.12

Significant at  $p = 0.05$  level of significance, DAP: Day after planting

#### 4. Conclusion

Among the sixteen genotypes evaluated Arka Bangara-2 performed better followed by Arka Agni and Maxima yellow with respect to flowering and quality parameters during kharif and summer season under UKP command area of marigold

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