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Evaluation of African marigold (*Tagetes erecta* L.) genotypes under north Bihar agro-ecological condition

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Abstract

Performance of five African marigold genotypes including one local check (Pusa Narangi Gainda) was evaluated during the years 2019, 2020 and 2021 for summer season flowering under North Bihar agro-ecological conditions at the Research farm of Dr Rajendra Prasad central Agricultural University, Pusa, Samastipur (Bihar). All the genotypes differed significantly with respect to vegetative, floral and yield characters. The marigold genotype, "BRMG-113" proved to be the best cultivar for summer season when the traditional cultivars fail to perform. The genotype, "Serakol" was found second best and performance of other genotypes was markedly poor.

Keywords: Marigold, genotypes, loose flower

Introduction

Marigold (*Tagetes erecta* L.), a annual herbs and member of family, Asteraceae, native to southwestern North America, tropical America, and south America is one of the most important loose flowers grown commercially in India and specially in Bihar. It has a habit of profuse flowering having short duration to produce marketable flowers along with wide spectrum of attractive shape, size and good keeping quality. These qualities make marigold one of the most important and remunerative loose flower crops grown commercially in India. Marigold is commercially in great demand for making garlands and flower arrangements (Rangoli) for the decorations in various religious as well as in social events. It is also used for worshipping, offerings in religious functions and auspicious days. The Marigold has increased its popularity and adaptability as loose flowers due to its easy cultivation and hardy nature. The flowers are also used for the extraction of valuable essential oil, which is having a greater export demand being used in perfumery industry. The essential oil of African marigold (*Tagetes erecta* L.) flowers has been used as perfume, anti-hemorrhagic, anti-inflammatory, antiseptic, antispasmodic, astringent and diaphoretic. The oil has skin healing effects and also possesses insect repellent properties (Gupta, 2014) [1] It is cultivated on a large scale in Karnataka, Maharashtra, Tamil Nadu, West Bengal, Madhya Pradesh, Karnataka, Chhattisgarh, Gujarat and to a lesser extent in Andhra Pradesh, Haryana, Delhi, Uttar Pradesh, Bihar and Punjab. The area under the marigold cultivation in India is about 68.33 thousand ha with a production of 608.96 thousand MT in 2019 (Anon) [2].

The current issue with contemporary commercial varieties are, in summer months, most of the varieties perform poorly in terms of flower size and yield. In North Bihar, temperature reaches the heights during summer month with an average temperature of about 35°C (it may reach as high as 42 °C or more). Under this extreme situation, marigold varieties fail to perform with reduced flower size and yield. Marigold farmers of North Bihar cultivate the crop, targeting peak wedding seasons which prevails during summer months (April-July). However due to poor, unmarketable flower size, marigold growers suffer huge loss and most of them buy flowers from West Bengal to fulfill the demand. Although few farmers grow the variety Serakol which is having average flower size and round attractive shape but it has disadvantage of poor yield in this agro-ecological condition.

Keeping these facts in view, the experiment was carried out to evaluate the five new genotypes of African marigold to find out suitable marigold cultivar for Bihar agro-climatic condition particularly during summer season at the research farm of Dr Rajendra Prasad Central Agricultural University, Pusa, Samastipur.

Materials and Methods

The experiment was conducted at research farm, Hi-tech Horticulture of RPCAU, Pusa in RBD design during the years 2019, 2020 and 2021. The experimental site was located at 25.98° N and 85.67° E with an altitude of 52.0 m above mean sea level. The climate of experimental site is sub-tropical characterized with moderate precipitation, hot and dry summer and cold winter with maximum yearly rainfall (about 90%) received due to south-west monsoon during June to October. April, May and June are the hottest where average temperature is around 40 °C, while, the RH ranged from 60 percent to 93 percent. Five marigold genotypes namely; Bihar Marigold-113 (BRMG-113), Serakol, Bidhan Marigold-2 (BM-2), Bidhan Marigold-3 (BM-3) and Pusa Narangi Gaiinda (PNG) were evaluated for vegetative growth and flowering and yield in a randomized block design with four replications. Thirty plants per treatment were planted at a spacing of 45 x 45 cm in the summer season of each the year (2019, 2020 and 2021). The observations were recorded from five randomly selected plants for recording various vegetative and floral attributes of the flower viz; Plant height (cm), Plant spread (cm), Days to first flower bud appearance, Days to 50% flowering (days), Flowering duration (days), Number of flowers per plant, Diameter of flower (cm), Weight of individual flower (g), Loose flower yield per plant (kg) and finally the cost benefit ratio was worked out to evaluate these genotypes economically.

Results and Discussion

The research findings of the three years (2019, 2020 and 2021) experimentation on screening of five African marigold genotypes revealed that the vegetative, floral and yield characters of the marigold plants have greatly influenced due to its genotypes. The marigold genotype, Bihar Marigold-113 was proved to be the best cultivar for the agro-ecological conditions of the Bihar recording a quality of floral, vegetative and yield characters of marigold flowers in all the three years (2019, 2020 and 2021) of experimentation. This marigold genotype BRMG-113 had the maximum plant height (66.08 cm), plant spread (46.10 cm), lowest days to first flower appearance (42.03 days) and 50 percent flowering stage (45.50 days), maximum flowering duration (61.50 days), maximum number of flowers per plant (115.03), diameter of flower (5.54 cm), weight per flower (5.85 g) and flower yield per plant (0.59 kg) followed by genotype Serakol, plant height (60.25 cm), plant spread (41.71 cm), days to first flower appearance (47.86 days), 50 percent flowering stage (51.06 days), flowering duration (49 days), number of flowers per plant (98.83), diameter of flower (4.85 cm), weight per flower (5.0 g) and flower yield per plant (0.52

kg).

The other genotype, Bidhan Marigold-2 was found to be significantly superior to those of Bidhan Marigold-3 and the Pusa Narangi Gaiinda in all the floral, vegetative and yield qualities recording plant height (56.20 cm), plant spread (40.50 cm), days to first flower appearance (50.66 days), 50 percent flowering stage (54.56 days), flowering duration (42.86 days), number of flowers per plant (85.25), diameter of flower (4.75 cm), weight per flower (4.50 g) and flower yield per plant (0.40 kg). However genotypes, Bidhan Marigold-3 and the local Check Pusa Narangi Gaiinda had the plant height (53.50 and 50.85 cm), plant spread (35.20 and 25.50 cm), days to first flower appearance (55.15 and 60.50 days), 50 percent flowering stage (59.90 and 65.20 days), flowering duration (34.23 and 30.50 days), number of flowers per plant (75.15 and 44.80), diameter of flower (4.55 and 4.13 cm), weight per flower (4.10 and 3.64 g) and flower yield per plant (0.30 and 0.19 kg), respectively (Table – 1). The floral and other quality characters of these marigold flowers have positively reflected into the economic returns due to its higher demand in the national and international markets. The marigold genotype, Bihar Marigold-113 was proved to be the most economically profitable recording maximum B:C ratio (1:3.95) followed by those of the genotype, Serakol (1:3.60) while the genotypes, Bidhan Marigold-2 and Bidhan Marigold-3 had the B:C ratio of 3.20 and 2.65, respectively. The local check genotype, Pusa Narangi Gaiinda had only 1:1.80 B: ratio (Table- 1). A research trial has been conducted by Rao *et al.*, (2005) [16] on varietal evaluation of African marigold and significant results have been obtained as the variety Marigold Bonanza showed good flower yield per hectare whereas the variety Cotton Red showed significantly lesser yield per hectare as compared to the other varieties in an evaluation trial.

The present findings are almost in close conformity with the reports of earlier workers on the subject at different agro climatic locations (Shiv Kumar *et al.*, 2014; Kumar *et al.*, 2014; Singh *et al.*, 2014; Chaudhary *et al.* 2014; Bharti and Jawaharlal, 2014; Rao *et al.*, 2005; Panwar *et al.*, 2013; Singh *et al.*, 2004; Singh and Singh, 2006; and Yuvraj and Dhatt, 2014) [3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13]. It is obvious from the study that these genotypes had varied significantly in their vegetative as well as floral characters due to genetic variations under the influence of agro climatic conditions of the region. The flowering duration of different marigold varieties are different for each variety as observed by Sagvekar *et al.* (2013) [15]. The flower yield per plant has been found significantly different from each variety also observed by Ahmad *et al.* (2017) [14] they worked on varietal evaluation of marigold and showed significant difference in the flower yield per plant.

Table 1: Performance of African marigold genotypes on vegetative and floral parameters during 2019, 2020 and 2021 (Pooled)

Sl. no	Treatments (Genotypes)	Plant height (cm)	Plant spread (cm)	Days to first flower appearance	Days to 50% Flowering	Flowering duration (Day)	No. of flower/plant	Diameter of flower (cm)	Weight (g) per flower	flower yield per plant(kg)	B: C ratio
1	Serakol	60.25	41.71	47.86	51.06	49.00	98.83	4.85	5.00	0.52	1:3.60
2	Bihar Marigold -113	66.08	46.10	42.03	45.50	61.50	115.03	5.54	5.85	0.59	1:3.95
3	Bidhan Marigold-2	56.20	40.50	50.66	54.56	42.86	85.25	4.75	4.50	0.40	1:3.20
4	Bidhan Marigold-3	53.50	35.20	55.15	59.90	34.23	75.15	4.55	4.10	0.30	1:2.65
5	Pusa Narangi Gaiinda (check)	50.85	25.50	60.50	65.20	30.50	44.80	4.13	3.64	0.19	1:1.80
	CD at 0.05	5.36	9.24	7.27	8.62	5.20	10.30	0.41	0.59	0.05	-
	CV %	6.96	12.54	7.54	8.28	6.33	6.53	5.66	5.72	6.82	-

Conclusion

The research findings of three years experimentation and pooled data (2019, 2020 and 2021) reveal that the vegetative and floral qualities of the different genotypes of African marigold are varied significantly under the agro ecological conditions of Bihar. Among the five genotypes evaluated, 'Bihar Marigold - 113' followed by 'Serakol' and 'Bidhan marigold 2' are found suitable for cultivation due to their floral quality as well as shelf life potential over others genotypes under the agro climatic situations of Bihar for growing in summer. It is obvious from the study that both the genotypes have very good economic potential and it would provide maximum net return to the growers/farmers of the State.

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