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Varietal performance of marigold (*Tagetes spp.*) under sub-tropical condition of Bihar

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Abstract

A field experiment was conducted at experimental station of Nalanda College of Horticulture, Noorsarai, Nalanda, Bihar (India) to assess the varietal performance of marigold with respect to growth and yield. Thirty seven cultivars of marigold collected from different location of Bihar and West Bengal and all cultivars were arranged in factorial randomized block design replicated thrice. Data were collected on plant height (cm), number of primary and secondary branches, number of flowers/ plant, diameter of flower, average weight of flower (g), flower yield/plant (kg), yield (q/ha.) Almost all the parameters influenced significantly due to various treatments and recorded maximum average flower wt (g) with Inka yellow after that Inka Orange, Inka White and M-6 respectively which were significantly at par. The maximum flower yield/plant and flower yield (q/ha) were recorded with Pusa Narangi and Pusa Basanti, respectively. Range of flower yield varies from 39.00-249 (q/ha) while, entries M-4, M-5, M-6, Hilsa marigold, MS-1, MS-2, MS-3, MS-4, MS-5, Pusa Narangi and Pusa Basanti were recorded significantly higher flower yield (q/ha).

Keywords: growth characters, marigold, varieties, yield

Introduction

Marigold (*Tagetes spp L.*) is one of the most commonly grown loose flower, which belongs to family Asteraceae. Marigold is native of Central and South America, especially Mexico. It is one of the most important flower crop grown commercially in different parts of the country on account of its easy cultural practices and wide adoptability. Due to its short duration to produce marketable flowers, wide spectrum of attractive color, shape, size and good keeping quality attracted the attention of flower growers. Therefore, in India, marigold accounts for more than half of the nation's loose flower production. It is grown in 42 880 hectare area with production of 360 000 MT (National Horticulture Board) [5]. Flowers are sold in the market as loose or for making garlands. Flowers are traditionally used as offering in temples, churches and in festivals, beautification and landscape. It is highly suitable for pot culture, bedding purpose and window boxes. It contains medicinal and nematicidal properties and recommended for growing as a trap crop with the tomato and onion to reduce the menace of fruit borer in IPM system (Meena *et al.* 2015) [3]. There are about 50 species of the genus *Tagetes*. Among these, *T. erecta* L (African marigold), *T. patula* L. (French marigold) and *T. tenuifolia* Bartl. syn. *T. signata* (Bush marigold) are most popular species and used for commercial cultivation. Among these *T. erecta* L. and *T patula* L. are the most important species and used for commercial cultivation (Arora, 1989) [1]. 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 world demand of its oil is about 10 tonnes annually (Naik *et al.*, 2003) [10]. There are several varieties and local cultivars are grown traditionally since long time in different locality of country which has significant diversity in account of growth, yield and quality. The extent of improvement depends upon the amount of variability in different characters present in the crops, which is an indispensable prerequisite for successful breeding programmes. The higher yield of flower is the ultimate aim in most of the flowering plants. The interaction of a number of component characters may result in boosting the yield of crop. Keeping in view the above, present investigation was carried out to assess suitable variety/genotype with respect to growth and yield under sub-tropical condition of Bihar (India)

Materials and Methods

An experiment was conducted to assess the varietal performance of marigold at Nalanda College of Horticulture, Noorsarai, Nalanda, campus of Bihar Agricultural University Sabour,

Bhagalpur, Bihar during 2014-15 and 2015-16. The experimental site was situated about 10 km from Nalanda district head quarter and 65 km from Patna city at 25.27 latitude and 85.45 longitude and 57 meters above the mean sea level. The experiment involving thirty seven cultivars of marigold i.e. Inka Yellow, Inka Orange, Inka White, Midnapore M Orange, Midnapore M Yellow, Midnapore China, M-6, M-5, M-4, Frismany marigold mixture, Hilsa Marigold, MS-1, MS-2, MS-3, MS-4, MS-5, Pusa Basanti, Pusa Narangi, Siera Yellow, M-2, M-1, M-3, Hybrid M Orange, Tajpur Basanti Orange, MS-23, Dhapa Orange, New China Orange, Dhapa Yellow, Super Red, MS-6 (BAU), Hooghey-1 Orange, MS-11 (BAU), Tapus Yellow, New China Gold, China Blood Red, Grass China, and Hybrid Yellow (BAU) collected from different location of Bihar and West Bengal. The experiment was laid out in Randomized Block design with three replications. The seedlings were grown in raised bed nursery. Four week old seedlings (4-6 leaf stage) were transplanted as per treatment in the plots having 3 m x 2 m size in the month of October during both the consecutive years 2014 and 2015. The data was recorded on plant height (cm), number of primary branches/ plant, number of secondary branches/plant (at final harvesting) Number of flower/ plant, Average weight / flower (g), flower yield/ plant (kg), and flower yield (q/ha) and analyzed statistically following the method suggested by (Fisher and Yates, 1949) [2].

Results and Discussion

From the perusal of Table-1, it is evident that all the growth and yield parameters were influenced significantly due to various genotypes of marigold. MS-4 genotype attained maximum plant height (88.90 cm) while, the genotype Midnapore M Orange, Pusa Basanti and Pusa Narangi produced maximum primary branches per plant. Number of flower per plant (75.00) were recorded significantly higher in

MS-4 (84.00) followed by Midnapore China (75.00), Frismany marigold mixture (74.67), respectively. Flower diameter (9.34 mm) and average flower weight (11.50g) was maximum in Inka Yellow followed by Inka Orange, Inka White. Genotypes i.e. Pusa Narangi (0.53 kg/plant), Pusa Basanti (0.52 kg/plant), MS-1 (0.52 kg/plant) produce significantly more number of flower/ plant. The maximum flower yield (q/ha) were recorded with genotype Pusa Narangi (249.00 q/ha), Pusa Basanti (237.00 q/ha), MS-1 (232.50 q/ha) and MS-2 (225.00 q/ha), respectively. These variations may be due to the genetic potential and adaptability of genotypes in the specific climatic conditions. The variation among genotypes for different growth and yield attributing traits of marigold could be designated to the genetic attributes of selected genotypes. Similar type of reasons has also been reported by (Singh *et al.*, 2002) [6] in Dahlia and (Verma *et al.* 2002) [9] in marigold. Observation mentioned in Table-2 reveals that the all genotype have significant variation and recorded maximum range of observation among high and low value for each characteristics. The maximum and minimum number of flower/plant (84.00-19.67), average flower weight (9.34-3.43 g), Flower diameter (9.34-3.43 mm), flower yield/plant (0.09-0.53 kg) and flower yield (249.00-39.00 q/ha) indicated huge variability among genotypes which will be beneficial for improvement through selection. Fig.1 and Fig.2 indicated that Pusa Narangi and Pusa Basanti produces maximum flower yield under sub-tropical condition of Bihar. It means these varieties are well adopted for cultivation in this region besides this genotype MS-1, Ms-2, MS-3, MS-4, MS-5, Hilsa Marigold, M-4, M-5, M-6 performed best in this region. It might be due to genetic potential and well adaptability of genotype in this region. Similarly, the variation in yield of flowers had also been observed by (Singh *et al.* 1997; Nand Kishore and Raghava 2001; Sreekala *et al.* 2002) [7, 4, 8] in marigold.

Table 1: Varietal performance of Marigold (*Tagetes spp.*) under sub-tropical condition of Bihar.

S. No.	Varieties/genotypes	Plant height (cm)	No. of primary branches	No. of secondary branches	No. of flower /plant	Average flower wt (g)	Flower diameter (cm)	yield/plant (kg)	Yield q/ha
1	Inka Yellow	25.40	12.00	22.67	26.00	11.50	9.34	0.31	139.20
2	Inka Orange	24.23	12.67	19.67	25.33	10.23	8.22	0.28	124.20
3	Inka White	20.23	13.67	18.33	19.67	9.40	8.05	0.20	88.50
4	Midnapore M Orange	30.67	15.33	20.00	32.67	8.58	5.09	0.28	126.00
5	Midnapore M Yellow	31.10	11.00	21.67	65.67	6.58	4.86	0.43	194.40
6	Midnapore China	69.57	15.00	28.67	75.00	3.92	3.40	0.29	130.40
7	M-6	76.57	14.00	37.67	50.00	9.40	6.77	0.47	210.00
8	M-5	77.63	14.33	31.67	56.00	8.57	6.15	0.47	213.00
9	M-4	78.90	13.33	32.00	54.67	9.13	5.87	0.48	217.50
10	Frismany marigold mixture	28.40	9.67	30.67	74.67	4.67	2.82	0.35	156.00
11	Hilsa Marigold	59.37	12.67	33.00	51.67	9.82	5.83	0.50	225.00
12	MS-1	77.63	10.67	38.33	61.67	8.68	6.07	0.52	232.50
13	MS-2	78.03	12.00	38.33	54.33	9.27	6.80	0.50	225.00
14	MS-3	70.97	12.00	38.33	51.67	9.40	6.73	0.48	216.00
15	MS-4	88.90	13.33	48.67	84.00	5.57	5.60	0.47	211.50
16	MS-5	69.47	14.00	35.67	54.00	9.07	6.50	0.49	220.50
17	Pusa Basanti	82.17	14.00	46.67	62.33	8.82	7.07	0.52	237.00
18	Pusa Narangi	80.83	14.67	53.33	65.67	8.98	7.07	0.53	249.00
19	Siera Yellow	58.17	10.00	28.00	61.33	6.80	5.22	0.41	184.50
20	M-2	41.67	7.00	23.33	37.00	6.07	4.92	0.21	96.00
21	M-1	47.90	8.00	22.00	37.67	5.17	5.10	0.19	84.00
22	M-3	33.33	7.67	20.00	30.00	3.48	4.30	0.10	45.90
23	Hybrid M Orange	38.33	7.00	20.00	40.33	8.20	5.50	0.33	148.50

24	Tajpur Basanti Orange	50.23	10.00	24.33	36.67	4.80	4.27	0.17	76.50
25	MS-23	72.57	11.67	28.67	61.00	3.07	3.27	0.18	80.25
26	Dhapa Orange	50.33	7.67	20.67	36.67	5.07	4.85	0.18	82.50
27	New China Orange	50.50	8.00	21.00	28.00	4.45	4.78	0.12	54.00
28	Dhapa Yellow	37.33	6.33	17.67	22.67	3.83	4.37	0.09	39.00
29	Super Red	22.83	5.00	15.00	22.33	3.70	4.00	0.32	142.50
30	MS-6 (BAU)	42.33	9.00	18.00	22.67	4.07	4.52	0.09	41.25
31	Hooghey-I orange	47.83	7.00	15.67	24.33	3.82	4.27	0.09	40.95
32	MS-11(BAU)	57.33	10.33	19.67	34.00	3.47	3.82	0.12	52.20
33	Tapus Yellow	35.33	7.00	25.00	34.33	3.40	3.80	0.12	51.90
34	New China Gold	44.67	9.00	20.00	34.00	4.57	4.43	0.15	68.25
35	China Blood Red	30.57	8.33	19.00	32.33	4.27	4.08	0.14	61.65
36	Grass China	17.67	5.00	10.67	22.67	3.27	3.43	0.29	131.85
37	Hybrid Yellow (BAU)	42.00	6.00	14.00	20.67	3.77	3.23	0.07	31.50
C.D.		8.022	3.225	5.520	5.655	0.723	0.368	0.159	70.362
SE (m)		2.840	1.142	1.954	2.002	0.256	0.130	0.056	24.906
SE (d)		4.016	1.615	2.764	2.831	0.362	0.184	0.080	35.222

Table 2: Range of observation recorded within genotypes of Marigold (*Tagetes spp.*) under sub-tropical condition of Bihar.

S. No.	Plant height (cm)	No. of primary branches	No. of secondary branches	No. of flower /plant	Average flower wt (g)	Flower diameter (cm)	yield/plant (kg)	Yield q/ha
Range	20.23-88.90	5.00-15.00	10.67-53.33	19.67-84.00	3.27-11.50	3.43-9.34	0.09-0.53	39.00-250.00

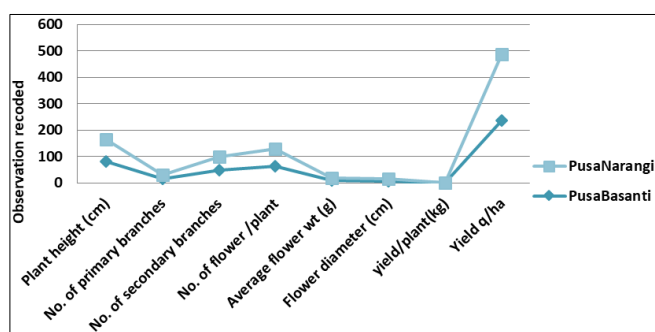


Fig 1: Performance of Pusa Narangi and Pusa Basanti in sub tropical region of Bihar

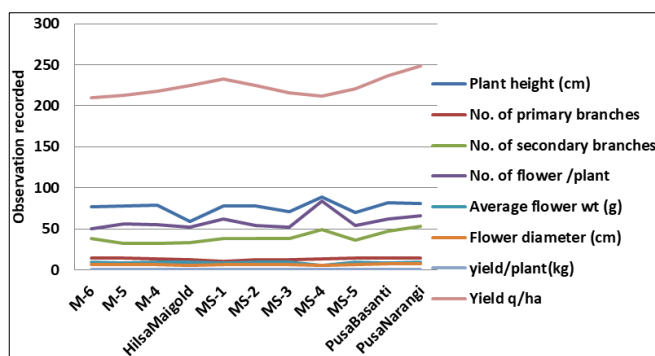


Fig 2: Best performing genotypes of marigold under sub tropical region of Bihar

Conclusion

Regarding the production potential of the genotypes, it may be concluded that the characters such as flower weight, flower diameter, number of flowers per plant, flower yield per plant are the most important characters contributing towards the yield and therefore, they should be kept in mind during the selection of a best genotypes for recommendation of commercial cultivation as well as crop improvement programmes. Keeping these all in view, the genotypes Pusa Narangi, Pusa Basanti, MS-1, MS-2, MS-3, MS-4, MS-5,

Hilsa Marigold, M-4, M-5, M-6 were found to be most desirable because of its high flowers yield per plant, more number of flowers per plant and flower yield (q/ha). Pusa Narangi and Pusa Basanti variety of marigold may be recommended for commercial cultivation in subtropical condition of Bihar.

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