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Evaluation of Marigold Genotypes under Tropical Conditions of Tirupati

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ABSTRACT

The study was conducted on performance of 20 genotypes of marigold under tropical conditions of Tirupati. Experiment was laid out in Randomized block design (RBD) with three replications, at Citrus Research Station, Tirupati during two winter season of 2016-17 and 2017-18.All the genotypes showed significant variations for growth, flowering and yield parameters. The genotype Vikrant Yellow exhibited best performance in terms plant spread (62.3 cm), Yellow Keonic exhibited high numbers of secondary branches per plant (62.7), number of buds per plant was high in PusaNarangiGainda (70.6), duration of flowering was high in Tennis Ball (68.2 days) and flower yield per hectare was high in Vikrant Yellow(2168 q). The genotype PusaNarangiGainda recorded maximum stem diameter (2.1 cm) and dry weight of plant was high in Semi Tall Orange (62.27 g), whereas it was minimum in AW Dwarf Yellow (9.8 g). Maximum diameter of flower (8.2cm) was recorded in Astagandaha and Suvarna Yellow, while it was minimum (4.3 cm) in AW Dwarf Yellow. The maximum dry weight of flower (2.2 g) was recorded in Suvarna Yellow.

Key words*: Genotypes, growth, quality, marigold, yield*

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INTRODUCTION

Marigold *(Tagetes*spp.*),* a member of family Asteraceae is one of the most important flower grown commercially in India. It is native of Central and South America especially Mexico. Genus *Tagetes*consists of 33 species, out of these species, *Tageteserecta*L., commonly called African marigold and *Tagetespatula* L. popular as French marigold are of great horticultural importance and is grown commercially for exquisite blooms. Both the species of marigold are suitable for garden display and grown commercially for use as cut flowers and loose flowers. It is highly suitable as a bedding plant in an herbaceous border and is also ideal for newly planted shrubberies to provide color and to fill the space. It has attracted the attention of flower growers due to its wide spectrum of attractive colors, shape, size and good keeping quality. Flowers of African marigold can be used for extraction of 1-lemoene, ecomene, 1-linylaetate and 1-linauol (7). An extract obtained from the flowers is mixed with other ingredients in the preparation of an obtained which is used in curing ulcer. Orange colour marigold has emerged as rich source of carotenoid pigments namely xanthophyll, which is widely used as dietary supplement in poultry industry to enhance the chicken skin colour and egg yolk pigmentation (6). Therefore, it is realized that under the changing scenario and advancement of floriculture sector, some important germplasm of marigold should be evaluated under semi arid conditions on different parameters and recommended to farmers for exploitation of their potential. Keeping in view its wide importance, a study was conducted to assess the performance of twenty marigold genotypesunder Tropical conditions of Tirupati.

MATERIAL AND METHODS

The experiment was conducted at Citrus Research Station, Tirupati from November, 2016-17 and September 2017-18 during two winter season to study the performance of different genotypes under tropical conditions of Tirupati. The soil of the experimental field is red loamy with pH 6.4. The region lies in Seshachalam hill ranges dominated by sedimentary rocky-hilly terrain .It receives an average rainfall of 900- 1000 mm with sub-humid conditions and remains almost free from frost. During summers the temperature touches the mark of 42-45 degrees centigrade, whereas during winters it falls to 18- 200 C. The source of planting material is from Indian Institute of Horticultural Research,Namdhari Seeds, IndusSeeds Bangalore.

The materials utilized for the present study consisted of 20 genotypes of African marigold *(Tageteserecta*J) Raised nursery beds of size 3.0 x 1.0 m were first prepared and drenched with captan (0.01 %). Seeds of different genotypes were sown in lines. The nursery beds were watered daily twice for first 10 days and daily once for the remaining period. The seedlings were ready for transplanting at 28-30 days after sowing. One month old, healthy, vigorous and uniform seedlings were selected and transplanted in 60 beds during September. The plot size was kept 3x3m and in each plot consisted of 30 plants and they were transplanted at a spacing of at a spacing of 30 x 30 cm in beds at a depth of 6-8 cm in three replications. All the fertilizer and protection measures was carried out as per the recommendations. The plants were earthed-up after one month of planting by making ridges along the plant rows. The observations were recorded on five randomly selected plants in each treatment plot and the mean values were statistically analyzed using analysis of variance technique. Five plants were selected in each replication of each genotype for taking observations after discarding the border plants at both the ends. The observations were recorded on plant spread, stem diameter, number of secondary branches per plant, dry weight of plant, number of buds per plant, flower diameter, dry weight of flower, duration of flowering and flower yield per plot. Two season data were pooled and analysed statistically.

All observations on the plant and its related parts were made at full bloom stage. The experimental data of two years relating each parameter were pooled and statistically analyzed by technique of analysis of variance using randomized block design.

RESULTS AND DISCUSSION

The analysis of variance revealed that all the genotypes differed significantly from each otherfor all the growth, flowering and yield attributes studied, exhibiting wide variation in thematerial investigated (Table1).The mean performance of the genotypes for various growth parameters have been presented in Table 2.

Plant spread varied significantly in different genotypes of marigold and it ranged from 33.25 to62.32 cm. The maximum plant spread (62.32 cm) was recorded in genotype Vikrant Yellow which was statistically superior to all other genotypes, whereas it was the minimum in Inca Orange (33.25 cm). (14) reported that genotype TEG21 had showed maximum plant spread (79.10 cm) inmarigold, which closely confirms the results of the present investigation. Variation in plant spread has been attributed to the additive gene effects. Similar variations in plant spread have also been observed by earlier workers (1,8, 10) inmarigold germplasm.

The stem diameter varied from 0.5 to 2.1 cm .The maximum stem diameter (2.1 cm) was recorded in genotype PusaNarangiGainda followed by Suvarna Orange (1.8 cm), Suvarna Yellow, Inca Yellow (1. 7 cm), while it was minimum (0.5cm) in Aw Dwarf Yellow. Production of strong and sturdy stem or thin and weak stern might be dependent upon the genotype that could have been further persuaded by the environmental conditions. Hence, variation in stem diameter of the studied genotypes could have resulted due to their genetic makeup and environmental conditions prevailed during experimentation. The results corroborate the findings of in marigold (16) and in gladiolus (2).

The number of secondary branches per plant varied from 25.4 to 62.2. The maximum numbers of secondary branches per plant (62.2) was observed in genotype Yellow Keonic which was significantly higher over all other genotypes, while the minimum numbers of secondary branches per plant was recorded in genotype Inca Yellow. The number of secondary branches per plant is an important genotypic character in marigold that might be primarily governed by the genetic makeup of the genotypes. Similar results have also

been reported in marigold (3,13) and in China aster (5).

The highest dry weight of plant (62.7 g) was observed in genotype Semi Tall Orange followed by PusaNarangiGainda (61.4 g), whereas it was lowest (9.8 g) in AW Dwarf Yellow. The high accumulation of dry matter in genotypes Semi Tall Orange and PusaNarangiGainda was owing to vigorous growth of their plants. The variation in these vegetative characters may be due to the congenial environment to express the dominant genes in the genotypes. The increase in these characters could be due to higher uptake of nitrogen. Nitrogen is a very important constituent of protoplasm and its favourable effect on chlorophyll content of leaves might have increased the synthesis of carbohydrates, amino acids etc.from which phytohormones have been synthesized resulting in increase in vegetative characters (3,4, 12) in marigold also reported similar variation in number ofsecondary branches per plant.

On the perusal of data presented in Table 2 revealed that flowering and yield parameters differed significantly among the genotypes studied.

The maximum number of buds per plant (70.6) was recorded in genotype PusaNarangiGainda, which was statistically at par with all other genotypes, while it was minimum (28.1) in African Vanilla. The variation in number of buds per plant might be due to hereditary traits of the genotypes. Thus, it could be concluded that the variation in number of buds per plant might be primarily due to their genetic makeup that could have also been influenced by the environmental conditions.

The size of flower in different genotypes ranged from 4.3 to 8.2 cm. The maximum diameter of flower (8.2cm) was recorded in genotype Suvama Yellow, Astagandha closely followed by Arjun Yellow, AM Mixed, Vikrant Yellow (7.2 cm), while it was (4.3 cm) in AW Dwarf Yellow. This could be due to production of high leaf area and higher nutrient uptake ((10). The results are in corroborated with the findings in African marigold.(7,9)

The results of dry weight of flower clearly indicated that the genotypes Suvarna Yellow was significantly superior over other genotypes. Whereas, the minimum dry weight of flower was observed in genotype Inca Orange, AW Dwarf Yellow with the mean value of 0.2 g. The difference in dry weight of flower might be due to inherent characters of the individual genotypes. The findings of the present investigation confirm well with results reported by in marigold (14,15,16)

Table 1 Analysis variance (ANOVA) for different characters of Marigold genotypes

Source of variance	df	Plant Spread	Stem Diameter	No of secondary branches	Dry wt of plant	No of flowers /plant	Duration of flowering	Flower Diameter	Dry wt of flower	Flower yeild (q/ha)
Replications	2	24.47	0.17	47.45	30.10	69.48	43.94	0.35	0	2156.40
Treatment	19	5381.59**	9.01**	6561.61**	11534.92**	7952.02**	8178.36**	75.39**	11.81**	17731213.9**
Error	38	19.83	0.07	23.78	9.29	46.81	19.55	0.22	0.04	3077.68

** significant at 1% level probability

The duration of flowering varied from 34.3 to 70.1 days . The longest flowering duration (70.1 days) was observed in genotype Rocket Gold, followed by Tennis Ball, Yellow Keonic (68.2, 66.2 days), whereas the shortest flowering duration (34.3 days) was recorded in PusaNarangiGainda. This could be due to more dry matter accumulation because of absorption of more nitrogen and other nutrients and nutrients uptake in addition to

prevailing favourable environment, i.e., low night temperature and short day lengths (12). The genetic control of all these characters and modification in their expression due to environmental conditions might be the possible causes of observed variation. (9) reported high range for duration of flowering (51.00- 75.00 days) in African marigold. Similar findings have been also reported in marigold [3, 10, 12].

Table:2 Mean performance of marigold genotypes for various growth traits (two years pooled data)

Genotype	Plant Spread (cm)	Stem Diameter (cm)	No of secondary branches/plant	Dry wt of plant (g)	No of flowers /plant	Duration of flowering (days)	Flower Diameter (cm)	Dry wt of flower (g)	Flower yield (q/ha)
Pusa Narangi Gainda	54.20	2.18	42.20	61.48	70.67	34.30	5.17	1.05	801.75
Inca Yellow	33.40	1.72	25.47	30.90	31.00	41.88	7.17	1.15	617.17
Inca Orange	33.25	0.72	36.53	20.37	43.50	47.70	4.35	0.25	271.58
Suvarna Orange	56.45	1.80	26.17	46.45	59.25	37.62	5.30	1.15	671.00
Yellow Keonic	43.10	1.68	62.27	51.62	62.17	66.23	6.65	1.20	1332.50
Suvarna Yellow	56.48	1.73	46.03	40.42	53.17	51.27	8.20	2.23	1816.33
African Vanilla	37.30	1.48	22.87	21.35	28.17	40.42	5.23	0.75	457.50
Double Orange	45.10	1.53	57.05	52.17	63.00	42.87	5.20	1.02	1423.83
AnandKeonic	57.55	1.33	40.33	38.17	57.67	63.30	6.32	1.18	1116.92
Semi tall Orange	44.83	1.25	46.20	62.77	58.83	50.15	5.18	1.48	1546.92
Arjun Yellow	61.23	1.18	41.50	36.85	43.50	40.12	7.22	1.25	1032.75
Astagandha	52.00	1.40	44.37	36.40	54.17	61.67	8.22	1.62	2187.42
AM Mixed	33.93	1.45	26.97	37.33	34.00	43.90	7.20	1.17	850.08
Tennis Ball	52.57	1.42	46.40	52.02	58.00	68.28	7.13	1.35	1454.25
Yellow Max	54.53	0.73	37.65	24.07	43.50	66.73	6.18	1.22	1105.25
Rocket Gold	44.00	1.13	46.07	51.90	53.00	70.18	6.53	1.15	1187.33
Vikrant Yellow	62.32	1.17	45.70	30.23	51.83	56.17	7.25	1.80	2168.08
Yellow Benz Tall	51.87	1.35	55.15	51.77	62.00	37.15	6.72	1.18	1428.67
Arka Agni	55.02	1.20	31.83	38.83	38.83	64.82	6.33	0.77	878.00
AW Dwarf Yellow	34.00	0.50	35.27	9.87	40.33	56.25	4.35	0.25	223.25
CD	1.199	0.069	1.313	0.821	1.842	1.190	0.126	0.056	14.933
SE(m)	0.417	0.024	0.457	0.286	0.641	0.414	0.044	0.020	5.196

Flower yield is one of the most important characters for commercial flower cultivation in marigold. A close sight of the data revealed that the genotypes demonstrated highly significant differences for flower yield per plot, which ranged from 2187.4 to 223.2 q/ha. The maximum flower yield per hectare (2187.4 q/ha) was recorded in Astagandha followed by Vikrant Yellow (2168.0 q/ha), while it was lowest in AW Dwarf Yellow (223 q/ha). Similar findings was observed in African marigold (11) where significant variation in flower yield/m^2 ranged from 1.69 kg to 8.27kg/m^2. It might be due to inherent capacity of genotypes to yield flowers. The present findings confirm well with the findings of (7,12,15,16) in marigold The genotypes were collected from different agro-climatic conditions and such had different genetic makeup and hence, the variation in genotypes may be due to genetic andenvironmental interaction.

CONCLUSION

The following genotypes Vikrant Yellow exhibited best performance in terms plant spread ,

Yellow Keonic exhibited high numbers of secondary branches per plant,PusaNarangiGainda in number of buds per plant , Tennis Ball in terms of duration of flowering was high and flower yield per hectare was high in Vikrant Yellow.

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