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GENETIC DIVERSITY IN AFRICAN MARIGOLD (*TAGETES ERECTA* L.) UNDER VELLORE CONDITIONS

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Abstract

The present investigation was undertaken to study the genetic parameters such as heritability, genotypic and phenotypic coefficient of variation (GCV, PCV) for twelve characters of African marigold genotypes collected from various regions suitable for Vellore districts in the experimental farm of the Adhiparasakthi Horticultural college, Kalavai during 2017-19. The maximum value of genotypic coefficient of variation (GCV) and phenotypic coefficient of variation (PCV) were recorded for flower yield (19.12 % and 19.06 %, respectively) and number of flowers per plant (14.37 % and 13.60 % respectively). The genotypes showed high heritability for most of the traits, and it was ranged from 20.81 to 99.41 per cent. The highest broad sense heritability was recorded for flower yield (g/plant) (99.41 %), number of leaves (99.11 %), plant height (99.01%), days to first flower emergence (91.12 %), number of flowers per plant (89.63 %), flower diameter (81.17 %), duration of flowering (87.01 %) and Xanthophyll content (88.90 %). However, highest genetic advance over mean was recorded for flower yield (g/plant) (39.13 %), number of flowers per plant (26.53 %), Number of leaves (22.47 %), days to first flower emergence (18.72 %). The studies revealed that genetically diverse genotypes should be further utilized as parents in crop improvement programme for the development of the varieties/ hybrids with broad genetic base for Vellore district conditions.
Keywords **:** Genetic diversity, *Tagetes erecta*, GCV, PCV.

Introduction

Marigold (*Tagetes erecta* L.) is one of the important commercial annual flower crop belonging to the family Asteraceae. African marigold is popular throughout the world because of wide spectrum of attractive colours, shape and good keeping quality has attracted the attention of flower growers. They are extensively used as loose flower, potted plant and also as a bedding plant. It has gained popularity in India on account of its easy cultivation, wide adaptability and production throughout the year. Nowadays, varieties of African marigold are less vigorous, prone to lodging and low yielding. Development of high yielding semi tall varieties of marigold requires genetically stable genotypes having high yield potential (Bharathi *et al*., 2014). Selection of superior variety depends upon the variation. Variability in a population with respect to character is an essential requirement for a successful breeding programme. Use of open pollinated crops for exploiting increased variations especially in heterozygous crop like marigold is gaining considerable importance (Singh and Misra, 2008). Estimation of heritability reveals transmission of characters from one generation to another generation. Heritability alone is not useful for breeding programmes, heritability along with genetic advance is pre-requisite for selection process. The adequate information on extent of variability parameters may be helpful to improve the yield by selecting the yield component traits because yield is a complex trait, whose manifestation depends on the component traits (Angadi and Archana, 2014). Being a cross pollinated crop there is need of high yielding variety with specific coloured flowers to overcome farmer's predicament. The estimation of genetic coefficient of variation indicates the amount of genetic variation present for different desirable traits while the heritability gives an insight into the proportion of variation which is inherent. The heritability estimates gives an idea about the proportion of observed variability, which is attributed to genetic difference. Based on the requirement, this research work has been undertaken to assess and estimate the magnitude of variation among the population with respect to various traits which can be further utilized in crop improvement programme.

Materials and Methods

The present investigation with 25 marigold accessions *viz.,* Lattoo Orange, Thiruvannamalai Local, Vedaranyam Local, Pusa Basanti Gainda, Suvarna Orange, Suvarna Yellow, Kaniyanur Local Orange, Kaniyanur Local Yellow, Pusa Narangi Gainda, Serapattu Local, Chengam Local Yellow, Chengam Local Orange, Hosur Local, Kavanur Local, Pollur Local, Mettur Local, Meruvathur Local, Vellore Local, Tindivanam, Local, Villupuram Local, Chakkaramallur local, Bondaguda local, Hataguda local, Dumbriguda local, Kerenga local was carried out in the Experimental farm of the Adiparasakthi Horticultural college, Kalavai, during 2017-19. The experiment was laid out in randomized block design with three replications. Regular cultural practices were adopted to raise the crop successfully. Observations on plant height, number of branches, number of leaves, leaf area, days to first flowering, duration of flowering, number of flowers, flower head diameter, flower yield and xanthophyll content were recorded and statistically analyzed. Phenotypic and genotypic co-efficient of variation were calculated by using the formulae suggested by Cockerham (1963). The broad sense heritability (h2BS) was estimated by following the procedure suggested by Weber and Moorthy (1952). The expected genetic advance as per cent of mean for each character was predicted by the formula given by Johnson *et al*. (1955).

Results and Discussion

In any breeding programme, the mean performance and variability are the important factors for selection. Based on mean performance undesirable plant may be eliminated and also variability may be used for selection procedure. With a view to understand the extent to which the observed variations are due to genetic factors, the range, mean, phenotypic coefficient of variation (PCV), genotypic

coefficient of variation (GCV), broad sense heritability (h2) and genetic advance as per cent mean (GAM) were worked out and are presented in Table 1. In the present study, the estimates of genotypic coefficient of variation (GCV) were higher than their corresponding phenotypic coefficient of variation (PCV) for all the characters. The maximum value of genotypic coefficient of variation (GCV) and phenotypic coefficient of variation (PCV) were recorded for flower yield (19.12 % and 19.06 %, respectively) and Number of flowers per plant (14.37 % and 13.60 % respectively). The moderate value of GCV and PCV were recorded for number of leaves (10.96 and 11.01 % respectively), plant height (10.11 and 10.06 % respectively), leaf area (16.31 and 11.49 % respectively), days to first flower emergence (9.97 and 9.52 % respectively), flowering duration (7.89 to 7.36 % respectively), flower diameter (10.54 and 7.15 % respectively) compare to other characters, indicating the presence of high amount of genetic variability for these traits and effective for selection because the response to selection is directly proportional to the variability present in the experimental material. The results of the present experiment are in conformity with the previous results as reported by Namita *et al*. (2009), Pratap *et al*. (2009) and Kumar *et al*. (2014) in marigold. Narrow difference between PCV and GCV revealed that variability existing among different genotypes of marigold was mainly due to genetic makeup and there was less environmental influence on the expression of this trait.

The genotypes showed high heritability for most of the traits, and it was ranged from 20.81 to 99.41 per cent. The highest broad sense heritability was recorded for flower yield (g/plant) (99.41 %), number of leaves (99.11 %), plant height (99.01%), days to first flower emergence (91.12 %), number of flowers per plant (89.63 %), flower diameter (81.17 %), duration of flowering (87.01 %) and xanthophyll content (88.90 %). This indicates good correspondence between genotypic and phenotypic values and thereby low environmental effect on the expression of these characters. These results are in agreement with the findings of Mathew *et al* (2005), Namita *et al*. (2009), Yuvraj and Dhatt (2014)in marigold. The lowest heritability was recorded for single flower weight (20.81 %), flower diameter (46.03 %), leaf area (49.75 %) and stem girth (50.23 %).

Heritability estimates alone do not provide reliable information about the gene action governing the expression of a particular character and also it does not provide the information of the amount of genetic progress that would result from the selection of best individuals. Highest genetic advance over mean was recorded for flower yield (g/plant) (39.13 %), number of flowers per plant (26.53 %), Number of leaves (22.47 %), days to first flower emergence (18.72 %). The genotypic variations for such characters are probably due to high additive gene effects and least influenced by the environment. Similar results were also reported by Namita *et al*. (2009), Kumar *et al*. (2014) and Singh *et al*.(2014) in marigold. However, low genetic advance was reported for single flower weight, flower diameter, stem girth, number of branches, and leaf area, therefore, selection for these characters would not be much effective. The studies revealed that genetically diverse genotypes should be further utilized as parents in crop improvement programme for the development of the varieties/ hybrids with broad genetic base for Vellore district conditions.

Table 1 : Variability, heritability and genetic advance for growth and yield parameters of marigold genotypes

S.No	Characters	Range	Mean	PCV (%)	GCV (%)	h2 (%)	Genetic Advance as per cent of mean
1.	Plant height	87.48-123.14	104.04	10.06	10.11	99.01	20.62
2.	Number of branches	11.87-15.99	14.86	7.28	9.40	60.11	11.63
3.	Stem girth	4.74-6.01	5.44	6.91	9.76	50.23	10.09
4.	Number of leaves	90.05-132.53	115.69	10.96	11.01	99.11	22.47
5.	Leaf area	79.29-121.05	99.22	11.49	16.31	49.75	16.69
6.	Days to first flower emergence	53.86 – 76.38	66.14	9.52	9.97	91.12	18.72
7.	Duration of flowering	56.92 – 75.31	67.34	7.36	7.89	87.01	14.14
8.	Flower diameter	3.84 – 5.03	4.57	7.15	10.54	46.03	9.99
9.	Number of flowers per plant	30.01 – 53.02	42.03	13.60	14.37	89.63	26.53
10.	Single flower weight	3.74 – 5.13	4.55	2.24	13.37	20.81	0.77
11.	Xanthophyll content	14.98 – 18.35	16.27	8.95	9.50	88.90	17.39
12.	Flower yield	108.92 – 222.62	163.16	19.06	19.12	99.41	39.13

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