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Short communication

Studies on genetic variability, heritability and genetic advance in chrysanthemum

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ABSTRACT

Studies on genetic variability, heritability and genetic advance were carried out among ten genotypes of chrysanthemum for characters to identify elite genotypes to be used in breeding programme. The results showed high phenotypic and genotypic co-efficient of variation for traits like number of suckers per plant (GCV = 90.13; PCV = 95.67) and flower disc diameter (GCV = 63.19; PCV = 66.76). High heritability values were obtained for all the characterister except number of sprays per plant and plant spread. In high heritability estimate coupled with high genetic advance as per cent of mean was observed for number of suckers per plant (174.91), flower disc diameter (123.23) and number of flowers per plant (114.81). It was observed that heritable variability in the breeding materials characters like number of suckers per plant, flower disc diameter, number of flowers per plant, flower weight, yield per plant and number of ray florets could be exploited for improvement through crop breeding programme.

Key words: Chrysanthemum, genetic variability, genetic advance heritability

Chrysanthemum (*Dendranthema grandiflora* Tzvelev.) is a multi-use flower crop and gaining more popularity as a cut flower for interior decoration and in bouquets. In India, due to research on genetic improvement at different institutions, approximately one thousand varieties, have been developed. In spite of wide range of variability, very little attention has been paid for its improvement. There is a need for identification of varieties suitable for growing in different agro climatic conditions for specific purposes. Information on the nature and magnitude of variability present in the existing material and association among the various characters is pre-requisite for any breeding programme for high yield and quality. Flower yield, a complex character, is not only influenced by its associated characters but also are governed by number of genes, and environment. For effective selection, it is necessary to separate genetic variability from total variability, which enables breeders to adopt suitable breeding programmes. The assessment of genetic variability is necessary to evaluate the performance of the individual cultivars. The analysis of variance permits estimation of phenotypic and genotypic co-efficient of variability of various polygenic traits. The genotypic co-efficient of variation measures the extent of variability among the different traits caused due to the inherent capacity of genotype. The genotypic and phenotypic co-efficient of variation are needed to understand the effect of environment on various polygenic traits (Allard, 1960). The aim of present study was to understand the nature and extent of variability present in a set of ten genotypes and to identify elite genotypes to be used in hybridization programme to bring about desired improvement for crop yield.

The present experiment was carried out at the Horticultural Research Station, Department of Horticulture, Gandhi Krishi Vigyan Kendra, University of Agricultural Sciences, Bangalore during the year 1999 – 2000. The experiment was laid out in Randomized Block Design, comprising ten genotypes and replicated thrice. Each genotype was allotted at random in each sub-block. The crop was successfully raised by following recommended agronomic practices during the period of crop growth. Five plants selected at random per variety per replication avoiding border plants were tagged, which constituted the sample for observations. Observations were recorded on twenty different traits. Phenotypic and genotypic co-efficient of variations and heritability (Burton and Devane, 1953) and genetic advance (Johnson *et al*, 1995) were estimated.

Data on phenotypic and genotypic co-efficient of variations, heritability and genetic advance for different traits

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Table 1. Genetic Parameters of Chrysanthemum

S. No	Parameters	Range	Mean	PCV	GCV	Heritability (h^2)	Genetic advance asper cent mean
1	Plant height	30.26-54.03	41.97	19.03	15.92	70.02	11.52
2	Number of leaves per plant	102.76-216.86	146.24	29.59	25.66	75.19	45.84
3	Number of branches per plant	25.26-60.33	40.64	32.66	30.49	87.16	58.64
4	Plant spread	24.20-47.10	35.79	21.30	16.22	57.99	25.44
5	Number of sprays per palnt	15.00-42.46	28.28	42.09	28.68	46.41	40.24
6	Stem girth						
	a) Basal	0.62-1.11	0.81	23.68	18.99	64.32	31.37
	b) Middle	0.38-0.66	0.51	18.75	14.33	58.64	22.66
	c) Top	0.25-0.38	0.31	21.03	16.97	65.10	22.73
7	Number of days taken for flowering from bud initiation	14.00-29.33	23.75	23.73	19.59	68.11	33.30
8	Number of days taken for 50% flowering	110.33-155.66	134.86	15.43	11.97	60.25	19.15
9	Duration of flowering	26.33-51.66	38.46	26.77	23.43	76.60	42.25
10	Yield per plant	94.00-365.00	205.15	46.06	44.05	91.47	86.68
11	Yield per square meter	1.04-4.05	2.27	46.07	44.07	91.48	86.83
12	Number of suckers per plant	2.73-58.50	17.03	95.67	90.13	88.73	174.91
13	Flower diameter	2.01-8.14	4.99	34.28	33.13	93.41	65.97
14	Flower disc diameter	0.11-1.38	0.69	66.76	63.19	89.60	123.23
15	Stalk length	4.67-17.52	12.16	36.77	34.31	87.09	65.95
16	Stalk girth	0.11-0.32	0.22	28.64	27.17	90.00	53.10
17	Number of flowers per plant	37.00-287.00	124.16	58.84	57.27	94.71	114.81
18	Flower weight	0.48-3.59	2.12	53.39	47.45	78.97	86.85
19	Number of ray florets per head	47.33-253.20	175.24	42.89	40.83	90.64	80.08
20	Length of ray florets	0.74-3.96	2.13	46.07	45.38	97.02	45.39

PCV: Phenotypic coefficient of variation
GCV: Genotypic coefficient of variation

are presented in Table 1. A wide range of variability for all the traits except stem girth, flower yield per square meter, flower disc diameter, stalk girth, flower weight and length of ray florets was reported. Estimates of genotypic co-efficient of variation were lesser than the estimates of phenotypic co-efficient of variation, indicating that the apparent variation is not only due to genotype but also due to influence of environment. The present results are in agreement with the interpretations of the works of Ponuswami *et al* (1985) on the estimates of co-efficient of variation in chrysanthemum. High phenotypic and genotypic co-efficient of variation were found for the traits number of suckers per plant (GCV = 90.13; PCV = 95.67) and flower disc diameter (GCV = 63.19; PCV = 66.76). This is in line with the earlier findings of Hemalatha *et al* (1992). High genotypic co-efficient of variation obtained for the above characters is important and impress the plant breeders for the effective utilization of the existing variability for further breeding programmes. Low genotypic and phenotypic co-efficient of variation were noticed for the characters number of days taken for 50% flowering, plant height, plant spread, number of days taken for flowering from bud initiation, stem girth, duration of flowering, stalk girth, number of leaves per plant, number of branches per plant, flower diameter, stalk length, number of sprays per plant, yield per plant, number of ray florets and length of ray florets. The results were in accordance with the findings of Misra *et al*, (1987), Choudhary (1987) and Srinivas (1993) in dahlia. Chaugule (1985) obtained lower values of genotypic co-efficient of variation and phenotypic co-efficient of variation for duration of flowering in chrysanthemum. Narrow difference in phenotypic and genotypic co-efficient of variation were obtained for number of flowers per plant, flower diameter, length of ray florets and stalk girth indicating least effect of environment on these characters. Thus, these traits expressed the true genetic potential in varied environments.

A similar trend of low environmental influence has been reported for flower diameter by Choudhary (1987) in dahlia. The characters showing the least difference between phenotypic and genotypic co-efficient of variation may be utilized in the selection programme. High heritability values were obtained for all the characteristics except number of sprays per plant and plant spread. Highest heritability values were noticed for length of ray florets (97.02%), number of flowers per plant (94.71%) and flower diameter (9.41%). Similar results were obtained by Chaugule (1985) for number and weight of flowers per plant and for number of flowers per plant in chrysanthemum (Ponnuswamy *et al*, 1985). Heritability estimates along with genetic advance is a useful criteria in selecting an individual. High heritability estimate coupled with high genetic advance as per cent of mean was observed for number of suckers per plant (174.91), flower disc diameter (123.23) and number of flowers per plant (114.81) suggesting the role of additive gene action in the expression of these characters and as such could be considered as reliable indices for selection. The result is in conformity with the findings of Chaugule (1985) for number of flower per plant in chrysanthemum. These results are in agreement with the reports of Ponnuswamy *et al* (1985) and Hemalatha *et al* (1992) in chrysanthemum.

From the present study, it could be concluded that heritable variability exists in the breeding materials for characters like number of suckers per plant, flower disc diameter, number of flowers per plant, flower weight, yield per plant and number of ray florets and could be exploited for improvement through crop breeding programme.

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