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Genetic Variability, Heritability and Genetic Advance of Various Polygenic Traits in *Capsicum*

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ABSTRACT

Genetic variability, heritability and genetic advance among 54 genotypes of *Capsicum* for ten economic traits were studied in *kharif* 1992. A wide range of phenotypic variability was observed for fresh fruits weight/plant, fruit shape index, number of fruits/plant and plant height. The highest genotypic coefficient of variation values coupled with heritability (broad sense) and genetic advance (expressed as per cent of the mean) were exerted by number of fruits/plant followed by fresh fruit weight/plant and length of fruit indicating their importance in selection. The selection based on phenotypic performance for these traits would, therefore, be most effective in yield improvement of this crop.

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INTRODUCTION

Chilli (*Capsicum annuum* L. var *annuum*) is an annual and most valuable commercially grown vegetable crop of India. Inspite of its importance as a spice in dried form varietal improvement is at a much less advanced stage. Germplasm collections exist in many agricultural stations in India but no systematic records are currently available on extent of variation in economic traits, so that genetic improvement can be achieved either through selection or hybridization. Therefore, information on genetic variation was collected to help the plant breeder in producing cultivars of hot pepper suitable for semi-arid areas of the country.

MATERIALS AND METHODS

The experimental material of 54 diverse accessions of chillies was sown in *kharif* 1992 at the Vegetable Research Station, Gujarat Agricultural University, Junagadh, Gujarat in a Randomized Block Design with 3 replications. The inter and intra-row spacings were 75 and 60 cm, respectively. Each accession was accomodated in a row of 6 m length. Recommended agronomic and plant protection practices were followed to raise a good crop. Five competative plants from each entry were randomly chosen for recording observations viz., days to first fruit picking, plant height (cm), fruit length (cm), fruit girth (cm), fruit shape index, number of primary branches, number of fruits

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TABLE 1

Analysis of variance for ten polygenic traits of chillies.

Sr. No.	Character	Mean sum of squares		
		Replications (d.f. = 2)	*Genotypes (d.f.=53)*	*Error (d.f. = 106)*
1.	Days to 50% flowering	2.75	14.16**	1.45
2.	Days to maturity	46.00	157.20**	30.41
3.	Days to first fruit picking	17.06	325.22**	6.26
4.	Plant height (cm)	6.91	546.14**	3.66
5.	Number of fruits/plant	4.59	1455.66**	4.15
6.	Number of branches/plant	0.97	2.56**	0.14
7.	Length of fruit (cm)	0.40	22.10**	0.46
8.	Girth of fruit (cm)	0.08	4.87**	0.08
9.	Fruit shape index (%)	33.62	895.16**	130.71
10.	Fresh fruit weight/plant (g)	418.12	4241.55**	259.14

**significant at 1% level.

and fresh fruit weight (g)/plant. Days to 50 per cent flowering and days to maturity were recorded on plot basis. Average values were subjected to standard statistical procedures, namely, analysis of variance (Panse and Sukhatme, 1978), genotypic and phenotypic coefficient of variation (Burton, 1952) and heritability and expected genetic advance (Allard, 1960).

RESULTS AND DISCUSSION

The data revealed highly significant varietal differences for all the ten characters studied (Table 1). The range (Table 2) showed wide variation among the genotypes for the traits, like fresh fruit weight/plant (29.33 to 168.00 g.), fruit shape index (28.69 to 135.78), number of fruits/plant (5.20 to 83.22) and plant height (22.00 to 75.00 cm). The present findings corroborated with result obtained by Padhar (1989).

The estimates of phenotypic and genotypic variance components (Table 2) were high for fresh fruit weight/plant, number of fruits/plant, fruit shape index, plant height and days to first picking indicating good amount of genetic variation for selecting superior genotypes for these characters. Similar findings were also reported by Pandya (1982), Padhar (1989) and Sahoo *et al.*, (1989).

The present study revealed high genotypic and phenotypic coefficient of variation for numer of fruits/plant, length of fruit (cm), fresh fruit weight/plant(g) and girth of fruit (cm) (Table 2). The results are akin to those of Pandya (1982), Meshram (1987), Padhar (1989) and Pandita *et al.*, (1991). The closeness of these two parameters further suggested that a major portion of total variation was accounted for by the genetic cause and

TABLE 2

Mean, phenotypic range and variability parameters of ten traits in chillies.

Sr. No.	Character	Mean	Phenotypic range	Variance Components		Coefficients of Variation		Heritability (%)	Genetic advance (per cent of mean)
				Genotypic	Phenotypic	Genotypic	Phenotypic		
1.	Days to 50% flowering	50.74	45.52 — 55.20	5.69	4.24	4.06	4.70	74.51	7.21
2.	Days to maturity	212.47	198.00 — 223.00	72.67	42.26	3.06	4.01	58.15	4.81
3.	Days to first fruit picking	112.75	94.00 — 133.00	108.45	108.38	9.23	9.24	99.94	19.02
4.	Plant height (cm)	45.75	22.00 — 75.00	184.49	180.83	29.39	29.69	98.01	59.94
5.	Fruits/plant	39.98	5.20 — 83.22	487.99	483.84	55.02	55.25	99.15	112.85
6.	Branches/plant	5.74	4.20 — 7.43	1.95	1.81	15.06	16.98	93.00	46.61
7.	Length of fruit (cm)	6.53	2.79 — 12.58	7.67	7.21	41.12	42.41	94.01	82.13
8.	Girth of fruit (cm)	3.98	1.85 — 6.75	1.68	1.60	32.75	32.54	95.20	63.82
9.	Fruit shape index (%)	65.86	28.69 — 135.78	385.53	364.61	27.99	28.81	94.58	58.08
10.	Fresh fruit weight/plant (g)	94.68	29.33 — 168.00	1586.61	1549.00	38.48	42.07	97.67	84.61

thus, selection based on phenotypic performance would be rewarding for improvement in these traits.

The perusal of data (Table 2) further revealed that the heritability values were of higher magnitude in eight traits except days to 50 per cent flowering and days to maturity. *Capsicum* researchers also obtained high value of heritability for major fruit yield and associated traits, like number of fruits/plant (Ramakumar *et al.*, 1981, Pandita *et al.*, 1991 and Varalakshmi and Hari Babu, 1991), fruit size (Padhar, 1989), number of branches/plant (Sahoo *et al.*, 1989), girth of fruit (Ramakumar *et al.*, 1981), fruit length and plant height (Sahoo, *et al.*, 1989 and Varalakshmi and Hari Babu, 1991) and fruit yield (Pandita *et al.*, 1991). Selection criteria for yield and its associated components may be useful in chillies as reflected by very high heritability values. The highest heritability was recorded for days to first picking (99.94%) but low GCV and PCV values render this character unsuitable for direct selection for further improvement.

The expected genetic gain at 5% selection intensity was highest for number of fruits/plant (112.85%) followed by fresh fruit weight/plant (84.61) and length of fruit (82.13). The results are in accordance with Ramakumar *et al.*, (1981) and Pandita *et al.*, (1991) for number of fruits/plant and Pandya (1982) and Pendita *et al.*,. (1991) for fruit yield/plant.

Results of present study indicate that direct selection based on number of fruits/plant, fresh fruit weight/plant and length of fruit having high GCV, high heritability coupled with high genetic advance may be utilized in future capsicum breeding programmes for developing high yielding varieties and also in characterization of germplasm.

REFERENCES

Allard, R. W. (1960). Principles of Plant Breeding. John Wily and Sons, Inc. New York.

Burton, G. W. (1952). Quantitative inheritance in grasses. Proc. *6th Int. Grass Cong.*, 1 : 273-283.

Meshram, L. D. (1987). Studies on genetic variability and correlation in chilli. *P.K.V. Res. J.*, 11 (2) : 104-106.

Padhar, P. R. (1989). Genetic studies in relation to selection criteria in chillies (*Capsicum annuum* L.) M. Sc. (Agri.) thesis, GAU, S. K. Nagar, Gujarat.

Pandita, M. L., Dahiya, M. S. and Vashitha, R. N. (1991). Genetic variability and heritability studies in chilli (*Capsicum frutescens* L.). *Haryana J. Hort. Sci.*, **20** : 234-238.

Pandya, H. M. (1982). Genetic variability heritability, correlation and path coefficient analysis in chillies. M. Sc. (Agri.) thesis, GAU, S.K. Nagar, Gujarat.

Panse, V. G. and Sukhatme, P. V. (1978). Statistical Methods for Agricultural Workers, ICAR, New Delhi.

Ramakumar, P. V., Shiramachandramurthy, N. and Durga Prasad, M.M.K. (1981). Genetic variability, correlation and discriminant function in chilli. *Indian J. Agric. Sci.*, **51** (10) : 723-725.

Shoo, S. C., Mishra, S. N. and Mishra, R. S. (1989). Variability in F_2 generation in a diallel cross of chilli. *South Indian Hort.*, **37** (6) : 348-49.

Varalakshmi, B. and Hari Babu, K. (1991). Genetic divergence heritability and genetic advance in chilli (*Capsicum annuum* L.) *Indian J. Genet.* **51** (2) : 174-178.