International Journal of Farm Sciences **4(4)** : 112-116, 2014

Genetic variability, heritability and genetic advance in chilli, *Capsicum annum* L

SHIKHA SHARMA, SWATI BARCHE, SK SENGUPTA, BK VERMA and TARUN JAMKAR

Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur 482004 Madhya Pradesh
Email for correspondence: sbkdap07@rediffmail.com

ABSTRACT

The present investigations were conducted at Horticulture Complex, JNKVV, Jabalpur, MP during the year 2013-14. Analysis of variance revealed highly significant variation for all the characters indicating greater variability in the existing material. High phenotypic coefficient of variation (PCV) and genotypic coefficient of variation (GCV) were observed for the number of primary branches per plant at 30 days after transplanting (DAT), fruiting span, fruit length, number of fruits per plant, fruit weight of dry chilli, dry fruit yield per plant and fruit yield per plant indicating greater diversity for these traits and their further improvement through selection. High heritability coupled with high genetic advance as per cent of mean was recorded maximum in dry fruit yield per plant, fruit yield per plant and fruit length that suggested that they could be improved through direct selection.

Keywords: Variability; PCV; GCV; DAT; diversity

INTRODUCTION

Genetic variability in a group of germplasm is a pre-requisite for a successful breeding programme. Since most of the characters influencing yield are polygenic it is essential for plant breeders to estimate the type of variation available in the germplasm. Therefore the present investigations were undertaken to estimate the magnitude and nature of variation in the collected germplasm of chilli with respect to different morphological, phonological and quality parameters which can be used in the improvement programme.

MATERIAL and METHODS

An experiment was conducted at Horticulture complex, JNKVV, Jabalpur, MP during Rabi 2013-14. The experiment was laid out in a completely randomized block design with three replications. The experiment material consisted of twenty two genotypes of chilli. Seed of germplasm was collected from different parts of India. The seeds were sown in September in nursery beds in twenty two separate plots. Uniform and healthy seedlings were transplanted in the month of October. The plot size was kept 3.0 m x 3.0 m. Each

plot consisted of thirty plants. All the cultural practices were adopted uniformly for all the genotypes. Observations were recorded on growth, flowering and yield characters viz plant height, number of primary branches per plant, bearing habit, days to first picking, fruiting span, fruit length, fruit width, number of fruits per plant, fruit weight of green chilli and fruit weight of dry chilli of five randomly selected plants from each genotype per replication. Collected data on various parameters were subjected to statistical analysis as described by Panse and Sukhatme (1967), heritability in broad sense was estimated as suggested by Hanson et al (1956) and genetic advance (GA) was calculated by the formula given by Johnson et al (1955b) at 5 per cent selection intensity.

RESULTS and DISCUSSION

Highly significant differences due to genotypes for the entire traits studied (Table 1) indicated sufficient genetic variability among the genotypes. The mean, range, coefficient of genotypic and phenotypic variation, heritability estimates and expected genetic advance as per cent of mean are given in Table 2. Yield per plant was found as the maximum variable trait with the variability ranging between 293.67 to 999.33 g followed by number of fruits per plant (160.67 to 653.33) and fruiting span (76.67 to 108.99). High variability might be due to the presence of high genetic variability and influence of environment on the expression of the traits. On the other hand fruit width, fruit weight of dry and green chilli, number of primary branches per plant and fruit length exhibited low variability. For all the traits though the phenotypic coefficient of variation (PCV) was higher than the corresponding genotypic coefficient of variation (GCV) both showed a close relationship indicating less influence of environment on the expression of these traits. The highest PCV (55.21) and GCV (55.18) were observed for dry fruit yield per plant followed by number of fruits per plant, fruit yield per plant and fruiting span indicating the possibility of obtaining high selection response in respect of these traits. Days to 50 per cent flowering showed the lowest coefficient of variation at both the levels. Fruit length exhibited nearly equal PCV and GCV values indicating least influence of environment on expression of these traits. In this condition effective selection can be made on the basis of phenotype alone with a good probability of success. Genotypic coefficient of variation along with heritability estimates were more reliable parameters to give better idea about the amount of advance to be expected in next generation (Burton 1952). The value of heritability (in broad sense) was found to be high for dry fruit yield per plant (99.90%), fruit weight of dry chilli (96.50%), fruit yield per plant (96.00%), number of fruits per plant (94.50%) and fruit length (92.80%). However it was recorded to be medium for fruiting span (89.30%), number of primary branches per

Table 1. Analysis of variance for growth yield and quality traits in chilli

		Source of variation		
		Replications	Genotypes	Error
Trait/DF		2	21	42
Plant height (cm) at	30	31.3	46.791*	5.5712
(DAT)	60	141.23	68.623*	11.031
	90	90.477	340.440*	33.328
	120	95.718	339.370*	35.142
# primary branches/	30	9.26	6.428*	0.316
plant at (DAT)	60	32.862	4.383*	0.637
Days to flower initiation		465.2	55.140*	9.292
Days to 50% flowering		572.79	47.714*	8.787
Days to first picking		318.924	497.417*	86.570
Fruiting span		51.651	1367.414*	52.476
Fruit length (cm)		13.264	20.697*	0.523
Fruit width (cm)		0.140	0.094*	0.005
# fruits/plant		38.674	36541.280*	698.587
Fruit weight of green chilli (g)		3.520	1.393*	0.082
Fruit weight of dry chilli (g)		0.016	0.101*	0.001
Dry fruit yield/plant (g)		19.982	2148.544*	0.828
Fruit yield per plot (kg)		26.090	10.096*	1.270

*Significant at 5% level

plant at 30 DAT (86.50%), fruit width (84.90%), fruit weight of green chilli (84.10%), plant height at 90 DAT (75.40%), plant height at 120 DAT (74.50%) and plant height at 30 DAT (71.10%). Low estimates of heritability were recorded for fruit yield per hectare (69.90%), fruit yield per plant (69.80%), number of primary branches per plant at 60 DAT (66.20%), plant height at 60 DAT (63.50%), days to flower initiation (62.50%), days to first picking (61.30%) and days to flowering (59.60%). Based on the estimate of heritability (in broad sense) expected genetic advance was computed. Due to masking influence of environment upon character concerned values of genetic advance exhibited high fluctuation. Therefore to attain relative comparison to the character in relation to environment genetic advance as per cent of mean was calculated to predict the genetic gain. The highest estimates of genetic advance as per cent of mean were recorded for dry fruit

Table 2. Estimates of genetic parameters for various characters in Chilli

Character		Grand mean	Range		PCV (%)	GCV (%)	Heritability (%)	Genetic advance	GA as % of mean
			Min	Max					
Plant height (cm)	30 DAT	14.16	8.73	26.00	30.97	26.12	71.10	6.44	45.49
	60 DAT	21.58	14.26	32.00	24.70	19.68	63.50	7.19	33.33
	90 DAT	39.67	22.06	67.73	29.35	25.49	75.40	18.10	45.63
	120 DAT	45.21	26.73	71.26	25.84	22.27	74.30	17.87	39.54
# primary	30 DAT	4.39	2.64	7.86	34.91	32.48	86.50	2.73	62.30
branches/plant	60 DAT	7.95	5.40	10.21	17.21	14.00	66.20	1.87	23.56
Days to flower initiation		48.43	41.66	53.66	10.95	8.63	62.20	6.35	13.11
Days to 50% flowering		57.32	50.33	65.33	8.13	6.28	59.60	5.73	10.00
Days to first picking		85.25	78.66	95.33	13.04	10.21	61.30	18.80	22.13
Fruiting span		88.47	76.67	108.99	37.05	35.01	89.30	40.75	46.07
Fruit length (cm)		8.31	3.65	11.89	32.25	31.06	92.80	5.14	61.91
Fruit width (cm)		0.95	0.70	1.43	19.35	17.82	84.90	0.32	34.42
# fruits/plant		289.05	160.67	653.33	38.90	37.81	94.50	218.86	75.72
Fruit weight (g) of green chilli		3.96	3.07	5.15	18.31	16.78	84.10	1.24	31.52
Fruit weight (g) of dry chilli		0.87	0.62	1.39	30.72	30.18	96.50	0.37	42.53
Dry fruit yield/plant (g)		39.84	14.23	59.7	55.21	55.18	99.90	55.08	138.27
Fruit yield/plant (g)		606.80	293.67	993.33	37.54	36.78	96.00	427.31	70.42
Fruit yield/plot (kg)		7.66	3.69	10.50	26.81	22.40	69.80	2.95	38.55
Fruit yield/ha (q)		85.10	40.99	116.66	26.81	22.42	69.90	32.83	38.58

yield per plant (138.27%), number of fruits per plant (75.21%), fruit yield per plant (70.42%) and number of primary branches per plant at 30 DAT (62.30%) and fruit length (61.91%), fruiting span (46.07%), plant height at 90 DAT (45.63%), plant height at 30 DAT (45.49%), fruit weight of dry chilli (42.53%), plant height at 120 DAT (39.54%), fruit yield per hectare (38.58%), fruit yield per plot (38.55%), fruit width (34.42%), plant height at 60 DAT (33.33%) and fruit weight of green chilli (31.52%) showed moderate values while number of primary branches per plant at 60 DAT (23.56%), days to first picking (22.13%), days to flower initiation (13.11%), days to 50 per cent flowering (10.00%) exhibited low genetic advance as per cent of mean. Heritability estimates together with genetic advance provide better response during selection than either of the parameters alone (Johnson et al 1955a). In the present study high genetic advance coupled with high heritability was obtained for number of fruits per plant, fruit yield per plant and dry fruit yield per plant indicating that individual plant selection could be effectively utilized for isolation of superior genotypes for these traits. High heritability with high genetic advance for number of fruits per plant was also reported by Munshi and Behera (2000), Gopalakrishnan et al (1987) and Bhavaji and Murthy (1982). High heritability with low genetic advance indicated that these traits were governed by non-additive gene and heterosis breeding would be effective for improvement of these traits.

Analysis of variance revealed highly significant variation for all the characters indicating greater variability in the existing material.

REFERENCES

Bhavaji JN and Murthy NS 1982. Selection indices for yield components in chilli (*Capsicum annuum* L). South Indian Horticulture **30:** 17-21.

Burton GW 1952. Quantitative inheritance in grasses. Proceedings of 6th International Grassland Congress **1:** 277-283.

Gopalakrishnan TR, Gopalakrishnan PK and Peter KV 1987. Variability in a set of chilli lines. Agricultural Research Journal of Kerala **25:** 1-4.

Hanson CH, Robinson HR and Comstock RS 1956. Biometrical studies of yield segregating populations of Korean lespedesa. Agronomy Journal **48:** 268-272.

Johnson HW, Robinson HF and Comstock RE 1955a. Estimates of genetic and environmental variability in soybeans. Agronomy Journal **47(7):** 314-318.

Johnson HW, Robinson HF and Comstock RE 1955b. Genotypic and phenotypic corelations in soybeans and their implications in selection. Agronomy journal **47(10):** 477-483.

Munshi AD and Behera TK 2000. Genetic variability, heritability and genetic advance for some traits in chillies (*Capsicum annuum* L). Vegetable Science **27:** 39-41.

Panse VG and Sukhatme PV 1967. Statistical methods for agricultural workers. 2nd edn, ICAR, New Delhi, India, 381p.

Received: 9.8.2014 ***Accepted: 27.10.2014***