



## Variability and Character Association in Chilli (*Capsicum annuum* L.)

**Key words :** Chilli, Correlation, Heritability, Path Analysis, Variability

Chilli is the most important spice cum vegetable grown in India with great export potential. The critical assessment of nature and magnitude of variability in the germplasm stock is one of the important pre-requisite for formulating effective breeding method as the genetic improvement of any crop depends on magnitude of genetic variability and the extent of heritability of economically important characters. Knowledge of inter-character relationship is very important in plant breeding for indirect selection. Therefore, field investigation was carried out with a view to study the correlation by assessing the chilli germplasm.

The studies were carried out at Regional Agricultural Research Station (RARS), Lam, Guntur during 2007-08. The basic material for the study involved 57 diverse chilli genotypes laid in three replications in randomized block design. Six weeks old seedlings were transplanted at spacing of 60 x 30 cm. Each treatment was considered as a plot and consisting of three rows of thirteen plants per row. The data were recorded on both quantitative and qualitative traits. Ten randomly selected plants were tagged in each genotype in each replication to record the following observations viz., plant height (cm), plant spread (cm), days to 50 % flowering, days to maturity, number of branches per plant, number of fruits per plant, 100-dry fruit weight (g), fruit length (cm), fruit girth (cm), number of seeds per fruit, 1000-seed weight (g), oleoresin (%), capsanthin (EOA colour value), capsaicin content (%) and dry fruit yield per plant (g). The quality characters were estimated at chilli quality control laboratory, RARS, Lam, Guntur. The data were statistically analyzed to estimate the genotypic and phenotypic correlation coefficients of various biometrical characters as per the procedure suggested by Singh and Choudhary (1977).

The genotypic and phenotypic coefficient of variation, heritability, genetic advance as per cent over mean for all the characters studied are presented in Table 1. The difference between phenotypic and genotypic coefficient of variation were found to be narrow for most of the characters,

suggesting that these traits are least affected by environment and selection for these traits on phenotypic value would be rewarding. For plant height, number of branches per plant, number of fruits per plant and 1000-seed weight the estimates of PCV were greater than GCV. Similar observations were reported in chilli by Shah *et al.* (1986).

In the present study, most of the characters exhibited high estimates of heritability except plant height and 1000-seed weight. The high estimates of heritability for oleoresin (97.85 %), capsaicin (97.12 %), capsanthin (96.93 %), dry fruit yield per plant (92.45 %), 100-dry fruit weight (91.09 %), fruit girth (88.56 %), number of seeds per fruit (86.61 %), plant spread (84.36 %), days to 50 % flowering (79.97 %), fruit length (79.53 %), days to maturity (75.75 %), number of fruits per plant (71.57 %) and number of branches per plant (63.0 %) suggested that selection will be effective for these characters. These results are in conformity with those of Sahoo and Mishra (1989).

In the present study, high heritability coupled with high genetic advance as per cent of mean was registered for plant spread, number of branches per plant, number of fruits per plant, 100-dry fruit weight, fruit length, fruit girth, number of seeds per fruit, oleoresin, capsanthin, capsaicin and dry fruit yield per plant except plant height and 1000-seed weight. These results indicate the preponderance of additive gene action component. Thus, there is an ample scope for improving these characters based on the direct selection. Similar observations were reported in chilli by Smitha and Basvaraja (2007), Ukkund *et al.* (2007) and Farhad *et al.* (2008).

Moderate heritability coupled with high genetic advance as per cent of mean was observed for 1000-seed weight implies equal importance of both additive and non-additive gene actions. High heritability coupled with low genetic advance as per cent of mean was recorded for days to 50% flowering and days to maturity. These are in conformity with the reports of Vijay Kumar (2007) and Farhad *et al.* (2008).

In most of the characters studied, the genotypic correlation coefficient was higher in

Table 1. Mean, variability, heritability ( $h^2_{(b)}$ ) and genetic advance as per cent of mean for yield and yield components in chilli (*Capsicum annum* L.)

Character	Range		Mean	Coefficient of variation		Heritability(%) (Broad sense)	Genetic advance as per cent of mean
	Minimum	Maximum		GCV(%)	PCV(%)		
Plant height(cm)	85.20	138.20	111.43	9.75	12.68	59.09	15.43
Plant spread (cm)	53.06	148.06	74.77	23.22	25.28	84.36	43.93
Days to 50% flowering	54.33	67.66	58.47	5.14	5.74	79.97	9.46
Days to maturity	117.33	140.00	125.09	4.50	5.17	75.75	8.07
No.of branches per plant	1.60	3.03	2.19	13.94	17.56	63.00	22.79
No.of fruits per plant	86.46	219.86	167.37	17.47	20.65	71.57	30.44
100-dry pod weight(g)	53.23	209.59	88.12	30.51	31.97	91.09	59.99
Fruit length(cm)	3.48	11.17	7.61	15.72	17.63	79.53	28.89
Fruit girth (cm)	2.18	7.31	3.71	23.05	24.49	88.56	44.68
No.of seeds per pod	32.46	86.06	54.10	24.43	26.25	86.61	46.84
1000-seed weight(g)	4.65	8.82	6.45	12.97	17.17	57.04	20.18
Oleoresin(%)	5.58	13.54	8.70	20.59	20.82	97.85	41.96
Capsanthin (EOA colour value)	15778.66	58946.33	38096.53	29.71	30.18	96.93	60.26
Capsaicin(%)	0.15	0.56	0.31	29.53	29.97	97.12	59.96
Dry fruit yield per plant(g)	166.66	933.33	454.67	43.02	44.74	92.45	85.20

PVC : Phenotypic coefficient of variation GCV: Genotypic coefficient of variation

magnitude than the phenotypic correlation coefficient indicating a strong inherent association among these characters which may be ascribed to the low effect of environment on the character association (Table 2). The phenotypic and genotypic associations of dry fruit yield per plant were significantly positive with all the characters except days to 50 % flowering, days to maturity, number of branches per plant, 100-dry fruit weight, 1000-seed weight, oleoresin, capsanthin and capsaicin contents. The dry fruit yield per plant had significant positive correlation with plant height, fruit length, number of seeds per fruit, fruit girth, number of fruits per plant and plant spread. Chatterjee *et al.* (2007), Singh *et al.* (2007), Vijay Kumar (2007), Sivanageswara Rao *et al.* (2006) and Ahmed *et al.* (2006) reported similar results. Number of fruits per plant showed significant and positive correlation with fruit length. Similar results are reported by Sivanageswara Rao *et al.* (2006) and Vijay Kumar (2007).

Fruit length exhibited significant and positive correlation with plant height, number of fruits per plant, dry fruit yield per plant, capsanthin and capsaicin contents. These findings are in consonance with Sivanageswara Rao *et al.* (2006) and Chatterjee *et al.* (2007). Number of seeds per fruit showed significant and positive correlation with

days to 50 % flowering, days to maturity, 100-dry fruit weight, oleoresin and dry fruit yield per plant. Similar results were observed by Sivanageswara Rao *et al.* (2006) and Chatterjee *et al.* (2007). Fruit girth showed significant and positive correlation with 1000-seed weight, capsanthin, 100-dry fruit weight and dry fruit yield per plant. Similar results were also reported by Sivanageswara Rao *et al.* (2006). The plant height exhibited significant and positive correlation with plant spread, days to maturity, number of branches per plant, number of fruits per plant and fruit length both at phenotypic and genotypic levels in conformity with Venkata Reddy (1997), Sivanageswara Rao *et al.* (2006), Chatterjee *et al.* (2007) and Vijay Kumar (2007).

Correlation studies suggested that during selection more emphasis should be given on plant height, plant spread, number of fruits per plant, fruit length, fruit girth and number of seeds per fruit as these characters have high positive correlation with dry fruit yield per plant. Therefore, direct selection on the basis of these traits could be very effective to develop high yielding genotypes. Thus the present study revealed that the wealth of variability available in the chilli crop offers good prospects for improvement of dry/ fruit yield in future.

Table 2. Phenotypic (above diagonal) and genotypic (below diagonal) correlation coefficients for 15 characters in 57 chilli (*Capsicum annuum* L.) genotypes.

Characters	Plant height	Plant spread	Days to 50% flowering	Days to Maturity	No. of branches per plant	No. of fruits per plant	100-dry pod weight	Fruit length	Fruit girth	No. of seeds per pod	1000-seed weight	Oleo-resin	Capsanthin (EOA colour value)	Capsaicin	Dry fruit yield per plant
Plant height	–	0.15*	-0.08	-0.02	-0.22**	0.17*	0.08	0.17*	0.01	0.11	0.11	0.11	0.00	0.04	0.24**
Plant spread	0.19*	–	-0.05	-0.08	-0.00	-0.27**	-0.03	0.03	-0.76	0.03	-0.00	-0.12	0.07	-0.22**	0.16*
Days to 50% flowering	-0.06	-0.05	–	0.96**	-0.26**	0.00	0.12	0.077	-0.13	0.15*	-0.15*	-0.01	-0.26**	0.07	-0.05
Days to maturity	-0.00	-0.10	0.98**	–	-0.25**	0.05	0.15*	0.05	-0.11	0.16*	-0.12	0.02	-0.24**	0.05	-0.03
No. of branches per plant	-0.40**	-0.05	-0.31**	-0.30**	–	0.02	0.01	-0.02	0.12	-0.12	0.08	0.16*	0.15*	-0.15*	-0.12
No. of fruits per plant	0.14	-0.39**	-0.01	0.02	0.05	–	-0.08	0.18*	0.05	0.11	0.06	0.02	0.02	0.04	0.15*
100-dry pod weight	0.09	-0.05	0.11	0.15*	0.02	-0.08	–	0.11	0.33**	0.15*	0.47**	0.11	0.15*	-0.30**	-0.05
Fruit length	0.21**	0.02	0.05	0.046	-0.02	0.22**	0.12	–	-0.08	0.14	-0.05	0.09	0.19*	0.16*	0.29**
Fruit girth	0.01	-0.09	-0.18*	-0.16*	0.14	0.02	0.36**	-0.09	–	0.04	0.33**	-0.05	0.16*	-0.15*	0.18*
No. of seeds per pod	0.12	0.02	0.18*	0.21**	0.16*	0.17*	0.17*	0.16*	0.04	–	0.10	0.25**	0.04	-0.13	0.25**
1000-seed weight	0.16*	-0.06	-0.21**	-0.18*	0.17*	0.08	0.65**	-0.13	0.48**	0.12	–	0.07	0.15*	-0.28**	-0.05
Oleoresin	0.14	-0.14	-0.01	0.02	0.22**	0.01	0.12	0.10	-0.06	0.27**	0.09	–	-0.06	-0.12	-0.03
Capsanthin (EOA colour value)	-0.00	0.08	-0.31**	-0.30**	0.22**	0.02	0.16*	0.21**	0.18*	0.05	0.19*	-0.06	–	-0.14	0.14
Capsaicin	0.13	-0.24**	0.09	0.06	-0.19*	0.06	-0.31**	0.20**	-0.16*	-0.13	-0.41**	-0.12	-0.15*	–	-0.05
Dry fruit yield per plant	0.35**	0.19*	-0.06	-0.04	-0.15*	0.20**	-0.06	0.35**	0.20**	0.27**	0.11	-0.04	0.14	-0.06	–

\* = Significant at 5% level \*\* = Significant at 1% level

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