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Assessment of Genetic Variability, Character Association and Path Coefficient of Some Quantitative Traits of Chilli

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A B S T R A C T

Chilli (*Capsicum annuum* L) is one of the most important cum vegetable spice crop grown in India with great export potential. The exoeriment was undertaken to study the variability, genetic correlations and path coefficients of yielding traits in 24 genotypes of chilli. The analysis of variance revealed the significant differences among the genotypes for almost all the characters studied which indicating that presence of great deal of genetic variability for different traits. Among these genotype Hyb-3(2)-2 one of the most promising one showed maximum fruit yield plant^{-1}, fruit length, fruit girth and pericarp thickness. Genetic variability of fruit yield plant^{-1}, number of fruits plant^{-1}, fruit girth and seeds fruit^{-1} emerged as most reliable characters for selection because of their probable conditioning by the additive gene action. Moderate GCV coupled with high broad sense heritability and moderately high genetic advance was registered in three characters namely fruit yield plant^{-1}, number of fruits plant^{-1}, fruit girth and seeds fruit^{-1}. Character associations both correlation and path co-efficient revealed that fruit weight, number of fruits plant^{-1}, primary branches plant^{-1}and plant canopy were the most important selection criteria for improving yield of both green and dry chilli.

Introduction

Chilli (*Capsicum annuum* L.) mainly used for its pungency and pleasant flavor and one of the most important vegetable and condiment crop having immense commercial and therapeutic value. Consumption of small amount of chilli enriches diet and considered as of minerals, vitamins and other food components (Farhad *et al.*, 2010). Both green and dry chillies are one of the rich sources of Vitamin A and C and the seeds contain traces of starch. Capsaicin and oleoresin are also used in many pharmaceutical preparations like pain balms, vapor linements, skin ointments and ointment for cold, sore throat, chest congestion etc. India is now one of the leading chilli producing and is the largest exporter countries in the world and at present 2.5 to 3.0% of the total production of India is exported. In spite of its nutritive, commercial, pharmaceutical as well export values, India is

still lagging far behind to attain the average productivity of chilli in the world (14.4 t green chilli/ha). Huge advantage of wide cultivation and presence of huge quantum of genetic diversity could not so far been capitalized. Therefore, much concerted efforts are necessary to improve its yield and yield attributes. Chilli cultivars are generally distinguished on the basis of morphological traits and have a wide variability of botanical characteristics. The existence of variability in a particular trait is an important prerequisite for its heritable improvement. High yield with good quality is the most important objective in chilli breeding. The progress in breeding for yield and its contributing characters of any crop is polygenically controlled, environmentally influenced and determined by the magnitude and nature of their genetic variability (Wright,1935 and Fisher, 1981). The magnitude of heritable variation of the genetic components is very important to understand their genetic constitution which has a close bearing on its response to selection. Study of correlation between different quantitative characters provides an idea of association that could be effectively utilized in selecting a better plant type in chilli breeding programme. Correlation in grouping with path analysis would give a better insight into cause and effect relationship between different pairs of characters (Jayasudha and Sharma, 2010). Partitioning of total correlation into direct and indirect effect by path analysis helps in making the selection more effective (Priya and Joel, 2009). A significant association suggests that such characters could be improved simultaneously. However, such an improvement depends on phenotypic correlation, additive variance and heritability (Hayes *et al.*, 1955). It is necessary to have a good knowledge of those characters that have significant association with yield because the characters can be used to direct selection criteria or indices to enhance performances of varieties in a new plant population. Considering the importance of chilli on these aspects the present investigation was taken up to evaluate chilli germplasm to identify genotypes with higher yield by study these genetic parameters as well as to determine interrelationship among the characters and their direct and indirect effects on yield which would be utilized for further improvement of chilli through appropriate breeding programs.

Materials and Methods

The field experiments were carried out at Central Research Farm, Gayeshpur, Bidhan Chandra Krishi Viswavidyalaya, Nadia, West Bengal, lying at $22^0 57' N$ latitude and $88^0 20' E$ longitude with an average altitude of 9.75 m above the mean sea level. It comes under Gangetic new alluvial plain of sandy loam soil with neutral to slight acidity. The experimental site is situated under sub-tropical humid region with an average temperature range of 25–37 ^{0}C during summer to 12–25 ^{0}C during winter months. Field experiments were carried out over the period of three season and Twenty four genotypes (Table 1) were evaluated in Randomized Complete Block Design with three replications. Each plot consisted of 20 plants spaced by 50 cm x 50 cm. Standard crop management practices and plant protection measures were taken time to time. Ten randomly selected plants from each replication were taken to record the following quantitative observations. Quantitative character were recorded such as plant height, plant canopy widtht, primary branches, plant^{-1}, days to flowering, fruits plant^{-1}, fruit length (cm), fruit grith (cm), seed fruit^{-1}, fruit weight (gm), pericarp thickness, fruit pedicel length cm, pedicel/fruit ratio, dry weight of ripe fruit and fruit yield plant^{-1}. The genotypic and phenotypic coefficient of variation (GCV and PCV respectively) was calculated on the basis of formula given by Burton (1952).

Heritability in broad sense was calculated according to the formula suggested by Jhonson *et al.,* (1955). Genotypic correlation coefficients were estimated using the formula suggested by Singh and Chaudhury (1979), Johnson *et al.,* (1955) and Al-Jibouri *et al.,* (1958). Path coefficients analysis was done according to the method suggested by Dewey and Lu (1959). All the statistical analysis was carried out using Genres computer software.

Results and Discussion

Genetic variability for yield components of chilli

Analysis of variance revealed significant differences among the genotypes for almost all the characters except fruit length, fruit weight and pedicel/ fruit ratio (Table 1). The wide range of variation noticed in all the characters would offer scope of selection for improvement of desirable types. The extent of variability present in the genotypes was measured in terms of range, coefficient of variation, genotypic coefficient of variation (GCV), phenotypic coefficient of variation (PCV), broad sense heritability and genetic advance (GA). It was found that moderate to high range of variation was recorded in all characters, indicating better scope for improvement through selection. Mean growth, fruit characters and fruit yield of the 24 varieties (Table 2) showed quite a good genotypes among the varieties for almost all the 14 characters, indicating the suitability of the genotypes for carrying out the study of genetic variability for different characters. Fruit length is the most important character of chilli particularly for export purpose. Top five genotypes for long and attractive fruits were viz., AC-173 (10.47), AC-571 (10.45), Hyb-3(2)-3 (10.22), AC-575 (9.9 cm) and Hyb-3(2)-1 (9.06 cm). Fruit yield appeared to a cumulative character of fruit number plant^{-1}, fruit length and fruit weight. The highest fruit yielding genotypes *viz.*, Hyb-3(2)-2, Hyb-3(2)-1, AC-571 had long fruit and of the other two genotypes, AC-573 had medium long fruit and AC-575 had medium fruit length. Hence, all these genotypes hold ample promise to be regarded as a promising variety for green chilli purpose.

The coefficient of variation estimated was low to moderate for plant height, plant canopy, days to first flowering, primary branches plant^{-1}and pedicel length and moderately high to very high for fruits plant^{-1}, fruit length, fruit girth, seeds fruit^{-1}, pericarp thickness, pedicel: fruit ratio and both green and ripe fruit yield plant^{-1} (Table 3). Both phenotypic coefficient of variation (PCV) and genotypic coefficient of variation (GCV) showed wide differences for the characters particularly, fruit girth, fruit weight and pericarp which indicated marked genotype-fruit harvest interaction for the expression of these characters. Highest mean genotypic coefficient of variation was recorded for fruit yield plant^{-1} followed by fruits plant^{-1} and fruit weight. In the present investigation fruit yield plant^{-1}, fruits plant^{-1}, fruit length, fruit girth and fruit weight showed high GCV. The high broad sense heritability (80% and above) was recorded for the characters namely, fruit yield plant^{-1}, plant height, plant canopy, days to first following, fruits plant^{-1}, seeds fruit^{-1} and pedicel length (Table 3). High genetic advance as percentage of mean considering for fruit yield plant^{-1} (86.80%), number of fruits plant^{-1} (72.48%), fruit girth (70.53 %) and seeds fruit^{-1} (62.71 %).

Character association and path co-efficient analysis

Selection of a character for its improvement may simultaneously lead to selection of the associated characters. Therefore, it is essential to understand the inter-relationship among

different characters so that improvement of the targeted character does not carry with it the non-targeted characters rather desirable characters could be simultaneously included which may lead to ultimate success on breeding programme. Genotypic (G) and phenotypic (P) correlation coefficients among the pair of yield contributing characters pertaining to chilli (Table 4) have been presented. The fruit yield plant^{-1} was significantly and positively correlated consistently with days to first flowering (rP = 0.492), number of fruits plant^{-1} (rP = 0.694) and seeds fruit^{-1} (rP = 0.627). Fruit length was significantly and positively correlated with fruit girth and fruit weight indicating that with fruit length may increase concomitantly with the increase in fruit girth and weight. Number of fruits plant^{-1} was positively and significantly correlated with seeds fruit^{-1}.

The path coefficient analysis using phenotypic correlation coefficient among pair of characters depicting direct and indirect effect on yield chilli did not change considerably with the harvest pattern of the fruits (Table 5). Highest positive direct effect on yield was registered by fruit weight (0.824), number of fruits plant^{-1} (0.630) followed by primary branches plant^{-1} (0.435) and plant canopy (0.147). Of these three characters, only fruits plant^{-1} had significant and positive correlation with fruit yield which indicated that linear correlation did not always suggest that the character would exert high and positive direct effect on the dependent variable, yield in this investigation. From the study of character association, combining correlation and path co-efficient, the characters namely, fruit weight, number of fruits plant^{-1}, primary branches plant^{-1} and plant canopy were the most important selection criteria for improving fruit yield of chilli.

The wide range of variation noticed in all the characters would offer scope of selection for improvement of desirable types. Significant variations in the mentioned characters in chilli genotypes were earlier reported by Gogoi *et al*., (2002), Chowdhary and Samadia (2004) and many other workers. In the present investigation fruit yield plant^{-1}, fruits plant^{-1}, fruit length, fruit girth and fruit weight showed high GCV and this finding was supported by Choudhary and Samadia (2004) and Rani *et al.* (1996). The high broad sense heritability (80% and above) was recorded for the characters namely, fruit yield plant^{-1}, plant height, plant canopy, days to first following, fruits plant^{-1}, seeds fruit^{-1} and pedicel length (Table 3) which confirmed the earlier findings of Choudhary and Samadia (2004), Rani *et al*., (1996). High estimates of broad sense heritability in the quantitative characters has been found to be useful from plant breeders view point as this would enable him to base his selection on the phenotypic performance.

High genetic advance as percentage of mean considering for fruit yield plant^{-1} (86.80%), number of fruits plant^{-1} (72.48%), fruit girth (70.53 %) and seeds fruit^{-1} (62.71 %) were in also conformity with the findings of Chowdhary and Samadia (2004). Johnson *et al*., (1955) had suggested that heritability estimates along with genetic gain is usually more helpful than the heritability alone in predicting the resultant effect for selecting best individuals. So these two genetic parameters must be considered together to predict the expected genetic progress possible through selection. In the present investigation, moderate GCV coupled with high broad sense heritability and moderately high genetic advance was registered in three characters namely fruit yield plant^{-1}, number of fruits plant^{-1}, fruit girth and seeds fruit^{-1}. Report on the combination of these genetic variability estimates for these characters was supported by earlier finding of Acharyya *et al*., (2003), Manju and Sreelathakumary (2002).

Table.1 Analysis of variance for different component characters of chilli

Characters	Mean sum of squares		
	Genotypes	Replication	Error
Plant height	112.648**	3.51	5.69
Plant canopy(N-S)	76.79**	0.29	4.49
Plant canopy(E-W)	80.44**	0.66	5.40
Days to first flowering	73.86**	1.52	4.69
Primary branches/ plant	5.74**	0.41	0.64
Fruits/plant	824.66**	51.09	57.28
Fruit length	76.60NS	29.22	39.03
Fruit girth	5.76**	0.57	0.55
Seeds/fruit	1346.50**	7.98	57.47
Fruit weight	58.50NS	49.03	46.45
Pericarp thickness	0.61**	0.18	0.18
Pedicel length	0.36**	0.02	0.03
Pedicel:fruit ratio	0.13NS	0.17	0.14
Fruit yield	31131.01**	1924.50	1832.55

Table.2 Mean of different yield component characters of chilli

Genotype	Plant height (cm)	Plant Canopy (N-S) (cm)	Plant canopy (E-W) (cm)	Days to first flowering	Primary branches/ plant	Fruits/ plant	Fruit length (cm)	Fruit girth (cm)	Seeds/ fruit	Fruit weight (g)	Pericarp thickness (mm)	Pedicel length (cm)	Pedicel : fruit ratio	Fruit Yield/plant (g)
Hyb-3(2)-3	48.10	44.37	44.30	51.30	3.80	41.53	10.22	5.12	38.44	8.31	3.36	3.12	1.27	244.22
Hyb 3(2)-1	39.27	39.43	31.27	50.27	6.33	54.13	9.06	4.53	96.33	8.47	2.18	2.53	0.28	428.67
KDCS 810	38.83	36.33	33.13	38.83	10.37	37.17	6.82	3.68	78.50	6.45	1.96	2.59	0.39	117.61
Pant C-1	38.23	29.90	32.20	35.43	6.23	72.60	5.17	2.91	77.37	4.76	1.57	2.72	0.54	228.30
AC571	30.23	32.23	37.23	45.43	7.17	50.82	10.45	3.96	75.63	8.88	1.45	2.82	0.27	343.20
AC173	37.23	39.23	33.13	33.43	6.63	58.87	10.47	3.52	65.30	5.26	1.97	3.15	0.30	254.98
AC501	38.13	36.83	37.43	34.70	7.20	34.47	5.66	2.48	38.60	5.44	1.63	2.86	0.52	117.65
BC-4	46.23	35.27	29.63	34.23	7.83	16.30	3.92	3.01	43.33	7.31	1.77	2.47	0.68	74.76
BCC 54	47.93	41.43	29.90	38.23	8.67	20.27	7.74	2.98	53.83	6.84	1.41	3.47	0.45	81.85
AC 587	43.17	40.17	40.80	36.87	10.23	63.57	8.13	2.67	76.13	5.50	1.50	3.18	0.40	249.57
HP25	29.27	35.10	40.40	37.40	5.47	13.83	8.28	3.09	31.40	8.50	2.36	3.15	0.38	135.72
HP 29	29.13	30.20	27.40	37.80	6.57	19.27	8.36	3.11	37.83	8.64	2.42	2.81	0.34	124.19
HP 27	27.23	34.43	27.27	33.27	7.20	17.40	8.97	1.67	42.80	7.25	2.46	2.79	0.31	157.97
AC 576	39.87	38.17	34.73	40.30	8.20	44.30	7.48	0.53	51.83	6.79	1.85	2.34	0.32	210.52
PBC 374	32.70	26.70	28.73	42.23	6.43	26.20	8.15	1.41	43.60	7.63	2.43	2.07	0.26	161.28
AC 573	45.27	36.30	39.77	38.57	6.97	64.27	9.62	3.13	78.63	5.68	1.83	3.42	0.36	305.11
AC-585	36.43	33.23	35.43	40.83	6.70	55.80	6.81	3.45	61.60	7.56	1.59	2.57	0.38	246.31
AC-575	40.17	41.17	38.83	38.57	7.17	42.70	9.90	4.38	90.13	8.85	2.44	2.82	0.29	294.43
KA-2-1	32.23	28.23	24.83	37.17	8.30	48.47	8.32	3.68	112.80	7.98	1.86	3.20	0.39	273.44
Hyb 3(2)-2	42.13	35.33	36.27	44.13	7.30	48.70	9.83	4.32	85.43	9.58	1.75	2.74	0.28	437.36
BCC 62	41.97	23.77	28.77	37.93	6.63	34.57	8.32	3.56	75.60	5.65	1.81	3.12	0.38	157.27
LCA 235	42.13	30.43	27.27	32.83	6.70	46.27	5.49	2.94	55.87	6.39	1.71	2.79	0.53	150.18
AC 615	44.47	39.27	34.87	34.27	8.43	28.47	6.42	2.98	67.43	6.45	1.55	3.10	0.49	89.90
AC 574	33.17	35.81	37.93	35.20	7.47	46.23	8.71	4.17	56.37	6.87	2.09	3.29	0.38	280.26
S.Em (±)	**1.95**	**1.73**	**1.91**	**1.77**	**0.65**	**6.81**	**5.11**	**0.61**	**6.91**	**5.57**	**0.34**	**0.15**	**0.30**	**34.95**
C.D.(P = 0.05)	**3.94**	**3.49**	**3.86**	**3.58**	**1.31**	**13.76**	**10.32**	**1.23**	**13.96**	**11.25**	**0.69**	**0.30**	**0.61**	**70.60**

Table.3 Genetic variability parameters for different yield component characters of chilli

Component of variation / Characters	Mean	Coefficient of variation(C.V.) %	PCV (%)	GCV (%)	Heritability (%)	Genetic Advance (GA)	Genetic Advance (% of Mean)
Plant height	38.48	6.19	16.71	15.52	86.2	11.42	29.68
Plant canopy(N-S)	35.14	6.03	15.22	13.97	84.3	9.28	26.41
Plant canopy(E-W)	33.81	6.87	16.31	14.79	82.3	9.34	27.62
Days to first flowering	38.72	5.59	13.60	12.40	83.1	9.02	23.30
Primary branches/ plant	7.25	11.02	21.09	17.98	72.7	2.29	31.59
Fruits/plant	41.09	18.41	43.06	38.92	81.7	29.78	72.48
Fruit length	8.89	30.29	80.79	39.82	24.3	3.59	40.39
Fruit girth	3.35	22.209	45.2	39.37	75.9	2.36	70.53
Seeds/fruit	63.95	11.8548	34.51	32.41	88.2	40.1	62.71
Fruit weight	6.26	20.89	113.58	32.04	08.00	1.16	18.55
Pericarp thickness	1.96	21.547	28.93	19.3	44.5	0.52	26.58
Pedicel length	2.88	6.337	13.16	11.53	76.8	0.6	20.84
Pedicel:fruit ratio	0.43	26.46	86.79	7.45	7.50	0.01	2.36
Fruit yield	215.20	19.893	50.05	45.92	84.2	18.68	86.80

Table.4 Genotypic (G) and Phenotypic (P) correlation of chilli for yield and its attributing traits

Characters		Plant height	Plant canopy (N-S)	Plant Canopy (E-W)	Days to first flowering	Primary branches/ plant	Fruits/ plant	Fruit length	Fruit girth	Seeds/fruit	Fruit weight	Pericarp thickness	Pedicel length	Pedicel: fruit ratio	Fruit yield
Plant height	**P**	1.000	0.497**	0.307	0.204	0.089	0159	0169	0268	0119	0073	-0125	0179	0301	-0055
	G	1000	0451	0235	0087	0150	0205	0278	0313	0127	0082	-0228	0233	3201	-0048
Plant canopy (N-S	**P**		1.000	0.644**	0.298	0.053	0046	0307	0320	-0062	0241	0178	0202	0212	0097
	G		1000	0.597	0.177	0.127	0075	0563	0363	-0082	0698	0191	0300	2020	0148
Plant Canopy (E-W)	**P**			1.000	0.385	-0.174	0251	0357	0390	-0077	0284	0179	0241	0201	0257
	G			1000	0.300	-0.157	0324	0670	0451	-0108	0877	0174	0307	1861	0344
Days to first flowering	**P**				1.000	-0.347	0144	0448**	0503**	0161	0414	0337	-0215	0156	0492**
	G				1000	-0.393	0199	0897	0600	0187	1380	0446	-0231	1276	0622
Primary branches/ plant	**P**					1.000	0135	-0592**	-0502**	0365	-0638**	0603**	-0131	-0492**	-0064
	G					1000	-0043	-0531	-0390	0324	-0913	-0598	-0028	-0801	-0265
Fruits/ plant	**P**						1000	-0179	0089	0643**	-0334	-0382	0190	-0308	0694**
	G						1000	0360	0293	0599	0220	-0230	0042	1238	0666
Fruit length	**P**							1000	0771**	-0238	0951**	0732**	-0048	0806**	-0007
	G							1000	0827	-0032	0964	0703	0577	-0070	0602
Fruit girth	P								1000	0083	0709**	0529**	0170	0619**	0231
	G								1000	0259	1027	0408	0442	2107	0488
Seeds/fruit	P									1000	-0325	-0359	0181	-0372	0627**
	G									1000	-0234	-0312	0089	-1184	0617
Fruit weight	P										1000	0773**	-0183	0852**	-0057
	G										1000	1108	0686	-3468	0998
Pericarp thickness	P											1000	-0212	0559**	-0084
	G											1000	0000	-0133	0159
Pedicel length	P												1000	-0147	0080
	G												1000	2799	-0051
Pedicel: fruit ratio	P													1000	-0338
	G													1000	-0273
Fruit yield	G														0434
	P														1.000
	G														1000

* and ** Significant at 5% level and 1% level respectively

Table.5 Phenotypic path coefficient analysis for chilli yield as dependent variable

Characters	Type	Plant height	Plant canopy (N-S)	Plant Canopy (E-W)	Days to first flowering	Primary branches/ plant	Fruits/ plant	Fruit length	Fruit girth	Seeds/fruit	Fruit weight	Pericarp thickness	Pedicel length	Pedicel: fruit ratio	Fruit yield
Plant height	Ripe	**0.288**	0.073	0.012	0.089	0.006	0.100	0.143	0.000	0.032	0.060	0.004	0.029	0.015	-0.055
Plant canopy (N-S)	Ripe	0.143	**0.147**	0.026	0.130	0.003	0.029	0.260	0.001	0.017	0.198	0.005	0.032	0.004	0.097
Plant Canopy (E-W)	Ripe	0.088	0.095	**0.040**	0.167	0.011	0.158	0.302	0.001	0.021	0.234	0.005	0.039	0.000	0.257
Days to first flowering	Ripe	0.059	0.044	0.016	**0.435**	0.022	0.090	0.379	0.001	0.043	0.341	0.010	0.034	0.007	0.492
Primary branches/ plant	Ripe	0.026	0.008	0.007	0.151	**0.064**	0.085	0.500	0.001	0.098	0.526	0.018	0.021	0.000	-0.064
Fruits/ plant	Ripe	0.046	0.007	0.010	0.062	0.009	**0.630**	0.151	0.000	0.173	0.275	0.012	0.031	0.009	0.694
Fruit length	Ripe	0.049	0.045	0.014	0.195	0.038	0.113	**0.845**	0.001	0.064	0.784	0.022	0.008	0.003	-0.007
Fruit girth	Ripe	0.077	0.047	0.016	0.219	0.032	0.025	0.652	**-0.002**	0.022	0.584	0.016	0.027	0.005	0.231
Seeds/fruit	Ripe	0.034	0.009	0.003	0.070	0.023	0.405	0.201	0.000	**0.269**	0.268	0.011	0.029	0.006	0.627
Fruit weight	Ripe	0.021	0.035	0.011	0.180	0.041	0.210	0.804	0.001	0.087	**0.824**	0.024	0.029	0.004	-0.057
Pericarp thickness	Ripe	0.036	0.026	0.007	0.146	0.038	0.241	0.619	0.001	0.097	0.637	**0.030**	0.034	0.000	-0.084
Pedicel length	Ripe	0.052	0.030	0.010	0.093	0.008	0.120	0.041	0.000	0.049	0.151	0.006	**0.160**	0.001	0.080
Pedicel: fruit ratio	Ripe	0.171	0.024	0.000	0.109	0.000	0.210	0.109	0.000	0.058	0.118	0.000	0.006	**0.026**	0.484

Residual effect = 0.200

Generally high GCV coupled with high broad sense heritability and genetic advance is attributable to additive gene action controlling the concerned characters (Panse, 1957), so early generation selection would be helpful for improving the characters like, fruit yield plant^{-1}, number of fruits plant^{-1}, fruit girth and seeds fruit^{-1}. Very low heritability accompanied with very low to moderately low genetic advance was recorded for fruit length, fruit weight, pericarp thickness and pedicel: fruit ratio indicating less responsiveness of these characters to selection. Improvement of these characters needs selection over several successive years, preferably across locations and over different plantings because such association of genetic parameters may be attributed to non-additive gene action (Liang and Walter, 1998) and high genotype-environment interaction, hence, simple selection will not be rewarding.

The correlation coefficients at genotypic level were in general higher than phenotypic correlation values. Higher genotypic correlations than phenotypic ones might be due to modifying or masking effect of environment in the expression of these characters under study as explained by Nandpuri *et al*., (1973). Johnson *et al.*, (1955) also reported that higher genotypic correlation than phenotypic correlation indicated an inherent association between various characters. The findings on the positive direct effect of the fruit weight (0.824), number of fruits plant^{-1} (0.630) followed by primary branches plant^{-1} (0.435) and plant canopy (0.147) on yield were supported by earlier works of Jabeen *et al.*, (1999), and Jose *et al.*, (2002). Significance of these characters as important selection indices was also suggested by earlier workers such as Devi *et al.*, (1999), Kataria *et al.*, (1997), Rani (1996) and Das *et al*,. (2000).

In conclusion, among these genotype Hyb-3(2)-2 one of the most promising one showed maximum fruit yield plant^{-1}, fruit length, fruit girth and pericarp thickness. Genetic variability of fruit yield plant^{-1}, number of fruits plant^{-1}, fruit girth and seeds fruit^{-1} emerged as most reliable characters for selection because of their probable conditioning by the additive gene action. Moderate GCV coupled with high broad sense heritability and moderately high genetic advance was registered in three characters namely fruit yield plant^{-1}, number of fruits plant^{-1}, fruit girth and seeds fruit^{-1}. From the study of character associations both correlation and path co-efficient, the characters, namely, fruit weight, number of fruits plant^{-1}, primary branches plant^{-1}and plant canopy were the most important selection criteria for improving yield of chilli.

References

Acharyya, P., Rajput, C.B.S., and Acharyya, P. 2003. Variability and correlation studies for different traits in capsicum with respect to leaf curl complex. Indian J. Hort. 60 : 381-87.

Al-Jibouri, H. A., Miller, A., and Robinson, H. F. 1958. Genotypic and environmental variation and correlation in upland cotton cross of interspecies origin. Agron. J. 50: 633-37.

Burton, W.G. 1957. The influence of sprout development at planting on subsequent growth and yield. The growth of potato. Proc. of Tenth Easter School in Agril. Sci., Univ. of Nottingham, 1963. Butter Worths, London. pp. 21-29.

Choudhary, B.S., and Samadia, D.K. 2004. Variability and character association in chilli land races and genotypes under arid environment. Indian J. Hort. 61 : 132-36.

Das, M,. Behra, T.K., and Singh, G. 2000. Correlation and path coefficient analysis in chilli. Indian J. Hort. 57: 157-59.

Devi, D.S., Arumugam, R., and Devi, D.S. 1999. Correlation and path co-efficient

analysis in chilli (*C. annuum* L.). Crop Res. 17: 90-93.

Fisher, R.A. 1981. The correlation among relative on the supposition of Mendelian Inheritance. Trans. Royal Soc. Edinberg.

Gogoi, D., Gautam, B.P., and Gogoi, D. 2002. Variability, heritability and genetic advance in chilli. Agric. Sci. Digest. 22: 102–104.

Hayes, H.K., Forrest, R.I., and Smith, D.C. 1955. Methods of plant Breeding correlation and regression in relation to plant breeding. McGrow - Hill Company Inc. 2nd Ed. pp. 439–57.

Jabeen, N., Ahmed, N., Tanki, M.I., and Jabeen, N. 1999. Genetic variability in hot pepper (*C. annuum* L.). Appl. Bio. Res. 1: 87-89.

Jayasudha, S., and Sharma, D. 2010. Genetic parameters of variability, correlation and pathcoefficient for grain yield and physiological traits in Rice (*Oryza sativa* L.) under shallow lowland situation. Electronic J. Plant Breed. 1: 33-38

Johnson, H.W., Robinson, H.F., and Comstock, R.E. 1955. Estimation of genetic and environmental variability in soybean. Agron. J. 47:314-18.

Jose,,L., Khader, K.M.A., and Jose, L. 2002. Correlation and path co-efficient analysis in chilli. Capsicum Egg plant Newsletter. 21 : 56-59.

Kataria, G.J., Pandey, H.M., and Vaddaria, M.A. 1997. Genetic variability, heritability and genetic advance of various polygenic traits in capsicum. Gujarat Agric. Univ. Res. J. 22 : 18-21.

Liang, G.H.L., and Walter, T.H. 1968. Heritability estimates and gene effects for agronomic traits in grain sorghum (*Surghum vulgare*). Crop Sci. 8: 77-80.

Manju, P.R., and Sreelathakumary, I. 2002. Genetic variability, heritability and genetic advance in hot chilli (*Capsicum chinense* Jacq).). J. Trop. Agric. 40:4-6.

Nandpuri, K.S., Singh, S., and Lal, T. 1973. Studies on genetic variability dnd corrcolatlon of some economic characters in tomato. J. Res. Punjab Agrie. Univ. 10: 316 -321.

Panse, V.G. 1957. Genetics of quantitative characters in relation to plant breeding. Indian J. Genet. 28: 225-29.

Pawade, S.B., Sontake, M.B., Shinde, N.N., and Borikar, S.T. 1995. Studies on correlation and path analysis for some characters in local chilli (*C. annuum* L.) types form Nagpur district. PKV. Res. J. 19 : 93-94.

Priya, A.A., and Joel, A.J. 2009. Grain yield response of rice cultivars under upland condition, Electronic J. Plant Breed. 1: 6-11.

Rani, P.U., and Singh, D.P. 1996. Variability, heretability and genetic advance in chilli (*C. annuum* L). J. Res. APAU. 24 : 1-8.

Singh, R.K., and Choudhary, B.D. 1979. Biometrical Methods in Quantitative Genetic Analysis. Revised ed. Kalyani Publishers, New Delhi. pp. 57.

Wright, S. 1935. The analysis of variance and correlations between relative with respect to deviations from an optimum. J. Genet. 30: 243-256.

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