

## Variability parameters for quantitative and qualitative traits in sweet pepper in mid hills of western himalaya

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**Abstract :** Variability parameters studies including mean, genotypic and phenotypic variances, coefficients, genetic advance and genetic gain for quantitative and qualitative traits in sweet pepper were conducted at Defence Institute of Bio Energy Research, Pithoragarh, Uttranchal. Significant variation among all the genotypes was recorded for all the characters studied. High heritability along with high GCV and high genetic gain was observed in fruit weight, fruit yield per plant, number of fruits per plant, total chlorophyll and fruit width.

**Keywords:** Sweet pepper, heritability, genetic advance, genetic gain

### Introduction

Capsicum also known as 'sweet pepper' or 'bell pepper' is a member of family Solanaceae. Botanically it is known as *Capsicum annum* L. *grossum* Sendt. It is native of central and South America. It is commercially grown in Tamil Nadu, Himanchal Pradesh, some parts of Uttar Pradesh and Uttrakhand. In hill stations, it is grown in summer and rainy season and in plain areas, its planting time is during autumn and winter season. It is an important off season vegetable crop of hilly region. Variability parameters are important assets to the breeder especially crop like capsicum where improvement for quantitative and qualitative characters are required. Proper screening and evaluation of germplasm lines would provide an estimate of their potential value as suitable genotypes for utilization of varietal development. The information of nature and magnitude of variability, heritability, genetic advance and genetic gain for various characters in respect of germplasm available is required for maximizing the correlated response to selection. Therefore the present study was framed with the objective to determine the component traits of variation,

to examine the genetic variability, to select superior germplasm for yield and related characters.

### Material and Methods

Twelve genotypes of sweet pepper viz. Feroj, SP-24, DARL-70, DARL-71, EC-579997, SP-701, SP-19, SP-6, SP-7, DARK GREEN, CAPSICUM VIOLET, CALIFORNIA WONDER, collected from different State Agricultural Universities were raised during 2010-11 in randomized block design with three replications at Defence Institute of Bio Energy Research, Pithoragarh, Uttrakhand. The plants were spaced 60 cm apart between and within rows. Net plot size 5.40 m<sup>2</sup>. Recommended cultural practices were adopted for the proper growth and stand of the crop. Fruits of five randomly selected plants were harvested for recording data on eight characters viz. fruit length (cm), fruit width (cm), fruit weight (g), number of fruits per plant, fruit yield per plant (kg), fruit yield per plot (kg), ascorbic acid (mg/100g) and total chlorophyll (kg/100g). Samples taken from fresh fruit were cut into small pieces and mixed in equal proportion for estimating ascorbic acid (AOAC.1970) and total chlorophyll (Rangana, S. 1976). The mean values were used for computation. The analysis of variance was carried out as suggested by Gomez and Gomez (1976). Phenotypic Coefficient of Variation (PCV) and Genotypic Coefficient of Variation (GCV) calculated after (Burton and Devane 1953), heritability in broad sense and genetic advance was calculated by the formula given by (Allard, 1960). Genetic gain by using the procedure given by Johnson et al (1955) was calculated.

### Result and Discussion

The analysis of variance (Table 1) showed significant difference for all the eight characters studied. Mean performance of twelve genotypes for all the characters were shown in the Table 2. Among genotypes, California Wonder exhibited maximum fruit yield per plant (1.620)

**Table 1.** Analysis of variance for economic traits

Characters	Mean Sum Square		
	Replication (df=2)	Treatment (df=11)	Error (df=22)
Fruit length	1.658	4.368**	0.335
Fruit width	3.139	35.521**	1.266
Fruit weight	150.695	1490.657**	73.422
Number of fruits per plant	35.110	250.330**	3.474
Fruit yield per plant	0.192	0.2379**	.0287
Fruit yield per ploy	44.535	36.924**	1.936
Ascorbic acid	11.813	1306.178**	175.287
Total chlorophyll	0.1171	2243.36**	.0103

\*\* significant at 1% level

followed by SP-24 (1.580) and highest ascorbic acid content (126.60) followed by SP-19 (113.87). Maximum fruit length and fruit width was recorded in the genotype SP-6 (10.13, 21.06) respectively. DARL-71 exhibited highest fruit weight (103) followed by SP-6 (88). Highest total chlorophyll was recorded in the genotype California Wonder (129.23). Estimates of variance and genetic parameters for economic traits were presented in Table 3. The highest variability (phenotypic variability  $V_p$  and genotypic variability  $V_g$ ) was recorded for fruit weight (1490.65 and 1417.24) followed by total chlorophyll (747.79 and 747.78) while lowest values were observed in fruit yield per plant (0.236 and 0.208) and fruit length (1.47 and 1.44). The minimum difference between genotypic and phenotypic

variance was observed for total chlorophyll revealed that this character is less influenced by environmental effect. In general, estimates of PCV were higher than their corresponding GCV, however good correspondence was observed between GCV and PCV for all the characters. A wide range of PCV was observed for traits ranging from 14.26% for fruit length to 461.48 % for number of fruits per plant. Higher magnitude of PCV was recorded for number of fruits per plant followed by fruit weight (62.33%). GCV ranged from 14.12 % to 60.77%. Higher magnitude of GCV % was recorded for fruit weight (60.77 %). The low estimate of GCV was recorded for fruit length (14.12%). Relatively low magnitude of differences was observed between GCV and PCV for characters. These findings suggested less environmental influence in the expression of these attributes. High heritability was observed for the traits viz. fruit length (97.75%), fruit width (96.42%), fruit weight (95.07%), number of fruits per plant (98.60%) and total chlorophyll (99.99%). In ascorbic acid moderate heritability (68.26%) was observed. High heritability for these different traits indicated that large proportion of phenotypic variance was due to genotypic variance and therefore reliable selection could be made for these traits on the basis of phenotype. Early findings on heritability confirms this study ( Mishra *et al*, 2005) and Sood *et al* (2007). High heritability along with high GCV and high genetic gain was observed in fruit weight,

**Table 2.** Mean performance of genotypes for economic traits

Genotypes	Fruit length (cm)	Fruit width (cm)	Fruit weight (g)	Number of fruits per plant	Fruit yield/plant (kg)	Fruit yield/plot (kg)	Ascorbic acid (mg/100g)	Total chlorophyll (kg/100g)
Feroj	7.6	17.1	53.0	20.0	0.950	15.230	56.60	74.82
SP-24	8.2	23.0	86.7	24.0	1.580	19.870	444.94	54.28
DARL-70	9.6	20.6	71.7	18.0	1.470	17.670	99.87	23.73
DARL-71	9.6	25.2	103.0	14.0	1.220	15.650	83.63	40.03
EC-579997	8.8	13.7	35.0	39.0	1.170	20.980	128.91	44.65
SP-701	9.1	16.6	56.6	33.0	1.380	21.660	77.38	36.95
SP-19	9.6	17.0	68.3	33.0	1.520	19.880	113.87	32.57
SP-6	10.1	21.1	88.0	20.0	1.150	23.900	104.71	52.14
SP-7	8.3	15.8	50.0	38.0	1.640	21.130	103.89	66.49
Dark Green	7.2	16.3	43.3	42.0	1.570	28.000	81.16	54.14
Capsicum Violet	5.0	15.3	30.0	28.0	0.790	19.780	58.81	50.06
California Wonder	8.6	17.1	60.0	32.0	1.620	23.550	126.60	129.23
SEM	0.105	0.649	4.947	1.076	0.098	0.803	7.644	0.585
CD at 5%	0.309	1.905	14.509	3.156	0.287	2.356	22.418	0.172
CD at 1%	0.421	2.589	19.720	4.290	0.3904	3.202	30.409	0.233

**Table 3.** Estimates of variance and genetic parameters for economic traits

Characters	Genetic variance	Phenotypic variance	GCV %	PCV %	Heritability ( $h^2$ %)	Genetic advance %	Genetic gain %
Fruit length	1.44	1.47	14.12	14.26	97.95	2.44	28.60
Fruit width	34.25	35.52	32.10	32.69	96.42	11.83	64.89
Fruit weight	1417.24	1490.65	60.77	62.33	95.07	75.61	122.06
Number of fruits per plant	246.85	250.33	32.06	32.69	98.60	26.36	92.07
Fruit yield per plant	0.208	0.236	34.08	36.30	88.14	0.883	65.99
Fruit yield per ploy	11.66	13.59	16.63	27.41	85.79	4.274	20.85
Ascorbic acid	376.96	552.24	20.54	24.85	68.26	33.04	34.93
Total chlorophyll	747.78	747.79	49.39	49.48	99.99	56.32	101.90

fruit yield per plant, number of fruits per plant, total chlorophyll and fruit width. It indicates that the traits were controlled by additive gene effects (Panse, 1957) and would respond very well to continuous selection.

From the above study on mean performance and other genetic parameters, it was revealed that the characters fruit weight, fruit yield per plant, number of fruits per plant, total chlorophyll and fruit width were the most important for improving the genotypes while other characters fruit length, ascorbic acid, fruit yield per plot were considered second most important for applying selection in capsicum genotypes.

### References

- Allard, RW (1960) *Principles of plant breeding*. John Wiley and Sons, INC. New York. 485 pp.
- Burton, GW and Dewane, EH (1953) Estimating heritability in tall fescue (*Festuca arundinacea*) from replicated clonal material. *Agron. J.* **45**:478-81.
- AOAC (1970) Official methods of analysis. 11<sup>th</sup> Edn. Association of Official Analytical Chemists. Washington :777-778.
- Rangana, S (1976) In: Manual of analysis of fruits and vegetable products McGraw Hill New Delhi p77.
- Sood, Sonia, Bindal Anil and Sharma Akhilesh (2007) Genetical study for quality traits in bell pepper (*Capsicum annum* L. var *grossum* Sendt.) *Indian J. Genet.*, **67**(1): 95-96.
- Johnson, HW, Robinson, HF and Comstock, RE (1955) Estimates of genetic and environmental variability in soybean. *Agron. J.* **47**: 314-18.
- Mishra, AC, Singh, RV and Hari Har Ram (2005) Studies on genetic variability in capsicum (*Capsicum annum* L.) under mid hills of Uttranchal. *Indian J. Hort.* **62** (30) : 248-252.
- Panse, VG (1957) Genetics of quantitative characters in relation to plant breeding. *Indian J. Genet. Pl. Breed.* **17**: 318-28.