

Studies on Variability, Heritability and Genetic Advance in Chilli (*Capsicum annuum* L.)

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Genetic variability, heritability and genetic advance for 20 different quantitative characters were studied in 69 genotypes of chillies. The study indicated that the moderate to high genotypic coefficient of variation (GCV) and phenotypic coefficient of variation (PCV) were observed for all the characters, high heritability (broad sense) with high genetic advance as percent mean was observed for most of the characters except plant height.

Key words: Variability, Heritability, Genetic advance, Chilli

Chilli (*Capsicum annuum* L.) is an important vegetable as well as spice crop widely grown throughout India. India being the secondary centre of origin, a lot of variability exists in this crop. A critical estimate and study of genetic variability is pre-requisite for initiating appropriate breeding procedure for effective selection of superior genotypes. The partitioning of total variability into heritable and non-heritable components by using suitable design will enable the progenies. Natural genetic variation for most of the yield attributes is considerable high in chillies. Therefore, there is an urgent need of information on the nature and magnitude of variation available in the material and part played by environment in expression of different characters. Keeping this in view,

the present investigation was undertaken to estimate the magnitude of heritable and non-heritable component of variation and genetic parameters such as genotypic coefficient of variation, heritability and genetic advance in 69 genotypes of chillies.

Material and Method

The present investigation was carried out at the AICRP (Vegetable), Department of Horticulture, University of Agricultural Sciences, Dharwad during the *khari*f 2004-05. Sixty-nine germplasm consisting some local collections of Byadagi and Dyavanur and some collections from Kashmir were taken for the study (Table 1). The mean performance of growth, yield and

Table 1. Source and place of collection of chilli genotypes used in the study

Sl. No.	Genotype code	Source/place of collection	Sl. No.	Genotype code	Source / Place of collection	Sl. No.	Genotype code	Source /place of collection
1	'101'	Hubli	25	'177'	Srinagar	49	'142'	Sherewad
2	'95'	Bilehal	26	'178'	Srinagar	50	'160'	Sherewad
3	'91/3'	Bilehal	27	'176'	Srinagar	51	'147'	Bilehal
4	'73/2'	Sherewad	28	'173'	Srinagar	52	'148'	Sherewad
5	'73/1'	Sherewad	29	'171'	Srinagar	53	'34/2'	Kubihal
6	'64'	Sherewad	30	'150'	Kubihal	54	'12'	Kundgol
7	'29/1'	Bilehal	31	'153'	Annigeri	55	'8/3'	Kundgol
8	'27'	Kundgol	32	'154'	Sherewad	56	'7'	Kubihal
9	'21'	Sherewad	33	'168'	Srinagar	57	'79'	Sherewad
10	'15'	Annigeri	34	'174'	Srinagar	58	'17/2'	Kundgol
11	'17'	Kundagol	35	'172'	Srinagar	59	'97'	Hubli
12	'13/1'	Kubihal	36	'169'	Srinagar	60	'25'	Annigeri
13	'13/4'	Kubihal	37	'166'	Srinagar	61	'167'	Srinagar
14	'80'	Sherewad	38	'170'	Srinagar	62	'117/3'	Dyavanur
15	'102'	Hubli	39	'175'	Srinagar	63	'89/2'	Kundgol
16	'29/6'	Bilehal	40	'117/2'	Dyavanur	64	'89/3'	Kundgol
17	'86'	Kundgol	41	'136'	Dyavanur	65	'106'	Hubli
18	'29/5'	Bilehal	42	'117/1'	Dyavanur	66	'115/1'	Hubli
19	'34/3'	Kubihal	43	'139'	Hubli	67	'91/4'	Bilehal
20	'6/1'	Bilehal	44	'137'	Hubli	68	'23'	Sherewad
21	'6/2'	Bilehal	45	'140'	Sherewad	69	'29/4'	Bilehal
22	'13/2'	Kubihal	46	'159'	Sherewad	70	'Byadagi Kaddi'	UAS Dharwad
23	'13/3'	Kubihal	47	'138'	Hubli	71	'Dyavanur Dabbi'	UAS Dharwad
24	'117/4'	Dyavanur	48	'146'	Sherewad			

disease components were presented (Table 2a, 2b and 2c). Experiment was laid out in randomized block design with two replications. Five weeks old seedlings were transplanted in 60x45 cm spacing and all the recommended agronomic package of practices were followed. The observations were recorded on five

randomly selected plants per replication for each germplasm on 20 important characters. The parameters of variability like grand mean, range, phenotypic and genotypic coefficient of variation (Burton and Dewane, 1953), broad sense heritability (Hanson *et al.*, 1956) and genetic advance (Johanson *et al.*, 1955) were calculated.

Table 2a. The mean performance of chilli genotypes for different growth parameters

S.No.	Genotype code	Plant height (cm)	No. of branches per plant	Plant spread (cm) (north-south)	Plant spread (cm) (east-west)	Stem length (cm)	Days to first flowering	Days to 50 per cent flowering
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	101	50.62	5.20	33.50	31.50	5.60	77.50	79.50
2	95	39.92	4.50	34.50	29.30	5.70	73.50	79.00
3	91/3	51.80	5.97	34.50	30.00	5.60	69.00	70.00
4	73/2	46.70	3.30	36.30	31.50	5.70	68.50	37.00
5	73/1	51.62	5.05	37.60	31.30	6.20	76.50	39.00
6	64	49.55	5.50	42.20	42.30	4.50	66.50	74.50
7	29/1	47.70	3.55	36.50	32.10	5.50	69.50	76.00
8	27	59.78	5.90	45.20	36.10	5.60	70.50	76.00
9	21	59.85	4.00	41.90	34.30	5.40	64.50	74.50
10	15	45.89	5.00	34.30	27.60	6.30	64.00	80.50
11	17	53.00	5.53	35.40	24.70	6.80	65.00	68.00
12	13/1	36.05	3.03	31.50	23.50	6.10	64.00	38.50
13	13/4	54.50	4.40	39.30	30.10	6.10	62.00	38.50
14	80	50.00	4.90	42.80	36.00	6.40	66.50	79.00
15	102	40.33	6.41	39.60	30.10	5.30	68.50	70.00
16	29/6	58.07	5.30	46.30	36.50	5.80	69.00	76.00
17	86	58.97	5.40	44.30	40.00	6.30	76.00	43.50
18	29/5	61.20	2.05	45.40	41.40	5.60	75.50	83.50
19	34/3	53.97	4.62	49.80	37.20	5.80	71.00	75.50
20	6/1	57.20	5.50	52.50	45.10	4.80	69.00	83.00
21	6/2	53.78	3.20	40.40	32.10	5.40	72.00	36.00
22	13/2	59.10	5.45	43.10	35.50	5.20	73.50	66.00
23	13/3	61.40	4.00	47.10	38.30	6.80	75.00	79.00
24	117/4	47.40	11.75	37.50	31.10	6.30	72.00	87.00
25	177	31.60	5.50	33.50	19.20	6.10	33.50	67.00
26	178	38.70	6.48	33.30	28.60	5.20	35.50	69.00
27	176	40.80	6.10	31.10	27.60	6.20	38.50	74.50
28	173	38.70	4.75	40.40	31.30	5.60	35.00	89.00
29	171	38.22	4.05	35.60	27.50	5.80	35.50	80.50
30	150	41.00	6.00	31.20	24.50	6.00	78.50	70.00
31	153	36.30	4.15	31.30	26.90	5.60	75.00	76.00
32	154	34.12	11.50	32.20	27.40	5.10	82.00	90.00
33	168	36.70	6.05	33.20	24.30	7.40	32.50	79.50
34	174	36.10	6.00	37.40	30.50	5.40	33.50	72.50
35	172	40.20	5.90	40.20	33.80	6.15	34.50	78.50
36	169	42.10	3.88	29.20	28.40	5.80	35.50	84.00
37	166	50.00	4.80	51.50	35.60	6.70	36.50	83.00
38	170	39.70	6.35	31.70	25.20	5.60	35.00	80.00
39	175	35.95	4.12	40.50	27.40	5.10	33.50	73.00
40	117/2	40.65	9.00	32.40	26.10	5.60	74.00	78.00
41	136	50.25	5.82	32.50	26.80	6.50	80.50	78.50
42	117/1	36.33	4.50	35.70	23.20	5.30	72.50	73.00
43	139	44.47	3.62	27.15	22.30	7.00	79.50	75.00
44	137	45.00	2.38	33.40	26.70	5.70	43.00	34.00
45	140	43.90	3.00	39.40	27.60	5.60	75.50	75.00
46	159	48.63	5.40	39.70	36.20	5.00	73.00	65.50
47	138	48.60	5.85	36.20	30.20	5.00	77.00	75.00
48	146	47.88	7.50	40.50	28.50	5.10	45.00	75.00
49	142	46.25	4.90	31.70	25.60	6.30	44.00	76.00
50	160	40.10	6.10	33.10	31.50	4.60	77.50	71.00

Contd.

Table 2a Contd.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
51	147	40.73	2.50	37.50	32.60	4.40	40.50	36.50
52.	148	41.62	3.50	37.80	29.10	5.30	39.50	36.00
53.	34/2	57.65	5.40	43.30	31.20	5.00	68.00	82.00
54.	12	51.20	5.90	38.40	32.20	5.50	72.50	65.00
55.	8/3	43.40	4.90	38.50	30.40	5.25	73.50	73.00
56.	7	47.30	4.05	33.30	29.40	6.50	66.50	70.00
57.	79	56.00	6.43	42.30	29.50	5.90	76.50	73.00
58.	17/2	39.70	5.00	44.40	41.70	5.70	74.50	71.50
59	97	41.60	4.60	40.70	32.20	5.90	72.00	38.00
60	25	53.75	4.30	46.20	38.70	5.20	71.50	36.50
61	167	42.35	3.75	50.10	41.50	6.60	71.00	66.50
62	117/3	44.00	8.35	43.00	40.20	4.45	68.00	70.00
63	89/2	54.10	4.75	30.50	30.20	4.00	70.50	79.00
64	89/3	40.55	3.69	40.50	33.30	3.70	75.50	67.00
65	106	42.05	6.50	41.30	37.50	2.90	75.00	73.00
66	115/1	32.00	5.70	35.20	25.20	4.50	82.00	77.00
67	91/4	45.50	4.40	64.50	42.50	7.45	86.50	40.50
68	23	59.00	5.60	61.50	65.40	4.55	75.00	38.50
69	29/4	41.00	4.80	29.20	38.20	5.15	73.50	80.00
70	Byadgi Kaddi	70.25	4.95	31.20	37.80	5.80	61.50	74.00
71	Dyavanur Dabbi	57.10	6.60	37.90	33.50	5.60	60.50	90.00
	S.Em±	6.23	0.60	-	-	-	2.35	3.55
	CD (1%)	16.57	1.59	-	-	-	6.25	9.44
	CD (5%)	12.46	1.20	-	-	-	5.10	4.70

Table 2b. The mean performance of chilli genotypes for different yield components

S.No.	Genotype	No. of fruits per plant	Fruit length (cm)	Fruit diameter (cm)	Fruit stalk length (cm)	Pericarp weight (g)	Weight of seeds per fruit (g)	Fruit stalk weight (g)	Fruit weight (g)	Number of seeds per fruit (g)	Fruit yield per plant (g)	Fruit yield per ha (kg)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1	101	2.50	7.20	2.23	323	0.34	0.14	007	0.54	26.00	1.00	3703
2	95	7.50	8.15	4.15	3.20	0.33	0.33	0.09	0.75	4720	440	16296
3	91/3	450	560	2.78	3.16	0.31	0.01	0.05	0.38	200	1.45	53.71
4	73/2	5.75	6.80	283	3.15	0.26	0.12	004	0.42	22.30	2.00	74.07
5	73/1	12.50	7.36	3.05	3.15	0.28	0.13	003	0.45	15.15	3.70	137.04
6	64	6.00	388	401	4.26	0.29	0.65	0.02	0.96	4040	3.90	14445
7	29/1	5.80	653	606	3.67	0.57	0.43	0.05	1.04	51.80	5.30	19629
8	27	7.25	7.66	4.62	355	0.45	0.30	006	0.81	47.70	5.09	188.33
9	21	18.50	7.05	5.10	3.40	0.37	0.55	004	0.95	64.00	6.80	251.85j
10	15	2.50	499	3.12	2.49	0.23	0.11	0.03	0.37	21.25	3.92	145.37
11	17	3.75	5.94	4.09	3.17	0.39	0.20	0.04	0.63	25.14	1.85	6852
12	13/1	5.50	7.00	4.05	3.59	0.34	0.35	0.02	0.71	50.40	380	140.74.1
13	13/4	8.65	7.46	389	3.46	0.24	0.30	002	0.56	49.35	3.81	141.11
14	-30	965	9.03	3.93	3.20	0.52	0.32	002	0.36	3430	5.50	20370
15	102	4.15	6.76	3.16	343	0.39	0.16	0.04	0.60	25.05	2.39	88.51
16	29/6	6.80	792	351	3.12	0.42	0.31	0.04	0.76	57.06	3.85	142.40
17	86	6.65	606	297	3.32	0.23	0.14	0.05	0.42	24.10	2.34	8649
18	29/5	600	5.84	428	3.28	0.38	0.26	004	0.67	41.28	3.88	143.52
19	34/3	12.90	8.09	3.15	3.36	0.29	0.27	005	0.62	38.93	580	214.82
20	6/1	10.00	790	407	3.32	0.53	0.30	0.06	0.88	61.65	8.38	310.18
21	6/2	4.35	622	3.19	3.25	0.29	0.25	0.07	0.61	38.50	1570	581.48
22	13/2	8.50	6.75	3.17	340	0.20	0.25	007	0.50	42.96	3.39	125.56
23	13/3	9.15	699	294	3.46	0.24	0.25	0.05	0.55	36.00	3.85	14260
24	117/4	5.85	7.12	437	3.06	0.33	0.26	009	0.68	39.82	4.10	151.85
25	177	685	5.68	350	3.15	0.25	0.05	005	0.36	8.76	2.26	83.70
26	178	15.85	6.77	3.22	3.25	0.22	0.23	008	0.53	50.18	6.15	227.78
27	176	11.25	6.11	3.28	3.05	0.32	0.06	0.03	0.41	2.85	3.55	131.48
28	173	300	6.66	3.60	3.15	0.20	0.14	006	0.40	19.15	1.20	44.44
29	171	11.25	5.09	2.97	300	0.23	0.19	001	0.44	34.70	362	134.26
30	150	3.50	9.62	538	3.18	0.39	0.25	0.04	0.67	4370	1.95	7222
31	153	1.75	6.88	2.75	3.00	0.24	0.18	0.09	0.50	27.85	0.65	24.08

Cont.

Table 2b Contd.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
32	154	475	4.12	6.39	263	0.31	032	0.08	0.71	52.15	3.68	136.11
33	168	4.10	5 77	3.22	305	0 17	021	0.04	042	41.32	1.73	64.07
34	174	5.50	7.10	4 15	3.10	037	0.41	0.07	0.85	74.70	4.10	151.85
35	172	6.75	9.40	4.57	3.64	050	0.36	0.07	0.92	5683	4.12	152.78
36	169	17.25	5.85	3.95	3.28	030	027	003	0.65	45.55	6.88	254.63
37	166	13.50	6.43	356	3.08	0.23	0 19	0.01	043	19.55	4.98	18463
38	170	5.90	6.53	341	3.32	0.28	0.32	0.07	067	57 18	3.61	13370
39	175	4.50	5.30	4.80	3.38	022	0 28	0.06	0.56	52 50	2.25	8334
40	117/2	200	8 12	500	3 33	0.4!	0.81	009	1.30	79.00	265	98 15
41	136	3.75	9 15	3.06	3.45	0.36	028	0.08	0.72	38.67	3.00	111.11
42	117/1	7.50	6.65	3.35	5.85	0.19	0.11	006	0.37	2385	3.50	129.63
43	139	475	5.78	3 12	3.37	036	0.13	0.07	0.54	19 58	2.75	101.85
44	137	5.00	845	3.95	2.79	0.22	0.28	009	0 58	37.22	3.53	130.56
45	140	6.35	680	3 33	3.12	0 31	0.17	003	0.51	24.25	2.34	86.66
46	159	4.50	8.25	303	3.18	0.36	020	0.02	0.59	30.72	2.90	107.41
47	138	2.25	902	3.10	2.13	0.32	0.42	0.06	080	7000	1 65	61.11
48	146	4 50	6.51	3.13	3 15	0.29	0.16	004	0.49	31 81	1.74	64.44
49	142	7.00	6.30	3.80	4.10	029	049	0.08	0.86	58.40	3.15	116.66
50	160	8.65	622	379	299	0.06	0.39	0.01	0.46	5900	476	176 11
51	147	725	644	4.75	3.13	0.54	0.16	006	0.77	21.67	3.30	122.40
52	148	7.25	9.05	4.15	3.04	0 34	0.28	004	067	58.25	420	155.55
53	34/2	1565	7 56	2 55	347	0 31	030	0.03	0.64	49 18	6.95	257.41
54	12	3.25	5.64	3.24	3.19	0.38	0.16	0.04	0.58	2395	2.03	7500
55	8/3	2.50	6.65	322	2.78	0.26	009	008	0.43	9.12	1.12	41 67
56	7	2.00	483	3.50	3.33	0.50	0.13	0.08	0.72	17 30	1 35	5000
57	79	350	4.89	3.21	3.38	0.28	0 14	005	0.47	20.19	1.60	59.26
58	17/2	6.50	7.68	4.43	3.18	0 52	0.39	0.01	0.93	59.68	5.62	208.33!
59	97	3.00	7.88	3.50	338	0.41	0.19	0.06	066	3045	2.20	81.48
60	25	14 75	8.18	3.71	3.36	0.17	0.56	006	0.79	59.45	7.75	287.04
61	167	9.75	8.99	3 14	3.65	0.59	0.16	006	0.81	37.08	7.03	260.18
62	117/3	6 00	7.75	5 10	330	0.31	0.38	0 09	0.78	4990	4.40	16296
63	89/2	1.00	11.75	5.15	3.60	065	0.70	009	1.45	82.50	1.45	53.71
64	89/3	1:50	1062	3.75	338	037	045	008	090	51 00	1 20	44.44
65	106	5.00	8 10	4 25	4.70	029	0.36	0.07	0.72	62 15	325	120.37!
66	115/1	26 50	7.20	3 30	3 10	024	0 18	0.05	0.47	27,10	1075	398,15
67	91/4	3.00	743	3.28	3 10	0 34	0.11	0.05	0.51	2300	1.55	5741
68	23	400	728	2.67	3.10	0.14	0.63	002	0.78	4888	2.90	10740
69	29/4	10.00	6.75	330	3.45	0.16	0.47	0.02	064	68.01	5.75	212.96
70	Byaclagi Kaddi	8.00	10.97	3.37	288	0.56	025	0.09	0.94	24.10	5.65	209.26
71	Dyavanur Dabbi	2.50	728	5 10	3.20	0 53	0.20	0.08	0.85	19.20	6.40	237.04
	S.Em ±	080	0.65	0.29	0.28	006	0.05	0.01	5.11	0.03	0.66	24.78
	CD<1%t	2.12	1.72	0.77	0.74	0 17	0.13	002	1359	0.09	1.75	65.91
	CD (5%)	1.60	1.30	0.58	056	0 13	0 10	0 12	1022	0.07	8 32	4956

Angular transformed values were used disease and pest incidence parameters.

Results and Discussion

The analysis of variance indicated highly significant differences among genotypes for all the characters studied, providing ample of scope for selection for majority of the traits in the progenies. The mean, range, genotypic variance, phenotypic variance, genotypic coefficient of variation (GCV), phenotypic coefficient of variation (PCV), heritability, genetic advance and genetic advance as per cent mean for 20 characters studied were

presented in Table 3. Number of fruits per plant varied from 1.00 in (89/2) to 26.50 (115/1), dry fruit yield per plant from 0.65 g (6/2) to 15.70 g (117/3), powdery mildew disease incidence from 32.36 in genotype 27 to 71.79 (13/1), Nandadevi and Hosamani (2003), Munshi and Behera (2000), Acharyya *et al.* (2002) and Prabhudeva (2003) also reported wide range of variation for most of the characters studied in this crop. The GCV, which gives a picture of extent of genetic variability in the population ranged from 12.63 per cent (fruit stalk length) to 64.60 percent (number of fruits per plant).

Table 2c. The mean performance of chilli genotypes for different pest and disease components (Transformed values)

S.No.	Genotype	Powdery mildew incidence	Fruit borer incidence	Fruit rot incidence	Leaf curl complex incidence	RHHC incidence
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	101	62.45	18.15	32.58	58.46	39.11
2	95	54.90	20.42	40.38	54.85	17.92
3	91/3	38.60	16.80	20.25	48.62	14.64
4	73/2	66.30	16.50	26.75	52.86	16.06
5	73/1	59.10	20.79	31.62	43.32	7.90
6	64	64.69	20.74	35.67	44 18	18.85
7	29/1	66.13	15.70	26 80	50.30	20.63
8	27	32.36	9.43	30.98	36.30	17.92
9	2V	59.12	14.60	18.42	41.58	16.42
10	15	53 52	18.09	45.58	54.06	25 83
11	17	54.73	19.76	39 53	51.88	10.20
12	13/r	71.79	21 70	20.25	47 67	34.60
13	13/4	57.55	17 31	21.53	41.89	20.26
14	80	53.40	15.05	38.35	34.24	13.00
15	102	47 26	18.15	25.10	43 51	30.65
16	29/6	60.49	17.26	38.94	51.44	1942
17	86	44.43	13.85	22.00	51.42	10.00
18	29/5	42.18	16.85	40 10	50.07	20.13
19	-34/3	46.67	17.85	14.13	47.35	37.79
20	6/1	48.22	7.55	39.52	51.12	22.90
21	6/2	44.65	16 53	31.11	43.67	17 25
22	13/2	60.82	20.85	35.55	49.18	16.48
23	13/3	59.68	15.92	29.99	32.26	18.04
24	117/4	60.43	20.20	31.62	49.17	20.17
25	177	57.03	17.85	18 38	33.56	16.32
26	178	58.57	19.59	13.55	47.04	8.66
27	176	53 74	16.10	36.26	52.17	21.96
28	173	64.30	15.10	32 89	43.34	30.06
29	171	55.89	16.69	20 67	45.57	33.08
30	150	55.00	23 34	20.25	34.85	19.77
31	-153	40 63	21.09	25.10	43.65	36.03
32	154	47.12	17.60	18.57	44.08	30.05
33	-168	52.87	24.53	13.66	40.90	35.90
34	174	58.20	25.33	8.86	33.82	43.62
35	172	60.94	1846	6.95	34.91	45.45
36	169	58.70	22.05	15.89	44.43	19.58
37	166	59.44	21.25	28 14	51.86	27.83
38	170	55.00	17.15	34.44	40.61	32.32
39	175	40.72	12.58	17.42	48.97	42.39
40	117/2	45.97	15.18	10.46	32.14	15.49
41	136	56.76	23.36	22.74	49.11	16.55
42	117/1	59.47	25.62	30.99	47.12	19.15
43	139	46.09	16.73	34.75	39 70	22.53
44	137	52 19	20.96	37.47	39 43	39.53
45	140	49.90	23.97	39.53	47.50	18.24
46	159	45.00	20.55	32.89	32 01	24.23
47	138	44.17	23.76	35 56	40.60	15.23
48	146	50.19	24.15	30.31	46.64	12.52
49	142	58.39	11.86	23.97	49.67	11.27
50	160	58.66	7.56	34.90	36.27	28.07
51	147	55.25	18.67	29.14	48.28	12.84
52	148	61.49	22.21	28.56	45.35	13.63
53	34/2	59 44	18.94	18.36	38.26	28.82
54	12	65.05	22.17	3864	35.94	24.17
55	8/3	64.86	16.69	35.05	51.85	24.61
56	T	51.79	14.43	31.31	50.85	11.46
57	79	34.85	23.40	29.81	46.52	44.47
58	17/2	63.85	20.19	26.90	41.93	27.25
59	97	60.77	21.68	33 83	43.34	31.85

Contd.

Table 2c Cont.

(1)	(2)	(3)	(4)	(5)	(6)	(7)
60	25	54.72	23.69	20.20	45.03	17.05
61	167	65.01	17.20	27.61	46.26	14.81
62	117/3	59.78	19.66	34.44	46.55	30.36
63	89/2	44.53	15.04	13.51	34.63	34.73
64	89/3	63.13	14.71	17.95	50.25	38.44
65	106	59.26	21.80	26 53	52.36	10.40
66	115/1	65.01	24.46	13.16	37.08	38.99
67	91/4	68 27	26 74	35.03	47.67	27.28
68	23	50.01	24.90	23.05	39.92	37.79
69	29/4	55.58	19.73	31.62	52.57	17.20
70	Byadagi					
	Kaddi	53.06	23.77	29.66	56.95	27.17
71	Dyavanur					
	Dabbi	63.65	18.99	26.56	48.78	34.50
	S.Em±	2.30	0 81	1.37	1.13	0.57
	CD(1%)	6.11	2 15	3.64	3.00	1.52
	CD (5%)	4.60	1.62	2.74	2.66	1.14

The GCV values were considerable high for most of characters except for fruit stalk length, powdery mildew disease incidence and leaf curl complex incidence. These high GCV values bearing characters having higher range of variation have a better scope for improvement through selection. Table 2 showed narrow difference between GCV and PCV values for most of the characters indicated that these characters were less influenced by environment. These findings are in agreement with those reported by Munshi and Behera (2000), Acharyya *et al.* (2002) and Prabhudeva (2003). Heritability estimates were high for all the characters under study except plant height (56.40). The highest being observed in red headed hairy caterpillar incidence (99.70). High genetic advance with high heritability was reported in most of the characters except plant height. High heritability coupled with high genetic advance is indicative of greater proportion of additive genetic variance and consequently a high genetic gain is expected from selection under such a situation (Singh and Rai, 1981). The characters, which exhibited high variability with moderate or low genetic advance, can be improved by intermating the superior genotypes in the segregating population developed from multiple crosses and the desirable genes can be accumulated in lines (Bhagyalakshmi *et al.*, 1990).

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Table 3. Different genetic parameters for twenty quantitative traits in chilli germplasm

Character	Mean	Range	Genotypic variance (σ_g)	Phenotypic variance (σ_p)	Genotypic coefficient of variance (GCV%)	Phenotypic coefficient of variance (PCV%)	Heritability (h^2_{lm} %)	Genetic advance (GA)	Genetic advance as percent mean (GAM%)
Plant height	46.78 cm	31.60-61.40 cm	50.16	56.39	15.14	20.16	56.40	10.95	23.40
Number of branches per plant	5.19	2.05-11.50	2.65	3.25	31.35	33.45	87.80	3.14	60.50
Days to first flowering	63.78	32.50-86.50	250.39	255.89	24.81	25.08	97.80	32.25	50.56
Days to 50% flowering	68.85	34.00-90.00	242.33	254.94	22.61	23.19	95.10	31.27	45.41
Number of fruits per plant	7.00	1.00-26.50	20.47	21.37	64.6	65.62	96.90	9.19	131.14
Fruit length	7.20 cm	4.12-11.75 cm	1.87	2.52	18.99	21.07	81.20	2.54	35.27
Fruit diameter	3.73 cm	2.23-6.39 cm	1.12	1.60	20.06	23.85	70.80	1.30	34.85
Fruit stalk length	3.29 cm	2.13-5.85 cm	0.017	0.45	12.63	15.37	67.50	0.70	21.12
Fruit weight	0.66 g	0.36-1.45 g	0.043	0.10	31.35	32.93	90.60	0.41	62.12
Pericarp weight	0.33 g	0.06-0.65 g	0.013	0.06	33.99	37.37	87.20	0.21	63.63
Fruit stalk weight	0.05	0.01-0.90	0.00045	0.01	40.59	45.61	79.20	0.04	80.00
Number of seeds per fruit	39.49	2.00-82.50	323.04	328.15	45.50	47.31	92.50	35.61	90.17
Weight of seeds per fruit	0.27 g	0.01-0.81 g	0.24	0.06	55.95	57.64	94.20	0.31	114.81
Dry fruit yield per plant	3.87 g	0.85-15.70 g	5.69	6.35	61.50	63.88	92.70	175.20	121.98
Dry fruit yield per hectare	143.62 kg	24.08-581.44 kg	7802.5	7827.28	61.50	63.88	92.70	175.20	121.98
Powdery mildew disease incidence	55.12	32.36-71.79	66.10	68.40	14.75	15.33	92.60	16.11	29.22
Fruit borer incidence	18.89	7.55-26.74	16.28	17.30	21.36	22.03	94.00	8.06	42.66
Fruit rot incidence	27.49	6.95-45.58	17.33	78.70	31.98	32.37	97.60	17.90	65.51
Leaf curl complex incidence	44.92	32.01-58.46	42.00	43.13	14.43	14.65	97.00	13.15	29.27
Red headed hairy caterpillar incidence	23.94	7.90-45.45	98.50	98.82	41.13	41.52	99.70	24.41	101.96

References

- Acharyya P, AK Joshi and CBS Rajput (2002) Studies on variability and character association for different traits in six generations of the cross LCA-301 x Punjab Lal (*Capsicum annum* L.) under two environments with respect to leaf curl complex. *Capsicum and Eggplant Newsletter* 21: 60-65.
- Bhagyalakshmi PV, C Ravishankar, B Subramanya and VG Babu (1990) Study on heritability, genetic advance and character association in chilli (*Capsicum frutescens* L.). *South Indian Horticulture* 38: 15-17.
- Burton GW and EM Dewane (1953) Estimating heritability in tall fescue (*Festuca circumclinavae*) from replicated clonal material. *Agronomy Journal* 45: 478-481.
- Munshi AD and TK Behera (2000) Genetic variability, heritability and genetic advance for some traits in chillies (*Capsicum annum* L.). *Vegetable Science* 27(1): 39-41.
- Nandadevi and Hosamani RM (2003) Genetic studies in chilli (*Capsicum annum* L.). *Capsicum and Eggplant Newsletter*, 22: 43-46.
- Prabhudeva SA (2003) Variability, genetic diversity and heterosis studies in chilli (*Capsicum annum* L.). M.Sc. (Agri.) Thesis, University of Agricultural Sciences, Dharwad.
- Hanson CH, HR Robinson and RS Comstock (1956) Biometrical studies of yield in segregating populations of Korea, Lesedezo. *Agronomy Journals* 48: 268-272.
- Johanson HW, HF Robinson and RE Comstock (1955) Estimation of genetic and environmental variability in soybean. *Agronomy Journal* 47: 477-483.
- Singh RP and JN Rai (1981) Note on the heritability and genetic advance in chilli (*Capsicum annum* L.). *Progressive Horticulture* 13(1): 89-92.