



GENETIC VARIABILITY, HERITABILITY AND DIVERGENCE ANALYSIS IN CHILLI (*CAPSICUM ANNUUM* L.)

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Abstract

The present investigation was conducted during the year 2014-15 at Research cum Instructional Farm, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.), India. The experiment was comprised of nineteen genotypes of chilli and laid out in randomized block design (RBD) with three replications. Data were analysed to work out the variability, correlation coefficient, path analysis and genetic divergence for the characters for yield and its component character. The analyses of variance revealed that mean sum of squares due to genotypes were highly significant for all characters. Which indicated that the presence of variability in the genotype. The genotype 2012/CHIVAR-5 was found highest yield and earliest flowering was noted in 2012/CHIVAR – 8 earliest.

Key words : Chilli, genetic variability, heritability, divergence.

Introduction

Chilli (*Capsicum annum* L.) is a fruit vegetable widely cultivated in the world. It belongs to the family “Solanaceae” and has a chromosome number of $2n = 24$. It is a often cross pollinated crop bearing a pod like fruit (berry) and has a predominant position among the spices grown all over India. Chilli also known as hot pepper was introduced into India from Brazil in the 16th century by Portuguese. In India, chilli is grown in an area of 7.94 lakh hectares with a production of 13.04 lakh tonnes and the productivity is 1.6 t/ha (1,600 kg/ha). The genetic improvement of any crop depends upon the available genetic variability for quantitative traits and its judicious exploitation through efficient breeding methods (Yadav and Kumar, 2012). The information about the nature and magnitude of genetic divergence is essential for selection of diverse parents, which upon hybridization can result in productive hybrids. Evaluations of available germplasm assumes importance in this regard and are necessary. At present, there is urgent need to develop early maturing high yielding region specific varieties to address local problems and also varieties with wider adoptability, The great genetic diversity available for Chilli breeders has facilitated the development of new varieties and hybrids. India being considered an secondary centre of origin and good genetic variation is present for almost all characters.

Knowledge of association and contribution of different character is required for planning of good breeding programme.

Materials and Methods

The study was carried out during *Kharif* season (2014-2015) at Horticulture Research cum Instructional farm at Department of Horticulture, I.G.K.V., Raipur (C.G.), India. The experiment comprised of nineteen genotypes of chilli *viz.*, 2014/CHIVAR – 1, 2014/CHIVAR – 2, 2014/CHIVAR – 3, 2014/CHIVAR – 4, 2014/CHIVAR – 5, 2014/CHIVAR – 6, 2014/CHIVAR – 7, 2014/CHIVAR – 8 2014/CHIVAR – 9, 2014/CHIVAR – 10, 2012/CHIVAR – 2, 2012/CHIVAR – 3, 2012/CHIVAR – 4, 2012/CHIVAR – 5, 2012/CHIVAR – 6, 2012/CHIVAR – 8, Kashi Anmol – 2, LCA – 334 and Indira Mirch - 1. The experiment was laid out in a Randomized Block Design with three replications at 60 cm × 50 cm row to row and plant to plant spacing. All the recommended cultural practices were adopted to raise a healthy crop. Data were recorded on five randomly selected plants with respect to characters *viz.*, plant height (cm), stem girth (cm), number of branches/plant, days to first flowering, days to 50% flowering, days to first picking, number of pickings, days to last picking, fruit length (cm), fruit girth (cm), fruit weight (g), number of fruits/plant, fruit weight per plant (g), fruit yield per plot (kg), fruit

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Table 1 : Mean performance for fruit yield & its components in chilli.

Characters	Plant height (cm)	Stem girth (cm)	No. of branches per plant	Days to first flowering	Days to 50% flowering	Days to first picking (g)	No. of picking (g)	Days to last picking (g)	Fruit length (cm)	Fruit girth (cm)	Fruit weight	No. of fruits per plant	Fruit weight per plant (g)	Fruit yield per plot (kg)	Fruit yield/ha (q)
2014/CHIVAR-1	69.08	4.50	13.00	54.00	52.33	93.00	5.33	170.00	7.07	4.87	4.16	50.85	212.67	7.66	68.92
2014/CHIVAR-2	71.54	5.00	15.33	60.33	54.00	95.00	5.00	172.33	9.17	4.13	3.64	42.05	153.33	5.52	49.69
2014/CHIVAR-3	70.56	5.50	15.33	65.00	54.00	93.33	6.00	171.00	9.70	4.00	3.95	143.19	564.00	20.30	182.78
2014/CHIVAR-4	72.53	4.17	11.67	54.33	50.67	95.00	5.33	172.67	11.33	5.17	6.01	44.07	263.00	9.47	85.23
2014/CHIVAR-5	83.85	4.50	14.00	68.00	56.00	93.00	6.00	170.00	6.23	3.50	2.59	69.55	180.00	6.48	58.33
2014/CHIVAR-6	66.13	4.83	15.00	61.33	61.00	95.00	6.00	173.33	10.60	4.63	5.19	102.32	530.00	19.08	171.76
2014/CHIVAR-7	82.86	5.00	12.00	61.67	63.67	95.00	6.00	172.67	10.57	4.33	5.39	53.22	286.33	10.31	92.79
2014/CHIVAR-8	56.79	4.50	11.33	56.33	50.33	94.00	6.00	172.33	6.00	3.50	2.05	169.21	345.00	12.42	111.81
2014/CHIVAR-9	74.01	4.50	13.67	64.00	59.33	95.67	6.33	175.00	13.97	4.40	7.94	52.19	414.00	14.90	134.17
2014/CHIVAR-10	68.10	4.33	12.33	64.67	55.67	94.00	6.00	175.00	7.53	3.50	3.44	93.88	314.67	11.33	101.98
2012/CHIVAR-2	62.33	4.50	13.00	47.33	64.33	88.00	4.83	170.00	11.33	3.53	5.27	98.84	497.00	16.84	133.66
2012/CHIVAR-3	58.00	5.17	14.67	51.33	54.67	90.67	5.50	172.33	12.53	4.33	5.77	87.96	480.00	14.05	111.51
2012/CHIVAR-4	67.00	5.17	13.00	51.33	53.67	90.00	5.33	171.67	11.03	8.97	5.17	86.18	547.00	12.64	100.33
2012/CHIVAR-5	54.67	5.00	14.33	64.33	49.33	94.00	5.00	175.67	6.47	3.45	3.00	211.32	362.70	24.06	190.92
2012/CHIVAR-6	51.67	5.50	14.00	41.67	47.00	85.00	5.50	168.00	9.20	3.57	3.63	152.29	337.26	21.39	169.80
2012/CHIVAR-8	50.00	5.67	15.00	40.33	53.67	80.33	5.50	165.00	11.10	4.33	2.67	157.07	270.31	15.43	122.42
LCA-334	48.42	4.50	11.00	54.67	51.67	94.00	6.00	172.67	7.26	3.50	2.48	201.04	511.53	17.89	161.06
Kashi Anmol-2	45.47	5.00	14.00	64.00	61.33	94.67	6.00	172.67	7.67	3.43	2.79	174.94	441.70	17.28	155.56
Indira Mirch - 1	74.50	5.33	13.67	69.33	56.33	97.67	6.00	176.00	7.77	3.43	3.69	150.23	340.92	19.69	177.27
Mean (x)	64.60	4.88	13.49	57.58	55.21	92.49	5.67	172.02	9.29	4.24	4.15	112.65	371.13	14.57	125.26
S.E.m.±	5.88	0.30	0.74	1.74	3.13	0.71	0.39	1.42	0.58	0.31	0.21	15.26	7.50	0.67	13.49
CD (p = 0.05)	16.88	0.86	2.14	5.00	9.00	2.05	1.13	4.07	1.66	0.88	0.62	43.77	21.53	1.95	38.71
CV (%)	15.78	10.76	9.61	5.25	9.85	1.34	12.04	1.43	10.83	12.66	9.02	23.46	6.31	8.08	18.66

Table 2 : Analysis of variance for fruit yield and its component characters in chilli.

S. no.	Character (df)	Means sum of square		
		Replication (2)	Treatment (18)	Error (36)
1.	Plant height (cm)	92.301	382.329*	104.008
2.	Stem girth (cm)	0.123	0.582	0.276
3.	Number of branches/plant	4.702	5.458**	1.683
4.	Days to first flowering	43.105	214.253**	9.142
5.	Days to 50% flowering	3.316	70.008**	29.575
6.	Days to first picking	-922.404	54.111**	1.541
7.	Number of pickings	50.781	0.912	0.466
8.	Days to last picking	12.281	21.573**	6.058
9.	Fruit length (cm)	7.735	16.237**	1.014
10.	Fruit girth (cm)	0.515	4.823*	0.289
11.	Fruit weight (g)	1.286	7.041**	0.140
12.	Number of fruits/ plant	385.040	9172.049**	698.837
13.	Fruit weight per plant (g)	473.912	13773.086**	169.153
14.	Fruit yield per plot (kg)	2661.749	95.540**	1.387
15.	Fruit yield per ha (q.)	44.007	5730.474**	546.679

*: Significant at 5%, **: Significant at 1%.

yield per ha (q). The estimates of genotypic and phenotypic coefficient of variance were classified as low (less than 10%), moderate (10 to 20%) and high (more than 20%) as suggested by Sivasubramaniam and Madhavamenon (1973).

Results and Discussion

The mean values of different divergence and yield parameters with respect to genotypes are presented in table 1. The highest yield quintal per hectare was recorded in genotype 2012/CHIVAR – 5 (190.92 q) followed by 2014/CHIVAR – 3 (182.78 q), Indira Mirch – 1 (177.27 q). The earliest flowering was recorded in 2012/CHIVAR – 8 (40.33 days), which was followed by 2012/CHIVAR – 6 (41.67 days), 2012/CHIVAR – 2 (47.33 days). Maximum number of fruits per plant was recorded in 2012/CHIVAR – 5 (211.32) followed by LCA - 334 (201.04), Kashi Anmol – 2 (174.94). Maximum fruit length was recorded in 2014/CHIVAR – 9 (13.97 cm) followed by 2012/CHIVAR – 3 (12.53 cm), 2012/CHIVAR – 2 (11.33 cm). Maximum fruit girth was recorded in 2012/CHIVAR – 4 (8.97 cm) followed by 2014/CHIVAR – 4 (5.17 cm), 2014/CHIVAR – 1 (4.87 cm). Fruit weight ranged from 2.05 g (2014/CHIVAR – 9) to 7.94 g (2014/CHIVAR – 9) followed by 2014/CHIVAR – 4 (6.01 g), 2012/CHIVAR – 3 (5.77 g). Earliest picking was recorded in the genotype 2012/CHIVAR – 8 (80.33 days) followed by 2012/CHIVAR – 6 (85 days), 2012/CHIVAR – 2 (88

days). Similar finding were also reported by Khurana *et al.* (2003), Verma *et al.* (2004), Bhardwaj *et al.* (2007), Patil *et al.* (2008), Datta and Jana (2010), Pandit and Adhikary (2014) and Kanhaiya *et al.* (2014).

Days to last picking positive and significant correlation with days to first flowering, days to first picking, at genotypic and phenotypic level but with number of pickings, only at genotypic level. It indicated that major emphasis should be given on these components for increasing the fruit yield per plot. Similar findings are reported by Ajjappalavar *et al.* (2005), Nehru *et al.* (2003), Mallikarjun (2003), Gogoi and Gautam (2002).

Path coefficient analysis revealed that fruit weight showed the highest positive direct effect days to first flowering (0.978) followed by fruit length (0.911), number of fruits (0.772), fruit weight (0.648), days to last picking (0.384), number of branches (0.155) and fruit girth (0.147). On the other hand days to first picking, stem girth, fruit length, fruit weight, plant height and days to 50% flowering. The present findings are in accordance with Giritammanavar (1995), Sarma and Roy (1995), Saraladevi and Arumugam (1999), Munshi *et al.* (2000), Mubarak (2002), Gogoi and Gautam (2003), Chaudhary and Samdia (2004) and Singh *et al.* (2005).

The highest genotypic and phenotypic coefficient of variation was recorded for number of fruit per plant (47.18% and 52.69%), fruit yield per plot (34.45% and

39.30%) and fruit yield per ha (33.19% and 38.08%). The phenotypic coefficients of variation were higher than the genotypic coefficient of variation. The highest heritability was noted in characters like fruit weight per plant (96.2%), days to first flowering (88.2%) and days to first picking (85.8%). Whereas, highest heritability coupled with highest genetic advance were observed for characters *viz.*, fruit weight per plant, days to first flowering and days to first picking. Hence, these characters might be improved by simple selection. Similar finding were also reported earlier by Amit *et al.* (2014), Hosamani and Shivkumar (2008), Khadar and Mini (2006), Munshi *et al.* (2000) and Sreelathakumary and Rajamony (2004).

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