SHORT COMMUNICATION

GENETIC VARIABILITY STUDIES IN CHILLI (*CAPSICUM ANNUUM*L.)

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Abstract: The present studies were carried out to assess the genetic variability, heritability and genetic advance for different characters in nine genotypes (six lines and three testers) in diverse genotypes of Chilli. The experiment was conducted in RandomisedBlock Design (RBD) with three replications during the *rabi* season 2011-2012 at Department of Horticulture under All India Coordinated research Project on Vegetable Crops, Indira Gandhi KrishiVishwavidyalaya, Raipur (C.G.), India. The analysis of variance indicated the sufficient genetic variation among the genotypes from all the characters studied. Among the genotypes KA-2 (580 g/plant) was the highest green fruit yielder. Number of fruits/plant was highest in Indira Chilli-1 (191.00), fruit length was maximum in 2011-03 (10.37 cm) and average per fruit weight in 2011-03 (4.77 g). The high phenotypic coefficient of variation and genotypic coefficient of variation were observed for fruit length, number of seeds/fruit, plant height and fruit weight. High heritability coupled with high genetic advance were observed for all characters studied, except number of primary branches, number of secondary branches, days to first picking, fruit bearing period, fruit width, duration of crop (sowing to last harvest days) indicating these characters are governed by additive gene action.

Keywords: Genetic variability, Genetic advance, Heritability, *Capsicum annuum*

INTRODUCTION

Chilli (*Capsicum annuum* L.) is an important spice crop, grown extensively in different states of India. It is the most common ingredient in Indian diet. Chilli is valued for its characteristic pungency, colour value and pleasant flavor. Hence, the development of plant breeding strategy for any crop depends mainly on the support provided by the genetic information of the major quantitative characters associated with fruit yield. A rich diversity of capsicum exists due to varied geoclimatic regions of Indian continent. It is widely cultivated from July to December in northern states of India (Choudhary and Samadia, 2004). It is an annual herbaceous plant of the Solanaceae family including hot pepper and sweet or bell pepper. The great phenotypic diversity in plant habit and especially in shapes, sizes (Andrews 1995; DeWitt and Bosland, 1996). For hybridization, existence of variability and relative divergence among the genotypic is must. Hitherto, very little attention is given by the workers on systematic crop improvement work of chilli. Since it has wide range of variability in order to know extent of variability among the available genotypes, so that genetic variability studies in chillies was undertaken.

MATERIAL AND METHOD

The experimental material comprised of nine diverse genotypes of Chilli (6 lines and 3 testers) which were received from All India Coordinate Research Project on Vegetable Crops, Indira Gandhi KrishiVishwavidyalaya, Raipur (C.G.).The trials were evaluated during *Rabi* season of 2011-12 at the Horticulture Farm, Department of Horticulture. The soil of the experimental field was sandy loam in texture which is locally known as "*Matasi*" and is neutral in reaction with the pH 7.5. The experiment was conducted in a Randomized Block Design (RBD) with three replications.

The six week old seedlings of nine parents (6 line and 3 testers) were transplanted in a randomized block design with three replications. Each plot consisted of 4.2 x 3.5 m^2 areas and a gap was kept in 60 cm between rows and 30 cm between plants and only one seedling sown per hill.All the standard agronomical practices and plant protection measures were followed timely to raise a crop successfully. Five plants were selected randomly for recording different yield related traits. However green fruit yield, days to first and 50% flowering and days to first picking were recorded on plot basis. After recording data Genotypic Coefficient of Variation (GCV) and Phenotypic Coefficient of Variation (PCV) were calculated as per the formula suggest by Comstock and Robinson (1952). Heritability in Board sense and expected genetic advance were calculated as per formula given by Jonson *el al.* (1955).

RESULT AND DISCUSSION

Analysis of variance (Table-1) revealed that wide range of variability was observed for all the characters *viz.*,days to 50% flowering, plant height, days to fruiting, fruit bearing period, number of seeds/fruit, number of fruits/plant, duration of crop (sowing to last harvest days), green fruit yield/plant (g). These findings were supported by Choudhary and Samadia (2004) &Danduayaka (2008).

The genotypic and phenotypic coefficients of variations are presented in (Table-2). High genotypic as well as phenotypic coefficient of variations were recorded for traits *viz*., fruit length (31.64 and 30.97 percent), number of seeds per fruit (30.91 and 30.77 percent), plant height (27.41 and 26.65 percent) and fruit weight (24.96 and 24.32 percent).

Moderate genotypic and phenotypic coefficients of variations were observed for Stalk/pedicel length (19.98 and 19.67 percent), number of fruits/plant (15.90 and 14.26 percent), number of secondary branches (15.35 and 11.42 percent), days to first flowering (15.34 and 15.07 percent), green fruit yield/plant (14.89 and 14.72 percent),number of primary branches (14.55 and 10.91 percent), days to fruiting (13.99 and 13.68 percent), days to 50 % flowering (13.07 and 12.85 percent) and fruit width (12.27 and 10.14 percent).

Whereas, low genotypic and phenotypic coefficient of variations were observed for days to first picking (9.01 and 8.90 percent), duration of crop (3.91 and 3.17 percent) and fruit bearing period (3.86 and 2.85 percent).These findings are in accordance with the findings of Verma*et al.* (2004) and Datta and jana (2010).

The broad sense heritability estimates and genetic advance expressed as percentage of mean have been presented in (Table-2). Most of the characters showed high broad sense heritability except for fruit bearing period (54.55 percent), number of secondary branches (55.30 percent) and number of primary branches (56.20 percent).

Whereas, all the characters recorded high genetic advance except number of primary branches (16.85 percent), number of secondary branches (17.49 percent), fruit width (17.26 percent), days to first picking (18.10 percent),duration of crop (sowing to last harvest days) (5.28 percent) and fruit bearing period (4.34 percent). These findings are in accordance with the findings of Krishana*et al*. (2007) and Lahbib*et al.* (2012).

Table 1: Mean performance of genotypes (six lines and three tester)

Parents	Characters															
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
Line (Female)																
2011-07	35.667	43.333	76.333	2.733	4.500	39.667	63.667	118.667	5.267	1.100	2.600	3.500	70.000	156.333	158.333	403.333
2010-03	44.667	52.667	66.000	3.367	6.867	47.333	75.333	115.000	8.200	1.400	4.333	3.833	77.333	123.000	153.667	530.000
2011-08	49.667	56.667	54.667	2.600	5.767	53.333	78.000	124.000	7.400	1.300	4.000	3.000	93.667	131.000	154.000	520.000
2010-06	51.000	58.000	73.333	3.300	6.700	54.000	79.667	119.000	8.067	1.367	3.267	3.100	105.000	141.667	149.000	458.333
2011-03	55.333	63.000	61.000	3.200	6.500	57.667	81.333	120.000	10.367	1.233	4.767	4.333	101.000	122.667	150.000	570.000
2011-01	52.000	59.000	64.667	2.500	5.567	54.333	85.667	125.000	3.533	1.167	2.567	2.500	35.000	155.000	164.000	390.000
Average	**48.056**	**55.445**	**66.000**	**2.950**	**5.984**	**51.056**	**77.278**	**120.278**	**7.139**	**1.261**	**3.589**	**3.378**	**80.333**	**138.278**	**154.833**	**478.611**
Tester (Male)																
KA-2 (Check)	37.333	45.333	22.667	3.600	7.000	40.000	67.333	123.333	6.600	1.367	3.600	2.500	50.333	165.667	157.333	580.000
LCA-334	40.667	47.333	79.000	3.233	6.167	43.333	75.667	127.333	6.567	1.200	3.733	3.300	66.333	150.667	160.000	560.000
Indira Chilli-1	43.000	49.333	63.000	3.033	5.867	46.000	77.333	118.667	4.467	1.000	2.300	2.600	73.667	191.000	148.667	440.000
Average	**40.333**	**47.333**	**54.889**	**3.289**	**6.345**	**43.111**	**73.444**	**123.111**	**5.878**	**1.189**	**3.211**	**2.800**	**63.444**	**169.111**	**155.333**	**526.667**
Overall average	**45.482**	**52.741**	**62.296**	**3.063**	**6.104**	**48.407**	**76.000**	**121.222**	**6.719**	**1.237**	**3.463**	**3.185**	**74.704**	**148.556**	**155.000**	**494.630**
SEm±	**0.754**	**1.806**	**2.359**	**0.170**	**0.362**	**1.609**	**0.620**	**1.821**	**0.251**	**0.049**	**0.137**	**0.065**	**1.261**	**6.043**	**2.057**	**6.558**
CD at 5%	**2.259**	**5.415**	**7.044**	**0.511**	**1.085**	**4.826**	**1.858**	**5.458**	**0.752**	**0.148**	**0.411**	**0.194**	**3.782**	**18.116**	**6.167**	**19.637**
CV %	**2.870**	**5.932**	**6.533**	**9.632**	**10.265**	**5.759**	**1.413**	**2.601**	**6.470**	**6.914**	**6.863**	**3.523**	**2.925**	**7.045**	**2.299**	**2.293**

01 Days to first flowering **02** Days to 50% flowering **03** Plant height (cm) **04** Number of primary branches
05 Secondary branches **06** Days to fruiting **07** Days to 1st picking **08** Fruit bearing period
09 Fruit length (cm) **10** Fruit width (cm) **11** Fruit weight (g) **12** Stalk/pedicel length (cm)
13 Number of seeds /fruit **14** Number of fruits/ plant **15** Duration of crop (sowing to last harvest days) **16** Green fruit yield /plant (g)

Table 2: Genotypic and phenotypic coefficients of variation (GCV and PCV), Heritability (h^2), Genetic advance as % of mean and components of variance for greenfruit yield and its component characters of genotypes

Characters		Days to first flowering	Days to 50% flowering	Plant height (cm)	Number of primary branches	Secondary branches	Days to fruiting	Days to first picking	Fruit bearing period	Fruit length (cm)	Fruit width (cm)	Fruit weight (g)	Stalk/ pedicel length (cm)	Number of seeds per fruit	Number of fruits per plant	Duration of crop (sowing to last harvest days)	Green fruit yield per plant (g)
Range	Max.	55.33	63.00	79.00	3.60	7.00	57.67	85.67	127.33	10.37	1.40	4.77	4.33	105.00	191.00	164.00	580.00
	Min.	35.67	43.33	22.67	2.50	4.50	39.67	63.67	115.00	3.53	1.00	2.30	2.50	35.00	122.67	148.67	390.00
PCV%		15.34	13.07	27.41	14.55	15.35	13.99	9.01	3.86	31.64	12.27	24.96	19.98	30.91	15.90	3.91	14.89
GCV%		15.07	12.85	26.65	10.91	11.42	13.68	8.90	2.85	30.97	10.14	24.32	19.67	30.77	14.26	3.17	14.72
Heritability (%)		96.50	96.71	94.53	56.20	55.30	95.71	97.54	54.55	95.82	68.27	94.93	96.89	99.10	80.37	65.47	97.77
Genetic advance as % of mean		30.49	26.04	53.38	16.85	17.49	27.57	18.10	4.34	62.46	17.26	48.82	39.88	63.10	26.33	5.28	29.98

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