The Bioscan 10(4): 1963-1968, 2015 (Supplement on Genetics and Plant Breeding) www.thebioscan.in
AN INTERNATIONAL QUARTERLY JOURNAL OF LIFE SCIENCES

HETEROSIS STUDY FOR YIELD COMPONENTS IN CHILLI (*CAPSICUM ANNUUM* L.)

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KEYWORDS
Mid parent
Better parent
Standard parent
Heterosis
Line × Tester

Received on :
22.04.2015

Accepted on :
18.09.2015

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ABSTRACT

Magnitude of heterosis was estimated by Line × Tester analysis including 18 F_1 cross combinations using 9 parents (six lines and three testers) after selfing. These 27 genotypes (6 lines and 3 testers and resulting 18 F_1 hybrids) were evaluated for growth and yield contributing traits. Analysis of variance for Line x Tester analysis for green fruit yield and its components revealed significant differences among genotypes. The magnitude of variance for Line x Tester analysis revealed that the gca variance were relatively higher than the sca variance for all the characters. The relative heterosis for green fruit yield per plant ranged from -9.68 percent (2011-07xLCA-334) to 52.46 percent (2010-03xKA-2) and 2011-03xKA-2 (52.46%) exhibited highest significant positive relative heterosis for this trait. The extent of heterobeltiosis ranged from -22.32 percent (2011-07xLCA-334) to 51.14 percent (2011-03xKA-2) and 2011-03xKA-2 (51.14%) showed highest significant positive heterobeltiosis for this trait. The heterosis over check variety for green fruit yield per plant varied from -25.28 percent (2011-07xIndira Chilli-1) to 51.14 percent (2011-03xKA-2) and 2011-03xKA-2 (51.14%) exhibited significant positive standard heterosis over check variety for this trait. The most promising crosses showing significantly standard heterosis for maximum yield were 2010-03xKA-2 followed by 2010-06xIndira Chilli-1, 2010-03xLCA-334 and 2011-03xLCA-334.

INTRODUCTION

Chilli (*Capsicum annuum* L.) is mainly used in culinary to add aroma, colour and taste. In India no dish is complete without chillies. It belongs to family solanaceae. A few varieties are still recommended for commercial cultivation, there is a need for genetic evaluation of the available chilli germplasm for increasing the productivity considering the preference of the consumer's demand. Germplasm characterization is important for conservation and utilization of plant genetic resources (Thul *et al.,* 2012). 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). Analysis of genetic diversity is useful in selecting diverse parental combinations, reliable classification of accessions and for exact identification of variety (Bahurupe *et al.,* 2013). Exploitation of heterosis in chilli has been recognized as a practical tool in providing the breeders a means of increasing yield and other economic traits. The success of any crop improvement programme depends upon the nature and magnitude of genetic variability existing in breeding material with which plant breeder is working, choice of parents for hybridization and selection procedure (Meena and Bahadur, 2014). Heterosis breeding has been advantageous for increased chilli production for effective transfer of desirable genes controlling both quantitative and qualitative traits in the resultant progenies, it is also necessary to exploit the better combining breeding materials (Kearsey and Farquhar, 1998). This investigation was planned to determine the heterosis in chilli genotypes and identify superior heterotic cross combinations for yield.

MATERIALS AND METHODS

The experimental material comprised of nine diverse genotypes of chilli (6 line and 3 testers) which were received from All India Coordinate Research Project on Vegetable Crops, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.). The selected chilli genotypes were grown during *Rabi* season of 2012-13 and 2013-14 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 experimental materials including six lines and three testers were sown in crossing block to derive 18 F_1's following Line × Tester mating design during *Rabi* season of 2012-13. 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. One popular standard variety named KA-2 was used as check variety in present experiment. The nine parents including six lines and three testers along with its 18 derived F_1's were grown out in randomized block design (RBD) with three replications for possible evaluation during *Rabi* season of 2013-14. Each parent and F_1's was transplanted in separate block. Recommended package and practices were applied to raise good crops. Data of ten randomly selected plants of each genotypes and its crosses in each replication was recorded for yield and its component traits *viz*. days to first flowering, days to 50% flowering, plant height (cm), number of primary branches, secondary branches, days to fruiting, days to 1st picking, fruit bearing period, fruit length (cm), fruit width (cm), fruit weight (g), stalk/pedicel length (cm), number of seeds/fruit, number of fruits/plant, duration of crop (sowing to last harvest days), green fruit yield/plant (g) and averaged replication wise mean data was used for statistical analysis. The analysis of variance (ANOVA) for line × tester analysis was done according to Singh and Chaudhary (1985). Relative heterosis, heterosis over better parent (heterobeltiosi) and standard/check variety (KA-2) were estimated (Table-3). The heterosis of F_1's over the better parent (heterobeltiosi) (Rai, 1979), mid parent (relative heterosis) (Fonseca and Patterson, 1968) and check variety (standard heterosis) (Tysdal *et al.* 1962 and Rai, 1979) were calculated by using the following formula: Heterobeltiosis (%) $= \frac{\overline{F}_1 - BP}{\overline{BP}} \times 100$

Relativeheteosis (%) $= \frac{\overline{F}_1 - MP}{\overline{MP}} \times 100$,

Standard heterosis (%) $= \frac{\overline{F}_1 - SV}{\overline{SV}} \times 100$

Where, F_1 = mean performance of cross, BP = mean performance of better parent and SV = mean performance of standard variety (KA-2). Significance of heterosis is tested with the help of standard error using 't' test.

RESULTS AND DISCUSSION

Analysis of variance for all the traits under study has been presented in the (Table 1). The variance due to parents was noted highly significant for all the characters. The variance due to hybrids was also found highly significant for all the characters under study. The variance due to parents vs. hybrids was highly significant for almost all the characters except number of secondary branches and fruit width. The variance due to lines was found non-significant for all the characters except for days to first flowering, days to 50%

Table 1: Analysis of variance for Line x Tester analysis for green fruit yield and its component characters

Characters Source	D.F.	DFF	D50%	PH	NPB	SB	DF	D1st
Replication	2	16.333	9.271	33.419	0.083	0.333	6.567	9.679
Treatment	26	77.367**	67.691**	705.041**	0.443**	0.542**	77.061**	86.938**
Parents	8	59.342**	34.083**	780.871**	0.301*	2.014**	62.333**	71.037**
Parents Vs. hybrids	1	156.055**	140.746**	743.265**	0.706*	0.154	119.265**	335.117**
Hybrids	17	81.221**	79.208**	667.107**	0.495**	1.402**	81.508**	79.822**
Lines	5	174.641**	171.041**	536.6111	0.365	1.459	171.352**	108.374
Tester	2	140.24**	108.962*	352.667*	1.475*	1.182	135.185**	196.907*
Lines X Testers	10	22.707*	27.341**	795.2444**	0.364**	1.417*	25.851*	42.129**
GCA variance (Ã²g)		6.529	4.534	-24.587	0.061	-0.001	-0.001	6.074
SCA variance (Ã²s)		21.085	21.346	235.708	0.082	0.082	0.319	21.339
Ã²g/Ã²s		0.31	0.223	-0.104	0.744	0.744	-0.002	0.285
Error	52	6.154	10.707	10.548	0.114	0.399	6.581	7.333

Table 1: Cont...........................

Source	FBP	FL	FW_i	FWe	S/PL	NS/F	NF/F	DC	GFY/P
	29.123	0.052	0.0005	0.051	0.003	10.481	88.444	15.642	586.111
Replication	99.861**	16.309**	0.0455**	2.006**	1.843**	1703.823**	1955.18**	121.208**	46752.137**
Treatment	49.342**	22.392**	0.0264*	2.124**	2.169**	2320.425**	583.371*	43.425*	41325.926**
Parents	340.895**	3.351**	0.0121	0.347**	0.642**	46.722**	9522.000**	65.488*	1512.500**
Parents Vs. hybrids	109.456**	14.208**	0.0564**	2.049**	1.760**	1511.143**	2155.642**	161.09**	51966.803**
Hybrids	48.596	3.338	0.0106	0.233	1.143	426.551	5170.563**	129.307	51942.685
Lines	117.851	50.045*	0.0516	9.566**	5.811*	836.685	1625.018	66.685	171903.241**
Tester	138.207**	12.470**	0.0803**	1.453**	1.258**	2188.329**	754.307**	195.862**	27991.574**
Lines X Testers	8.598	-1.131	2.087	-0.002	0.314	0.253	-75.091	48.372	-7.176
GCA variance (Ã²g)	18.113	32.6448	3.067	0.018	0.728	0.391	547.256	685.96	54.823
SCA variance (Ã²s)	0.475	-0.035	0.68	-0.111	0.434	0.647	-0.137	0.071	-0.131
Ã²g/Ã²s	12.341	0.113	0.0081	0.046	0.012	4.981	73.983	11.552	230.021
Error	12.341	0.113	0.0081	0.046	0.012	4.981	73.983	11.552	230.021

*Significant at P = 0.05 level; ** Significant at P = 0.01 level

DFF	Days to first flowering	D50%	Days to 50% flowering	PH	Plant height (cm)	NPB	Number of primary branches
SB	Secondary branches	DF	Days to fruiting	D1st	Days to 1st picking	FBP	Fruit bearing period
FL	Fruit length (cm)	FW_i	Fruit width (cm)	FWe	Fruit weight (g)	S/PL	Stalk/pedicel length (cm)
NS/F	Number of seeds /fruit	NF/F	Number of fruits/ plant	DC	Duration of crop (sowing to last harvest days)	GFY/P	Green fruit yield /plant (g)

Table 2: Heterosis (Over mid parent, better parent and check variety) and Inbreeding Depression for green fruit yield and component characters in chilli

Hybrids	1. Days to first flowering			2. Days to 50% flowering			3. Plant height (cm)			4. Number of primary branches		
	RH	HB	SH	RH	HB	SH	RH	HB	SH	RH	HB	SH
2011-07xKA-2	28.767**	25.893**	25.893**	23.308**	20.588**	20.588**	-12.458**	-43.231**	91.176**	-17.895**	-27.778**	-27.778**
2010-03xKA-2	22.764**	12.687**	34.821**	18.367**	10.127**	27.941**	69.173**	13.636**	230.882**	-11.962**	-14.815**	-14.815**
2011-08xKA-2	13.410**	-0.671	32.143**	9.804**	-1.176	23.529**	15.517**	-18.293**	97.059**	-19.355**	-30.556**	-30.556**
2010-06xKA-2	-1.132	-14.379**	16.964**	-3.871**	-14.368**	9.559**	31.944**	-13.636**	179.412**	-8.213**	-12.037**	-12.037**
2011-03xKA-2	7.914**	-9.639**	33.929**	8.308**	-6.878**	29.412**	49.801**	2.732*	176.471**	-3.922**	-9.259**	-9.259**
2011-01xKA-2	15.672**	-0.641	38.393**	5.431**	-6.780**	21.324**	25.954**	-14.949**	142.647**	-22.404**	-34.259**	-34.259**
2011-07xLCA-334	24.017**	16.393**	26.786**	20.588**	15.493**	20.588**	-31.331**	-32.490**	135.294**	-15.084**	-21.650**	-29.630**
2010-03xLCA-334	12.500**	7.463**	28.571**	6.667**	1.266	17.647**	-52.184**	-56.118**	52.941**	10.101**	7.921**	0.926
2011-08xLCA-334	4.059**	-5.369**	25.893**	1.923	-6.471**	16.912**	-24.688**	-36.287**	122.059**	14.286**	3.093**	-7.407**
2010-06xLCA-334	-4.000**	-13.726**	17.857**	9.494**	-0.575	27.206**	-4.595**	-8.017**	220.588**	-2.041	-3.030**	-11.111**
2011-03xLCA-334	10.417**	-4.217**	41.964**	6.949**	-6.349**	30.147**	7.619**	-4.641**	232.353**	-3.627**	-4.124**	-13.889**
2011-01xLCA-334	12.950**	0.641	40.179**	5.956**	-4.520**	24.265**	6.265**	-3.376**	236.765**	-17.442**	-26.804**	-34.259**
2011-07xIndira Chilli-1	38.983**	27.132**	46.429**	28.777**	20.946**	31.618**	-49.282**	-53.712**	55.882**	-5.202**	-9.890**	-24.074**
2010-03xIndira Chilli-1	19.392**	17.164**	40.179**	13.072**	9.494**	27.206**	-3.359**	-5.556**	175.000**	-3.125**	-7.921**	-13.889**
2011-08xIndira Chilli-1	-0.719	-7.383**	23.214**	-1.258	-7.647**	15.441**	-28.045**	-32.804**	86.765**	-4.142**	-10.989**	-25.000**
2010-06xIndira Chilli-1	-9.220**	-16.340**	14.286**	-6.832**	-13.793**	10.294**	4.156**	-3.182**	213.235**	-8.421**	-12.121**	-19.444**
2011-03xIndira Chilli-1	1.695	-9.639**	33.929**	0.297	-10.582**	24.265**	-2.151	-3.704**	167.647**	-9.091**	-11.458**	-21.296**
2011-01xIndira Chilli-1	12.281**	2.564*	42.857**	10.769**	1.695	32.353**	30.548**	28.866**	267.647**	-16.868**	-24.176**	-36.111**

Table 2: Cont... Heterosis (Over mid parent, better parent and check variety) and Inbreeding Depression for green fruit yield and component characters in chilli

Hybrids	5. Secondary branches			6. Days to fruiting			7. Days to 1st picking			8. Fruit bearing period		
	RH	HB	SH	RH	HB	SH	RH	HB	SH	RH	HB	SH
2011-07xKA-2	-1.449	-19.048**	-19.048**	26.360**	25.833**	25.833**	12.977**	9.901**	9.901**	-0.826	-2.703*	-2.703*
2010-03xKA-2	-20.673**	-21.429**	-21.429**	25.191**	15.493**	36.667**	12.150**	6.195**	18.812**	-1.538	-4.865**	-4.865**
2011-08xKA-2	-16.449**	-23.810**	-23.810**	12.857**	-1.250	31.667**	1.376**	-5.556**	9.406**	-7.547**	-7.796**	-7.297**
2010-06xKA-2	-24.574**	-26.191**	-26.191**	-2.128	-14.815**	15.000**	-2.041	-9.623**	6.931**	-11.417**	-12.973**	-12.973**
2011-03xKA-2	-5.185**	-8.571**	-8.571**	8.532**	-8.092**	32.500**	4.933**	-4.098**	15.842**	-6.849**	-8.108**	-8.108**
2011-01xKA-2	-16.711**	-25.238**	-25.238**	16.608**	1.227	37.500**	6.754**	-4.669**	21.287**	8.456**	7.733**	9.189**
2011-07xLCA-334	5.625**	-8.649**	-19.524**	22.892**	17.692**	27.500**	12.919**	3.965**	16.832**	-6.233**	-9.424**	-6.486**
2010-03xLCA-334	-23.785**	-27.670**	-29.048**	13.971**	9.155**	29.167**	-0.221	-0.441	11.881**	-0.963**	-5.759**	-2.703*
2011-08xLCA-334	-6.704**	-9.730**	-20.476**	2.759*	-6.875**	24.167**	-0.651	-2.137	13.366**	-6.897**	-8.115**	-5.135**
2010-06xLCA-334	5.699**	1.493	-2.857*	-4.795	-14.198**	15.833**	-6.009**	-8.368**	8.416**	-3.383**	-6.545**	-3.514**
2011-03xLCA-334	3.158**	0.513	-6.667**	9.571	-4.046**	38.333**	4.883**	1.230	22.277**	-0.809	-3.665**	-0.541
2011-01xLCA-334	6.250**	1.081	-10.952**	11.945**	0.613	36.667**	4.132**	-1.946	24.752**	-1.717	-2.618*	0.541
2011-07xIndira Chilli-1	-13.183**	-23.296**	-35.714**	33.852**	24.638**	43.333**	22.931**	12.069**	28.713**	6.180**	6.180**	2.162
2010-03xIndira Chilli-1	8.377**	0.485	-1.429	18.571**	16.901**	38.333**	11.790**	10.345**	26.733**	9.843**	8.146**	4.054**
2011-08xIndira Chilli-1	2.006	1.136	-15.238**	-2.013	-8.750**	21.667**	-4.292**	-4.701**	10.396**	-3.297**	-5.376**	-4.865**
2010-06xIndira Chilli-1	-17.241**	-22.388**	-25.714**	-9.333**	-16.049**	13.333**	-2.335*	-3.766**	13.861**	2.665*	2.521*	-1.081
2011-03xIndira Chilli-1	-6.199**	-10.769**	-17.143**	2.894	-7.514**	33.333**	2.101	-0.410	20.297**	8.659**	8.056**	5.135**
2011-01xIndira Chilli-1	-10.204**	-12.500**	-26.667**	12.957**	4.294**	41.667**	1.022	-3.891**	22.277**	2.873*	0.267	1.622

Table 2: Heterosis (over mid parent, better parent and check variety) and Inbreeding Depression for green fruit yield and component characters in chilli

Hybrids	9. Fruit length (cm)			10. Fruit width (cm)			11. Fruit weight (g)			12. Stalk/pedicel length (cm)		
	RH	HB	SH	RH	HB	SH	RH	HB	SH	RH	HB	SH
2011-07xKA-2	-26.966**	-34.343**	-34.343**	-16.216**	-24.390**	-24.390**	-11.828**	-24.074**	-24.074**	-10.000**	-22.857**	8.000**
2010-03xKA-2	-5.405**	-14.634**	6.061**	-8.434**	-9.524**	-7.317**	5.042**	-3.846**	15.741**	7.368**	-11.304**	36.000**
2011-08xKA-2	-2.381*	-7.658**	3.535**	-2.500*	-4.878**	-4.878**	-14.912**	-19.167**	-10.185**	16.364**	6.667**	28.000**
2010-06xKA-2	-7.727**	-16.116**	2.525*	-7.317**	-7.317**	-7.317**	17.476**	12.037**	12.037**	15.476**	4.301**	29.333**
2011-03xKA-2	26.916**	3.859**	63.131**	2.564*	-2.439	-2.439	15.538**	1.399	34.259**	21.951**	-3.846**	66.667**
2011-01xKA-2	-34.211**	-49.495**	-49.495**	-15.790**	-21.951**	-21.951**	-17.838**	-29.630**	-29.630**	68.000**	68.000**	68.000**
2011-07xLCA-334	-42.535**	-48.223**	-48.485**	-10.145**	-13.889**	-24.390**	-20.000**	-32.143**	-29.630**	-52.941**	-54.286**	-36.000**
2010-03xLCA-334	6.095*	-4.472**	18.687**	2.564*	-4.762**	-2.439	6.612**	-0.769	19.444**	23.364**	14.783**	76.000**
2011-08xLCA-334	-0.239	-5.856**	5.556**	14.667**	10.256**	4.878**	0.862	-2.500*	8.333**	30.159**	24.242**	64.000**
2010-06xLCA-334	-1.139	-10.331**	9.596**	-3.896*	-9.756**	-9.756**	-11.429**	-16.964**	-13.889**	6.250*8	3.030**	36.000**
2011-03xLCA-334	39.370**	13.826**	78.788**	9.589**	8.108**	-2.439	10.588**	-1.399	30.556**	-7.424**	-18.462**	41.333**
2011-01xLCA-334	-28.713**	-45.178**	-45.455**	-9.859*	-11.111**	-21.951**	-20.635**	-33.036**	-30.556**	16.092**	2.020	34.667**
2011-07xIndira Chilli-1	-16.438**	-22.785**	-38.384**	1.587	-3.030**	-21.951**	0.680	-5.128*	-31.482**	-54.098**	-60.000**	-44.000**
2010-03xIndira Chilli-1	47.368**	13.821**	41.414**	8.333**	-7.143**	-4.878**	18.593**	-9.231*	9.259**	6.736**	-10.435**	37.333**
2011-08xIndira Chilli-1	13.483**	-9.009**	2.020	10.145**	-2.564*	-7.317**	33.333**	5.000*	16.667**	17.857**	10.000**	32.000**
2010-06xIndira Chilli-1	26.064**	-2.066	19.697**	4.225**	-9.756**	-9.756**	10.180**	-6.122**	-14.815**	-1.754	-9.677**	12.000**
2011-03xIndira Chilli-1	8.764**	-22.187**	22.222**	4.478**	-5.405**	-14.634**	13.208**	-16.084**	11.111**	28.846**	3.077**	78.667**
2011-01xIndira Chilli-1	-0.833	-11.194**	-39.899**	10.769**	2.857*	-12.195**	2.740	-2.597*	-30.556**	-4.575**	-6.410**	-2.667*

Table 2: Heterosis (Over mid parent, better parent and check variety) and Inbreeding Depression for green fruit yield and component characters in chilli

Hybrids	13. Number of seeds per fruit			14. Number of fruits per plant			15. Duration of crop (sowing to last harvest days)			16. Green fruit yield per plant (g)		
	RH	HB	SH	RH	HB	SH	RH	HB	SH	RH	HB	SH
2011-07xKA-2	-4.709**	-18.095**	13.907**	5.590**	2.616	2.616*	-2.429*	-2.737*	-2.119	-7.797**	-21.839**	-21.839**
2010-03xKA-2	10.705**	-8.621**	40.397**	-17.321**	-27.968**	-27.968**	-5.252**	-6.356**	-6.356**	11.712**	6.897**	6.897**
2011-08xKA-2	36.111**	4.626**	94.702**	-13.034**	-22.133**	-22.133**	-7.281**	-8.263**	-8.263**	-7.273**	-12.069**	-12.069**
2010-06xKA-2	24.464**	-7.937**	92.053**	26.898**	17.706**	17.706**	-10.337**	-12.712**	-12.712**	31.621**	17.816**	17.816**
2011-03xKA-2	26.432**	-5.281**	90.066**	33.179**	15.895**	15.895**	-6.725**	-8.898*8	-8.898**	52.464**	51.149**	51.149**
2011-01xKA-2	22.656**	3.974**	3.974**	11.642**	8.048**	8.048**	2.490*	0.407	4.661**	-5.155**	-20.690**	-20.690**
2011-07xLCA-334	-36.430**	-38.095**	-13.907**	18.350**	16.205**	9.658**	-8.691**	-9.167**	-7.627**	-9.689**	-22.321	-25.000
2010-03xLCA-334	29.466**	20.259**	84.768**	38.611**	25.885**	14.487**	-4.357**	-6.250**	-4.661**	46.789**	42.857**	37.931**
2011-08xLCA-334	28.750**	9.964**	104.636**	29.231**	20.796**	9.859**	-6.369**	-8.125**	-6.568**	4.012**	0.298	-3.161**
2010-06xLCA-334	22.957**	0.317	109.272**	19.270**	15.708**	5.231**	-3.560**	-6.875**	-5.297**	-1.146	-10.119**	-13.218**
2011-03xLCA-334	1.195	-16.172**	68.212**	28.049**	16.150**	5.634**	-1.505	-4.583**	-2.966*	38.643**	37.427**	35.057**
2011-01xLCA-334	-13.158**	-33.668**	-12.583**	26.063**	24.301**	16.298**	-4.938**	-6.098**	-2.119	-5.965**	-20.238**	-22.989**
2011-07xIndira Chilli-1	-39.211**	-40.724**	-13.245**	13.244**	2.967*	18.712**	1.629	-1.474	-0.847	2.767**	-1.515	-25.287**
2010-03xIndira Chilli-1	1.104	-1.293	51.656**	2.548	-15.707**	-2.817*	4.300**	2.603*	0.212	5.842**	-3.145**	-11.494**
2011-08xIndira Chilli-1	15.936**	3.559**	92.715**	15.321**	-2.792*	12.072**	-2.643*	-4.329*	-6.356**	27.778**	17.949**	5.747**
2010-06xIndira Chilli-1	3.731**	-11.746**	84.106**	22.445**	6.632**	22.938**	1.456	1.342	-4.025**	47.310**	44.364**	14.080**
2011-03xIndira Chilli-1	14.886**	-0.660	99.338**	7.545**	-11.693**	1.811	6.027**	5.556**	0.636	18.812**	5.263**	3.448**
2011-01xIndira Chilli-1	-39.877**	-55.656**	-35.099	7.900**	-2.269	12.676	-0.640	-5.285	-1.271	9.237**	3.030**	-21.839**

* Significant at P = 0.05 level; ** Significant at P = 0.01 level, **RH**-Relative Heterosis, **HB**-Heterobeltiosis, **SH**-Standard Heterosis,

Table 3: Top five hybrids on the basis of heterosis (%) for green fruit yield per plant

S. No.	Hybrids Relative heterosis	Heterobeltiosis	Standard heterosis
01.	2010-03x KA-2 (52.46%)	2010-03x KA-2 (51.14%)	2010-03x KA-2 (51.14%)
02.	2010-06xIndira Chilli-1 (47.31%)	2010-06xIndira Chilli-1 (44.36%)	2010-06xIndira Chilli-1 (14.08%)
03.	2010-03x LCA-334 (46.78%)	2010-03x LCA-334 (42.85%)	2010-03x LCA-334 (37.93%)
04.	2011-03x LCA-334 (38.64%)	2011-03x LCA-334 (37.42%)	2011-03x LCA-334 (35.05%)
05.	2010-06x KA-2 (31.62%)	2010-06x KA-2 (17.81%)	2010-06x KA-2 (17.81%)

flowering, days to fruiting and numbers of fruits per plant. The variance due to testers was significant for most of the characters except plant height, secondary branches, fruit bearing period, fruit width, number of seeds per fruit, number of fruits per plant and duration of crop (sowing to last harvest days). Overall, the variance due to the line x tester was highly significant for all the characters. The magnitude of variance revealed that the gca (σ^2gca) were relatively higher than the sca variance (sca) for all the characters (Table 1). The ratio of (gca /sca) was less than unity for all the characters studied indicating predominance of non-additive gene action as similar reported by Agarwal *et al.* (2014), Makani *et al.* (2013).

The relative heterosis for green fruit yield per plant (Table-2) ranged from -9.68 percent (2011-07xLCA-334) to 52.46 percent (2010-03xKA-2). Twelve crosses showed significant positive relative heterosis for this trait. 2011-03xKA-2 (52.46%) exhibited highest significant positive relative heterosis followed by 2010-06xIndira Chilli-1 (47.31%), 2010-03xLCA-334 (46.78%), 2011-03xLCA-334 (38.64%), 2010-06xKA-2 (31.62%), 2011-08xIndira Chilli-1 (27.77%), 2010-03xKA-2 (11.71%) etc. while five crosses showed significant negative relative heterosis for green fruit yield per plant. Chaudhary *et al.* (2013) and Nascimento *et al.* (2014) who reported similar results studied on yield and quality traits in the pepper (*Capsicum annuum* L.). The extent of heterobeltiosis (Table-2) ranged from -22.32 percent (2011-07xLCA-334) to 51.14 percent (2011-03xKA-2). Out of eighteen crosses, nine exhibited significant positive heterobeltiosis. The crosses, 2011-03xKA-2 (51.14%), 2010-06xIndira Chilli-1 (44.36%), 2010-03xLCA-334 (42.85%), 2011-03xLCA-334 (37.42%), 2011-08xIndira Chilli-1 (17.94%), 2010-06xKA-2 (17.81%) etc. showed significant positive heterobeltiosis for this trait. While 2011-07xIndira Chilli-1 (-1.51%) showed negative heterobeltiosis as similar result was found by Chaudhary *et al.* (2013). The heterosis over check variety for green fruit yield per plant (Table 2) varied from -25.28 percent (2011-07xIndira Chilli-1) to 51.14 percent (2011-03xKA-2). All the eighteen crosses showed significant standard heterosis over check variety. Makani *et al.* (2013) who reported similar results studied on yield and contributing attributes in Brinjal (*solanum melongena* L.) also similar reported by Prajapati and Agalodia (2011) and Verma *et al.* (2004).

The cross 2011-03xKA-2 (51.14%) exhibited significant positive standard heterosis followed by 2010-03xLCA-334 (37.93%), 2011-03xLCA-334 (35.05%), 2010-06xKA-2 (17.81%), 2010-06xIndira Chilli-1 (14.08%), 2010-03xKA-2 (6.89%), 2011-08xIndira Chilli-1 (5.74%), 2011-03xIndira Chilli-1 (3.44%). While ten crosses showed significant negative standard heterosis over check variety for green fruit yield per plant. As per the similar reported by Prajapati and Agalodia (2011); Navhale *et al.* (2014).

The top five hybrids were selected on the basis of highest relative heterosis, heterobeltiosis and standard heterosis for green fruit yield per plant are 2010-03xKA2, 2010-06xIndira Chilli-1, 2010-03xLCA-334, 2011-03xLCA-334 and 2010-06xKA-2 presented in Table 3.

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