

## Heterosis Studies in Chillies (*Capsicum annuum* L.)

Chilli (*Capsicum annuum* L.) a spice cum vegetable crop belongs to the family solanaceae and has chromosome number of  $2n=24$ . It is valued for its pungency, which is due to crystalline alkaloid called capsaicin, present in the placenta of fruits. Chilli has become a part and parcel of our daily diet. It is a rich source of vitamin C. The yield potential and total production of chilli crop is low due to poor yielding varieties and high incidence of pests and diseases. One of the methods to achieve quantum jump in yield is heterosis breeding. Therefore, to meet this objective in shorter time heterosis breeding has been undertaken to develop and identify the suitable best performing hybrids.

An experiment was conducted at Agricultural Research Station, Devihosur, Dharwad during kharif 2004-05. The experimental material consisted of 10 lines (SKAU-SC-304-1, SKAU-SC-965-5, SKAU-SC-578, SKAU-SC-105, SKAU-SC-814-2, SKAU-SC-1003, SKAU-SC-115, SKAU-SC-1005, SKAU-SC-618-2, SKAU-SC-105-4 and four testers viz., Byadagi kaddi, Arka Lohit, Kiran, GPC-82) and commercial check Tejaswini. These parents were crossed in line x tester design to produce 40 hybrids, along with parents and commercial check (Tejaswini) were sown in kharif 2004-05 with two rows of ten plants of each entry in a randomized block design with two replications. Observations were recorded on fourteen quantitative traits of chilli. The mean over two replications for all the hybrids for each of the trait was calculated over mid parent, better parent and standard check and used in the estimation of heterosis as per the standard procedure given by Turner (1953) and Fonesca and Patterson (1968).

The mean sum of squares of 14 quantitative characters are presented in Table 1. The analysis of variance for parents showed significant differences for all the characters studied except pericarp thickness indicating the presence of sufficient variability among parents. The variance due to females were significant for all the traits except days to 50 per cent flowering, fruit length and pericarp thickness indicating the existence of enormous amount of genetic variability for yield attributes among the female parents. Similarly, male parents showed significant difference for all the traits except number of primary branches, fruit width, pedicel length and pericarp thickness.

The interaction between female x male was significant for all the characters studied except plant spread, fruit length, pedicel length, pericarp thickness. The crosses showed highly significant differences for all the characters studied. Parents Vs hybrids showed significant differences for all the traits except plant spread and average fruit weight.

The heterosis range for 14 quantitative traits is presented in Table 2. High magnitude of average heterosis (152.67%), better parent heterosis (88.27) and economic heterosis (60.51%) was recorded by the cross SKAU-SC-1003 x Arka Lohit for fruit yield per plant. Heterosis for fruit yield per plant was also reported by Gaddagimath (1992) and Shukla *et al.* (1999).

Table 1. General ANOVA for 14 traits in green chilli

Source	df	Days to flowering	Plant height (cm)	No. of primary branches	No. of secondary branches	Plant spread (cm)	No. of fruits per plant	Fruit length (cm)	Fruit width (cm)	Average fruit weight(g)	Pedicel length (cm)	Pericarp thickness (cm)	No. of seeds per fruit	Seed weight per fruit(g)	Fruit yield per plant (g)
Repn	1	1.81	0.01	0.01	0.68	28.84*	546.75**	0.98	0.007	0.81**	0.01	0.064**	40.21	0.01	564.90**
Parent	13	1.84**	139.68**	0.22**	1.66**	20.07**	6078.80**	1.53**	0.123**	0.55**	0.44**	0.001	641.00**	0.02**	17810.46**
Female	9	0.33	67.84**	0.26**	1.23**	19.18**	2287.58**	0.79	0.136**	0.46**	0.53**	0.001	423.38**	0.01**	15302.23**
Males	3	2.67**	38.11**	0.06	2.09**	23.99**	9466.83**	3.73**	0.013	0.73**	0.26	0.001	1128.33**	0.02**	1617.13**
F vs M	1	12.86**	1090.99**	0.37*	4.23**	16.37	30035.71**	1.61	0.338**	0.77**	0.13	0.001	1137.67**	0.02**	88964.58**
Cross	39	4.10**	60.96**	0.13**	2.22**	37.43**	4416.22**	3.50**	0.044**	1.08**	0.39**	0.142**	412.28**	0.07**	35619.11**
Par vs Hyb	1	8.01**	2416.24**	3.97**	118.03**	1.98	25933.81**	5.15**	0.171**	0.29	0.53*	2.296**	1889.56**	0.75**	338954.03**
Error	53	0.48	5.97	0.06	0.21	5.24	4.35	0.54	0.005	0.10	0.10	0.011	10.43	0.00	5.03

\* Significant at 5% level      \*\* - Significant at 1% level

Table 2 . Heterosis range for 14 quantitative traits in green chilli

Sl. No.	Characters	Days to 50% flowering		
		Mid parent	Better parent	Commercial check
1.	Days to 50% flowering	6.62 to 4.51	-5.93 to 6.11	3.25 to 12.20
2.	Plant height (cm)	-12.92 to 39.07	-14.39 to 15.91	-28.99 to 4.63
3.	Number of primary branches	-14.29 to 55.13	-22.22 to 44.05	-42.47 to 17.26
4.	No. of secondary branches	1.08 to 114.63	-6.06 to 87.78	-16.81 to 55.75
5.	Plant spread (cm)	-20.46 to 15.67	-26.18 to 14.80	-3.85 to 55.15
6.	No. of fruits per plant	-28.13 to 98.73	-46.75 to 35.34	-10.00 to 250.67
7.	Fruit length (cm)	-34.08 to 47.48	-37.66 to 34.42	-34.21 to 40.79
8.	Fruit width (cm)	-40.79 to 63.98	-53.33 to 60.90	-44.83 to 47.59
9.	Average fruit weight (g)	-56.72 to 59.37	-64.29 to 54.55	-41.67 to 112.50
10.	Pedicle length (cm)	-32.91 to 49.07	-26.02 to 57.89	-25.71 to 37.14
11.	Pericarp thickness (cm)	-33.33 to 1138.10	-43.33 to 1138.10	-76.00 to 246.67
12.	No. of seeds per fruit	-38.26 to 84.42	-33.15 to 114.29	30.83 to 77.50
13.	Seed weight per fruit (g)	-84.14 to 68.12	-82.69 to 114.81	-60.00 to 180.00
14.	Fruit yield per plant (g)	-52.80 to 152.67	-56.87 to 88.27	-62.18 to 60.51

For average fruit weight, significant positive heterosis was exhibited in SKAU-SC-578-1 x GPC-82, magnitude of average heterosis (59.31), better parent heterosis (54.55) and economic heterosis (112.50) followed by the cross SKAU-SC-304-1 x GPC-82 i.e., magnitude of average heterosis (33.9), better parent heterosis (29.85) and economic heterosis (78.75).

For number of fruits per plant significant positive heterosis was exhibited by the cross SKAU-SC-965-5 x Arka Lohit and magnitude of average heterosis (69.4), better parent heterosis (6.91) and economic heterosis (250.67%) was high for yield contributing characters such as days to 50 per cent flowering in SKAU-SC-105 x GPC-82 (4.88%), fruit width in SKAU-SC-1005 x GPC-82 (40.79), fruit length in SKAU-SC-1003 x Byadagi Kaddi (40.79), plant height in SKAU-SC-1005 x Arka Lohit (4.63) exhibited high value of useful heterosis. Significant

positive heterosis in respect of yield contributing characters like number of fruits, fruit width, fruit length, fruit weight and plant height was also reported by Bhagyalakshmi et al, (1991), Mishra et al. (1991), Lippert (1975) and Natarajan (2000).

Maximum standard heterosis for total yield per plant was observed in the cross SKAU-SC-1003 x Arka Lohit (60.51%) followed by SKAU-SC-965-5 x Arka Lohit (54.23%), G-3 x Lokur local (39.92%), SKAU-SC-814-2 x Arka Lohit (35.49). The hybrid SKAU-SC-1003 x Arka Lohit also exhibited significant standard heterosis for seed weight per fruit, growth parameters and yield components, while the hybrid SKAU-SC-965-5 x GPC-82 showed significant standard heterosis for plant spread, number of fruits per plant, fruit length, fruit width, average fruit weight, pedicel length, pericarp thickness, number of seeds per fruit.

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