



Estimation of Heterosis for Yield Attributing Traits and Fruit Borer Incidence in Round Brinjal (*Solanum melongena* L.)

Ravi Kumar^{1*}, Randhir Kumar¹, Amit Kumar¹ and Divakar Kumar Bharati¹

¹*Department of Horticulture (Vegetable and Floriculture), Bihar Agricultural University, Sabour 813 210, Bhagalpur, India.*

Authors' contributions

This work was carried out in collaboration between all authors. Authors Ravi Kumar and Randhir Kumar designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author AK managed the analyses of the study. Author DKB managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Heterosis is widely utilized for the selection of superior cross combinations. Since the heterosis has become commercially feasible in developing hybrid brinjal. In the present investigation, six parents were selected on the basis of divergence and crossed in diallele design. The manifestations of hybrid vigour in thirty hybrids were studied. Significant heterosis over better parents and standard check was observed for yield attributes and Fruit borer incidence. The hybrid KS-224 × Swarna Mani and SBRB-6/12 × SBRB-3/12 expressed significant and desirable heterobeltiosis and standard heterosis for yield and fruit borer incidence. Heterosis for fruit yield per plant ranged from -31.78% (SBRB-2/12 × KS224) to 60.40 percent (KS224 × Swarna Mani) over better parent and -5.01% (SBRB-2/12 × KS224) to 88.79% (SBRB-3/12 × SBRB-2/12) over standard parent.

*Corresponding author: E-mail: Rk050588@gmail.com;

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1. INTRODUCTION

Brinjal (*Solanum melongena* L.) is an important vegetable of both tropics and subtropics part of the world and has originated in India. In India, it is cultivated all over the country. India is the major producer of Brinjal in the world followed by China, and Turkey. Brinjal occupies an area of 0.71 Million hectare with an annual production and productivity of 13.56 Million tonnes and 19.10 t/ha respectively. While, in Bihar Brinjal occupies an areas of 0.058 Million hectare with an annual production of 1.24 Million tonnes. Brinjal fruits have high nutritive value and high market demand. Therefore, its cultivation is most remunerative. In the face of increasing population, there is a need for increased production and productivity levels of Brinjal. In view of very high local preferences for colour, shape, taste, there are specific genotypes suited for specific locality. It is not possible to have one common cultivar to suit different localities and local preferences. It is therefore required to improve the yield potential of Brinjal [1]. In India, productivity of Brinjal is low as compared to the other developing countries, because of low yielding cultivars grown for local preference. The goals of increasing productivity in the quickest possible time can be achieved only through heterosis breeding which is feasible in this crop [2]. The estimation of heterosis for yield and its attributing characters would therefore be useful to evaluate the best hybrid combination for exploitation of superior hybrids. Growth and productivity of Brinjal is largely hampered by the incidence of Fruit Borer causing up to 60 to 70% yield losses [3]. Therefore, it is necessary to have the security of crop through inbuilt resistance. Hence In the present study, an attempt has been made to gather information on the extent of heterosis in a diallel cross to produce promising hybrids in Brinjal.

2. MATERIALS AND METHODS

The experiment was conducted during monsoon season 2012-2013 at Department of Horticulture (Vegetable and Floriculture), Bihar Agricultural College, Bihar Agricultural University, Sabour, Bhagalpur (Bihar) which is situated at longitude of 87°2'42" East and latitude of 25°15'40" North. This place is situated at an altitude of 45.75 m in the vast Indo-Gangetic plain of North Eastern India. Six parental lines were crossed in full diallel fashion including reciprocal to derive the 30 F₁ hybrids. The 30 F₁ hybrids and 6 diverse

parents were raised in a Randomized Complete Block Design with three replications. During the experiment, all recommend cultural practices were used adopting a spacing of 60 x 60 cm. Observation were recorded for the ten economical traits namely days taken to first flowering, days taken to 50 per cent flowering, average length of fruit, average fruit diameter, average fruit weight, number of primary branches per plant, plant height, average number of fruits per plant, average yield per plant and % incidence of Fruit borer. The Fruit borer incidence per cent was calculated by the numbers of fruits affected by borer and total number of fruits harvested. The soil of plot was sandy loam in texture having good fertility, properly leveled and well drained. The analysis of variance had been calculated using procedure given by [4]. The magnitude of heterosis in hybrids was expressed as percentage of increase or decrease of a character better parent (Heterobeltiosis) and standard variety Swarna Mani (standard heterosis) was estimated. The significance of magnitude of the heterobeltiosis and standard heterosis was tested at error degrees of freedom by the formula as suggested by Hayes et al. [5].

3. RESULTS AND DISCUSSION

The analysis of variance revealed that the analysis of variance due to genotypes, parents and hybrids were highly significant for all the traits except number of primary branches and Fruit borer incidence due to parents. However, for parents vs. hybrid only three characters viz; fruit length, number of primary branches, and plant height were found significant. The estimates of heterosis of F₁ hybrids are presented in Table 2.

3.1 Days to First Flowering

The results on heterosis for days to first flowering indicated, the range of heterosis over better parent varied from -10.54% (SBRB-6/12 x Swarna Mani) to 13.23% (KS-224 x SBRB-2/12). Heterosis over standard variety ranged from -12.87% (SBRB-6/12 x SBRB-3/12) to 2.72% (SBRB-2/12 x Swarna Mani). The SBRB-6/12 x Swarna Mani was best hybrid for this traits, showed heterosis in desirable direction. The similar finding also reported by [6]. Selection of hybrids with negative heterosis over their better parents for these traits may be useful for developing early yielding hybrids.

Table 1. Mean performance of hybrids and their parents for various traits

F ₁	Days to first flowering	Days to 50 per cent flowering	Fruit length (cm)	Fruit diameter (cm)	Av. fruit weight (gm)	No. of primary branches per plant	Plant height (cm)	No. of fruits per plant	Yield per plant (kg)	Fruit borer incidence per cent
SBRB-6/12	75.67	83.33	7.94	8.73	148.35	7.47	79.46	11.67	1.56	21.10
SBRB-1/12	80.67	85.67	16.12	8.24	225.01	7.47	88.80	9.50	1.36	20.28
KS-224	79.67	88.67	9.79	8.85	209.04	7.67	99.77	10.67	1.17	21.27
SBRB-2/12	71.33	81.67	8.30	8.88	170.04	7.40	101.66	12.77	1.57	17.05
Swarna Mani (CK)	83.33	89.33	8.72	8.78	193.93	7.87	104.91	8.57	1.13	21.27
SBRB-3/12	80.33	90.33	10.88	6.34	164.99	6.97	79.66	10.13	1.29	18.05
SBRB-6/12 × SBRB-1/12	76.67	84.33	9.41	9.13	180.18	8.37	73.75	14.03	1.76	20.77
SBRB-6/12 × KS-224	76.33	86.33	7.72	8.27	180.11	7.57	91.73	11.23	1.32	27.78
SBRB-6/12 × SBRB-2/12	74.33	84.67	7.74	8.43	161.34	6.73	74.87	15.37	1.67	26.02
SBRB-6/12 × Swarna Mani	72.67	81.67	11.42	9.65	167.71	7.03	85.24	12.63	1.52	33.19
SBRB-6/12 × SBRB-3/12	76.67	83.67	11.84	8.06	121.62	6.57	82.52	14.67	1.91	22.90
SBRB-1/12 × SBRB-6/12	75.33	89.67	9.62	7.81	189.21	7.03	87.49	8.47	1.18	21.84
SBRB-1/12 × KS-224	76.33	84.67	11.12	9.34	232.17	6.67	112.14	10.50	1.43	23.23
SBRB-1/12 × SBRB-2/12	80.33	89.67	14.17	7.84	215.32	7.67	85.64	11.70	1.32	16.81
SBRB-1/12 × Swarna Mani	73.33	81.67	8.82	8.27	213.25	6.37	118.37	11.60	1.47	21.74
SBRB-1/12 × SBRB-3/12	82.33	91.33	9.25	9.31	144.39	6.63	97.83	12.47	1.19	24.11
KS-224 × SBRB-6/12	75.33	83.33	7.92	8.14	216.90	6.53	89.10	9.80	1.13	16.42
KS-224 × SBRB-1/12	86.33	92.33	10.06	8.32	222.69	6.80	114.48	10.50	1.19	16.11
KS-224 × SBRB-2/12	78.33	88.67	9.84	8.19	196.84	6.80	96.74	8.63	0.80	14.35
KS-224 × Swarna Mani	78.33	87.33	12.22	8.80	202.00	7.63	99.58	8.67	1.88	16.60
KS-224 × SBRB-3/12	78.33	86.67	9.81	9.35	256.24	7.07	89.57	10.40	1.71	18.36
SBRB-2/12 × SBRB-6/12	83.67	92.33	11.28	8.36	208.01	6.43	84.72	8.37	1.24	17.12
SBRB-2/12 × SBRB-1/12	72.67	81.33	11.27	9.36	252.10	7.17	95.60	11.57	1.48	17.10
SBRB-2/12 × KS-224	85.67	92.33	9.03	7.96	234.85	6.83	117.20	8.83	1.07	14.55
SBRB-2/12 × Swarna Mani	83.67	92.33	17.14	7.15	205.13	6.83	103.86	13.07	1.11	15.76

F₁	Days to first flowering	Days to 50 per cent flowering	Fruit length (cm)	Fruit diameter (cm)	Av. fruit weight (gm)	No. of primary branches per plant	Plant height (cm)	No. of fruits per plant	Yield per plant (kg)	Fruit borer incidence per cent
SBRB-2/12 × SBRB-3/12	81.33	90.67	17.23	8.24	180.54	6.57	101.84	9.53	1.28	18.93
Swarna Mani × SBRB-6/12	81.67	88.33	14.15	7.06	184.75	7.17	80.06	10.47	1.45	25.33
Swarna Mani × SBRB-1/12	82.33	88.33	9.88	8.90	202.30	7.33	105.33	10.67	1.48	13.12
Swarna Mani × KS-224	74.33	81.33	9.08	9.55	224.25	7.07	110.97	9.63	1.27	15.42
Swarna Mani × SBRB-2/12	77.67	85.33	11.94	9.36	204.22	7.40	81.90	10.83	1.39	17.10
Swarna Mani × SBRB-3/12	83.67	91.33	11.58	9.14	191.16	6.43	88.29	10.77	1.60	14.06
SBRB-3/12 × SBRB-6/12	81.67	90.33	9.90	7.90	217.42	7.70	91.08	11.27	1.55	16.49
SBRB-3/12 × SBRB-1/12	79.67	89.33	10.99	8.19	206.83	6.63	117.31	11.93	1.48	16.90
SBRB-3/12 × KS-224	74.67	92.67	9.94	8.95	243.71	6.67	111.87	9.90	1.47	15.97
SBRB-3/12 × SBRB-2/12	80.67	86.67	11.44	9.24	242.31	7.73	102.82	14.53	2.13	19.01
SBRB-3/12 × Swarna Mani	83.67	92.33	8.59	9.47	221.00	6.37	101.97	10.50	1.27	16.11
C.D.	6.95	7.973	0.975	0.866	19.891	0.579	9.337	1.841	0.179	2.935
SE mean (±)	2.459	2.821	0.345	0.306	7.037	0.205	3.303	0.651	0.063	1.038
C.V.	5.387	5.585	5.57	6.209	6.069	5.017	5.973	10.253	7.752	9.352

Table 2. Estimates of heterosis (%) over better parent (BP) and standard variety (SV) for ten characters in Brinjal

F ₁	Days to first flowering		Days to 50 per cent flowering		Fruit length (cm)		Fruit diameter (cm)		Average fruit weight (gm)	
	BP	SV	BP	SV	BP	SV	BP	SV	BP	SV
SBRB-6/12 × SBRB-1/12	3.87	0.35	6.66*	2.02	-41.63**	7.83	4.50	3.99	-19.92**	-7.09
SBRB-6/12 × KS224	1.13	-7.92**	-4.43	-5.57	-21.14**	-11.50	-6.52	-5.73	-13.84**	-7.12
SBRB-6/12 × SBRB-2/12	2.04	-8.40**	3.74	-3.32	-6.71	-11.27	-5.14	-3.99	-5.12	-16.81**
SBRB-6/12 × Swarna Mani	-10.54**	-10.54**	-5.16	-5.16	30.91**	30.91**	9.95	9.95	-13.52*	-13.52*
SBRB-6/12 × SBRB-3/12	-9.16**	-12.87**	-9.68**	-9.01**	8.79	35.69**	-7.71	-8.17	-26.29**	-37.29**
SBRB-1/12 × SBRB-6/12	-4.88	-8.11**	-2.94	-7.16*	-40.31**	10.28	-10.57	-11.01	-15.91**	-2.43
SBRB-1/12 × KS224	-6.39*	-9.57**	1.10	-0.10	-31.00**	27.47**	5.57	6.46	3.18	19.72**
SBRB-1/12 × SBRB-2/12	-4.91	-8.13**	-1.26	-5.55	-12.08**	62.44**	-11.71	-10.63	-4.31	11.03
SBRB-1/12 × Swarna Mani	-3.41**	-3.41	0.07	0.07	-45.29**	1.07	-5.81	-5.81	-5.22	9.96
SBRB-1/12 × SBRB-3/12	-8.45	-11.56**	-9.15**	-8.49**	-42.63**	6.00	12.90	6.04	-35.83**	-25.55**
KS224 × SBRB-6/12	8.82**	-0.92	3.36	2.13	-19.14**	-9.25	-8.06	-7.29	3.76	11.85
KS224 × SBRB-1/12	-6.15	-9.33**	-5.81	-6.93*	-37.58**	15.32**	-6.03	-5.24	-1.03	14.83*
KS224 × SBRB-2/12	13.23**	3.09	5.08	3.83	0.48	12.76*	-7.84	-6.72	-5.84	1.50
KS224 × Swarna Mani	-6.47*	-6.47*	-1.05	-1.05	24.86**	40.12**	-0.60	0.23	-3.37	4.16
KS224 × SBRB-3/12	-1.61	-5.63	-3.07	-2.36	-9.87*	12.42*	5.61	6.49	22.58**	32.13**
SBRB-2/12 × SBRB-6/12	4.86	-5.87	3.86	-3.21	35.96**	29.31**	-5.85	-4.71	22.33**	7.26
SBRB-2/12 × SBRB-1/12	3.61	0.09	7.94*	3.25	-30.07**	29.19**	5.37	6.65	12.04*	30.00**
SBRB-2/12 × KS224	-4.22	-12.80**	-8.20**	-9.29**	-7.80	3.48	-10.43	-9.34	12.35*	21.10**
SBRB-2/12 × Swarna Mani	2.72	2.72	3.19	3.19	96.52**	96.52**	-19.55**	-18.57**	5.78	5.78
SBRB-2/12 × SBRB-3/12	4.73	0.45	2.59	3.34	58.33**	97.48**	-7.24	-6.11	6.17	-6.90
Swarna Mani × SBRB-6/12	-2.41	-2.41	1.05	1.05	62.21**	62.21**	-19.52**	-19.52**	-4.73	-4.73
Swarna Mani × SBRB-1/12	-1.93	-1.93	-1.26	-1.26	-38.68**	13.30*	1.37	1.37	-10.09	4.32
Swarna Mani × KS224	-1.60	-1.60	-1.49	-1.49	-7.22	4.13	7.91	8.81	7.28	15.64**
Swarna Mani × SBRB-2/12	-10.49**	-10.49**	-8.69**	-8.69**	36.91**	36.91**	5.33	6.61	5.30	5.30
Swarna Mani × SBRB-3/12	-6.85*	-6.85*	-5.37	-4.68	6.40	32.71**	4.18	4.18	-1.43	-1.43
SBRB-3/12 × SBRB-6/12	4.44	0.18	1.10	1.84	-9.01	13.49*	-9.50	-9.95	31.77**	12.11*
SBRB-3/12 × SBRB-1/12	1.50	-1.94	-0.10	0.63	-31.79**	26.02**	-0.61	-6.65	-8.08	6.65
SBRB-3/12 × KS224	-0.25	-4.32	-1.03	-0.31	-8.61	13.99*	1.13	1.97	16.58**	25.67**
SBRB-3/12 × SBRB-2/12	-6.87*	-10.67**	2.46	3.21	5.12	31.10**	3.98	5.24	42.50**	24.95**
SBRB-3/12 × Swarna Mani	-3.37	-3.37	-3.74	-3.04	-21.02**	-1.49	7.90	7.90	13.96*	13.96*

Table 2 (Contd.)

F ₁	Number primary branches per plant		Plant height (cm)		Number of fruit per plant		Yield per plant (kg)		Fruit borer incidence %	
	BP	SV	BP	SV	BP	SV	BP	SV	BP	SV
SBRB-6/12 × SBRB-1/12	11.89*	6.08	-16.95**	-29.70**	20.30*	63.46**	12.85	55.46**	-1.58	-2.35
SBRB-6/12 × KS224	-1.26	-4.22	-8.06	-12.56**	-3.83	30.68*	-14.78	17.40	30.61**	30.63**
SBRB-6/12 × SBRB-2/12	-10.02*	-14.70**	-26.35**	-28.63**	20.43*	78.78**	6.36	48.08**	23.32**	22.35**
SBRB-6/12 × Swarna Mani	-10.64*	-10.64*	-18.75**	-18.75**	8.22	47.05**	-2.57	34.22**	56.07**	56.07**
SBRB-6/12 × SBRB-3/12	-12.03**	-16.60**	3.59	-21.34**	25.81**	70.95**	22.70**	69.03**	-8.55**	-7.70**
SBRB-1/12 × SBRB-6/12	-5.84	-10.73*	-1.48	-16.61**	-27.58**	-1.59	-24.41**	4.13	3.51	2.70
SBRB-1/12 × KS224	-12.71**	-15.33**	12.40**	6.89	-1.78	22.19	4.90	26.25**	9.20	9.22
SBRB-1/12 × SBRB-2/12	2.90	-2.74	-15.76**	-18.37**	-8.26	36.19**	-15.68*	17.40	-17.13*	-20.97*
SBRB-1/12 × Swarna Mani	-19.17**	-19.17**	12.83**	12.83**	22.17	35.10**	7.60	29.50**	2.21	2.21
SBRB-1/12 × SBRB-3/12	-11.08*	-15.96**	10.17	-6.75	23.21*	45.15**	-12.50	5.31	18.87*	13.35
KS224 × SBRB-6/12	-14.41**	-16.98**	-10.70*	-15.07**	-16.01	14.12	-27.41**	0.00	-22.80**	-22.79**
KS224 × SBRB-1/12	-11.14*	-13.81**	14.75**	9.13	-1.78	22.19	-12.25	5.60	-24.28**	-24.26**
KS224 × SBRB-2/12	-11.19*	-13.85**	-4.85	-7.79	-32.19**	0.66	-28.39**	-0.29	-32.52**	-32.51**
KS224 × Swarna Mani	-3.29	-3.29	-5.08	-5.08	-18.71	1.12	60.40**	66.08**	-21.94**	-21.93**
KS224 × SBRB-3/12	-7.58	-10.35*	-10.22*	-14.62**	-2.74	20.99	33.07**	51.92**	-13.70	-13.68
SBRB-2/12 × SBRB-6/12	-14.21**	-18.67**	-16.67**	-19.25**	-34.28**	-2.44	-20.97**	10.03	-18.85**	-19.48**
SBRB-2/12 × SBRB-1/12	-3.62	-8.91	-5.97	-8.88	-9.38	34.52**	-5.93	30.97**	-15.66*	-19.58*
SBRB-2/12 × KS224	-10.67*	-13.34**	15.28**	11.71*	-30.73**	2.83	-31.78**	-5.01	-31.58**	-31.57**
SBRB-2/12 × Swarna Mani	-13.47**	-13.47**	-1.00	-1.00	2.40	52.02**	-29.03**	-1.18	-25.88**	-25.88**
SBRB-2/12 × SBRB-3/12	-11.27*	-16.85**	0.17	-2.93	-25.16**	11.09	-18.64**	13.27	4.88	-10.99
Swarna Mani × SBRB-6/12	-9.29*	-9.29*	-23.68**	-23.68**	-10.42	21.72	-6.85	28.32**	19.09**	19.09**
Swarna Mani × SBRB-1/12	-7.31	-7.31	0.40	0.40	12.38	24.28	8.82	30.97**	-38.31**	-38.31**
Swarna Mani × KS224	-10.30*	-10.30*	5.78	5.78	-9.88	12.10	8.83	12.68	-27.50**	-27.49**
Swarna Mani × SBRB-2/12	-6.21	-6.21	-21.93**	-21.93**	-15.08	26.07	-11.86	22.71*	-19.58**	-19.58**
Swarna Mani × SBRB-3/12	-18.37**	-18.37**	-15.85**	-15.85**	6.29	25.21	23.77**	41.30**	-33.89**	-33.89**
SBRB-3/12 × SBRB-6/12	2.98	-2.36	14.34*	-13.18**	-3.60	30.99*	-0.64	36.87**	-21.85**	-22.46**
SBRB-3/12 × SBRB-1/12	-11.26*	-16.13**	32.11**	11.82**	17.81	38.79**	9.07	31.27**	-16.67*	-20.53*
SBRB-3/12 × KS224	-13.02**	-15.63**	12.13*	6.63	-7.36	15.24	13.95	30.09**	-24.90**	-24.89**
SBRB-3/12 × SBRB-2/12	4.37	-2.20	1.13	-2.00	14.01	69.24**	35.59**	88.79**	5.30	-10.63
SBRB-3/12 × Swarna Mani	-19.38**	-19.38**	-2.80	-2.80	3.79	22.27	-1.81	12.09	-24.23**	-24.23**

* - Significantly different from Standard variety (CK), $P < 0.05$; ** - Remarkd Significantly different from Standard variety (CK), $P < 0.01$

Table 3. Analysis of variance in set of 6 × 6 diallel crosses for ten characters in Brinjal

Source of variation	DF	Days to first flowering	Days to 50 % flowering	Av. fruit length (cm)	Av. fruit diameter (cm)	Av. fruit weight (gm)	No. of primary branches per plant	Plant height (cm)	No. of fruits per plant	Yield per plant (kg)	Fruit borer incidence %
Replicates	2.00	2.43	17.92	0.29	0.12	27.75	0.65	18.38	0.09	0.01	1.58
Genotypes	35.00	47.84**	40.71**	18.09**	1.71**	2864.72**	0.75**	486.01**	9.88**	0.19**	56.00**
Parents	5.00	61.67**	36.47*	27.90**	2.94**	2535.16**	0.29	383.60**	6.76*	0.11**	10.10
Hybrids	29.00	46.11**	42.10**	16.88**	1.52**	2839.00**	0.74**	511.80**	10.61**	0.20**	65.57**
Parent Vs. hybrids	1.00	28.61	21.64	4.09**	1.23	5258.14	3.42**	250.28*	4.23	0.12	7.99
Error	70.00	8.64	10.30	0.36	0.41	177.27	0.17	32.73	1.69	0.02	3.23

* - Significantly different from Standard variety (CK), $P < 0.05$; ** - Remarkably significantly different from Standard variety (CK), $P < 0.01$

3.2 Days to 50 Per Cent Flowering

Days to 50 Per cent flowering with negative values of heterosis was considered to be best and desirable, however for other traits, higher and positive values of heterosis considered better. The best heterotic cross over better parents was SBRB-6/12 × SBRB-3/12 (-9.68%) for days to 50 Per cent flowering. The negative heterosis was also observed by [7] for days to 50 Per cent flowering.

3.3 Fruit Length

For this trait, the extent of heterobeltiosis varied from -41.63% (SBRB-6/12 × SBRB-1/12) to 96.52% (SBRB-2/12 × Swarna Mani). Heterosis over the standard variety ranged from -11.5% (SBRB-6/12 × KS-224) to 97.48% (SBRB-2/12 × SBRB-3/12). The desirable and significant heterosis was observed in seven hybrids over the better parent and twenty hybrids showed significant heterosis over the standard variety Swarna Mani. The range of heterobeltiosis is similar to the findings of [9].

3.4 Fruit Diameter

Data pertaining to fruit diameter showed that the range of heterobeltiosis varied from 19.55% (SBRB-2/12 × Swarna Mani) to 12.9% (SBRB-1/12 × SBRB-3/12). Regarding standard heterosis it ranged from -19.52% (Swarna Mani × SBRB-6/12) to 9.95% (SBRB-6/12 × Swarna Mani) over standard variety. Among the 30 F₁ hybrids none of the crosses showed significant positive heterosis in desirable direction over the better parent and standard variety. The low level of heterobeltiosis is might be due to high mean value of the parents involved. [8] Reported similar trend of results.

3.5 Average Fruit Weight

The extent of heterobeltiosis for average fruit weight ranged from -35.83% (SBRB-1/12 × SBRB-3/12) to 42.50% (SBRB-3/12 × SBRB-2/12). The extent of standard heterosis varied from -37.29% (SBRB-6/12 × SBRB-3/12) to 32.13% (KS-224 × SBRB-3/12). Out of 30 F₁ hybrids significant heterosis in desirable direction was observed in eight crosses over better parent and ten crosses showed significant heterosis in desirable direction over the standard variety. The similar trend also observed by [9].

3.6 Number of Primary Branches per Plant

The heterobeltiosis for primary branches per plant ranged from -19.38% (SBRB-3/12 × Swarna Mani) to 11.89% (SBRB-6/12 × SBRB-1/12). The range of standard heterosis varied from -19.38% (SBRB-3/12 × Swarna Mani) to 6.08% (SBRB-6/12 × SBRB-1/12). Out of 30 F₁ hybrids, only one cross SBRB-6/12 × SBRB-1/12 (11.89%) showed significant heterosis over better parent and none of the crosses showed significant heterosis for higher fruit weight over the standard variety Swarna Mani.

3.7 Plant Height

For plant height, the range of heterosis varied from -26.35% (SBRB-6/12 × SBRB-2/12) to 32.11% (SBRB-3/12 × SBRB-1/12) over the better parent. The standard heterosis ranged from -29.70% (SBRB-6/12 × SBRB-1/12) to 12.8% (SBRB-1/12 × Swarna Mani). The seven crosses showed positive and significant heterosis over better parent while only three F₁ hybrids showed positive and significant heterosis over standard variety.

3.8 Number of Fruits per Plant

Heterosis for fruits per plant varied from -34.28% (SBRB-2/12 × SBRB-6/12) to 25.81% (SBRB-6/12 × SBRB-3/12) over the better parent. The standard heterosis ranged from -2.44% (SBRB-2/12 × SBRB-6/12) to 78.78% (SBRB-6/12 × SBRB-2/12). Among the 30 F₁ crosses, four hybrids showed significant value of positive heterosis over better parent and thirteen crosses showed significant heterosis over standard variety. Similar observation also reported by [6].

3.9 Yield per Plant

Yield in any crop is the final product of different yield components. This ultimate produce in the plant is expressed through mutual balancing of characters. For the trait fruit yield per plant, the range of heterobeltiosis varied from -31.78 per cent (SBRB-2/12 × KS-224) to 60.40 per cent (KS-224 × Swarna Mani). Regarding standard heterosis it ranged from -5.01 per cent (SBRB-2/12 × KS-224) to 88.79 per cent (SBRB-3/12 × SBRB-2/12) over standard variety. Among the 30 F₁ hybrids desirable and significant heterosis was observed in five hybrids over the better

parent and seventeen hybrids namely showed significant heterosis over the standard variety.

3.10 Fruit Borer Incidence

On the other hand, for the character fruit borer incidence, the desirable heterobeltiosis has been observed for the hybrid Swarna Mani × SBRB-1/12 (-38.31%), Swarna Mani × SBRB-1/12 (-33.89%). These results are akin to the results of Prabhu et al. [10].

4. CONCLUSION

On the basis of economic heterosis, it can be concluded that the heterosis breeding could be advantageous for the improvement of brinjal genotypes for yield and fruit characters. Considering heterosis for the traits like yield and fruit borer incidence, it was found that the hybrid KS-224 × Swarna Mani and SBRB-6/12 × SBRB-3/12 expressed significant and desirable heterobeltiosis and standard heterosis for the major traits. Thus, these hybrids can be exploited in practical plan breeding for selection of better transgressive segregants and they may also be exploited through heterosis breeding programme in order to achieve hybrids with high fruit yield as well as least fruit borer infestation in Brinjal.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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