Vegetable Science (2011) 38(1) : 88-91

Short communication

Heterosis and Inbreeding Depression for fruit yield and its components in Brinjal (*Solanum melongena* L.)

Abhinav Sao and Nandan Mehta

Received : Oct 2009 / Accepted : Dec 2010

Brinjal is one of the major vegetable crops grown in whole India. It is most widely grown vegetable crop in Asian countries, especially in India, China, Philippines and Japan. The first generation hybrids offer several advantages such as earliness, uniformity and increased yield. To boost the productivity the trend has been in the direction evolving hybrids for exploiting heterosis.

However, the exploitation of hybrid vigour in brinjal has been recognized as a practical tool in providing the breeder a means of increasing yield and other economic traits. Most of the local varieties which are grown by the cultivators of India have not been fully utilized in any genetic improvement programs so far on scientific line. For the development of an effective heterosis breeding programme in brinjal one needs to elucidate the genetic nature and magnitude of quantitatively inherited traits and estimate prepotency of parents in hybrid combinations. Thus the present research work was undertaken to develop the heterostic cross combinations (F_1's) for fruit yield and its components.

Abhinav Sao
Regional Agricultural Research Station,
Jawaharlal Nehru Krishi Vishwa Vidyalaya,
Dindori (M.P.) India

Nandan Mehta
Department of Plant Breeding & Genetics,
Indira Gandhi Agricultural University,
Raipur (C.G.) India

The experimental material consisted eight local genotypes of Chhattisgarh state of India as lines, *viz.,* IGBR 44, IGBO 65, IGBO 71, IGBL 67, IGBL 70, IGBO 40, IGBO 43 and IGBO 83; six improved varieties of Brinjal as testers, *viz.*, KS 331, IVBL 9, BB 93, JNDBL 1, KS 327 and PPL; resulting forty eight cross combinations and their subsequent F_2 generations. The parents were crossed in Linex Tester mating fashion during *kharif*, 2003-04 and the F_1's were evaluated and raised to generate F_2 generation in *kharif*, 2004-05. All the experimental material including parents, hybrids and F_2's were raised in Randomized Block Design with three replications during *kharif*, 2005-06 at Horticulture Research Farm, Indira Gandhi Agricultural University, Raipur (Chhattisgarh), India.

Observations were recorded for days to first flowering, days to first fruiting, plant height, number of primary branches per plant, average fruit weight, fruit length, fruit girth, number of flowers per inflorescence, number of fruits per cluster, number of fruits per plant, total soluble solids, rind thickness, marketable fruit yield per plant and total fruit yield per plant on five random competitive plant basis in each replication. Linex Tester analysis was carried out adopting the method suggested by Kempthorne (1957).

The heterosis for days to first flowering is desired in negative direction for earliness. Significantly negative relative heterosis were observed in the hybrids, IGBO 40 x BB 93, IGBO 40 x IVBL 9 and IGBO 43 x KS 331 etc. Similarly the heterobeltiosis for earliness was exhibited by IGBO 71 x PPL, IGBO 65 x BB 93 and other sixteen hybrids out of forty eight. Whereas, negative standard heterosis was observed in the hybrids, IGBO 40 x BB 93, IGBL 67 x KS 327 etc. These reports are in accordance to the findings of Ingale and Patil (1967) and Das and Barua (2001). While the degree of

Print (19) - VS20090028

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

Hybrids	Days to Ist flowering				Plant Height (cm)				No. of Primary branches/ Pl.				Total no. of fruits/ plant				Marketable fruit yield/ plant (g)			
	RH	HB	SH	RH	RH	HB	SH	ID	HB	SH	ID	ID	RH	HB	SH	ID	RH	HB	SH	ID
IGBR 44 x KS 331	-6.87*	3.22*	-11.95*	10.09	21.03*	14.68*	0.86	16.08*	67.69*	40.35*	46.61*	15.95*	10.09	3.14	30.66*	14.99	-14.64	-16.91	-33.42*	7.45
IGBR 44 x IVBL 9	3.08*	9.22*	-6.84*	-3.97	-3.75	-6.77*	-12.50*	3.34	16.63*	8.87	13.72*	15.35*	-3.97	-15.04*	7.58	11.93	14.82	-4.46	-23.45	4.99
IGBR 44 x BB 93	-2.21*	8.98*	-7.04*	-5.65	-0.82	-6.48*	-7.15*	4.03	12.36*	5.73	10.50*	15.18*	-5.65	-22.81*	53.67*	20.12	48.65*	45.44*	21.80	16.52*
IGBR 44 x JNDBL 1	3.28*	8.21*	-7.70*	-11.52*	5.31	-0.52	-1.61	5.68	11.63*	-2.11	2.20	-0.17	-11.52*	-11.95	11.50	14.95	-31.08*	-34.73*	-41.50*	14.16
IGBR 44 x KS 327	1.19	2.90*	2.19	8.72	0.80	-6.33	5.47*	2.56	13.28*	5.90	19.08*	10.87	8.72	-1.53	29.83*	24.12*	19.01	2.64	17.95	11.89
IGBR 44 x PPL	3.84*	4.20*	3.48	22.62*	-4.45	-9.80*	1.55	3.67	-19.35*	-25.37*	-12.21*	3.26	22.62*	18.64*	26.88*	20.47	-4.96	-11.13	2.13	15.68
IGBO 65 x KS 331	-11.21*	-11.09*	-7.72*	21.87*	-1.76	-14.08*	-9.72*	1.55	13.31*	-2.16	-5.25	11.09*	21.87*	13.72*	45.25*	26.10*	30.07*	19.17*	8.61	53.11*
IGBO 65 x IVBL9	-8.84*	-4.72*	5.88*	37.24*	-13.16*	-17.80*	10.57*	11.56*	7.45	3.97	13.35*	8.75	37.24*	20.96*	30.47*	22.38	32.89*	5.24	37.57*	25.12*
IGBO 65 x BB 93	-12.84*	-13.15*	-8.97*	-2.11	-1.00	-3.73	1.15	-2.16	-22.81*	-24.68*	-27.11*	1.63	-2.11	-19.64*	59.91*	17.82	59.83*	53.35*	21.84	36.35*
IGBO 65 x JNDBL 1	-4.34*	1.10	-5.52*	21.26*	-8.96*	-11.64*	-7.15*	4.69	25.80*	14.06*	10.50*	10.28	21.26*	20.27*	53.67*	21.80	34.81*	33.69*	-36.09*	42.13*
IGBO 65 x KS 327	-7.73*	1.34	-11.86*	22.03*	-18.86*	-30.27*	-26.73*	3.15	-10.42	-13.19*	-15.93*	-13.31*	22.03*	10.94	73.16*	19.06	-14.34	-29.88*	27.02	-12.26
IGBO 65 x PPL	-3.78*	6.40*	6.40*	75.92*	-7.88*	-19.70*	8.01*	13.48*	-6.24	-10.09	-1.90	7.00	75.92*	69.52*	82.89*	52.37*	10.11	-2.83	-20.62	37.94*
IGBO 71 x KS 331	-11.65*	-11.22*	-8.74*	1.16	5.23	-2.28	-10.27*	10.01*	47.65*	24.42*	27.79*	28.12*	1.16	-11.48	30.58*	14.93	-8.59	-18.84*	-29.29*	6.32
IGBO 71 x IVBL9	-9.72*	-6.25*	-10.51*	-23.08*	-4.88	-5.91	-11.69*	3.03	-17.68*	-22.55*	-20.50*	-3.41	-23.08*	-36.14*	-5.75	-0.97	-6.36	-27.70*	4.97	4.76
IGBO 71 x BB 93	-7.59*	-6.68*	-4.07*	-12.05*	-2.86	-6.51*	-7.18*	7.01	-23.92*	-27.83*	-25.93*	-0.23	-12.05*	-23.42*	52.41*	21.65	15.65	7.34	-38.07*	29.81*
IGBO 71x JNDBL 1	-5.23*	-0.49	-7.01*	-14.18*	-3.52	-6.97*	-8.00*	2.04	17.37*	3.69	6.44	11.94*	-14.18*	-20.61*	17.16	19.13	-33.92*	-36.68*	-12.73	9.04
IGBO 71 x KS 327	-11.66*	-0.92	-16.18*	-35.14*	5.70	-3.69	-11.56*	9.10*	-10.68	-15.84*	-13.55*	5.49	-35.14*	-36.92*	-1.50	10.91	11.97	-10.77	12.20	15.12
IGBO 71 x PPL	-9.79*	-14.66*	-0.92	28.32*	-5.13	-12.22*	3.19	4.85	17.13*	9.24	26.33*	13.60*	28.32*	15.66*	44.12*	29.05*	-6.60	-20.01*	21.79	21.99*
IGBL 67 x KS 331	-10.88*	-6.76*	-11.42*	22.06*	10.85*	6.67*	-9.18*	5.73	11.71*	-13.27*	10.50*	6.75	22.06*	8.90	53.67*	18.66	96.10*	60.54*	1.44	22.28*
IGBL 67x IVBL9	-6.76*	-6.58*	3.37*	9.14	1.48	-3.22	16.26*	10.01*	-17.03*	-29.02*	1.71	9.19	9.14	-7.74	9.92	25.10*	39.27*	32.91*	46.38*	20.10*
IGBL 67x BB 93	-11.16*	-6.57*	-11.25*	1.18	10.98*	3.07	2.33	6.84	-0.39	-14.15*	9.32	6.51	1.18	-13.55*	72.08*	22.18	121.62*	74.80*	-36.75*	46.79*
IGBL 67 x JNDBL 1	-1.11	-0.29	-6.83*	-13.81*	5.67	-1.67	-2.75	12.51*	-18.86*	-34.34*	-16.44*	2.03	-13.81*	2.95	14.83	15.82	-8.34	-29.44*	38.87*	9.06
IGBL 67x KS 327	-3.44*	-1.01	-12.15*	-2.25	-0.26	-5.90	-19.87*	2.32	9.01	-6.61	18.98*	6.27	-2.25	6.96	45.25*	14.11	160.96*	139.12*	0.43	42.14*
IGBL 67 x PPL	-11.38*	-6.69*	-6.67*	-2.00	16.82*	11.99*	22.07*	14.65*	14.14*	-3.11	38.93*	21.98*	-2.00	-9.86	7.38	10.55	18.60	0.43	1.02	7.49

Hybrids	Days to Ist flowering				Plant Height (cm)				No. of Primary branches/ Pl.				Total no. of fruits/ plant				Marketable fruit yield/ plant (g)			
	RH	HB	SH	RH	RH	HB	SH	ID	HB	SH	ID	ID	RH	HB	SH	ID	RH	HB	SH	ID
GBL 70 x KS 331	-5.12*	6.53*	-11.23*	-1.65	23.97*	22.38*	-3.66	3.11	11.58	-6.92	-2.03	7.09	-1.65	-24.74*	57.00*	27.97*	42.36*	32.00*	0.14	19.09*
GBL 70 x IVBL9	0.06	7.34*	-10.55*	-31.37*	6.13	-3.57	-9.50*	9.47*	-7.24	-13.73*	-9.15	6.72	-31.37*	-49.65*	5.00	4.13	38.90*	26.46*	-18.02	7.68
GBL 70 x BB 93	-4.95*	7.30*	-10.45*	-45.72*	7.45*	-4.78	-5.46*	3.53	-10.67	-16.26*	-11.86*	5.77	-45.72*	-46.96*	10.67	17.92	-12.44	-22.34*	-34.96*	-0.16
GBL 70 x JNDBL 1	11.11*	17.87*	-1.80	-33.76*	7.46*	-4.61	-5.66*	2.94	-4.17	-16.24*	-11.86*	4.23	-33.76*	-45.96*	-13.79	3.43	-15.78	-27.43*	-4.17	4.40
GBL 70 x KS 327	2.22	4.45*	1.33	-42.81*	12.22*	11.36*	9.33*	1.28	-5.93	-12.39*	3.81	-3.86	-42.81*	-54.38*	-19.63	6.57	13.27	7.38	-0.16	12.83
GBL 70 x PPL	1.66	3.23	0.14	32.02*	4.54	3.59	3.58	-2.53	42.04*	30.95*	55.34*	9.34	32.02*	3.49	82.33*	37.21*	135.69*	127.41*	127.41*	43.49*
GBO 40 x KS 331	-10.57*	10.35*	-6.95*	-6.41	20.95*	18.09*	-2.43	6.58	3.22	-13.82*	-9.49	9.18	-6.41	-7.13	2.75	-5.84	-9.51	-20.03*	-39.32*	-8.83
GBO 40 x IVBL9	-14.60*	10.65*	-0.69	53.55*	11.56*	4.89	26.01*	17.05*	23.07*	14.57*	35.49*	15.21*	53.55*	45.42*	33.84*	24.55*	72.61*	65.17*	37.96*	31.66*
GBO 40 x BB 93	-18.46*	18.26*	-14.74*	-6.44	16.26*	6.51*	5.73*	4.00	-27.13*	-31.61*	-28.13*	-8.02	-6.44	-27.61*	44.08*	21.52	38.82*	17.68*	-1.44	37.73*
GBO 40 x JNDBL 1	-2.35	3.32*	12.40*	31.13*	15.92*	6.38*	34.68*	15.25*	42.04*	24.25*	46.94*	25.71*	31.13*	22.52*	29.76*	20.12	7.37	-11.43	13.85	26.33*
GBO 40 x KS 327	-7.44*	1.78	-11.49*	-9.82	-1.58	-5.82	-22.18*	-25.80*	-4.61	-11.08	-6.61	-13.43*	-9.82	-23.43*	19.50	4.32	114.86*	114.56*	24.95	55.22*
GBO 40 x PPL	-5.96*	4.11*	4.11*	42.27*	23.83*	20.45*	27.39*	9.01	-1.37	-8.98	7.63	-10.82	42.27*	36.59*	36.59*	25.91*	79.65*	64.86*	64.85*	33.65*
GBO 43 x KS 331	-13.66*	-12.24*	2.66	103.42*	22.31*	22.25*	23.32*	1.10	41.02*	23.22*	30.72*	3.94	103.42*	102.79*	89.51*	36.46*	61.48*	57.88*	71.80*	18.59*
GBO 43 x IVBL9	-10.43*	-8.07*	2.16	-7.86	-9.04*	-16.34*	0.51	1.04	-4.28	-6.12	-0.38	4.21	-7.86	-13.11	-19.28	19.09	-39.55*	-47.59*	-45.50*	-45.60*
GBO 43 x BB 93	-5.21*	-3.17*	-2.70	-17.22*	4.22	-6.53*	-7.20*	3.10	-12.37*	-13.32*	-18.30*	-16.18*	-17.22*	-35.74*	27.83*	30.90*	-8.64	-14.78	-28.63*	18.12*
GBO 43 x JNDBL 1	-1.60	2.11	-4.59*	-2.18	19.57*	7.42*	6.23*	10.93*	28.52*	18.00*	11.18*	13.57*	-2.18	-8.22	15.16	10.78	-7.87	-16.68	-25.32	12.85*
GBO 43 x KS 327	-9.85*	-2.84*	-1.62	29.47*	9.90*	7.61*	8.56*	6.79	14.56*	12.54*	19.27*	11.20*	29.47*	10.34	47.57*	22.51	68.69*	51.92*	57.95*	33.07*
GBO 43 x PPL	-1.96	6.37*	-8.63*	30.63*	17.70*	17.18*	-7.66*	2.92	-2.72	-5.46	-11.01*	-4.19	30.63*	25.96*	49.16*	21.96	18.72	16.46	-15.58	17.95*
GBO 83 x KS 331	-2.63*	8.50*	6.71*	4.92	5.52	0.91	11.44*	5.62	14.20*	3.66	0.76	5.68	4.92	3.91	-0.98	10.45	-8.73	-27.30*	-20.88	-6.55
GBO 83 x IVBL9	-0.43	6.04*	4.28*	14.48*	-10.09*	-13.73*	3.66	14.88*	-1.31	-3.62	-1.71	3.88	14.48*	6.67	1.61	16.69	57.62*	45.46*	11.02	30.23*
GBO 83 x BB 93	1.92	14.19*	-3.54*	-1.43	13.41*	5.97	5.20	12.18*	46.31*	41.69*	30.50*	24.42*	-1.43	-22.78*	53.67*	34.00*	-16.17	-35.57*	-46.03*	-4.72
GBO 83 x JNDBL 1	4.56*	10.12*	-6.98*	-1.70	1.15	-5.32	-6.35*	4.06	18.75*	13.55*	-2.03	2.60	-1.70	-6.64	17.08	18.15	13.26	-14.94	-23.75	-2.05
GBO 83 x KS 327	5.77*	7.34*	2.81	24.15*	-0.33	-6.54*	-17.08*	2.06	-0.51	-2.99	-54.38*	-2.31	24.15*	6.94	25.18*	30.50*	162.98*	133.37*	22.68	32.95*
GBO 83 x PPL	-5.42*	-4.62*	-6.20*	1.66	25.59*	19.66*	32.14*	23.04*	11.25	9.66	9.73	7.48	1.66	-0.75	-0.70	6.09	24.70*	2.59	2.59	4.51

inbreeding depression for days to first flowering was found significant only in ten hybrids out of forty eight, which showed their suitability for early generation selection. Similar findings were also reported by solanki *et al.* (1982) and Singh and Rai (1990).

High degree of relative heterosis upto 25.59 % was shown by the hybrid IGBO 83 x PPL and IGBO 70 x KS 331 etc. for plant height. Whereas, heterobeltiosis was found to 22.38 % for hybrid, IGBL 70 x KS 331 and forteen hybrids exhibited significant heterobeltiosis. The degree of standard heterosis was ranged to 34.68 % for IGBO 40 x JNDBL 1. While, a high degree of inbreeding depression was observed in IGBO 83 x PPL and IGBR 44 x KS 331, which suggests their utilization only in hybrid combination. These findings of heterosis are similar to the reports of Babu and Thirumurugan (2000). Whereas, inbreeding depression in negative direction for plant height was indicated by IGBO 40 x KS 327 suggests selection in later generation supported by Singh and Rai (1990).

Relative heterosis, heterobeltiosis and standard heterosis for total number of fruits per plant were observed to a high degree of 103.42 %, 102.79 % and 89.51 %, respectively for the hybrid IGBO 43 x KS 331. Twenty eight out of forty eight exhibited significant heterosis for plant height. Whereas, high degree of inbreeding depression (52.37 %) was exhibited by IGBO 65 x PPL and other thirteen hybrids. These results are similar to the findings of, Das and Sarma Barua (2001) and Pratibha *et al.* (2004) for heterosis. Solanki *et al.* (1982) and Singh and Rai (1990) for inbreeding depression results.

A high degree of relative heterosis (upto162.98 %) was exhibited by IGBO 83 x KS 327, IGBL 67 x KS 327 along with other twenty two hybrids for marketable fruit yield per plant. Similarly significant heterobeltiosis was observed in nineteen hybrids, some of them are IGBL 67 x KS 327, IGBO 83 x KS 327. These findings for heterosis was similar to reports of Sing *et al.* (2003) and Pratibha *et al.* (2004). Whereas, significant standard heterosis was observed upto 127.41 % for IGBL 70 x PPL alongwith other seven hybrids. Inbreeding depression was resulted to the extent of 55.22 % for IGBO 40 x KS 327. These findings for heterosis was similar to reports of Sousa *et al.* (1998), Singh *et al.* (2003) and Pratibha *et al.* (2004). Whereas, the inbreeding depression reports are similar to the findings of Singh and Rai (1990) and Kumar and Pathania (2003) for marketable fruit yield per plant.

Reference

Das G, Barua N Sarma (2001) Heterosis and combining ability for yield and its components in brinjal (*S. melongena* L.). Ann Agric Res 22(3):399-403

Kempthorne O (1957) An introduction to genetic statistics. John Wiley & Sons Inc New York

Kumar Vinod, Pathania NK (2003) Combining ability studies in brinjal (*S. melongena* L.). Veg Sci 30(1): 50-53

Singh RD, Rai B (1990) Studies on heterosis and gene action in brinjal (*S. melongena* L.). Veg Sci 17(2): 180-183

Solanki SS, Seth JN, Lal SD (1982) Heteosis and inbreeding depression in cucumber (*Curcumis sativus* L.). Prog Hort 14(2-3):121-125