

Heterosis breeding in Brinjal

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SUMMARY

A study was conducted to assess the magnitude of heterosis in a line x tester cross material involving 24 hybrids generated by crossing six lines with four testers and a standard check (Kalpataru) in brinjal during 2004-05 at Vegetable Research and Seed Production Section of Seed Unit, University of Agricultural Sciences, Dharwad. The analysis of variance indicated significant amount of variability among the genotypes for 15 of the 17 traits studied. Significant and standard heterosis in desirable direction was recorded by six hybrids for fruit yield. The present study revealed the direct relationship between heterosis and *per se* performance of hybrids for several characters. Among the hybrids studied Arka Sheel x Green Round, Arka Sheel x Kudachi Local A and Budihal Local x Green Round were found to be the best cross combinations for fruit yield and its components.

Key Words : Lines, Tester, Heterosis, Hybrid vigour

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Heterosis is 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 programme 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 combination. To have such a kind of plant architecture, different breeding methods can be employed. One of the methods employed is exploitation of hybrid vigour through hybridization. For the first time, Bailey and Munson (1891) reported artificial hybridization in brinjal. However, none of the hybrids exhibited any heterosis. Nagai

and Kida (1926) were probably the first to observe hybrid vigour, hoping some commercial acceptance in crosses among some Japanese varieties. Hence, a study was conducted in a line x tester design involving six lines and four tester developing 24 hybrid combinations.

MATERIAL AND METHODS

Experimental materials :

Ten genotypes selected from various regions were used as parents. Six cultivars as lines were crossed with four genotypes as testers to develop 24 F₁ hybrids using line x tester mating design. These 24 F₁s, ten parents and commercial check (Kalpataru) of Mahyco Company formed the material for the study.

Crossing programme :

The parental seeds were sown in rows in the seedling trays. These seeds were covered with a thin layer of fine sand and watered every day. Care was exercised against "damping off" by drenching 0.1 per cent carbendazim. The four-week-old seedlings were taken for field transplanting. For making line x tester crosses, unpaired parents planting arrangement was followed. For hybridization, the floral buds of the female parents (lines) were emasculated a day before their opening between 3 to 6 pm with the aid of pointed forceps and bagged

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to prevent cross pollination. The calyces were removed at the time of emasculation as prevention to every inhibition. On the same evening following emasculation or following morning pollen grains were collected from freshly opened flowers of the required male parent (testers), gently applied to the stigma of the emasculated flowers, then crossed flowers were tagged for easy identification and were bagged for two to three days. Later, ripened fruits were cut, pulp was squeezed out, removed by repeated washing with water and seeds were thoroughly dried under shade.

To ensure selfing of parental genotypes, flowers destined to open next day were covered with butter paper

bags. The seeds were extracted as explained above.

RESULTS AND DISCUSSION

The experimental findings obtained from the present study have been discussed in following heads:

Per Se performance and magnitude of heterosis :

The pertinent data on *per se* performance of 35 entries (10 parents + 24 F₁s + one commercial check) and magnitude of heterosis are detailed in Table 1 and 2.

Table 1: *Per se* performance and magnitude of heterosis for number of fruits per plant in brinjal

Sr. No.	Entries	<i>Per se</i> value	Heterosis over %		
			MP	BP	CC
Lines					
1.	Arka nidhi (AN)	21.40			
2.	Arka sheel (AS)	23.00			
3.	Arka shirish (AR)	24.70			
4.	Budihal local (BL)	26.80			
5.	Mullubadne (MB)	23.60			
6.	Hittalu local (HL)	24.90			
Testers					
1.	Malapur local	23.80			
2.	Kudachi A	28.20			
3.	Kudachi B	24.10			
4.	Green round	25.30			
F₁ hybrids					
1.	AN x ML	15.7	-30.53**	-34.03**	-26.98**
2.	AN x KA	17.0	-31.45**	-39.72**	-20.93**
3.	AN x KB	25.2	10.77**	4.56*	17.21**
4.	AN x GR	18.0	-22.91**	-28.85**	-16.28**
5.	AS x ML	20.7	-11.54**	-13.03**	-3.72
6.	AS x KA	19.7	-23.05**	-30.14**	-8.37**
7.	AS x KB	20.3	-13.80**	-15.77**	-5.58*
8.	AS x GR	23.9	-1.04	-5.53**	11.14**
9.	AR x ML	24.9	2.68	0.81	15.81**
10.	AR x KA	20.8	-21.36**	-26.24**	-3.26
11.	AR x KB	20.0	-18.03**	-19.03**	-6.98**
12.	AR x GR	22.7	-9.03**	-10.26**	5.52*
13.	BL x ML	19.7	-22.13**	-26.49**	-8.37**
14.	BL x KA	15.9	-42.18**	-43.62**	-26.05**
15.	BL x KB	16.7	-34.38**	-37.69**	-22.33**
16.	BL x GR	28.8	10.56**	7.46**	33.95**
17.	MB x ML	20.9	-11.81**	-12.18**	-2.79
18.	MB x KA	18.6	-28.19**	-34.04**	-13.49**
19.	MB x KB	18.6	-22.01**	-22.82**	-13.49**
20.	MB x GR	22.8	-6.75**	-9.88**	6.05*
21.	HL x ML	22.9	-7.85**	-11.58**	6.51**
22.	HL x KA	16.9	-37.52**	-40.07**	-21.40**
23.	HL x KB	25.6	2.40	-1.16	19.07**
24.	HL x GR	22.0	-14.06**	-15.06**	2.33
Commercial check					
	Kalpataru	21.50			
	S.E ±		0.42	0.49	0.49
	C.D. at 1%		0.86	1.01	1.01
	C.D. at 5%		1.17	1.37	1.37

Parent mean = 24.68 Cross mean = 20.76, * and ** Indicate significance of value at P=0.05 and 0.01, respectively

Phenological parameters :

The importance given to the number of fruits is more with respect to productivity. The parental range for number of fruits was 21.40 (Arka nidhi) to 28.20 (Kudachi local A), which is moderate compared to commercial check Kalpataru (21.50). However, it is denoted that most of the parents except Arka nidhi expressed significant higher fruit number than

commercial check. The mean performance of the F₁ hybrids was at par with commercial check with as many as nine hybrids having numerical higher number of fruits than the commercial check. Eight of the hybrids showing positive significant heterosis over commercial check for number of fruits per plant and magnitude of these heterosis values are high with highest value of 33.95 per cent (Budihal local x Green round).

Table 2 : Per se performance and magnitude of heterosis for yield per plant (g) in brinjal

Sr. No.	Entries	Per se value (g)	Heterosis over %		
			MP	BP	CC
Lines					
1.	Arka nidhi (AN)	769.00			
2.	Arka sheel (AS)	738.00			
3.	Arka shirish (AR)	1306.00			
4.	Budihal local (BL)	830.00			
5.	Mullubadne (MB)	796.00			
6.	Hittalu local (HL)	1093.50			
Testers					
1.	Malapur local	762.50			
2.	Kudachi A	1253.00			
3.	Kudachi B	893.00			
4.	Green round	798.00			
F₁ hybrids					
1.	AN x ML	837.00	9.30**	8.84**	-27.09**
2.	AN x KA	1032.50	2.13**	-17.60**	-10.06**
3.	AN x KB	978.00	17.69**	9.52**	-14.81**
4.	AN x GR	867.50	10.72**	8.71**	-24.83**
5.	AS x ML	870.00	15.96**	14.10**	-24.22**
6.	AS x KA	1725.00	73.28**	37.67**	50.26**
7.	AS x KB	1502.00	84.18**	68.20**	30.84**
8.	AS x GR	2019.00	162.89**	153.01**	75.87**
9.	AR x ML	905.00	-12.50**	-30.70**	-21.77**
10.	AR x KA	1350.00	5.51**	3.37**	17.60**
11.	AR x KB	1125.00	2.32**	-13.86**	-2.00**
12.	AR x GR	1487.00	41.35**	13.86**	29.53**
13.	BL x ML	854.00	7.28**	2.84**	-25.61**
14.	BL x KA	1024.00	-1.68**	-18.28**	-10.80**
15.	BL x KB	680.50	-21.61**	23.80**	-46.17**
16.	BL x GR	1626.00	99.75**	95.90**	41.64**
17.	MB x ML	770.00	-1.19	-3.27**	-32.93**
18.	MB x KA	1044.00	1.90	-16.68**	-9.06**
19.	MB x KB	710.50	-15.87**	-20.44**	-38.11**
20.	MB x GR	1075.00	34.88**	34.71**	-6.36**
21.	HL x ML	670.00	-27.80**	-38.73**	-41.64**
22.	HL x KA	727.50	-37.99**	-41.94**	-36.63
23.	HL x KB	951.50	-4.20**	-12.99**	-17.12**
24.	HL x GR	767.50	-18.88**	-29.81**	-33.14**
Commercial check					
	Kalpataru	787.50			
	S.E. ±		5.48	6.32	6.32
	C.D. at 1%		11.3	13.07	13.07
	C.D. at 5%		15.3	17.74	17.74

Parent mean = 923.90 Cross mean = 1066.60, * and ** Indicate significance of value at P=0.05 and 0.01, respectively

Fruit yield per plant is the ultimate and the most important trait. Considering the overall mean of the hybrids it was higher than the parental mean though it was less than that of check. However, looking at the highest mean value, which was shown by Arka sheel x Green round (2.01 kg/plant), it is much higher than the best parent Arka shirish (1.03 kg/plant) and also over that of check Kalpataru (1.14 kg/plant). Only six hybrids viz., Arka sheel x Green round, Arka sheel x Kudachi local A, Budihal local x Green round, Arka sheel x Kudachi local B, Arka shirish x Green round and Arka shirish x Kudachi local A showed significant positive heterosis over the commercial check. Out of these six hybrids, interestingly three of them involved Arka Sheel as one of the female parents and Green round as one of the tester parents in the crosses indicating the potentiality of Arka Sheel and Green round as a parental line for improving productivity.

In fact, the cross Arka Sheel x Green round with highest positive heterosis also showed the highest *per se* as well as commercial heterosis for fruit weight and fruit diameter indicating the close association between fruit weight, fruit diameter and productivity. Similar results were reported by

Gopinath and Madalageri (1986), Mandal *et al.* (1994), Kumar *et al.* (1999) and Bulgundi (2000).

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