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HETEROSIS IN BHINDI

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The cultivated varieties of bhindi *(Abelmoschus esculentus* (L.) Moench) are heterozygous in constitution inspite of its adaptation for self pollination. Out-crossing ranging from 11.80-60.00 per cent was reported by Martin (1983). As such, the scope for heterosis breeding is immense in this crop. Heterosis breeding as a tool for genetic improvement in bhindi has been advocated by many earlier workers (Venkataramani, 1952; Joshi *et al.* 1958; Elangovan *et al.*, 1981 and Parthap *et al.*, 1981). The ease in emasuculation and very high percentage of fruit setting point towards possibilities of exploitation of hybrid vigour in bhindi. Further, many workers have reported non-additive gene action for yield which also augments the proposition for heterosis breeding.

Materials and Methods

The present investigation was undertaken during 1983-'84 and 1984-'85 with six intervarietal hybrids of bhindi and their six parents aimed at estimation of heterosis for the different economic characters manifested by the hybrids and selecting the best hybrid with high yield potential and allied attributes. The hybrids were selected based on the results of a diallel cross study by Balachandran (1984) at the College of Agriculture, Vellayani, Trivandrum. Six parents and their six selected hybrids namely (1) Karingal local (2) Kilichundan (3) Pilicode local (4) Pusa Sawani (5) Selection 2-2 (6) Sevendhari (7) Pusa Sawani x Sevendhari (4 x 6) (8) Selection 2-2 x Kilichundan (5 x 2) (9) Selection 2-2 x Sevendhari (5 x 6) (10) Sevendhari x Karingal local (6 x 1) (11) Sevendhari x Kilichundan (6 x 2) and (12) Sevendhari x Pilicode local (5 x 3) were evaluated during January-Apil and April-July, 1985 in a randomised block design with three replications. Each treatment consisted of 30 plants of which, 10 were selected at random for recording observations. The characters studied included 17 yield components and one fruit quality attribute. Pusa Sawani, the most popular variety was taken as the standard for estimating standard heterosis.

Results and Discussion

The percentage of standard heterosis along with relative heterosis and heterobeltiosis exhibited by the hybrids are given in Table 1.

All the hybrids displayed desirable heterosis for major economic attributes such as fruits per plant and weight of fruits per plant in conformity with the findings of Joshi

et al. (1958), Thaker *et al.* (1982) and Balachandran (1984). The relative heterosis and heterobeltiosis are also high and positive for these two characters in all the six hybrids. Maximum standard heterosis (25.56) was recorded by the hybrid Selection 2-2 x Kilichundan for fruits per plant. The extent of standard heterosis for weight of fruits per plant was as high as 65.06 per cent (Selection 2-2 x Kilichundan) followed by 50.34 per cent (Sevendhari x Kilichundan). These findings revealed the marked superiority of these two hybrids over other hybrids.

Majority of the hybrids had negative heterosis for days to flower revealing that the hybrids were earlier in flowering. This is in agreement with the findings of Elmaksoud *et al.* (1984). Besides, these hybrids possessed comparatively long fruiting phase also.

Eventhough positive heterosis was displayed by the hybrids for number of flowers per plant, negative heterosis was noticed in the case of percentage of fruit set. By better management practices, the percentage of fruit set of the hybrids can be enhanced. This indicates the possibility of augmenting the yield potential of the hybrids by adopting better manurial and irrigation practices.

Majority of the hybrids displayed positive heterosis for the important fruit characters like length, girth and weight of single fruit. The maximum amount of standard heterosis was manifested by the hybrid Selection 2-2 x Kilichundan for weight and length of fruit, whereas for girth of fruit, maximum standard heterosis was recorded by Sevendhari x Kilichundan.

The hybrids displayed negative heterosis for height of plant. But positive standard heterosis was manifested for number of branches per plant and girth of stem in agreement with the findings of Elangovan *et al.* (1981). The hybrids were found to be fruiting at lower nodes and have lesser number of non-bearing nodes. Most of the hybrids displayed positive heterosis for mean leaf area. This may be attributed to the vegetative vigour expressed by the hybrids resulting from their heterozygous nature.

Less crude fibre content was found to be present in the fruits of the hybrids in comparison with the standard cultivar. Maximum negative heterosis for crude fibre content was manifested by the hybrid Selection 2-2 x Kilichundan. The present findings indicate that the hybrids are not only high yielding but also produce fruits with high quality supported by the findings of Elangovan *et al.* (1983).

Summary

Six parents and their six hybrids were evaluated during 1984-'85 on the basis of percentage of heterosis manifested by them for yield and its components. All the hybrids displayed desirable heterosis for the major economic characters such as weight of fruits per plant, number of fruits per plant etc. Negative heterosis was

Table 1

Percentage of relative hete (HB) and standard heterosis (SH) exhibited by the hybrids

No.	Characters		Hybrids 4x6	5x2	5x6	6x1	6x2	6x3
1	2	3	4	5	6	7	8	9
	Days to flower	RH	3.18	9.61	—1.16	1.69	—1.83	—0.97
		HB	2.49	—16.89	-1.24	—1.46	—9.13	—2.14
		SH	—2.49	3.11	-2.56	—2.79	5.30	—1.12
2	First fruiting node	RH	5.73	—9.52	21.05	15.06	-9.09	—11.81
		HB	—6.51	—20.67	12.80	10.92	—24.96	-22.26
		SH	—6.51	-6.33	0.36	—8.14	—11.39	—21.70
3	Mean ieaf area	RH	17.60	19.39	17.98	16.08	16.83	7.14
		HB	12.34	2.23	15.06	9.75	-2.03	-3.57
		SH	12.34	37.45	10.24	—0.06	31.73	9.76
4	Number of fruits	RH	12.36	38.54	14.21	28.21	32.45	20.54
	per plant	HB	12.13	34.44	10.65	5.95	24.65	14.73
		SH	12.13	25.56	10.21	5.53	24.15	14.28
5	Length of fruit	RH	5.34	12.91	8.50	5.62	15.00	8.81
		HB	2.80	2.88	5.65	3.27	2.29	2.87
		SH	2.89	25.68	6.13	3.00	24.97	9.91
6	Girth of fruit	RH	5.57	7.00	11.04	7.06	7.03	4.31
		HB	1.08	0.31	4.17	4.33	6.94	2.78
		SH	10.47	9.80	13.85	14.02	17.06	12.33
7	Weight of single fruit	RH	9.48	22.83	10.07	9.45	9.54	11.36
		HB	3.72	21.79	6.48	1.93	6.84	6.02
		SH	15.91	29.41	18.99	13.91	19.40	18.48
8	Weight of fruits per	RH	24.08	53.61	26.40	35.87	32.38	35.33
	plant	HB	18.20	41.47	19.40	6.91	28.85	23.29
		SH	30.56	65.06	31.89	18.09	50.34	36.19

1	2	3	4	5	6	7	8	9
9	Number of seeds per fruit	RH	-10.40	4.82	13.89	34.14	3.90	0.06
		HB	—19.04	—4.98	2.91	1.99	-1.63	-15.44
		SH	0.30	5.19	27.98	26.34	21.85	4.76
10	Number of ridges per fruit	RH	9.65	11.02	13.85	3.03	—9.55	8.00
		HB	-7.14	—7.60	—3.43	—11.26	—5.77	—7.28
		SH	33.86	39.60	39.21	27.92	42.38	33.66
11	Number of flowers perplant	RH	8.68	35.66	12.74	32.09	27.73	24.45
		HB	7.10	24.91	11.22	8.03	19.09	16.19
		SH	16.31	32.21	17.72	11.26	22.66	20.19
12	Fruiting phase	RH	5.91	16.52	1.90	7.43	9.02	6.29
		HB	4.26	16.03	7.21	7.21	5.56	4.69
		SH	4.26	6.19	3.87	—4.01	2.27	1.43
13	Number of non-bearing nodes	RH	1.58	—30.64	—11.29	—4.68	—26.60	-9.71
		HB	—15.46	—46.26	—22.76	—8.55	—48.34	—22.50
		SH	—5.40	-12.30	—30.74	—33.85	-15.71	-28,13
14	Height of plant	RH	17.68	10.86	19.37	22.63	—7.52	—21.93
		HB	—4.86	3.23	14.63	16.93	-0.43	-10.67
		SH	-4.86	—7.23	-11.15	0.54	—10.52	-2.11
15	No of branches	RH	3.79	-18.11	10.94	2.99	11.11	-0.50
		HB	-14.42	—35.60	4.81	—33.65	-8.67	-4.81
		SH	31.85	54.07	61.48	21.22	118.52	46.67
16	Girth of stem	RH	8.64	7.31	10.69	7.80	15.98	7.81
		HB	7.93	5.52	6.57	3.36	9.87	0.65
		SH	7.93	16.42	13.65	2.03	21.22	14.58
17	Percentage of fruitset	RH	2.64	1.07	1.97	1.99	3.76	3.12
		HB	0.41	—3.63	—2.29	—2.82	3.22	—5.10
		SH	0.41	-6.86	-6.43	—5.43	—0.23	-5.36
18	Percentage of crude fibre content	RH	3.91	0.00	-4.35	—1.08	3.52	1.87
		HB	2.82	—0.86	-12.95	-1.43	—5.04	—5.76
		SH	2.82	—19.31	-14.79	- 2.82	—7.04	—7.75

exhibited by the hybrids for crude fibre content, the most important quality attribute in bhindi. The results suggested that heterosis breeding could be effectively employed in augmenting the yield potential and allied attributes in bhindi.

The present study could identify two hybrids Selection 2-2 x Kilichundan and Sevendhari x Kilichundan with high yield potential coupled with other desirable attributes. The hybrids, Selection 2-2 x Kilichundun and Sevendhari x Kilichundan have out yielded the standard cultivar, Pusa Sawani, by 65.06 percent and 50.34 per cent respectively. Both the hybrids produced large number of long heavy fruits with good thickness and low crude fibre content. These hybrids will go a long way in boosting up the production potential of bhindi in homestead and commercial cultivations.

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