

Evaluation of Interspecific Hybrid Progenies of Bhendi with a Hybrid Index*

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The interspecific hybrid progenies derived from two cultivars of *Abelmoschus esculentus* and two wild forms of *A. manihot* were evaluated using a hybrid index formulated with distinguishing qualitative and quantitative characters. There was a rapid recovery of the cultivar build in both the pedigree and backcross method of breeding. There was a steep fall in the index values of F_2 population of pedigree progenies as well as in the F_2 generation of first backcross showing remarkable recovery of the cultivar build in the recombinants.

In breeding for disease resistance involving wild parents, certain undesirable characters of the wild parents like hairiness, miniature size of the fruits etc., are carried forward by the recombinants even in advanced generations. These characters eventually affect the plant type of the economic hybrids. However, it is very difficult to assess the contribution made by each parent involved in the cross in the ultimate morphology of the recombinant. For effective assessment, an index was formulated to record the improvement of the cultivar build in the progenies, as the incorporation of resistance in the cultivars without sacrificing the cultivar build is the main objective in breeding for disease resistance.

MATERIALS AND METHODS

Crosses were effected between two susceptible cultivars viz., Pusa Sawani

and Co.1 and two wild forms of *A. manihot* viz., *A. manihot* (African) and *A. manihot* (Japanese), to transfer the resistant genes of yellow vein mosaic disease to the susceptible cultivars. The interspecific hybrid progenies derived from these crosses were evaluated by using a hybrid index for certain important characters that distinguished the two parents in each cross. The hybrid index was constructed by adopting the procedure followed by Anderson (1936). The two wild species were selected to represent the high end of the scale while the cultivar parents were placed at the low end of the scale. Each character was assigned an index number which was always zero for the condition typical of the cultivar parents and 1, 2, 3 and 4 depending on the characters similar to those of wild parents. The index value assigned to the various

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TABLE I. Hybrid index values for the cultivars and wild parents

Character	Cultivars	Index value	Wild parents	Index value
General appearance	Erect and less branching	0	Bushy and highly branching	4
Petiole blotch	Small	0	Very broad	2
Epicalyx	Linear	0	Very broad	2
Fruit length	More than 17 cm	0	Less than 8 cm	3
Fruit shape	Linear	0	Globular or conical	2
Fruit beak	Long drawn	0	Rudiment	2
Number of ridges in the fruit	Five	0	More than six	1
Pubescence of fruit	Smooth	0	Pubescent	2
Stigma	Compact	0	Branched	1
Seed coat	Glabrous	0	Velvety	1
	Total	0		20

characters are detailed in Table I. The hybrid progenies in each generation were scored using the hybrid index.

RESULTS AND DISCUSSION

The usefulness and potentiality of the two wild donors in contributing resistance to yellow vein mosaic disease were assessed for the development of a resistant variety with desirable economic traits.

Pedigree Progenies: The hybrid index value scored by the progenies in each generation of all the four crosses are presented in Table II and III. The F₁ hybrids of the four crosses scored 13, deviating positively from the mid-parental value by 30.0 per cent. The means of F₂ population were between 11.50 and 11.98 in the four crosses as against the mid-parental value of 10.0. There

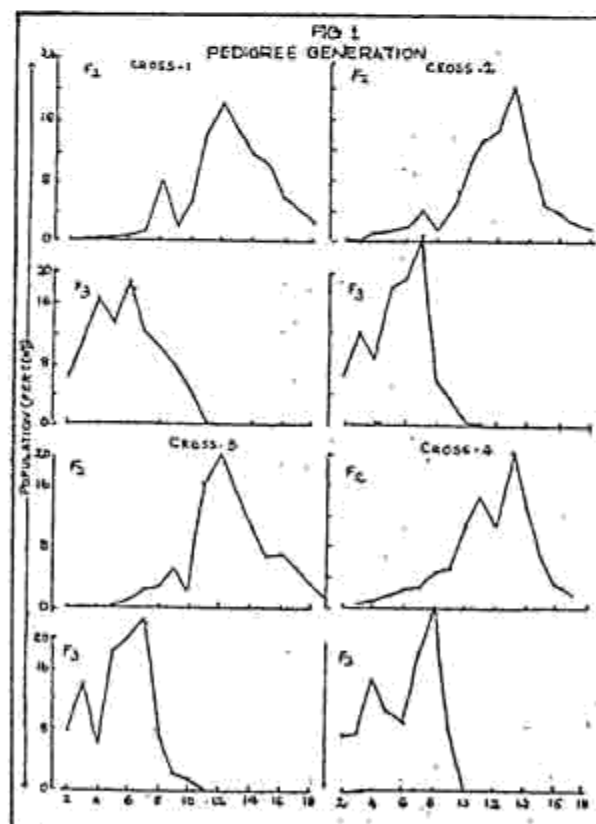


TABLE II. Mean performance of Pedigree generation in Hybrid index value

Generation	Parents		Cross-1 (P1 x P3)		Cross-2 (P2 x P3)		Cross-3 (P1 x P4)		Cross-4 (P2 x P4)	
	Mean \pm S.E.	C.V.	Mean \pm S.E.	C.V.	Mean \pm S.E.	C.V.	Mean \pm S.E.	C.V.	Mean \pm S.E.	C.V.
Pusa Sawani (P1)	0 \pm 0	0.0								
CO-1(P2)	0 \pm 0	0.0								
<i>A. manihot</i> (African) (P3)	20 \pm 0	0.0								
<i>A. manihot</i> (Japa- nese) (P4)	20 \pm 0	0.0								
F ₁			13.0 \pm 0.0	0.0	13.0 \pm 0.0	0.0	13.0 \pm 0.0	0.0	13.0 \pm 0.0	0.0
F ₂			11.68 \pm 0.24	43.79	11.58 \pm 0.34	44.53	11.67 \pm 0.32	42.35	11.50 \pm 0.33	42.27
F ₃			5.38 \pm 0.04	14.83	5.47 \pm 0.04	17.17	5.48 \pm 0.05	18.65	5.58 \pm 0.04	17.40

TABLE III. Deviation of F1, F2 and F3 generation means from the mid-parental and earlier pedigree generation values of Hybrid Index (Deviation expressed as per cent)

Cross	Mid-parental value	F1			F2			F3		
		Mean	Deviation from M.P.	Mean	Deviation from M.P.	Deviation from F.A.	Mean	Deviation from M.P.	Deviation from F. 1	Deviation from F. 2
Cross-1 (P1 x P3)	10.00	13.00	30.00	11.98	19.80	-14.09	5.38	-46.20	158.61	-55.09
Cross-2 (P2 x P3)	10.00	13.00	30.00	11.58	15.80	-10.92	5.47	-45.30	-57.92	-52.76
Cross-3 (P1 x P4)	10.00	13.00	30.00	11.97	19.70	-7.92	5.48	-45.20	-57.84	-54.21
Cross-4 (P2 x P4)	10.00	13.00	30.00	11.50	15.00	-11.54	5.58	-44.20	-57.07	-51.47

was a steep fall in the index values of F3 population from F2 showing remarkable recovery of the cultivar build. The variability in F2 generation ranged from 42.27 to 44.53 per cent while it ranged from 14.83 to 18.65 per cent only in F3 generation of all the crosses.

In the frequency distribution of the hybrid index values in F2 and F3 generations (Fig. 1) there was a gradual increase and then a sudden fall followed by a steep rise and rather gradual fall in the hybrid index values in F2 generation of all the crosses. In F3, the initial rise was steep compared to F2 generation. The shift to higher hybrid index values in F3 generation showed the rapid recovery of the cultivar build in the progenies. The curve was bimodal for both the generation with two peaks.

ii) Backcross Progenies: The hybrid index values of F1 generation of

the first backcross were higher than the mid-parental values (Table IV) of F1 and the cultivar parent. There was a reduction in the index values in the succeeding generations of the first backcross in all cross combinations. The fall in the hybrid index values was very steep in the F3 generation of the first backcross compared to its earlier generations performance, indicating the recovery of the cultivar build.

In the second backcross relatively lower values of hybrid index were observed in all the cross combinations in F₁ generation in comparison to the F₁ of the first backcross. There was a steep fall in the mean of the hybrid index values in the F2 generation of the second backcross.

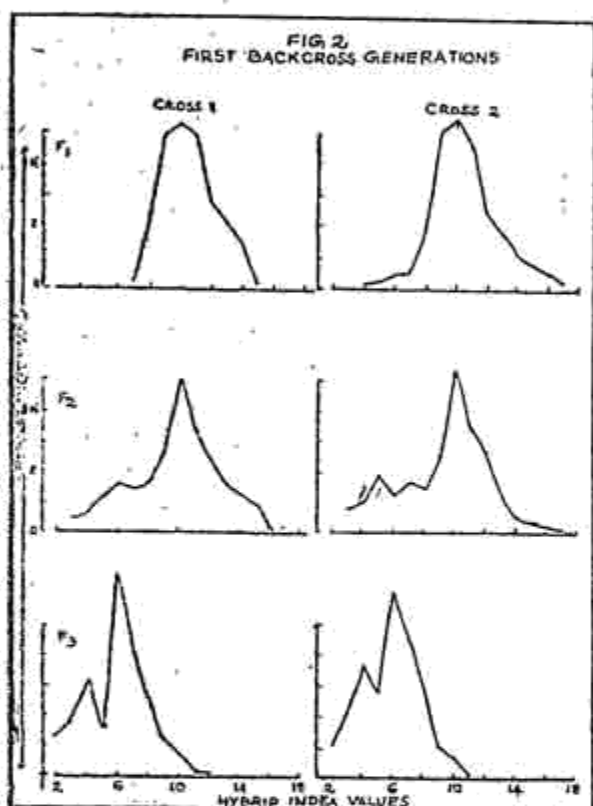
The variability for hybrid index values was considerably higher in all the backcross generations. Maximum

TABLE IV. Mean performance of Backcross generations in Hybrid index values in four crosses

Generation	Cross-1 (P1 x P3)		Cross-2 (P2 x P4)		Cross-3 (P1 x P4)		Cross-4 (P2xP4)	
	Mean \pm S.E.	C.V.	Mean \pm S.E.	C.V.	Mean \pm S.E.	C.V.	Mean \pm S.E.	C.V.
First Backcross-F1 1/2 (F1 + Cultivar Parent)	9.83 \pm 0.19	22.45	10.26 \pm 0.21	22.42	10.12 \pm 0.16	20.73	9.81 \pm 0.15	19.21
	6.50		6.50		6.50		6.50	
First Backcross-F2	9.50 \pm 0.19	44.18	9.53 \pm 0.30	42.99	8.68 \pm 0.18	37.09	9.23 \pm 0.30	40.07
First Backcross-F3	5.55 \pm 0.05	15.80	5.70 \pm 0.06	15.03	5.19 \pm 0.06	16.42	5.60 \pm 0.06	15.60
Second Back- cross-F1	8.12 \pm 0.15	20.15	7.86 \pm 0.15	21.33	8.09 \pm 0.15	20.72	7.90 \pm 0.13	18.39
Second Back- cross-F2	5.39 \pm 0.14	39.48	5.28 \pm 0.15	38.34	5.31 \pm 0.16	38.85	5.38 \pm 0.17	42.34

variations were in evidence in the second generations of both first and second backcrosses (37.09 to 41.18 per cent).

The frequency distribution of hybrid index values in the resistant selfed progenies of the first backcross to the susceptible parent shown in Fig.2 present



a trend similar to pedigree progenies in F2 and F3 generations, while the F1

hybrids showed a single smooth curve in all the crosses.

The recovery of cultivar build as measured hybrid index values was rapid from F2 to F3 than from F1 to F2 generations in the pedigree as well as backcross method of breeding. However, there were no significant differences between the two methods employed to develop resistant varieties in bhendi, though the reduction in the hybrid index values from F1 to first backcross-F1 was more than the reduction from F1 to F2. This has enabled the progenies of the second backcross to come closer to the cultivar parents than to the F3 progenies. Sivasubramanian (1971) claimed that the recovery of the cultivar build was very rapid in backcross breeding for resistance to little leaf disease in brinjal from *S. integrifolium* source.

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