

Pigeonpea Breeding

**Report of Work
June 1987-May 1989**

Project No.: P-103(85)IC

**Project Title: Development of Medium-Duration Cultivars and
Superior Breeding Lines for Grain Production**

K.C. Jain, M. Chenchi Reddy, and Laxman Singh



ICRISAT

Legumes Program

**International Crops Research Institute for the Semi-Arid Tropics
Patancheru, Andhra Pradesh 502 324, India**

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August 1989

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**International Crops Research Institute for the Semi-Arid Tropics
(ICRISAT), Patancheru 502324, A.P., India**

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HIGHLIGHTS

- * A proposal for the release of ICPL 270 (a wilt resistant line) for region I of Karnataka State has been submitted by the Senior Scientist (Pulses), ARS, Gulbarga, Karnataka, India.
- * Seven disease resistant and high yielding lines (ICPL 227, ICPL 8357, ICPL 85063, ICPL 85066, ICPL 87119, ICPL 88046 and ICPL 88047) were in different stages of testing in the All India Coordinated Pulses Improvement Project trials. In the south zone ICPL 87119, ICPL 85066 and ICPL 85063 occupied first three ranks in 1988-89 season.
- * One of the BDN 1 backcross progenies (BDN1 BC3-F2-2-S6-S3-SB-B) bred for SM resistance produced significantly higher grain yield (2.70 t/ha) as compared to the recurrent parent, BDN 1 (2.04 t/ha).
- * ICPL 88045, a wilt resistant line developed through irradiation of LRG 30 produced similar yield as control variety C 11.
- * In a medium-duration hybrids trial, all hybrids yielded more than control variety C 11. Eleven hybrids were significantly higher yielding than C 11 and three hybrids produced more than 4 t/ha grain yield.
- * One Helicoverpa tolerant line (ICPX 820042-E17-E5-EB) was the highest yielding entry in PIRYT (Pigeonpea Insect Resistant Lines Yield Test). It yielded 1.31 t/ha as compared to 1.09 t/ha for Helicoverpa control, ICPL 332, 1.22 t/ha for C 11 and 0.91 t/ha for BDN 1 control under pesticide-free conditions. The percent borer damaged pods in this line was 18.5% as compared to 23.4% in resistant control, 31.7% in C 11 and 47.8% in BDN 1 control.

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P-103(85)IC: Development of medium-duration cultivars and superior breeding lines for grain production

A. OBJECTIVES

(a) To develop high yielding medium-duration cultivars with resistance to yield constraints such as diseases and insect-pests and of acceptable grain quality that are adapted to pure and companion cropping with various other crops.

(b) To contribute breeding lines and populations to pigeonpea breeders throughout the semi-arid tropics.

B. IDENTIFICATION AND INVESTIGATION OF PARENTS

(i) Parents used in crosses: In 1987 three wilt resistant (ICP 8863, ICP 9174 and ICP 9145) and three wilt-susceptible parents (ICP 2376, ICP 6997 and LRG 30) were used in crosses to study the inheritance of resistance to Fusarium wilt. Two another wilt resistant parents (ICPL 335 and ICPL 9145) and two Helicoverpa tolerant parents (ICPL 87088 and ICPL 87089) were also selected. In addition one MS wilt resistant line (ICP 3783 ms - ms JA 275) and 15 wilt resistant lines were selected for making hybrids.

During 1988 ICPL 270 and C 11 were identified for making crosses with four Kenyan lines (60/8, NPP 270, 623/11 and 11RA).

C. CROSSES MADE AND F1'S GROWN

To study the inheritance of resistance to Fusarium wilt 15 crosses in diallel fashion were made in 1987. In addition four crosses between wilt resistant and two Helicoverpa tolerant lines were also made (Table 1). To develop wilt resistant high yielding hybrids in medium-duration, one wilt resistant medium-duration ms line ICP 3783 was crossed with 15 wilt resistant high yielding lines (Table 2). For the wilt inheritance study backcrosses to both the parents were made in 1988 (Table 3).

F1's Grown: Four single cross F1's (ICPX 860112 to 860115) involving wilt, SM and Phytophthora (P3 isolate) blight resistant parents and three BC1 F1's for roguing out the selves and for further advance were sown in 1987 rainy season. In 1988 rainy season 15 crosses made for wilt inheritance study were grown for making backcrosses and for producing F2 seed.

D. BREEDING POPULATIONS

(i) Three-Way Cross F2 Populations:

In 1987 a total of 11 TCF2 populations each in 4 m long 50 rows accommodating nearly 1000 plants per population were grown. These populations were observed for morphological and yield attributes. In five populations (ICPX 850093, -850100, -850102, -850103 and ICPX 850118) we could not observe enough variability for different agronomically desirable attributes. Hence single plant selection was not practiced and these populations were rejected. Another six populations (Table 4) were found promising and 25 plants from each population were selected for growing single plant progenies in wilt and SM nursery during 1988.

Table 1. List of Crosses made during 1987 rainy season at ICRISAT Center, Patancheru.

S.No.	Cross No.	Parentage	No. of Seeds
A. Wilt Inheritance:			
1	870107	ICP 8863 X ICP 9174	164
2	870108	ICP 8863 X ICP 9145	106
3	870109	ICP 8863 X ICP 2376	93
4	870110	ICP 8863 X ICP 6997	105
5	870111	ICP 8863 X LRG 30	300
6	870112	ICP 9174 X ICP 9145	155
7	870113	ICP 9174 X ICP 2376	211
8	870114	ICP 9174 X ICP 6997	134
9	870115	ICP 9174 X LRG 30	129
10	870116	ICP 9145 X ICP 2376	135
11	870117	ICP 9145 X ICP 6997	165
12	870118	ICP 9145 X LRG 30	265
13	870119	ICP 2376 X ICP 6997	129
14	870120	ICP 2376 X LRG 30	167
15	870121	ICP 6997 X LRG 30	65
B. Insect resistance:			
16	870122	ICPL 335 X ICPL 87088	180
17	870123	ICPL 335 X ICPL 87089	195
18	870124	ICP 9145 X ICPL 87088	193
19	870125	ICP 9145 X ICPL 87089	155

Table 2. List of medium duration hybrids made during 1987 rainy season at ICRISAT Center, Patancheru.

S.No.	Source Plot #	Hybrid No.	Parentage	No.of. Seeds
1	4101	IPH 477	ICP 3783 MS line X ICPL 270 (MS JA275)	337
2	4102	IPH 478	"	X ICPL 335 456
3	4103	IPH 479	"	X ICPL 227 388
4	4104	IPH 480	"	X ICPL 8357 375
5	4105	IPH 481	"	X ICPL 85066 468
6	4106	IPH 482	"	X ICPL 84008 370
7	4106	IPH 483	"	X ICPL 8356 397
8	4107	IPH 484	"	X ICPL 8863 560
9	4107	IPH 485	"	X ICPL 8363 357
10	4107	IPH 486	"	X ICPL 8362 340
11	4107	IPH 487	"	X ICPL 87119 380
12	4108	IPH 488	"	X ICPL 87121 335
13	4108	IPH 489	"	X ICPL 86034 285
14	4108	IPH 490	"	X ICPL 85067 477
15	4108	IPH 491	"	X ICPL 85069 384

Table 3. List of back crosses made during 1988 rainy season at ICRISAT Center, Patancheru.

S.No.	Cross No.	Cross	No. of Seeds
1	880156	(ICP 8863 X ICP 9174) X ICP 8863	104
2	880157	" X ICP 9174	181
3	880158	(ICP 8863 X ICP 9145) X ICP 8863	124
4	880159	" ICP 9145	159
5	880160	(ICP 8863 X ICP 2376) X ICP 8863	79
6	880161	" ICP 2376	209
7	880162	(ICP 8863 X ICP 6997) X ICP 8863	66
8	880163	" X ICP 6997	77
9	880164	(ICP 8863 X LRG 30) X ICP 8863	56
10	880165	" LRG 30	105
11	880166	(ICP 9174 X ICP 9145) X ICP 9174	274
12	880167	" X ICP 9145	400
13	880168	(ICP 9174 X ICP 2376) X ICP 9174	127
14	880169	" X ICP 2376	134
15	880170	(ICP 9174 X ICP 6997) X ICP 9174	229
16	880171	" X ICP 6997	52
17	880172	(ICP 9174 X LRG 30) X ICP 9174	280
18	880173	" X LRG 30	108
19	880174	(ICP 9145 X ICP 2376) X ICP 9145	203
20	880175	" X ICP 2376	130
21	880176	(ICP 9145 X ICP 6997) X ICP 9145	220
22	880177	" X ICP 6997	99
23	880178	(ICP 9145 X LRG 30) X ICP 9145	161
24	880179	" X LRG 30	49
25	880180	(ICP 2376 X ICP 6997) X ICP 2376	95
26	880181	" X ICP 6997	43
27	880182	(ICP 2376 X LRG 30) X ICP 2376	44
28	880183	" X LRG 30	40
29	880184	(ICP 6997 X LRG 30) X ICP 6997	108
30	880185	" X LRG 30	110
31	880186	(ICPL 335 X ICPL 87088) X ICPL 87088	156
32	880187	(ICPL 335 X ICPL 87089) X ICPL 87089	68
33	880188	(ICP 9145 X ICPL 87088) X ICPL 87088	194
34	880189	(ICP 9145 X ICPL 87089) X ICPL 87089	40

Table 4. List of selected TCF2's & F2 Populations advanced during 1987 rainy season.

S.No.	Source Plot No.	Cross. No.	Parentage	Gen	No. of Selections made
1	2577	850121	(ICPL 8363 X ICPL 270) X ICPL 343	TCF2	25
2	2578	850123	(ICPL 8350 X ICPL 270) X ICP 8102-5-E1	"	25
3	2579	850129	(ICPL 343 X ICPL 270) X T-15-15	"	25
4	2580	850132	(ICPL 343 X ICPL 270) X ICP 7774	"	25
5	2581	850133	(ICPL 332 X ICPL 270) X ICPL 227	"	25
6	2582	850134	(ICPL 84060 X ICPL 270) X ICPL 227	"	25
7	2583	850071	ICP 8863 X T-15-15	F2	25

(ii) F2 Populations

One F2 population of a single cross between wilt resistant genotype ICP 8863 and T-15-15, a white seeded cultivar of Gujarat State was grown. Our objective in this population was to select white seeded wilt resistant plants. We selected 25 white-seeded plants in this F2 population. These 25 selections were sown in 2-row plots in wilt sick nursery in 1988 rainy season. Of these 25 progenies, 16 had cream/white seed color and had wilt incidence upto 20% (Table 4). We plan to grow them in wilt-sick nursery for further monitoring and will evaluate for yield in 1989 rainy season.

(iii) Yield Potential of Populations

Three open-pollinated population mixtures one each from Parasia Block, Sausar Block, and Amarvada Block of Chhindwada District of M.P., one population known as 'Konda Kandi' collected from a tribal area in A.P., two germplasm accessions (ICP 10012 and ICP 10420) identified as high yielding in 1986 and two F2 populations (ICPX 840152 and ICPX 840160) found superior in 1986 in both rainy and post-rainy seasons were also evaluated for their yield potential. Each population was planted in 4 m long 100 rows. Populations from Parasia and Amarvada Blocks were of long-duration and appeared like pure varieties hence were not selected. The yield was recorded in three replications with plot size of 10 x 3.6 m in each population. The yield of populations was compared with control variety C11 (Table 5). Populations were low yielders, hence were not grown in 1988 rainy season for single plant selection.

Table 5. Performance of mass selected populations grown during 1987 rainy season.

S.No.	Source Plot No.	Pedigree	Parentage	Yield Kg/ha
1	2584	ICPX 840162 F2	ICPL 227 X ICPL 335	1425
2	2585	ICPX 840160 F2	ICPL 227 X ICPL 8341	1575
3	2586	ICP 10012	-	1575
4	2587	ICP 10420	-	1150
5	2589	Coll. from Sausar Block	-	775
6	2591	Konda Kandi	-	400
7	E#2304	C 11 (Control)	-	1880

(iv) Composite Populations:

We had advanced six male sterile composite populations upto 1986. But due to constraints on resources and manpower, all the populations were kept in cold store for future use. However, in 1988 ICPP-2 (Helicoverpa tolerant population) was reconstituted. For the second cycle of random mating eight Helicoverpa tolerant parents (ICPL 87088, -87089, -332, -84060, -187-1, -269, ICP 909-E3(x) and PPE 45-2) were selected. Equal quantity seed of these parents was bulked and was planted at every fourth plot as pollinator row. At flowering, male sterile plants from the ICPP2 composite population were identified and seed from about 200 Helicoverpa tolerant plants was collected to reconstitute the population for further advance in 1989 rainy season.

E. BREEDING FOR DISEASE RESISTANCE

a) Wilt:

The breeding material was screened in the wilt sick nursery. The wilt susceptible control, ICP 2376 was sown throughout the field after two test rows to monitor the disease spread in the nursery. The materials screened in the nursery were:

1987:

(i) LRG 30 BC2F2 Generation

The LRG 30, a wilt susceptible variety was crossed with ICP 8863 in 1984. The BC1 F2 was sown in wilt nursery and three plants from two resistant progenies were identified for making second backcross with LRG 30. Three BC2 F2 populations were grown in 1987 to select LRG 30 type wilt resistant plants. The wilt incidence in populations ranged from 84% to 90%. The resistant plants had very poor growth and did not appear promising for single plant selection. Hence no selection was made in these populations.

(ii) F3 Generation

White-seeded 25 single plant progenies from F2 between ICP 8863 and T 15-15 were sown in 1988 in wilt nursery. Wilt incidence in 16 progenies ranged from 0 to 16% (Table 6). Eleven progenies had less than 10% and 5 had upto 16% wilt incidence. These progenies will be tested for yield in 1989 rainy season and will be monitored for wilt reaction in the nursery.

(iii) F5 Generation

A total of 150 single plant selections made in 1986 from populations advanced through Single Pod Descent method and from other populations were screened in 2 row plots in wilt nursery. Eighteen progenies with less than 10% wilt incidence were selected (Table 7). In 1988 selected progenies were yield tested in Wilt Resistant Advanced Lines Yield Test (88P25). The results are reported in Table 44.

Table 6. List of selected F3 Progenies screened in Wilt Nursery during 1988 rainy season.

S.No.	Source Plot #	Pedigree (ICPX)	Parentage	X Wilt
1	180	850071-1-VB	ICP 8863 X T-15-15	14
2	181	-2-VB	"	13
3	183	-4-VB	"	5
4	184	-5-VB	"	19
5	185	-6-VB	"	8
6	186	-7-VB	"	7
7	187	-8-VB	"	7
8	188	-9-VB	"	2
9	189	-10-VB	"	16
10	190	-11-VB	"	16
11	191	-12-VB	"	4
12	192	-13-VB	"	3
13	196	-17-VB	"	5
14	197	-18-VB	"	5
15	198	-19-VB	"	17
16	199	-20-VB	"	13
17	200	-21-VB	"	16
18	202	-23-VB	"	9
19	204	-25-VB	"	3

Table 7. List of selected F5 progenies screened in Wilt Nursery during 1987 K at ICRISAT Center, Patancheru.

S.No.	Source Plot No.	Pedigree	Parentage	X Wilt
1	61	ICPX 810190F4B-W3	C 11 X ICPL 270	6
2	81	ICPX 810201F4B-W7	C 11 X AVR 74/15	9
3	95	ICPX 810202F4B-W1	C 11 X Bandapalera Coll.	4
4	101	ICPX 810202F4B-W7		10
5	106	ICPX 810202F4B-W12		9
6	109	ICPX 810202F4B-W15		0
7	120	ICPX 810203F4B-W6	C 11 X ICP 8863	8
8	121	ICPX 810203F4B-W7		5
9	128	ICPX 810203F4B-W14		3
10	132	ICPX 810203F4B-W18		8
11	133	ICPX 810203F4B-W19		9
12	139	ICPX 810204F4B-W5	BDN 1 X AVR74/15	9
13	149	ICPX 810204F4B-W15		9
14	150	ICPX 810205F4B-W1	BDN 1 X Bandapalera Coll.	5
15	166	ICPX 810195F4B-W5	LRG 30 X ICPL 295	4
16	169	ICPX 810195F4B-W8		2
17	172	ICPX 810195F4B-W11		3
18	204	ICPX 820193F4B-W7	ICPL 228 X ICPL 335	7

(iv) Irradiation of ICP 8863

In certain Indian states white seeded genotypes are used as dual purpose (vegetable and dhal) and wilt is a serious problem. White/cream color wilt resistant genotypes are in great demand in those states. ICP 8863, a wilt resistant high yielding but brown seed color genotype was selected for irradiation with the hope, of getting white/cream color mutants. The dry seeds of this genotype were irradiated with 5, 10, 15, 20 and 25 kR doses and were sown with untreated control in 1988. All the M1 seeds were collected for growing M2 population in 1989 rainy season.

(v) Monitoring and Maintenance of lines

Four wilt resistant lines (ICPL 8357, ICPL 85066, ICPL 84008, and ICPL 227) and 12 LRG 30 M4 progenies were grown in 1987 in wilt sick nursery for monitoring. The seed from resistant plants was bulked for further use. In 1988 some 150 advanced lines were screened in the nursery. The wilt incidence is reported in Table 8.

Table 8. List of station trial entries monitored in wilt nursery at ICRISAT Center during 1988 rainy season.

S.No.	Pedigree	X Wilt		Mean	Remarks
		R-I	R-II		
1	ICPL 87088	91.0	86.0	89.0	MPAY
2	ICPL 88041	90.0	70.0	80.0	"
3	ICPL 88042	95.0	79.0	87.0	"
4	ICPL 88043	1.3	0.0	0.7	"
5	ICPL 88044	1.7	3.3	3.0	"
6	ICPL 88045	2.6	2.7	3.0	"
7	ICPL 88046	4.2	4.0	4.0	"
8	ICPL 88047	1.4	0.0	0.7	"
9	ICPL 88048	29.0	15.0	22.0	"
10	ICPL 88049	4.7	32.0	18.0	"
11	BDN 1	35.0	78.0	57.0	"
12	C 11	82.0	34.0	58.0	"
13	ICPX 800324-E31-E1-EB-EB-EB-EB	6.5	69.0	38.0	PIRYT
14	ICPX 820042-E17-E5-EB-EB	100.0	96.0	98.0	"
15	ICPX 820052-E1-E1-EB-EB	91.0	88.0	90.0	"
16	ICPX 820045-E20-E1-EB-EB	97.0	97.0	97.0	"
17	ICPX 820051-E5-E3-EB-EB	93.0	87.0	90.0	"
18	ICPX 820041-E3-E4-EB-EB	98.0	93.0	96.0	"
19	ICPX 820045-E10-E3-E4-EB-EB	100.0	100.0	100.0	"
20	ICPX 820050-E12-E2-EB-EB	93.0	100.0	97.0	"
21	ICPX 820041-E2-E4-EB-EB	97.0	98.0	98.0	"
22	ICPX 820045-E6-E1-EB-EB	56.0	77.0	67.0	"
23	ICPX 820042-E5-E1-EB-EB	96.0	100.0	98.0	"
24	ICPX 820046-E1-E7-EB-EB	95.0	86.0	91.0	"
25	ICPX 820046-E2-E3-EB-EB	97.0	81.0	89.0	"
26	BDN 1	9.0	60.0	35.0	"
27	C 11	76.0	58.0	67.0	"
28	ICPL 332	76.0	95.0	86.0	"
29	823/11	95.0	91.0	93.0	Kenyan lines
30	ICP 8006	88.0	59.0	74.0	"
31	Early Selection	92.0	86.0	89.0	"
32	Medium Selection-1	80.0	100.0	90.0	"
33	Germplasm Selection	80.0	90.0	85.0	"
34	NPP 670	95.0	71.0	83.0	"
35	Kambi-Ya-Mave. Sel	100.0	78.0	89.0	"
36	Medium Selection-2	77.0	61.0	69.0	"
37	KATPP-E-31/4	65.0	79.0	72.0	"
38	60/8	93.0	89.0	91.0	"
39	KATPP-777	73.0	50.0	62.0	"
40	KATPP-69/6	68.0	34.0	51.0	"
41	KATPP-878	96.0	88.0	92.0	"
42	KATPP-11 RA	98.0	86.0	92.0	"
43	KATPP-81/3/3	49.0	50.0	50.0	"
44	C 11	31.0	41.0	36.0	"
45	ICPX 820169-B-S1-SVB*-SVB	.0 0	5.0	3.0	VSMALT
46	ICPX 820169-B-S4-SVB*-SVB	0.0	0.0	0.0	"

47	ICPX 820169-B-S5-SVB*-SVB	1.4	6	4	"
48	ICPX 820169-B-S19-SVB*-SVB	100.0	2.0	51.0	"
49	ICPX 820169-B-S21-SVB*-SVB	0.0	2.0	1.0	"
50	ICPX 820181-B-S2-SVB*-SVB	0.0	0.0	0.0	"
51	ICPX 820181-B-S3-SVB*-SVB	0.0	11.0	6.0	"
52	ICPX 820181-B-S6-SVB*-SVB	0.0	6.0	3.0	"
53	ICPX 820181-B-S7-SVB*-SVB	1.3	2.0	2.0	"
54	ICPX 820181-B-S8-SVB*-SVB	0.0	8.0	4.0	"
55	ICPX 820181-B-S14-SVB*-SVB	5.0	7.0	6.0	"
56	ICPX 820181-B-S15-SVB*-SVB	0.0	4.0	2.0	"
57	ICPX 820181-B-S19-SVB*-SVB	4.0	6.0	5.0	"
58	ICPX 820181-B-S25-SVB*-SVB	2.0	0.0	1.0	"
59	ICPX 820182-B-S2-SVB*-SVB	0.0	7.0	4.0	"
60	ICPX 820184-B-S1-SVB*-SVB	3.0	5.0	4.0	"
61	ICPX 820195-B-S9-SVB*-SVB	0.0	5.0	3.0	"
62	ICPX 820369-SB-S1-SVB*-SVB	0.0	5.0	3.0	"
63	ICPX 820369-SB-S2-SVB*-SVB	0.0	3.0	2.0	"
64	ICPX 820372-SB-S1-SVB*-SVB	0.0	4.0	2.0	"
65	ICPX 820372-SB-S2-SVB*-SVB	0.0	0.0	0.0	"
66	ICPX 820372-SB-S3-SVB*-SVB	0.0	13.0	7.0	"
67	ICPX 820372-SB-S6-SVB*-SVB	0.0	0.0	0.0	"
68	ICPX 820372-SB-S7-SVB*-SVB	0.0	0.0	0.0	"
69	ICPX 820372-SB-S11-SVB*-SVB	0.0	0.0	0.0	"
70	ICPX 820372-SB-S14-SVB*-SVB	0.0	7	4	"
71	ICPX 820372-SB-S16-SVB*-SVB	0.0	4	2	"
72	ICPX 820372-SB-S17-SVB*-SVB	0.0	0.0	0.0	"
73	ICPX 800004-B-B-B-SW2-SVB	10.0	85.0	48.0	"
74	ICPX 800006P5B-SW4-SVB	3.0	2.0	3.0	"
75	ICPX 800004P6B-SW3-SVB	9.0	17.0	13.0	"
76	ICPX 800004P6B-SW6-SVB	2.0	5.0	4.0	"
77	ICPX 800021P6B-SW6-SVB	3.0	5.0	4.0	"
78	ICPX 800021P6B-SW10-SVB	13.0	8.0	11.0	"
79	BDN 1	52.0	52.0	52.0	"
80	C 11	26.0	25.0	26.0	"
81	ICPL 88048	52.0	29.0	41.0	BDN1 BC3F6 PYT
82	ICPL 88049	18.0	28.0	23.0	"
83	BDN1 BC3F2-16*-S4*-S1*-SB*-B	26.0	22.0	24.0	"
84	BDN1 BC3F2-16*-S4*-S5*-SB*-B	35.0	32.0	34.0	"
85	BDN1 BC3F2-2*-S7*-S2*-SB*-B	39.0	22.0	31.0	"
86	BDN1 BC3F2-2*-S6*-S3*-SB*-B	26.0	19.0	23.0	"
87	BDN1 BC3F2-16*-S5*-S1*-SB*-B	53.0	70.0	62.0	"
88	BDN1 BC3F2-16*-S10*-S2*-SB*-B	37.0	71.0	54.0	"
89	BDN1 BC3F2-2*-S1*-S4*-SB*-B	44.0	60.0	52.0	"
90	BDN1 BC3F2-16*-S4*-S2*-SB*-B	84.0	77.0	81.0	"
91	BDN1 BC3F2-16*-S4*-S6*-SB*-B	40.0	32.0	36.0	"
92	BDN 1	91.0	55.0	73.0	"
93	ICPX 810190P4B-V3-VB	4.0	90.0	47.0	WRALT
94	ICPX 810201P4B-V7-VB	2.0	0.0	1.0	"
95	ICPX 810202P4B-V1-VB	2.0	2.0	2.0	"
96	ICPX 810202P4B-V7-VB	0.0	0.0	0.0	"
97	ICPX 810202P4B-V12-VB	5.0	0.0	3.0	"
98	ICPX 810202P4B-V15-VB	5.0	4.0	5.0	"
99	ICPX 810203P4B-V6-VB	2.0	2.0	2.0	"
100	ICPX 810203P4B-V7-VB	4.0	2.0	3.0	"
101	ICPX 810203P4B-V14-VB	2.0	0.0	1.0	"

102	ICPX 810203P4B-V18-VB	9.0	4.0	7.0	"
103	ICPX 810203P4B-V19-VB	0.0	4.0	2.0	"
104	ICPX 810204-P4B-V5-VB	4.0	5.0	5.0	"
105	ICPX 810204-P4B-V15-VB	8.0	3.0	6.0	"
106	ICPX 810205-P4B-V1-VB	12.0	3.0	8.0	"
107	ICPX 810195-P4B-V5-VB	5.0	7.0	6.0	"
108	ICPX 810195-P4B-V8-VB	4.0	5.0	5.0	"
109	ICPX 810195-P4B-V11-VB	2.0	0.0	1.0	"
110	ICPX 820193P4B-V7-VB	2.0	2.0	2.0	"
111	ICPX 810192P4B-S2-SB	22.0	42.0	32.0	SYALT
112	ICPX 810192P4B-S3-SB	75.0	55.0	65.0	"
113	ICPX 810192P4B-S4-SB	92.0	83.0	88.0	"
114	ICPX 810192P4B-S5-SB	26.0	17.0	22.0	"
115	ICPX 810192P4B-S7-SB	95.0	88.0	92.0	"
116	ICPX 810192P4B-S12-SB	85.0	71.0	78.0	"
117	ICPX 810192P4B-S15-SB	96.0	58.0	77.0	"
118	ICPX 810192P4B-S16-SB	36.0	10.0	23.0	"
119	ICPX 810192P4B-S17-SB	23.0	17.0	20.0	"
120	ICPX 810192P4B-S18-SB	45.0	48.0	47.0	"
121	ICPX 820172P4B-S2-SB	32.0	21.0	27.0	"
122	ICPX 820172P4B-S3-SB	85.0	46.0	66.0	"
123	ICPX 820172P4B-S4-SB	77.0	76.0	77.0	"
124	ICPX 820172P4B-S5-SB	47.0	89.0	68.0	"
125	ICPX 820172P4B-S9-SB	88.0	87.0	88.0	"
126	ICPX 820172P4B-S11-SB	64.0	77.0	71.0	"
127	ICPX 820172P4B-S12-SB	98.0	63.0	81.0	"
128	ICPX 820179P4B-S3-SB	27.0	57.0	42.0	"
129	ICPX 820179P4B-S5-SB	93.0	71.0	82.0	"
130	ICPX 820179P4B-S6-SB	13.0	0.0	7.0	"
131	ICPX 800023F5B-S2-SB	82.0	73.0	78.0	"
132	ICPX 800023F5B-S6-SB	86.0	55.0	71.0	"
133	ICPX 800023F5B-S9-SB	88.0	77.0	83.0	"
134	ICPX 800023F5B-S14-SB	87.0	77.0	82.0	"
135	ICPX 800023F5B-S16-SB	92.0	86.0	89.0	"
136	ICPX 800023F5B-S17-SB	85.0	79.0	82.0	"
137	ICPX 820134-13-DT1-B-B	94.0	94.0	94.0	"
138	ICPX 820143-46-DT3-B-B	51.0	64.0	58.0	DTADLT
139	ICPX 820135-16-DT2-B-B	91.0	84.0	88.0	"
140	ICPX 820134-32-DT3-B-B	87.0	67.0	77.0	"
141	ICPX 820134-28-DT1-B-B	81.0	60.0	71.0	"
142	ICPX 780227-1-1-1-1-B	92.0	56.0	74.0	"
143	ICPX 780227-1-1-1-15-B	10.0	7.0	9.0	"
144	ICPX 780227-1-1-3-10-B	15.0	14.0	15.0	"
145	ICPX 780227-1-1-1-B-B	82.0	40.0	61.0	"
146	(T-15-15 X HY-3A)F2-4-1-B-B	28.0	0.0	14.0	"
147	(B12 X ICP 6997)F2-1-1-B-B	36.0	67.0	52.0	"
148	C 11	44.0	18.0	31.0	"
149	BDN 1	76.0	82.0	79.0	"
150	ICPL 211	70.0	50.0	60.0	"

b) Sterility Mosaic

The screening of breeding material was done in SM screening nursery. The susceptible control ICP 8863 was planted after every 10 test rows to serve as indicator row to monitor the disease spread.

(1) F5-F6 Generation

A total of 41 single plant progenies derived from three SPD populations and 17 selections from one SPD population (ICP 6997 x ICP 2376) in F6 generation were screened in SM nursery. A total of 20 progenies (10 from ICPX 81192, 7 from ICPX 82172 and 3 from 82179) were found resistant. The % SM incidence in selected progenies ranged from 0 to 8% (Table 9). From 17 progenies planted in ICP 6997 x ICP 2376 population, six showed resistant reaction. The % SM incidence in selected progenies ranged from 0 to 9%.

During 1988 rainy season selected progenies were tested for yield under SM-free condition. The results are reported in Table 45. During 1988 no breeding material was screened in SM nursery.

c) Wilt and Sterility Mosaic

In wilt and SM screening nursery wilt susceptible but SM resistant control, ICP 2376 was planted after every two test rows. However SM susceptible control ICP 8863 was sown after every ten test rows. In 1988 season the susceptible control, ICP 8863 was sown after every 22 rows to monitor the disease spread in the nursery. The following material was screened.

Table 9. List of selected F5 & F6 progenies screened in SM Nursery during 1987 rainy season at ICRISAT Center, Patancheru.

S.No.	Source Plot #	Pedigree	Parentage	Gen	X SM
1	254	ICPX 810192F4B-S2	LRG 30 X ICP 6997	F5	0
2	255	ICPX 810192F4B-S3	"	"	5
3	256	ICPX 810192F4B-S4	"	"	2
4	257	ICPX 810192F4B-S5	"	"	6
5	259	ICPX 810192F4B-S7	"	"	8
6	264	ICPX 810192F4B-S12	"	"	4
7	267	ICPX 810192F4B-S15	"	"	5
8	268	ICPX 810192F4B-S16	"	"	5
9	269	ICPX 810192F4B-S17	"	"	3
10	270	ICPX 810192F4B-S18	"	"	0
11	276	ICPX 820172F4B-S2	ICPL 131 X ICP10997	"	5
12	277	ICPX 820172F4B-S3	"	"	8
13	278	ICPX 820172F4B-S4	"	"	4
14	279	ICPX 820172F4B-S5	"	"	8
15	283	ICPX 820172F4B-S9	"	"	3
16	285	ICPX 820172F4B-S11	"	"	6
17	286	ICPX 820172F4B-S12	"	"	6
18	289	ICPX 820179F4B-S3	LRG 36 X ICP 11157	"	7
19	291	ICPX 820179F4B-S5	"	"	3
20	292	ICPX 820179F4B-S6	"	"	2
21	295	ICPX 800023F5B-S2	ICP 6997 X ICP 2376	F6	9
22	299	ICPX 800023F5B-S6	"	"	3
23	302	ICPX 800023F5B-S9	"	"	5
24	307	ICPX 800023F5B-S14	"	"	0
25	309	ICPX 800023F5B-S16	"	"	9
26	310	ICPX 800023F5B-S17	"	"	7

(i) F2 Generation: Nine F2 populations involving parents with either having resistance to wilt, SM or both were screened in the nursery in 4 m long 36 rows accommodating about 750-800 plants per population. The wilt incidence in populations ranged from 84 to 98% (Table 10). The seed of all resistant plants within the population was bulked for further advance. In 1988 rainy season, these populations showed a good level of wilt resistance ranging from 6 to 30% (Table 11). These populations also segregated for white and brown seed color. For 1989 season brown and white color seeds in each population were separated for further screening.

In 1988 rainy season, three F2 populations that involved at least one wilt and SM resistant parent were also screened in the nursery. The wilt incidence in the populations ranged from 34 to 63%. Seeds from each resistant plant within a population were bulked for further screening in 1989 rainy season.

(ii) F3 Generation: Twelve populations constituted by bulking seed of wilt and SM resistant plants in F2 generation in 1987 were screened in the nursery. The wilt incidence was very high ranging from 80 to 99%. All the SM susceptible plants were rogued out and one pod each from surviving plants was bulked and reconstituted populations (F4 generation) were again screened. In 1988 rainy season the wilt incidence in populations ranged from 4% to 42% (Table 12). Five populations (ICPX 840154-SWB-SWB, -840166-SWB-SWB, -840173-SWB-SWB, 840177-SWB-SWB and ICPX 840181-SWB-SWB) showed more wilt incidence hence were rejected. Seven populations with less than 10% wilt incidence will be screened in 1989 rainy season for making single plant selections.

Table 10. List of F2 bulks screened in Wilt + SM Nursery at ICRISAT Center, Patancheru during 1987 rainy season.

S.No.	Source Plot #	Pedigree	Parentage	% Wilt
1	793	ICPX 850135	ICP 3783 X ICPL 127	88
2	794	ICPX 850136	ICP 3783 X ICPX 780287-DT1-B-B	91
3	795	ICPX 850137	ICP 3783 X ICPX 780293-DT7-B-2	89
4	796	ICPX 850138	ICP 3783 X ICPL 211	84
5	1308	ICPX 850139	ICPL 288 X ICPL 127	98
6	1309	ICPX 850144	ICPL85062 X ICPL 211	98
7	1310	ICPX 850145	ICPL84011 X ICPL 211	87
8	1311	ICPX 850151	ICPL 211 X ICPL 335	86
9	1312	ICPX 850069	ICP 8863 X ICP 7119	89

Table 11. List of selected F3 bulk populations from Vilt + SM nursery at ICRISAT Center, during 1988 rainy season.

S.No.	Source V+SMDN Plot #	Pedigree (ICPX)	Parentage	X Vilt
1	620	850135-SVB	ICP 3783 X ICPL 127	6
2	621	850136-SVB	" X 78287-DT1-B-B	24
3	622	850137-SVB	" . X 78293-DT7-B-2	30
4	623	850138-SVB	" X ICPL 211	8
5	624	850139-SVB	ICPL 288 X ICPL 127	19
6	625	850144-SVB	ICPL 85062 X ICPL 211	60
7	626	850145-SVB	ICPL 84011 X ICPL 211	46
8	627	850151-SVB	ICPL 211 X ICPL 335	12
9	628	850069-SVB	ICP 8863 X ICP 7119	8

Table 12. List of selected P4 SPD bulks from Vilt + SM nursery during 1988 rainy season.

S.No.	Source W+SMDN Plot #	Pedigree (ICPX)	Parentage	% Vilt
1	608	840154-SVB-SVB	ICPL333 X ICPL345	42
2	609	840158-SVB-SVB	DT230 X ICPL345	8
3	610	840159-SVB-SVB	ICPL227 X ICP7218(PDM-1)	10
4	611	840160-SVB-SVB	ICPL227 X ICPL83041	6
5	612	840161-SVB-SVB	ICPL227 X ICPL270	7
6	613	840162-SVB-SVB	ICPL227 X ICPL345	4
7	614	840166-SVB-SVB	ICPL83056 X ICPL345	18
8	615	840170-SVB-SVB	ICPL83063 X ICPL345	4
9	616	840173-SVB-SVB	ICPL346 X ICPL270	18
10	617	840177-SVB-SVB	ICPL83050 X ICPL270	38
11	618	840181-SVB-SVB	ICPL343 X ICPL270	39
12	619	840185-SVB SVB	ICPL366 X ICPL270	8

In 1988 rainy season 25 single plant progenies each from four crosses (ICPX 850132, -850121, -850123 and ICPX 850129) were screened in two row 4 m long plots. From a total of 100 progenies only 13 were found promising. The wilt incidence in selected progenies ranged from 51 to 76% and SM from 0 to 36% (Table 13). The resistant plants in each selected progeny were bulked for further purification in 1989.

(iii) F5-F7 Generation:

In 1987, 53 single plant progenies in F5, 27 in F6 and 20 in F7 generation were screened in the nursery. Only 28 progenies in F5, 2 in F6 and 4 in F7 generation had less than 10% wilt and SM incidence. Five progenies in F6 generation were completely free from wilt and SM. All 34 progenies were tested for yield in 1988. The wilt and SM incidence is reported in Table 14.

(iv) BDN1 BC3F6 Generation:

In 1987, 57 BDN 1 x ICPX 73054 F6 line BC3F6 progenies were screened in this nursery. Since none of the parents had resistance to wilt, all progenies had very high wilt incidence, therefore, no progeny was selected. However, from two progenies (plot nos. 506 and 521 of 1987) one resistant plant from each progeny was selected.

In 1988 these selections were screened in progeny rows. Both the progenies were free from SM and had wilt incidence 3 and 9%, respectively. The progenies also were uniform for plant height and other morphological characters. They will be tested for yield in 1989 rainy season.

Table 13. List of selected F3 SPP's screened Vilt + SM nursery during 1988 rainy season.

S.No.	Source V-SMDN Plot #	Pedigree (ICPX)	Parentage	X Vilt	X SM	Seed Colour
1	455	850121-7	(ICPL83063 X ICPL270) X ICPL 343	56	6	White, light brown
2	458	" -10	"	51	17	Brown
3	459	" -11	"	55	15	Brown, white
4	463	" -15	"	63	0	Brown, white
5	467	" -19	"	63	10	Brown
6	473	" -25	"	65	31	Brown, cream, black
7	485	850123-12	(ICPL83050 X ICPL270) X ICP 8102-5-E1	55	6	CR, BR
8	491	" -18	"	67	14	Cream
9	495	" -22	"	74	16	Light brown
10	497	" -24	"	66	29	Light brown
11	498	" -25	"	63	17	Cream, brown
12	504	850129-6	(ICPL 343 X ICPL 270) X T-15-15	71	15	Brown
13	509	-11	"	76	36	Brown

Table 14. List of selected F5, F6, & F7 progenies screened in Wilt + SM Nursery at ICRISAT Center, Patancheru during 1987 rainy season.

S.No.	Source Plot #	Pedigree (ICPX)	Parentage	Gen	X Wilt	X SM
1	585	820169-B-S1-SB*-SB	ICPL 131 X ICPL 335	F6	2	2
2	587	" -B-S4-SB*-SB	"	F6	0	3
3	588	" -B-S5-SB*-SB	"	F6	9	6
4	594	" -B-S19-SB*-SB	"	F6	5	3
5	595	" -B-S21-SB*-SB	"	F6	9	6
6	599	820181-B-S2-SB*-SB	ICPL 270 X ICPL 335	F6	0	0
7	600	" -B-S3-SB*-SB	"	F6	7	0
8	601	" -B-S6-SB*-SB	"	F6	9	0
9	602	" -B-S7-SB*-SB	"	F6	0	0
10	603	" -B-S8-SB*-SB	"	F6	3	0
11	606	" -B-S14-SB*-SB	"	F6	5	0
12	607	" -B-S15-SB*-SB	"	F6	9	0
13	610	" -B-S19-SB*-SB	"	F6	9	0
14	611	" -B-S25-SB*-SB	"	F6	7	0
15	612	820182-B-S2-SB*-SB	ICPL 270 X ICPL 227	F6	3	0
16	613	820184-B-S1-SB*-SB	ICPL 270 X ICP 10997	F6	7	0
17	616	820195-B-S9-SB*-SB	ICPL 228 X ICP 11157	F6	0	6
18	620	820369-SB-S1-SB*-SB	ICP11164 X ICP 10988	F6	3	3
19	621	820369-SB-S2-SB*-SB	"	F6	2	0
20	623	820372-SB-S1-SB*-SB	ICP11164 X ICPL 131	F6	0	0
21	624	" -SB-S2-SB*-SB	"	F6	2	0
22	625	" -SB-S3-SB*-SB	"	F6	2	0
23	626	" -SB-S6-SB*-SB	"	F6	7	2
24	627	" -SB-S7-SB*-SB	"	F6	6	4
25	629	" -SB-S11-SB*-SB	"	F6	4	2
26	630	" -SB-S14-SB*-SB	"	F6	3	3
27	631	" -SB-S16-SB*-SB	"	F6	0	0
28	632	" -SB-S17-SB*-SB	"	F6	0	0
29	559	800004-B-B-B-SW2-SB	ICP-1-6-1641-SWB*X ICP2376	F7	5	0
30	581	800006F5B-SW4-SW4-SB	ICP 7118-W13*----X ICP2376	F7	4	4
31	540	800004F6B-SW3-SB	ICP-1-6-1641-SWB*X ICP2376	F8	5	0
32	543	" -SW6-SB	"	F8	4	0
33	552	800021F6B-SW6-SB	ICP 7952 X ICP 7035	F8	1	7
34	556	" -SW10-SB	"	F8	3	9

(v) Progenies from wilt and SM male sterile composite population (ICPP4)

After three generations of random-mating, 500 agronomically superior plants were selected from disease-free isolation plot for screening in the nursery in 1987K to identify male fertile progenies combining wilt and SM resistance. From 500 single plant progenies screened only 68 plants were male fertile and had wilt and SM resistance (Table 15). These selections were further screened as progeny rows in 1988 rainy season. Of 68 progenies screened, 32 were found promising (Table 16). Two progenies (ICPP4-313-SW1) and ICPP-4-313-SW2) were totally free from wilt and SM incidence. These progenies will be tested for their yield potential in 1989.

(vi) Monitoring of Trial Entries:

During 1987 season, 143 lines included in different yield trials were screened for wilt and SM reaction. The % wilt and SM incidence is reported in Table 17. In 1988, 15 medium-duration hybrids (ms ICP 3783 and 15 wilt resistant parents) were screened in the nursery. The wilt incidence ranged from 0 to 64% (Table 18). The highest yielding hybrid (ICPH 487) between ms 3783 and ICPL 87119 had 42% wilt incidence. This hybrid will be remade in 1989 in wilt sick nursery to ensure wilt resistance.

d). Multiple Disease Resistance

In this nursery we simultaneously screen breeding material for wilt, SM and Phytophthora stem blight diseases. Four rows of NP(VR)15 were planted to serve as SM-infecter hedge. Wilt susceptible control, ICP 2376 was grown after every two test rows to monitor the disease spread in the

Table 15. List of fertile selections made in ICPP4 Progenies in Vilt + SM Nursery at ICRISAT Center, Patancheru during 1987 rainy season.

S.No.	Source Plot #	Pedigree	No.of selctions made
1	1314	ICPP 4-2	1
2	1323	-11	1
3	1337	-25	1
4	1340	-28	1
5	1354	-42	2
6	1374	-62	2
7	1387	-75	1
8	1419	-107	1
9	1429	-117	3
10	1443	-131	1
11	1448	-136	1
12	1449	-137	1
13	1453	-141	2
14	1457	-145	2
15	1466	-154	1
16	1468	-156	3
17	1470	-158	3
18	1478	-166	1
19	1525	-213	1
20	1535	-223	1
21	1536	-224	1
22	1558	-246	3
23	1559	-247	5
24	1586	-274	1
25	1587	-275	3
26	1591	-279	2
27	1599	-287	1
28	1602	-290	1
29	1606	-294	1
30	1625	-313	2
31	1638	-326	6
32	1640	-328	3
33	1643	-331	3
34	1665	-353	1
35	1667	-355	1
36	1668	-356	1
37	1672	-360	1
38	1767	-455	2

Total

68

Table 16. List of selected ICPP 4 Progenies from Vilt + SM nursery during 1988 rainy season.

S.No.	Source V-SMDN Plot #	Pedigree	Vilt	X SM
1	528	ICPP4-42-SV1	46	3
2	531	-62-SV2	52	4
3	532	-75-SV1	33	5
4	534	-117-SV1	8	28
5	536	-117-SV3	56	0
6	538	-136-SV1	42	0
7	539	-137-SV1	59	0
8	542	-145-SV1	29	16
9	543	-145-SV2	12	0
10	544	-154-SV1	55	16
11	547	-156-SV3	50	7
12	548	-158-SV1	43	12
13	549	-158-SV2	26	7
14	550	-158-SV3	35	0
15	558	-247-SV1	38	19
16	559	-247-SV2	15	6
17	561	-247-SV4	17	3
18	567	-279-SV1	56	0
19	569	-287-SV1	43	0
20	570	-290-SV1	54	8
21	572	-313-SV1	0	0
22	573	-313-SV2	0	0
23	574	-326-SV1	28	8
24	575	-326-SV2	31	2
25	576	-326-SV3	45	0
26	578	-326-SV5	29	21
27	579	-326-SV6	54	0
28	580	-328-SV1	28	9
29	583	-331-SV1	38	8
30	585	-331-SV3	49	4
31	588	-356-SV1	44	4
32	589	-360-SV1	28	0
33	590	-455-SV1	29	0
34	591	-455-SV2	50	0

Table 17. List of station trial entries monitored in Vilt + SM Nursery at ICRISAT Center, during 1987 rainy season.

S.No.	Pedigree	% Vilt	% SM	Remarks
1	ICPL 84008	11	95	MPAY
2	ICPL 85061	41	100	"
3	ICPL 85063	100	0	"
4	ICPL 85070	22	100	"
5	HPL 40	96	100	"
6	ICPL 87088	97	100	"
7	ICPL 87089	91	94	"
8	ICPL 87090	93	100	"
9	ICPL 87119	4	11	"
10	ICPL 87120	0	94	"
11	ICPL 87121	79	97	"
12	ICPL 87122	50	74	"
13	ICPL 87123	0	100	"
14	ICPL 270	84 ?	100	"
15	C 11	100	100	"
16	BDN 1	83	100	"
17	ICPL 270	89	100	ART
18	ICP 8863	77	100	"
19	ICPL 85066	23	100	"
20	HY 4	100	100	"
21	ICPL 86033	98	36	"
22	ICPL 332	100	100	"
23	ICPL 84060	78	100	"
24	BDN 1	82	100	"
25	MRG-53	3	100	"
26	ICPL 95	90	100	"
27	C 11	76	100	"
28	HY 14	97	100	"
29	BDN 12	85	100	"
30	MTH 19	100	100	"
31	ICPL 270	10	100	PIRYT
32	ICPL 332	18	64	"
33	BDN 1	23	100	"
34	C 11	68	100	"
35	ICPX 810300-E8-E3-E1-EB	94	94	"
36	ICPX 810300-E8-E1-EB-EB	100	100	"
37	ICPX 810167-E22-E1-E2-EB	92	100	"
38	ICPX 810580-E7-E1-E1-EB	100	100	"
39	ICPL 87088	100	100	"
40	ICPL 87089	100	100	"
41	ICPX 800324-E31-E1-EB-EB-EB	68	100	"
42	ICPX 800324-E44-E1-EB-EB-EB	100	100	"
43	ICP 11292	36	100	"
44	ICPX 780143-VB-VB-VB-VB-V48-B-B*	0	5	VRALT
45	ICPX 780153-VB-VB-VB-VB-V43-B-B*	7	100	"
46	LRG 30 BC1P2-W57*-W3-VB*-VB*	0	100	"
47	LRG 30 BC1P2-W69*-W1-VB*-VB*	0	100	"

48	LRG 30 BC1F2-V69*-V2-VB*-VB*	7	100	"
49	5 kR-12-VB	17	41	"
50	5 kR-18-VB*	0	100	"
51	10 kR-3-VB	20	97	"
52	10 kR-11-VB*	3	100	"
53	10 kR-12-VB	74	82	"
54	10 kR-17-VB*	7	100	"
55	15 kR-19-VB	5	100	"
56	20 kR-20-VB*	0	100	"
57	25 kR-23-VB	8	5	"
58	25 kR-33-VB	4	15	"
59	35 kR-8-VB	4	35	"
60	35 kR-13-VB	13	100	"
61	40 kR-1-VB	0	6	"
62	5 kR-B-VB	5	36	"
63	15 kR-B-VB	45	100	"
64	25 kR-B-VB	0	26	"
65	ICPL 265	66	100	"
66	ICPX 780052-SB-SB-SB-SB-B-9-B	93	61	SMALT
67	ICPX 780052-SB-SB-SB-SB-B-10-B	74	68	"
68	ICPX 780052-SB-SB-SB-SB-B-14-B	50	41	"
69	ICPX 780052-SB-SB-SB-SB-B-16-R	94	3	"
70	ICPX 780053-S(T)B-S(T)B-SB-SB-B-3-B	97	12	"
71	" -23-B	66	9	"
72	" -27-B	100	3	"
73	ICPX 780053-SB-SB-SB-SB-B-1-B	85	30	"
74	" -2-B	90	97	"
75	" -3-B	92	14	"
76	" -4-B	90	5	"
77	ICPX 780046-SB-SB-SB-SB-B-7-B	100	14	"
78	BDN1 BC3F2-2*-S1*-S1*-SB*	94	0	BDN 1 BC3F6 Prog. Test
79	BDN1 BC3F2-2*-S1*-S3*-SB*	100	0	"
80	BDN1 BC3F2-2*-S1*-S4*-SB*	97	0	"
81	BDN1 BC3F2-2*-S1*-S5*-SB*	94	0	"
82	BDN1 BC3F2-2*-S1*-S6*-SB*	77	0	"
83	BDN1 BC3F2-2*-S6*-S1*-SB*	94	3	"
84	BDN1 BC3F2-2*-S6*-S2*-SB*	100	0	"
85	BDN1 BC3F2-2*-S6*-S3*-SB*	97	0	"
86	BDN1 BC3F2-2*-S6*-S5*-SB*	86	0	"
87	BDN1 BC3F2-2*-S7*-S2*-SB*	97	3	"
88	BDN1 BC3F2-16*-S1*-S1*-SB*	100	0	"
89	BDN1 BC3F2-16*-S2*-S1*-SB*	100	0	"
90	BDN1 BC3F2-16*-S2*-S2*-SB*	95	0	"
91	BDN1 BC3F2-16*-S4*-S1*-SB*	83	3	"
92	BDN1 BC3F2-16*-S4*-S2*-SB*	100	0	"
93	BDN1 BC3F2-16*-S4*-S3*-SB*	92	0	"
94	BDN1 BC3F2-16*-S4*-S4*-SB*	97	0	"
95	BDN1 BC3F2-16*-S4*-S5*-SB*	95	0	"
96	BDN1 BC3F2-16*-S4*-S6*-SB*	100	0	"
97	BDN1 BC3F2-16*-S5*-S1*-SB*	90	5	"
98	BDN1 BC3F2-16*-S5*-S2*-SB*	100	0	"
99	BDN1 BC3F2-16*-S5*-S3*-SB*	100	0	"
100	BDN1 BC3F2-16*-S7*-S1*-SB*	89	0	"

101	BDN1	BC3F2-16*-S8*-S1*-SB*	100	0	"
102	BDN1	BC3F2-16*-S10*-S1*-SB*	92	5	"
103	BDN1	BC3F2-16*-S10*-S2*-SB*	96	0	"
104	BDN1	BC3F2-26*-S27*-S1*-SB*	94	9	"
105	BDN1	BC3F2-26*-S29*-S1*-SB*	95	18	"
106	BDN1	BC3F2-26*-S33*-S1*-SB*	91	12	"
107	BDN1	BC3F2-26*-S34*-S1*-SB*	89	44	"
108	BDN1	BC3F2-26*-S34*-S2*-SB*	89	24	"
109	BDN1	BC3F2-26*-S34*-S3*-SB*	94	14	"
110	BDN1	BC3F2-26*-S35*-S1*-SB*	97	21	"
111	BDN1	BC3F2-26*-S35*-S2*-SB*	100	9	"
112	BDN1	BC3F2-S6*-S36*-S1*-SB*	100	11	"
113	C 11	BC2F2-3*-S9*-S1*-SB*	100	8	C 11 BC2F6 Prog. Test.
114	C 11	BC2F2-3*-S9*-S2*-SB*	85	23	"
115	C 11	BC2F2-3*-S9*-S3*-SB*	100	24	"
116	C 11	BC2F2-3*-S9*-S4*-SB*	91	71	"
117	C 11	BC2F2-3*-S10*-S1*-SB*	89	0	"
118	C 11	BC2F2-3*-S10*-S3*-SB*	100	9	"
119	C 11	BC2F2-3*-S11*-S1*-SB*	100	6	"
120	C 11		33	100	"
121	ICPX	820134-5-DT1-B	89	4	F5 DT Prog. Test
122	ICPX	820134-13-DT1-B	96	100	"
123	ICPX	820134-13-DT2-B	90	100	"
124	ICPX	820134-15-DT3-B	97	71	"
125	ICPX	820134-22-DT3-B	81	100	"
126	ICPX	820134-28-DT1-B	100	6	"
127	ICPX	820134-32-DT1-B	100	100	"
128	ICPX	820134-32-DT3-B	91	100	"
129	ICPX	820135-10-DT2-B	90	97	"
130	ICPX	820135-11-DT4-B	75	100	"
131	ICPX	820135-16-DT2-B	96	88	"
132	ICPX	820135-17-DT2-B	79	100	"
133	ICPX	820135-42-DT1-B	83	100	"
134	ICPX	820135-43-DT1-B	76	100	"
135	ICPX	820136-3-DT1-B	91	91	"
136	ICPX	820136-38-DT5-B	91	100	"
137	ICPX	820137-11-DT5-B	64	100	"
138	ICPX	820139-11-DT2-B	88	16	"
139	ICPX	820143-46-DT3-B	100	25	"
140	ICPX	820139-1-DT2-B	100	12	"
141	ICPX	820139-1-DT3-B	88	18	"
142	ICPX	820139-29-DT8-B	100	100	"
143	ICPL	211	96	11	"

Table 18. List of Hybrids screened in Vilt + SM Nursery at ICRISAT Center, Patancheru during 1988 rainy season.

S.No.	Source V+SMN Plot #	IPH No.	Parentage	X Vilt	X SM
1	592	IPH 477	MS 3783 X ICPL 270	64	82
2	593	IPH 478	" X ICPL 335	25	88
3	594	IPH 479	" X ICPL 227	20	87
4	595	IPH 480	" X ICPL 8357	13	53
5	596	IPH 481	" X ICPL 85066	33	100
6	597	IPH 482	" X ICPL 84008	58	32
7	598	IPH 483	" X ICPL 8356	0	75
8	599	IPH 484	" X ICP 8863	27	73
9	600	IPH 485	" X ICP 8363	25	58
10	601	IPH 486	" X ICPL 8362	8	92
11	602	IPH 487	" X ICPL 87119	42	92
12	603	IPH 488	" X ICPL 87121	42	92
13	604	IPH 489	" X ICPL 86034	58	50
14	605	IPH 490	" X ICPL 85067	59	55
15	606	IPH 491	" X ICPL 85069	11	67
16	607	C-11		90	100

nursery. The SM susceptible control, ICP 8863 and Phytophthora blight susceptible control, Hy 3C (ICP 7119) were grown after every 11th row in 1987. However in 1988 only Phytophthora susceptible control ICP 7119 was sown.

(i) F2 Generation: In 1987 ten F2 populations were screened with a specific objective to identify genotypes combining resistance to all the three diseases. We could not identify genotype which combined resistance to wilt, SM and Phytophthora stem blight. Therefore, no further selection in the populations was done.

In 1988 rainy season two F2 populations (ICPX 860114 and ICPX 860115) were screened in 4 m long 42 rows accommodating nearly 1300 plants per population. We were able to select 50 plants in each population that showed resistant to all three diseases. These selections will be further screened in the nursery during 1989.

(ii) F6 Generation: Twelve single plant progenies from three crosses (ICPX 80003, -80001 and ICPX 80009) were screened in 4 m long two-row plots in 1987 rainy season. Only two progenies (ICPX 80002 PSB-SWP1 and ICPX 80003 PSB-SWP1) were found promising and were again screened in 1988 for further purification (Table 19). One progeny (ICPX 80002 PSB-SWP1-SWPB) was wilt resistant and also had less (23%) blight incidence. This progeny will be tested for yield in 1989.

(iii) F7 Generation: Six populations advanced through Single Pod Decent (SPD) method upto F6 generation were screened in the nursery in 1987. The disease incidence of populations is reported in Table 20. In F7 generation

Table 19. List of selected F6 progenies screened in multiple disease nursery at ICRISAT Center, Patancheru during 1987 rainy season.

S.No.	Source Plot #	Pedigree (ICPX)	Parentage	% Vilt	% SM	% Phytophthora
1	269	800002F5B-SWP1	ICP-1-6-1641-SVB* X ICP 6974-PB*	65	22	28
2	270	800003F5B-SWP1	ICP-1-6-1641-SVB* X ICP 7182-P1*-PB*	26	6	36

Table 20. List of F7 bulks screened in multiple disease nursery at ICRISAT Center, Patancheru during 1987 rainy season.

S.No.	Source Plot #	Pedigree (ICPX)	Parentage	X Wilt	X SM	X Phytophthora
1	273	800275-8-B-B*-B-SVPB	ICP 7414-1-S5* X ICP 7118-W1*-W1*-WB*	39	5	63
2	274	800264-7-B-B-B-SVPB	ICP 4866-1-S6* X 15-3-3	39	3	51
3	275	800284-22-B-B*-B-SVPB	ICP 8147-1-S2* X 15-3-3	62	9	53
4	276	800284-41-B-B*-B-SVPB	"	47	9	55
5	277	800284-17-B-B*-B-SVPB	"	32	26	51
6	278	800289-13-B-B*-B-SVPB	ICP 8151-8-S1* X 15-3-3	46	12	49

seed from resistant plants within a population was bulked for further advance in 1988. In this year a total of 61 single plant selections (ranging from 6 to 17 selections per population) were made (Table 21). These selections will be grown as progeny rows in 1989 season for further observations.

(iv) Monitoring of Multiple Disease Resistant Lines Yield Test Entries: Twentyfive advanced lines included in the test were monitored for their disease reaction in 1987 rainy season. From among 25, only two progenies were promising and were selected for further purification. In 1988 above mentioned progenies had 15% and 46% Phytophthora blight incidence. The progenies are of long-duration, therefore, they will be sent to Gwalior for their yield evaluation.

Table 21. List of selections made in P8 SPD bulk populations from Multiple Disease Nursery during 1988 rainy season.

S.No.	Source Plot #	Pedigree (ICPX)	Parentage	% PB	No. of selections
1	602	800275-8-B-B*-SVPB-SVPB	ICP 7414-1-S5* X ICP 7118-V13*-V1*-V1*	82	6
2	603	800264-7-B-B-B-SVPB SVPB	ICP 4866-1-S6* X 15-3-3	75	6
3	604	800284-22-B-B*-B-SVPB-SVPB	ICP 8147-1-S2* X 15-3-3	55	12
4	605	800284-41-B-B*-B-SVPB-SVPB	"	67	7
5	606	800284-17-B-B*-B-SVPB-SVPB	"	63	17
6	607	800289-13-B-B*-B-SVPB-SVPB	ICP 8151-8-S1* X 15-3-3	60	13

E. WILT AND HELICOVERPA RESISTANCE

In wilt and Helicoverpa screening nursery wilt susceptible control ICP 2376 was planted after every two test rows to monitor the disease spread and field was kept pesticide-free for natural build up of Helicoverpa population.

(i) F2 Generation: A total of 32 F2 populations involving wilt and Helicoverpa resistant/tolerant parents were screened. Each population was grown in 4 m long 50 rows accommodating about 1000 plants per population. From 11 promising populations single plant selections (ranging from 1 to 8) were made (Table 22). Other populations were discarded. These 40 selections (F3 generation) were screened as single plant progenies in 1988. Only 11 progenies had low wilt incidence ranging from 0 to 41% (Table 23). Selected progenies also showed tolerance to Helicoverpa. From 11 progenies, 41 single plant selections were also made. We plan to test these progenies for yield under normal and pesticide-free conditions in 1989. Single plant selections will be screened as progeny rows in the nursery. In addition one BC1F2 population of (ICPL 84060 x ICP 8863) x ICP 8863 cross was also screened. This population had 21% wilt. Wilt resistant and Helicoverpa tolerant plants, 85 in all, were selected for further screening.

(ii) F3 Generation: A total of 91 single plant progenies from 12 crosses were screened in 1987. Only 6 progenies were found promising and 12 single selections were made (Table 24). These 12 selections (F4 generation) were screened in 1988 in 4 m long two-row plots. Only one progeny (ICPX 840206-VE9-VE1) had 37% wilt incidence and showed tolerance to Helicoverpa

Table 22. List of selections made in F2's screened in Vilt + Helicoverpa nursery at ICRISAT Center, Patancheru during 1987 rainy season.

S.No.	Source Plot #	Pedigree (ICPX)	Parentage	X Vilt	No. of selections made
1	245	850165	770303-20-1-EB X ICP 4070	96	1
2	249	850169	" X ICP 9168	57	1
3	252	850179	" X ICP 8354	57	4
4	253	850180	" X ICPL 227	60	8
5	254	850181	" X ICPL 84071	67	11
6	255	850182	" X ICPL 8363	55	1
7	256	850185	" X ICPL 84001	76	1
8	257	850186	ICPL 84065 X ICPL 227	61	8
9	260	850189	ICPL 84065 X JA-275	36	1
10	265	850196	ICP 4070 X ICPL 84003	59	1
11	268	850199	"	31	3
Total					40

Table 23. List of progenies selected in F3, TCF3 and F4 generations in Vilt + Helicoverpa screening nursery during 1988 rainy season.

S.No.	Source V + HN Plot #	Pedigree (ICPX)	Parentage	Gen	X Vilt
1	16	850169-VE1	770303-20-1-EB X ICP 9168	F3-	15
2	22	850179-VE2	770303-20-1-EB X ICPL 83054	"	26
3	23	850179-VE3	770303-20-1-EB X ICPL 83054	"	12
4	25	850180-VE5	770303-20-1-EB X ICPL 227	"	11
5	33	850181-VE5	770303-20-1-EB X ICPL 84071	"	41
6	34	850181-VE6	770303-20-1-EB X ICPL 84071	"	9
7	39	850181-VE11	770303-20-1-EB X ICPL 84071	"	0
8	42	850186-VE1	ICPL 84065 X ICPL 227	"	2
9	44	850186-VE3	ICPL 84065 X ICPL 227	"	0
10	45	850186-VE4	ICPL 84065 X ICPL 227	"	41
11	54	850199-VE3	ICP 4070 X ICPL 83063	"	8
12	94	850134-15	(ICPL 84060 X ICPL 270) X ICPL 227	TCF3	40
13	6	840206-VE9- VE1	ICPL 333 X PPE-45-2	F4	38

Table 24. List of selected F3 & F4 progenies screened in Wilt + Helicoverpa nursery at ICRISAT Center, Patancheru during 1987 rainy season.

S.No.	Source Plot #	Pedigree (ICPX)	Parentage	Gen	% Wilt	No. of selections made
1	27	840202-VE9	ICPL 288 X ICPL 332	F3	27	1
2	59	840206-VE4	ICPL 333 X PPE-45-2	"	35	2
3	64	840206-VE9	ICPL 333 X PPE-45-2	"	12	2
4	69	840207-VE2	ICPL 333 X ICPL 332	"	32	2
5	103	840224-VE2	ICPX 740146 sel X PPE-45-2	"	75	1
6	104	840224-VE3	ICPX 740146 sel X PPE-45-2	"	56	4
7	191	830120-VEB-VE6	ICPL 346 X ICP 8860-5-S1*	F4	51	1
8	201	840205-VEB-VE2	ICPL 333 X ICPL 84060	"	30	1
Total						14

also. This progeny will be tested for yield in 1989 season. In addition, 15 single plant selections from seven progenies were made for further testing in 1989. In 1988, 50 single plant progenies, 25 each from two three-way crosses (ICPX 850133 and ICPX 850134) were screened in the nursery. Only one progeny (ICPX 850134-15) was promising for wilt and Helicoverpa tolerance. This progeny will be tested for yield potential in disease-free condition in 1989. In addition, 15 selections from eight progenies of ICPX 850133 cross and 17 selections from 10 progenies of ICPX 850134 were made for further monitoring in 1989 (Table 25).

(iii) F4 Generation: A total of 109 single plant selections from 13 crosses made in 1983 were grown as progeny rows in 1987. Only two selections (one from ICPX 840205-WEB-WE2 and the other from ICPX 830120-EB-VE6) were found promising and were selected for further screening. In 1988 these two progenies (F5 generation) were again screened in the nursery. None of the progenies combined resistance to wilt and Helicoverpa, hence rejected.

(iv) Selections from Composite Population: This composite population was developed by bulking equal quantity seed of nine pigeonpea genotypes by Pathology Unit. After two generations of random-mating, this population was screened in wilt and Helicoverpa screening nursery in 1986 and 19 selections that appeared resistant to both traits were made. The selections were grown in progeny rows in 1987. Only 3 progenies appeared promising and were selected for further screening in 1988. Subsequently none had combined resistance to wilt and Helicoverpa, and hence were rejected.

Table 25. List of single plant selections made in F4, F3 and TCP3 generation in Wilt + Melicoverpa screening nursery during 1988 rainy season.

S.No.	Source W + MM Plot #	Pedigree (ICPX)	Percentage	Gen	Wilt %	No. of selections made
1	4	840206-WE4-WE1	ICPL 333 X PPE-45-2	F4	7	2
2	7	840206-WE4-WE2	ICPL 333 X PPE-45-2	.	31	6
3	8	840207-WE2-WE1	ICPL 333 X ICPL 332	.	13	1
4	9	840207-WE2-WE2	ICPL 333 X ICPL 332	.	0	2
5	10	800224-WE2-WE1	740146-WDT11B-1B-1 X PPE-45-2	.	21	2
6	11	800224-WE3-WE1	.	.	40	1
7	14	800224-WE3-WE4	.	.	79	1
8	15	850165-WE1	770303-20-1-EB X ICP 4070	F3	24	1
9	24	850180-WE4	770303-20-1-EB X ICPL 227	.	17	1
10	28	850189-WE8	770303-20-1-EB X ICPL 227	.	30	2
11	29	850181-WE1	770303-20-1-EB X ICPL 84071	.	11	4
12	30	850181-WE2	770303-20-1-EB X ICPL 84071	.	14	0
13	31	850181-WE3	770303-20-1-EB X ICPL 84071	.	7	0
14	36	850181-WE6	770303-20-1-EB X ICPL 84071	.	50	1
15	37	850181-WE9	770303-20-1-EB X ICPL 84071	.	61	1
16	41	850185-WE1	ICPL 84065 X ICPL 84001	.	46	4
17	42	850186-WE2	ICPL 84065 X ICPL 227	.	24	2
18	48	850186-WE7	ICPL 84065 X ICPL 227	.	25	2
19	50	850189-WE1	ICPL 84065 X ICP 3783	.	25	2
20	53	850199-WE2	ICP 4070 X ICPL 83063	.	10	5
21	62	850133-8	(ICPL 332 X ICPL 270) X ICPL 227	TCP3	44	1
22	63	-9	.	.	41	1
23	64	-10	.	.	3	0
24	66	-12	.	.	19	2
25	69	-15	.	.	69	1
26	71	-17	.	.	43	2
27	72	-18	.	.	29	1
28	74	-20	.	.	20	3
29	86	850134-7	(ICPL 84060 X ICPL 270) X ICPL 227	.	20	2
30	87	-8	.	.	35	1
31	88	-9	.	.	20	3
32	89	-10	.	.	20	2
33	90	-11	.	.	17	2
34	92	-13	.	.	17	1
35	93	-14	.	.	63	1
36	95	-16	.	.	34	1
37	98	-19	.	.	38	1
38	102	-23	.	.	25	3

F. BREEDING FOR HELICOVERPA RESISTANCE

(i) F2 Generation: Two F2 populations (ICPX 850086 and ICPX 850193) were screened in the nursery in 1987 season. Each population was grown in 4 m long 50 row plot accommodating about 1000 plants per population. Thirty-six selections in ICPX 850086 and 64 in ICPX 850193 were made and screened as single plant progenies (F3 generation) in 1988. Helicoverpa tolerant control, ICPL 332, was grown after every four test plots to monitor the Helicoverpa incidence in the nursery. On the basis of yield and pod borer damage score only five progenies from the first cross and 25 progenies from the other cross were found promising (Table 26). Selected 30 progenies and 10 single plant selections made from five progenies (ICPX 850086-E4-E21, ICPX 850193-E10, -E38, E-39) will be further screened in 1989.

(ii) F3 Generation: Three hundred fifty five single plant progenies were screened in two-row plots in 1987. Progenies were scored for % pod damage on 1 to 9 scale where score 1 means free from damage and 9 means 90 to 100% damage. On the basis of uniformity, yield, borer damage score and 100 seed-weight, 80 progenies were found promising (Table 27). In addition, progenies which segregated for plant height, flowering period and borer incidence, 71 single plant selections were also made (Table 28). These 80 progenies (F4 generation) and 71 selections were again screened in 1988. On the basis of uniformity, yield and borer damage score, 20 progenies (Table 29) were selected for 1989 Pigeonpea Insect Resistant Yield Observation Nursery (PIRYN). From 71 single plant progenies only four were promising and will be included in PIRYN. In addition 10 selections were also made for further screening in 1989.

Table 26. Performance of selected P1 SPP's in Heliconia 3 rearing nursery during 1988 rainy season.

S.No.	Source 1988 K M N Plot #	Pedigree (ICPX)	Percentage	Yield (g/plot)		Pod Damage Score 1	
				Progeny	Nearest Check	Progeny	Nearest Check
1	4192	850086-E3	ICPL 332 X T-15-15	604	224	4	3
2	4193	-E4		319	223	3-4	3
3	4195	-E5		253	224	6	3
4	4212	-E19		441	431	6	7
5	4222	-E27		291	548	3	3
6	4237	850193-E3	ICP 4270 X ICPL 81054	547	707	3	3
7	4246	-E10		200	162	3	3
8	4250	-E13		354	585	2	2
9	4256	-E18		931	714	2	2
10	4257	-E19		540	-	3	-
11	4260	-E21		334	-	3	-
12	4262	-E23		623	490	2	2-3
13	4265	-E25		627	490	2-3	2-3
14	4266	-E26		599	490	3	2-3
15	4267	-E27		421	239	2	3
16	4268	-E28		296	239	4	3
17	4270	-E29		299	239	3	3
18	4271	-E30		377	230	3	3
19	4276	-E34		334	520	3	3
20	4277	-E35		437	295	2	4
21	4281	-E38		239	295	3	4
22	4282	-E39		282	230	3	4
23	4286	-E42		524	230	4	4
24	4291	-E46		542	289	3	3-4
25	4292	-E47		660	289	3	3-4
26	4306	-E58		583	420	3	4
27	4307	-E59		501	484	3	3
28	4311	-E62		501	484	3	3
29	4312	-E63		513	473	3	3
30	4313	-E64		569	473	3	3

1 Pod borer damage score based on 1 to 9 rating scale.

Table 27. Performance of selected Helicoverpa tolerant progenies from F3 progenies planted in Unsprayed block during 1987 rainy season.

S.No.	Source Plot #	Pedigree (ICPX)	Days to Flower	100-seed (Wt)	Yield Kg/ha		PDS 1	
					Prog	Nearest Check	Prog	Check
1	5122	840212-E14	118	10.0	307	141	4	9
2	5156	" -E43	96	8.2	330	32	5	6
3	5158	" -E45	123	9.7	196	185	4	5
4	5161	" -E47	118	10.3	407	286	3	6
5	5162	" -E48	118	9.4	328	286	4-5	6
6	5172	" -E56	116	11.0	695	102	4	9
7	5210	840214-E10	110	11.9	682	437	3	3
8	5212	" -E12	112	13.6	550	471	3	3-7
9	5215	" -E14	112	10.9	277	471	4	3-7
10	5216	" -E15	118	10.4	298	471	4-7	3-7
11	5217	" -E16	108	10.1	753	1247	2-3	3-5
12	5218	" -E17	110	10.4	497	1247	3-5	3-5
13	5220	" -E18	114	11.1	763	1247	3	3-5
14	5221	" -E19	110	9.9	855	1247	3	3-5
15	5222	" -E20	110	10.5	557	903	3	3-5
16	5223	" -E22	114	10.4	834	903	3-5	3-5
17	5226	" -E24	113	11.3	645	904	5-7	3-5
18	5260	" -E54	121	10.9	171	370	6	6-7
19	5261	" -E55	121	12.8	162	370	6	6-7
20	5272	" -E67	119	11.5	614	522	5	5
21	5275	" -E69	110	10.4	404	522	4	5
22	5277	840215-E32	94	9.6	624	723	5	5
23	5280	" -E35	108	9.0	522	166	4	4-7
24	5281	" -E36	112	10.2	457	166	4	4-7
25	5283	" -E45	84	8.7	432	166	5	4-7
26	5286	" -E49	92	8.8	360	226	3	5-7
27	5287	" -E50	96	8.0	670	226	3	5-7
28	5290	" -E54	90	8.1	380	226	5	5-7
29	5291	" -E56	94	8.7	1035	226	4	5-7
30	5292	" -E58	94	8.8	408	39	5	7-8
31	5296	840217-E33	84	7.7	127	39	5	7-8
32	5298	" -E42	90	8.7	314	878	5	3-7
33	5301	840218-E11	97	7.4	1305	878	3	3-7
34	5303	840220-E22	83	8.3	906	133	4	7
35	5306	" -E28	84	8.5	365	133	4	7
36	5307	" -E36	75	9.3	372	340	4	3-7
37	5310	" -E40	97	8.6	358	340	3	3-7
38	5312	840221-E17	95	9.2	390	365	3	4-7
39	5316	" -E22	94	9.5	381	365	3	4-7
40	5317	" -E23	95	9.2	683	469	4	5-7
41	5318	" -E24	108	9.3	422	469	3	5-7
42	5320	" -E25	112	11.6	475	469	4	5-7
43	5321	" -E26	114	10.7	474	469	4	5-7
44	5322	" -E27	92	8.9	572	357	3	4-7
45	5327	" -E32	114	11.8	945	344	4	6

46	5330	"	-E37	113	12.5	341	344	4	6
47	5331	"	-E38	112	10.4	456	344	4	6
48	5335	"	-E44	110	9.5	196	168	5	7
49	5340	"	-E50	106	10.9	219	81	5	7
50	5347	"	-E65	112	9.9	515	149	4	6
51	5348	"	-E66	112	10.6	365	149	5	6
52	5351	"	-E68	110	9.1	612	149	3	6
53	5355	"	-E71	108	10.2	214	238	4	3-6
54	5357	"	-E75	94	8.6	642	853	3	3-5
55	5361	"	-E80	110	8.0	666	853	4	3-5
56	5362	"	-E81	107	9.9	547	364	4	5-7
57	5363	"	-E83	96	10.0	448	364	4	5-7
58	5371	"	-E92	112	8.6	394	245	4-6	7
59	5378	"	-E98	120	10.2	131	193	3-8	5
60	5386	"	-E113	92	9.1	361	60	3	7
61	5392	"	-E120	95	9.5	334	625	4	3-6
62	5395	"	-E122	96	8.6	345	625	3	3-6
63	5396	"	E123	104	10.4	540	625	3	3-6
64	5400	"	-E126	100	11.2	291	233	4	7
65	5402	840222	-E6	110	10.0	476	698	4	4
66	5403	"	-E7	110	8.6	511	698	3	4
67	5405	"	-E9	110	8.8	681	698	3	4
68	5406	"	-E11	108	8.6	848	698	3	4
69	5410	"	E18	119	9.6	344	483	4	5
70	5416	"	E32	112	8.9	418	383	4	6
71	5421	"	-E48	123	9.0	192	222	4	3-7
72	5425	"	E54	119	11.9	252	268	4	7
73	5427	"	-E59	114	9.2	281	236	5	4-7
74	5428	"	-E61	110	9.5	407	236	5	4-7
75	5431	"	-E69	118	9.7	410	201	4	6
76	5468	840223	E33	112	10.5	197	483	4	3-6
77	5482	"	-E44	123	12.4	217	469	5	4
78	5538	"	-E90	122	11.0	187	300	4	3-7
79	5541	"	-E93	122	9.7	113	300	3-7	3-7
80	5551	"	E101	120	12.6	207	304	3	3-7

 1 Pod borer damage score based on 1 to 9 rating scale.

Table 28. List of selections made in F3 generation screening in *Helicoverpa* nursery at ICRISAT Center, Patancheru during 1987 rainy season.

S.No	Source Plot #	Pedigree (ICPX)	Parentage	No.of. selections made
1	5125	840212-E16	ICPL 83024 X ICPL 84060	3
2	5131	" -E21	"	1
3	5136	" -E26	"	2
4	5152	" -E40	"	1
5	5167	" -E52	"	1
6	5170	" -E54	"	1
7	5206	840214-E7	ICPL 83024 X ICPL 332	2
8	5207	" -E8	"	5
9	5208	" -E9	"	4
10	5211	" -E11	"	6
11	5213	" -E13	"	1
12	5225	" -E23	"	4
13	5227	" -E25	"	1
14	5231	" -E28	"	1
15	5248	" -E45	"	1
16	5267	" -E61	"	4
17	5268	" -E63	"	2
18	5270	" -E65	"	3
19	5282	840215-E41	ICPL 316 X ICPL 84060	2
20	5285	" -E46	"	3
21	5350	840221-E67	ICPL 84060 X ICPX 740146 F7	4
22	5352	" -E69	"	1
23	5371	" -E92	"	1
24	5391	" -E119	"	4
25	5393	" -E121	"	6
26	5395	" -E122	"	1
27	5401	" -E128	"	1
28	5458	840223-E25	ICPX 740360F4B-S218-- X ICPX 740146 F7 line	1
29	5532	" -E84	"	3
30	5536	" -E88	"	1
Total				71

Table 29. List of selected P4 Progeny bulks from *Melicoidiopsis* screening nursery during 1988 rainy season.

S.No.	Source 1988 K M N Plot #	Percentage	Yield (g/Plot)	A Borer Damage
		Parentage	Progeny Nearest Check	Progeny Nearest Check
1	4112	ICPL 83024 X ICPL 332	516	24
2	4129	ICPL 84019 X ICPL 84060	182	43
3	4141	ICPL 84060 X ICPL 740146- NDYIIB-18-1-MIVNDT-EB	236	23
4	4156	" - E80-EB	319	8
5	4157	" - E81-EB	203	8
6	4160	" - E92-EB	334	9
7	4161	" - E98-EB	300	13
8	4162	" - E113-EB	250	11
9	4165	" - E122-EB	178	18
10	4169	ICPL 332 X ICPL 740146- NDYIIB-18-1-MIVNDT-EB	350	12
11	4170	" - E7-EB	187	13
12	4172	" - E11-EB	118	4
13	4175	" - E32-EB	328	5
14	4176	" - E48-EB	351	9
15	4177	" - E54-EB	162	25
16	4179	" - E59-EB	155	27
17	4180	" - E61-EB	270	27
18	4181	" - E69-EB	131	21
19	4184	ICPX 740360748-S218 X ICPX 740216-NDYIIB-18-1-	263	7
20	4187	" - E101-EB	119	17

(iii) F4 Generation: A total of 204 single plant progenies from 24 crosses were screened in 1987. Only 46 progenies were found promising (Table 30). In addition 15 selections from three progenies (ICPX 83127-E56-E1, -83102-E26-E1 and ICPX 83122-E18-E2) were made and screened as progeny rows in 1988. Six progenies were found promising based on yield and % borer damage and were selected for testing in 1989 PIRYN (Table 31).

(iv) Monitoring of MPAY Lines: Entries of Medium-Duration Pigeonpea Adaptation Yield Trials (MPAY) conducted in 1987 and 1988 were monitored for Helicoverpa tolerance. The borer damage in 1987 was very high. However in 1988 the borer damage ranged between 2 to 6 as compared to 5 for C 11 and 7 for BDN 1 on 1 to 9 rating scale. In addition three entries (LRG 30-5, LRG 30) and LRG 30 from Dr. A. Satyanarayana, Senior Scientist (Pulses), Regional Agricultural Research Station, Lam, Guntur were screened in 4 m long four-row plots. All the three entries were susceptible.

G. YIELD TEST OF LINES

1987 Tests:

(i) BDN1 BC3F6 Progenies Test (87 P26): Thirtyfive of 42 SM resistant progenies selected in 1986 were tested for their yield potential. The entries were sown in 6x6 TL (Triple Lattice Design) with BDN 1 as control. Each plot consisted of 4 m long 4 rows. The row to row and within row spacing was kept at 60 and 20 cm, respectively. The observations on days to flower, plant height, 100-seed weight, plant stand, and grain yield and % SM in disease nursery were recorded. Due to very heavy Helicoverpa damage flowering continued in flushes and hence days to maturity could not

Table 30. Performance of *Helicoverpa* tolerant selections in F4 progenies planted in Unsprayed block during 1987-88 rainy season.

S.No.	Source Plot #	Pedigree (ICPX)	Days to Flower	100-seed (Vt)	Yield Kg/ha		PDS 1	
					Prog	Nearest Check	Prog	Check
1	5560	830105-E18-E4	118	9.4	643	575	3	3
2	5568	830107-E30-E1	118	8.1	561	446	3	4
3	5585	830122-E45-E3	117	10.5	437	497	4	4
4	5640	830094-E1-E2	114	11.4	781	776	4	3-4
5	5641	" -E1-E4	110	11.2	619	776	4	3-4
6	5642	" -E1-E5	116	11.9	552	538	4	4
7	5645	830094-E2-E1	114	12.1	377	538	3-7	4
8	5646	830099-E3-E1	102	10.3	845	538	3	4
9	5647	" -E3-E3	100	9.1	460	397	3	4
10	5650	" -E3-E5	100	8.9	426	397	4	4
11	5652	830101-E14-E1	102	8.7	448	194	3	7
12	5656	830102-E16-E2	110	9.5	578	194	3-7	7
13	5670	" -E29-E2	110	9.5	582	369	4	3-7
14	5672	" -E30-E2	110	10.1	413	369	3-6	3-7
15	5673	" -E30-E3	108	10.3	425	236	3	3-6
16	5675	" -E30-E4	112	10.8	582	236	3	3-6
17	5677	" -E33-E1	114	11.0	1153	189	3-7	7
18	5700	830104-E1-E2	114	10.3	633	621	4	3
19	5701	830105-E6-E5	112	10.1	661	621	4	3
20	5703	830107-E8-E2	108	9.7	353	439	3	4
21	5706	" -E8-E4	121	11.4	631	439	4	4
22	5708	830108-E8-E1	110	9.5	524	356	3	4
23	5713	" -E11-E2	108	9.6	534	395	3-5	4
24	5715	" -E11-E3	110	9.9	612	395	3	4
25	5717	" -E17-E2	112	10.5	273	437	4	3-7
26	5720	" -E18-E2	118	9.9	441	437	3	3-7
27	5721	" -E18-E4	106	9.9	395	437	4	3-7
28	5722	" -E18-E6	110	9.9	418	437	4	3-7
29	5728	830122-E3-E5	104	12.5	614	506	3	3-5
30	5732	" -E4-E1	104	10.7	423	584	3-6	4
31	5733	" -E5-E1	104	11.0	474	584	3-6	4
32	5736	" -E14-E4	108	9.9	596	584	3	4
33	5745	" -E17-E3	110	9.2	487	675	3	3
34	5747	" -E18-E1	112	10.4	543	367	3	3-5
35	5748	" -E18-E2	112	10.5	547	367	3-5	3-5
36	5750	" -E18-E3	114	11.8	1446	367	3	3-5
37	5751	" -E18-E4	108	10.0	485	367	3	3-5
38	5752	" -E21-E1	114	8.7	628	448	3	3
39	5771	830123-E2-E3	106	9.8	434	247	3	3-7
40	5773	830126-E1-E1	104	10.3	418	647	3	3-6
41	5776	" -E1-E3	106	10.9	707	647	3	3-6
42	5780	" -E5-E2	106	11.6	480	582	3	3
43	5787	830100-E8-E1	102	9.3	450	658	3	3-5
44	5788	" -E12-E1	100	11.0	270	658	3	3-5
45	5798	830103-E9-E3	110	9.1	626	578	3	3-5
46	5802	830106-E7-E2	106	9.6	474	427	3	3-7

1 Pod borer damage score based on 1 to 9 rating scale.

Table 31. Performance of selected F5 single plant progenies from *Helicoverpa* screening nursery during 1988 rainy season.

S.No.	Source	Pedigree	Parentage	Yield (g/plot)	Pod Damaging Score
	1988 K	(ICPX)			
	H N			Progeny Nearest Check	Progeny Nearest Check
	Plot #				
1	3980	830127-E56-E1-E1	(PPE-45-2-8*-X ICPL 304) X ICPL 304	599	4
2	3981	"	"	762	3
3	3982	"	"	528	4
4	3983	"	"	377	4
5	3993	830122-E10-E2-E2	(PPE-45-2-8*-X SDB-1) XDBW 1	366	4
6	3995	"	"	614	4

1 Pod borer damage score based on 1 to 9 rating scale.

be recorded.

The yield of progenies ranged between 1101 kg to 2373 kg/ha as compared to 1188 kg/ha for the control variety, BDN 1 (Table 32). Six progenies were significantly higher yielding than control. Most progenies had higher 100 seed-weight than the control. Twentyone progenies remained free from SM incidence and seven had less than 10% SM incidence. Because of high CV % due to Helicoverpa incidence it was decided to retest 11 best entries in 1988. Of 11 selected progenies two highest yielding progenies (2613 and 2634) will be tested in multilocation MPAY trial and the other progenies will be tested at Patancheru only.

(ii) C11 BC2F6 Progenies Test: Seven BC2F6 progenies with C 11 control were tested for yield in two replicate RBD. Three progenies were higher yielding than C 11 control but only two progenies had less than 10% SMD. These progenies were highly susceptible to wilt (Table 33), hence no progeny was advanced for multilocation testing.

(iii) Wilt Resistant Advanced Lines Test (87P27): In this test 16 LRG 30 M4 progenies selected from 156 M3 progenies in 1986 with six other wilt resistant lines were tested with ICPL 265 (wilt susceptible LRG 30), ICPL 270 (wilt resistant line) and C 11, controls for yield in a wilt-free field. These 25 entries were grown in 5x5 TL design. Each plot consisted of 4 m long 4 rows. The yield of entries ranged between 862 kg to 2004 kg/ha with test mean yield of 1656 kg/ha as compared to 1700 kg for ICPL 265, 1691 kg for ICPL 270 and 1473 kg/ha for C 11 control (Table 34). Twelve lines were higher yielding than the highest yielding control ICPL 265. The % wilt incidence ranged between 0 to 45%. Four lines (Sr. No.

Table 32. Performance of BDM 1 BC3F6 Progenies (87P26) grown at Patancheru, rainy season 1987.

Entry No.	Name	Days to flower	Plant height (cm)	100-seed weight (g)	Plant stand	Grain Yield (kg/ha)	Wilt	SM
23	BDM 1 BC3F2-16*-S7*-S1*-SB*	113	167	13.6	30	2373	99	0
34	BDM 1 BC3F2-26*-S35*-S2*-SB*	115	179	11.7	34	2343	100	9
14	BDM 1 BC3F2-16*-S4*-S1*-SB*	111	166	13.4	34	2298	83	3
18	BDM 1 BC3F2-16*-S4*-S5*-SB*	112	156	12.4	31	2297	95	0
33	BDM 1 BC3F2-26*-S35*-S1*-SB*	110	181	11.4	33	2285	97	21
10	BDM 1 BC3F2-2*-S7*-S2*-SB*	110	170	11.7	35	2205	97	3
8	BDM 1 BC3F2-2*-S6*-S3*-SB*	110	164	11.1	34	2161	97	0
20	BDM 1 BC3F2-16*-S5*-S1*-SB*	111	164	11.6	33	2153	90	5
26	BDM 1 BC3F2-16*-S10*-S2*-SB*	112	165	12.3	34	2148	96	0
29	BDM 1 BC3F2-26*-S33*-S1*-SB*	108	174	11.2	34	2140	91	12
3	BDM 1 BC3F2-2*-S1*-S4*-SB*	109	172	11.6	37	2104	97	0
15	BDM 1 BC3F2-16*-S4*-S2*-SB*	113	166	12.7	32	2099	100	0
19	BDM 1 BC3F2-16*-S4*-S6*-SB*	110	161	13.1	32	2075	100	0
28	BDM 1 BC3F2-26*-S29*-S1*-SB*	112	173	11.6	36	2063	95	18
25	BDM 1 BC3F2-16*-S10*-S1*-SB*	113	161	12.1	29	2052	92	5
31	BDM 1 BC3F2-26*-S34*-S2*-SB*	111	168	10.7	35	2025	89	24
30	BDM 1 BC3F2-26*-S34*-S1*-SB*	108	167	11.0	33	2000	90	44
22	BDM 1 BC3F2-16*-S5*-S3*-SB*	115	160	12.9	35	1976	100	0
21	BDM 1 BC3F2-16*-S5*-S2*-SB*	115	169	12.2	31	1945	100	0
27	BDM 1 BC3F2-26*-S27*-S1*-SB*	109	173	11.5	35	1911	94	9
4	BDM 1 BC3F2-2*-S1*-S5*-SB*	111	168	11.6	33	1860	94	0
6	BDM 1 BC3F2-2*-S6*-S1*-SB*	111	176	12.0	34	1823	94	3
12	BDM 1 BC3F2-16*-S2*-S1*-SB*	112	166	11.8	33	1755	100	0
32	BDM 1 BC3F2-26*-S34*-S3*-SB*	110	170	10.8	31	1749	94	14
17	BDM 1 BC3F2-16*-S4*-S4*-SB*	112	163	12.7	31	1737	97	0
1	BDM 1 BC3F2-2*-S1*-S1*-SB*	109	169	12.0	30	1687	94	0
7	BDM 1 BC3F2-2*-S6*-S2*-SB*	114	182	12.1	34	1659	100	0
13	BDM 1 BC3F2-16*-S2*-S2*-SB*	115	173	13.6	33	1632	95	0
5	BDM 1 BC3F2-2*-S1*-S6*-SB*	108	172	11.5	37	1600	77	0
11	BDM 1 BC3F2-16*-S1*-S1*-SB*	111	168	12.3	34	1569	100	0
2	BDM 1 BC3F2-2*-S1*-S3*-SB*	108	175	11.1	33	1444	100	0
16	BDM 1 BC3F2-16*-S4*-S3*-SB*	113	161	12.5	34	1437	92	0
9	BDM 1 BC3F2-2*-S6*-S5*-SB*	108	174	12.1	34	1240	86	0
36	BDM 1 (Check)	109	165	10.9	31	1100	-	100
35	BDM 1 BC3F2-26*-S36*-S1*-SB*	110	174	11.7	29	1170	100	11
24	BDM 1 BC3F2-16*-S8*-S1*-SB*	109	167	12.7	31	1101	100	0
		SE±	0.6	4.2	0.29	2.2	333.1	
		MEAN	111.0	169.6	12.03	33.1	1870.0	
		CV(%)	0.9	4	3	12	31	

Note: Days to maturity is not recorded because of high Heliothis damage.

Table 33. Performance of C 11 BC2F6 Progenies (87P28) grown at ICRISAT Center, Patancheru, rainy season 1987.

Entry No.	Name	Days to Flower	Plant height (cm)	100-seed weight (g)	Plant stand	Grain Yield (kg/ha)	% Wilt	% SN
3	C 11 BC2F2-3*-S9*-S3*-SB*	114	186	9.8	35	1841	100	24
6	C 11 BC2F2-3*-S10*-S3*-SB*	115	167	9.1	37	1788	100	9
1	C 11 BC2F2-3*-S9*-S1*-SB*	115	179	9.4	28	1773	100	8
8	C 11 (Check)	118	193	10.9	32	1683	33	100
2	C 11 BC2F2-3*-S9*-S2*-SB*	117	169	8.7	31	1649	85	23
4	C 11 BC2F2-3*-S9*-S4*-SB*	113	171	9.4	36	1620	91	71
7	C 11 BC2F2-3*-S11*-S1*-SB*	114	167	7.3	34	1328	100	6
5	C 11 BC2F2-3*-S10*-S1*-SB*	116	172	8.9	34	1068	89	0
	SE+	0.5	4.5	0.40	2.7	337.6		
	MEAN	115.2	175.1	9.20	33.1	1593.9		
	CV(%)	0.6	4	6	11	30		

Note : Days to maturity is not noted due to heavy Heliothis damage in first flush.

Table 34. Performance of entries in Milt Resistant Advanced lines test (87P27) grown at Patancheru, rainy season 1987.

Entry No.	Name	Days to Flower	Plant height (cm)	100-seed weight (g)	Plant stand	Grain Yield (kg/ha)	Milt in nursery	SM
22	25 KR-B-WB	128	197	9.9	37	2004	0	26
16	25 KR-33-WB	128	197	9.8	35	1993	4	15
15	25 KR-23-WB	130	202	9.9	35	1910	9	5
10	10 KR-11-WB*	114	172	9.9	36	1897	3	100
2	ICPX 78143-WB-WB-WB-W43-B-B*	126	204	10.9	36	1847	0	5
12	10 KR-17-WB*	112	174	10.2	35	1846	7	100
14	20 KR-20-WB*	134	227	8.9	35	1769	0	100
1	ICP 11292	120	187	10.7	35	1760	36	100
20	5 KR-B-WB	127	192	9.5	39	1754	5	36
3	ICPX 78153-WB-WB-WB-WB-W43-B-B*	127	191	10.1	36	1723	7	100
7	5 KR-12-WB	112	188	9.7	36	1719	17	41
17	35 KR-8-WB	127	203	9.5	35	1711	4	35
25	ICPL 265 (Check)	129	205	8.1	38	1700	44	100
23	ICPL 270 (Check)	111	178	12.1	35	1691	-	-
19	40 KR-1-WB	128	202	9.6	32	1669	0	6
11	10 KR-12-WB	128	207	9.8	32	1651	74	82
21	15 KR-B-WB	125	199	10.0	35	1643	45	100
13	15 KR-19-WB	114	168	10.1	38	1573	5	100
5	LRG 30 BC1P2-M69*-W1-WB*-WB*	108	159	9.6	38	1500	2	100
24	C 11 (Check)	118	197	10.9	36	1473	-	-
4	LRG 30 BC1P2-W57*-W3-WB*-WB*	114	164	8.8	35	1461	0	100
18	35 KR-13-WB	115	186	9.6	38	1448	13	100
6	LRG 30 BC1P2-M69*-W2-WB*-WB*	109	167	9.4	34	1438	7	100
9	10 KR-3-WB	127	201	10.0	32	1355	20	97
8	5 KR-18-WB*	110	182	10.6	36	862	0	100
		SE*	0.5	4.0	0.24	1.7	176.8	
		MZAM	120.9	190.7	9.91	35.7	1655.9	
		CV(%)	0.8	4	4	8	18	

Note: Days to maturity is not recorded because of heavy Heliothis damage in the first flush.

2, 15, 16 and 22) also had low SM incidence (5 to 26%). On the basis of yield, wilt and SM resistance these four lines will be tested in MPAY during 1988.

(iv) SM Resistant Advanced Lines Test (87P29): Twelve lines found resistant to SM in 1986 were tested for yield in three-replicate RBD with C 11 and BDN 1 as control cultivars. None of the lines was significantly higher yielding than controls (Table 35). Few lines that showed less than 10% SM were susceptible to wilt, hence none was selected for multilocation testing.

(v) Determinate Lines Test (87P25): Twenty-two determinate lines (P6 generation) were tested for yield in 5x5 TL design with C 11, BDN 1, and ICPL 211 (determinate line) as controls. The yield of lines ranged between 705 kg to 2352 kg/ha as compared to 1570 kg/ha for determinate control ICPL 211, 1604 kg/ha for C 11 and 1667 kg/ha for BDN 1. Two highest yielding entries (entry No. 2502, 2519) were selected for testing in sorghum intercrop in collaboration with RMP (Table 36).

(vi) Multiple Diseases Resistant Lines Test (87P22): Twenty-four lines found promising for wilt, SM, and Phytophthora stem blight were tested for yield with C 11 as control in 5x5 Triple Lattice Design. The yield of lines ranged between 1608 kg to 2999 kg/ha with mean yield of 2162 kg/ha. Five lines (serial no. 2510, 2515, 2519, 2521 and 2522) were significantly higher yielding than C 11 control (Table 37). Most entries were later than C 11 in flowering and maturity, except one line (ICPX 80275-SWP8-SWP5-SWP1(x)-SWP6-SWPV(x)). This line was selected for testing in MPAY trial.

Table 35. Performance of entries in SM Advanced lines test 87P29: grown at ICRISAT Center, Patancheru, rainy season 1987

Entry No.	Name	Days to Flower	Plant height (cm)	100-seed weight (g)	Plant stand	Grain Yield (kg/ha)	Wilt	SM
9	ICPX 78053-SB-SB-SB-B-2-B	122	182	10.2	36	1786	90	97
1	ICPX 78052-SB-SB-SB-SB-B-9-B	115	167	10.4	35	1580	93	61
3	ICPX 78052-SB-SB-SB-SB-B-14-B	110	200	11.5	37	1506	50	41
4	ICPX 78052-SB-SB-SB-SB-B-16-B	116	169	10.9	37	1467	94	3
7	ICPX 78053-S(T)B-SB-SB-B-27-B	108	175	11.2	37	1428	100	3
6	ICPX 78053-S(T)B-S(T)B-SB-B-23-B	116	177	11.1	36	1416	66	9
12	ICPX 78046-SB-SB-SB-SB-B-7-B	116	166	11.3	36	1385	100	14
14	C 11 (Check)	116	181	10.6	34	1295	-	-
13	BDH 1 (Check)	107	146	10.2	34	1275	-	-
2	ICPX 78052-SB-SB-SB-SB-B-10-B	115	169	10.3	35	1271	74	68
11	ICPX 78053-SB-SB-SB-SB-B-4-B	116	184	12.1	36	1076	90	5
5	ICPX 78053-S(T)B-SB-SB-B-3-B	112	174	11.8	37	1051	97	12
10	ICPX 78053-SB-SB-SB-SB-B-3-B	115	185	10.8	37	969	92	14
8	ICPX 78053-SB-SB-SB-SB-B-1-B	112	188	10.5	34	866	85	30
SE±		0.6	5.8	0.24	1.3	299.3		
MEAN		113.9	177.4	10.93	35.8	1312.2		
CV(%)		0.9	6	4	6	39		

Note: Days to maturity is not recorded because of Heliothis damage

in the first flush.

Table 36. Performance of entries in FS DT Progenies test (TP25 grown at Patancheru, rainy season 1987)

Entry No.	Name	Days to Flower	Plant height (cm)	100-seed weight (g)	Plant stand	Grain yield (kg/ha)	SM	% Mill.
2	ICPX 02134-13-DT1-B	114	140	9.8	35	2352	100	94
19	ICPX 02143-46-DT3-B	107	130	11.0	35	2179	75	100
11	ICPX 02135-16-DT2-B	112	138	9.4	35	2173	88	94
3	ICPX 02134-13-DT2-B	113	143	9.6	34	2119	100	90
8	ICPX 02134-32-DT3-B	111	141	11.2	35	2107	100	100
4	ICPX 02134-15-DT3-B	112	139	9.8	34	2051	71	92
6	ICPX 02134-28-DT1-B	112	133	10.2	37	1945	4	100
10	ICPX 02135-11-DT4-B	110	141	9.9	37	1923	100	75
13	ICPX 02135-42-DT1-B	108	138	9.7	34	1929	100	83
1	ICPX 02134-5-DT1-B	110	137	9.7	39	1874	4	89
7	ICPX 02134-32-DT1-B	104	133	11.0	41	1867	100	100
5	ICPX 02134-22-DT3-B	114	141	9.8	35	1793	100	81
22	ICPX 02139-19-DT8-B	108	125	12.4	32	1769	100	100
24	BDW 1(Check)	108	162	10.6	37	1667	100	83
18	ICPX 02139-11-DT2-B	110	122	11.6	34	1654	16	88
25	C 11(Check)	116	179	10.9	34	1604	100	100
23	ICPL 211(Check)	115	132	13.0	35	1570	11	94
16	ICPX 02136-38-DT5-B	111	134	9.4	33	1570	100	91
21	ICPY 02135-43-DT1-C	111	127	10.0	34	1560	100	76
12	ICPX 02135-17-DT2-B	107	129	9.6	38	1513	100	79
15	ICPX 02136-3-DT1-B	114	144	8.8	36	1495	91	91
9	ICPX 02135-10-DT2-B	111	128	10.6	33	1449	97	90
20	ICPX 02139-1-DT1-B	109	115	8.8	32	1428	12	100
21	ICPX 02139-1-DT3-B	107	126	9.8	37	1267	18	88
17	ICPX 02137-11-DT5-B	107	134	12.3	35	705	100	64

SE*	1.0	3.0	0.27	2.3	276.9
MEAN	110.6	136.4	10.38	35.4	1741.8
CV(%)	2	4	4	11	27

Note: Days to maturity is not recorded due to heavy Heliothis damage in the first flush.

Table 37. Performance of entries in Multiple disease resistant advanced lines test (87P22) grown at Patancheru, rainy season 1987.

Entry No. Name	Days to Flower	Plant height (cm)	100-seed weight (g)	Plant stand	Grain Yield (kg/ha)	Wilt	SM	Y	PB
22	ICPX 80289-SWP13-SWP2*-SWP2*-SWP12-SWPB*	156	261	10.8	30	2999	-	-	100
15	ICPX 80284-SWP22-SWP2-SWP1*-SWP15-SWPB*	149	237	10.6	34	2825	7	7	61
19	ICPX 80284-SWP22-SWP14-SWP1*-SWP15-SWPB*	147	243	10.5	33	2820	-	-	-
10	ICPX 80275-SWP8-SWP5-SWP1*-SWP6-SWPB*	122	236	10.4	33	2616	43	14	76
21	ICPX 80289-SWP13-SWP2*-SWP1*-SWP14-SWPB*	137	249	10.2	32	2530	-	-	100
6	ICPX 80275-SWP8-SWP1-SWP1*-SWP6-SWPB*	133	227	9.5	32	2329	0	50	92
18	ICPX 80284-SWP22-SWP14-SWP1*-SWP6-SWPB*	146	241	10.9	36	2252	-	-	-
14	ICPX 80284-SWP22-SWP2-SWP1*-SWP9-SWPB*	148	240	10.3	32	2245	8	8	68
5	ICPX 80189-SWP8-SWPB-B-3-B	134	260	11.1	36	2232	31	0	50
13	ICPX 80284-SWP22-SWP2-SWP1*-SWP5-SWPB*	154	232	10.9	36	2218	17	0	30
12	ICPX 80284-SWP22-SWP2-SWP1*-SWP3-SWPB*	150	238	10.0	34	2175	0	50	93
1	ICPX 80270-SWP8-SWPB-B-1-B	127	243	9.4	38	2133	71	71	77
23	ICPX 80054-SWP8-SWPB-SWP2-SWP10-SWPB*	137	255	9.4	31	2110	-	0	93
16	ICPX 80284-SWP22-SWP2-SWP1*-SWP18-SWPB*	141	238	10.4	34	2109	46	0	69
11	ICPX 80275-SWP8-SWP5-SWP2*-SWP12-SWPB*	126	235	11.2	36	2109	-	-	-
24	ICPX 80061-SWP8-SWP8-SWP1-SWP3-SWPB*	136	245	10.2	32	2061	-	-	-
9	ICPX 80275-SWP8-SWP3-SWP4*-SWP10-SWPB*	124	243	12.3	33	2017	-	-	-
8	ICPX 80275-SWP8-SWP3-SWP7*-SWP16-SWPB*	125	232	10.6	32	2017	-	-	-
17	ICPX 80284-SWP22-SWP2-SWP1*-SW12-SWP3*	135	243	11.4	35	1527	-	-	-
3	ICPX 80270-SWP8-SWPB-B-8-B	123	237	10.7	30	1835	-	-	-
20	ICPX 80289-SWP13-SWP2*-SWP1*-SWP13-SWPB*	145	249	10.0	33	1824	-	-	-
25	C 11 (Check)	126	235	11.3	29	1784	-	-	-
2	ICPX 80270-SWP8-SWPB-B-7-B	120	251	10.8	33	1683	-	-	-
4	ICPX 80270-SWP8-SWPB-B-9-B	124	230	10.1	31	1613	-	-	-
7	ICPX 80275-SWP8-SWP3-SWP7*-SWP12-SWPB*	122	231	10.1	32	1608	-	-	-
		SE±	0.8	3.8	1.7	223.8			
		MEAN	135.5	241.3	10.51	2162.1			
		CV(%)	1	3	7	10			

Note: Due to Heliothis damage days to maturity was not recorded.

(vii) **Heterosis and Inbreeding Depression Test (87P24):** This test included both parents, F1, F2 and F3 generations of four crosses. Parents and control cultivar C 11 were sown in 4 rows, F1's in two row 4 m long plots and F2 and F3 generations in 4 m long eight row plots. All the 19 entries with C 11 control were tested in RBD with three replications. The observations recorded on yield in different generations are reported in Table 38.

Percent heterosis on mid-parental value (MP), better parent (BP) and standard heterosis over cv C 11 for yield was calculated. Percent heterosis and inbreeding depression are reported in Tables 39 and 40.

A cross combination between ICPL 8530 and ICPL 270 recorded negative heterosis (-2.5%) over mid-parent value while another F1 (ICPL 8363 x PDM) recorded 82.3% heterosis for yield. F1 of ICPL 8530 x ICPL 270 also recorded negative better parent heterosis (BP) while better parent heterosis in other three crosses was 10.1, 72.6 and 63%, respectively. Standard heterosis over C 11 cultivar was also calculated. It ranged between 4.2% to 90.5% (Table 39).

One of four crosses between ICPL 8363 and PDM 1 was particularly outstanding for mid-parental, better parent and standard heterosis.

Inbreeding depression (%) was calculated for F2 and F3 generations. It was observed that in F2 generation two crosses (ICPX 84140 and -84177) did not show any inbreeding depression while other two crosses (ICPX 84161 and ICPX 84167) showed inbreeding depression. In F3 generation one cross (ICPX 84161) did not show inbreeding depression while in other crosses inbreeding depression was 11.3, 18.1 and 30.6%, respectively (Table 40).

Table 38. Yield (Kgha-1) in different generations of four pigeonpea crosses grown at ICRISAT Center, Patancheru during 1987 rainy season.

Generation	ICPL 304 X ICPL 8341	ICPL 227 X ICPL 270	ICPL 8350 X ICPL 270	ICPL 8363 X PDM 1
P1	1556	1538	2196	2006
P2	1759	1472	1472	1576
F1	1937	2654 *	1788	3269 *
F2	2082	1366	1845	1946
F3	1870	1347	1562	1490
SE \pm	\pm 194.8	\pm 194.8	\pm 194.8	\pm 194.8

* Significant at 5% level.

Table 39. Percent mid-parent, better parent and standard heterosis in four Pigeonpea crosses at ICRISAT Center, Patancheru during 1987 rainy season.

Cross No.	Parentage	Percent heterosis over		
		MP	BP	C 11
ICPX 840140	ICPL 304 X ICPL 8341	16.83	10.12	12.88
ICPX 840161	ICPL 227 X ICPL 270	76.34	72.56	54.66
ICPX 840177	ICPL 8530 X ICPL 270	-2.50	-18.57	4.19
ICPX 840167	ICPL 8363 X PDM 1	82.32	62.96	90.50

Table 40. Percent inbreeding depression for yield in four pigeonpea crosses at ICRISAT Center, Patancheru rainy season 1987.

Cross	% inbreeding depression in	
	F2 generation	F3 generation
ICPX 840140	6.96	11.33
ICPX 840161	94.28	1.41
ICPX 840177	3.08	18.11
ICPX 840167	67.98	30.60

(viii) Pigeonpea Insect Resistant Lines Yield Test (PIRYT): The PIRYT was conducted both in pesticide-free field and with pesticide protection. In this test eight Helicoverpa tolerant lines were tested with four controls (ICPL 332, BDN 1, C 11 and ICPL 270). This test was sown in four-replicate RBD and each plot consisted of 4 m long 4 rows.

In the pesticide protected test (87P23) the yield of lines ranged between 1357 kg to 2236 kg/ha as compared to 2732 kg for ICPL 332, 1964 kg for ICPL 270, 1880 kg for C 11 and 1538 kg/ha for BDN 1 control. Most lines flowered in the range of BDN 1 and ICPL 332 except one (entry No. 2311) which flowered in 98 days. Maturity of lines ranged between 153 to 191 days whereas C 11 matured in 210 days. The 100 seed-weight of test entries was smaller than the control varieties ranging between 6.6 g/100 to 9.8 g/100 seeds as compared to 11.1 g/seed for BDN 1, 10.8 g/100 seeds for C 11 and 12.4 g/100 seeds for ICPL 270 (Table 41).

In the unsprayed test (87P32) the yield of test entries ranged between 81 kg/ha to 692 kg/ha as compared to 265 kg/ha for Helicoverpa resistant control, 41 kg/ha for BDN 1, 40 kg/ha C 11 and 28 kg/ha for ICPL 270. The yield differences between control varieties BDN 1, C 11 and ICPL 270 and test lines were much greater indicating resistance to Helicoverpa in these lines. Four lines (entry Nos. 3209, 3210, 3211 and 3212) were higher yielding than the resistant control, ICPL 332. Although the coefficient of variation ($\% CV$) for yield was high (64%) entry nos. 3211 and 3212 were significantly higher yielding than the Helicoverpa tolerant control, ICPL 332. On the basis of $\%$ borer damaged pods, these two lines showed tolerance (38 and 36% respectively) as compared to 71% in tolerant control, ICPL 332 (Table 42). Based on seed size, yield and borer damage three lines were selected for 1988 MPAY trial.

Table 41. Performance of entries in PIRYT (Sprayed)(87P2) grown at ICRISAT Center, Patancheru, rainy season 1997

Entry No.	Name	Days to		Plant height (cm)	100-seed weight (g)	Flint stand (kg/ha)	Grain Yield (kg/ha)	M	W
		Flower Mature	height						
2	ICPL 332(Check)	119	189	238	7.9	32	2732	64	10
6	ICPX 01300-E0-E1-E0-E0	110	191	246	9.6	30	2216	100	100
5	ICPX 01300-E0-E3-E1-E0	116	188	229	9.8	33	2236	94	94
10	ICPL 07089	115	167	234	9.6	34	2041	100	100
1	ICPL 270(Check)	118	188	223	12.4	32	1964	102	10
4	C 11(Check)	126	210	234	10.8	33	1888	100	68
8	ICPX 01580-E7-E1-E1-E0	118	191	216	9.4	31	1839	100	100
12	ICPX 00324-E44-E1-E0-E0-E0	103	155	207	6.8	34	1875	100	100
9	ICPL 07088	114	179	227	9.2	33	1707	100	100
11	ICPX 00324-E31-E1-E0-E0-E0	98	153	205	8.4	31	1608	100	68
3	BDW 1(Check)	109	195	217	11.1	35	1538	100	23
7	ICPX 01167-E22-E1-E2-E0	100	180	226	9.8	32	1357	100	92
SE		1.4	2.5	5.2	0.15	2.1	271.1		
MEAN		113.4	180.5	225.1	9.53	32.8	1913.6		
CV(%)		2	1	5	3	13	20		

Table 42. Performance of entries in PISVT (Unsprayed)(67P32) grown at ICRISAT Center, Patancheru, rainy season 1987.

Entry No.	Name	Days to Flower	Plant height (cm)	100-seed weight (g)	Plant stand	Grain Yield (kg/ha)	% Borer damaged pods
11	ICPX 80324-E11-E1-E0-E0-E0	103	198	7.3	33	692	37.7
12	ICPX 80324-E44-E1-E0-E0-E0	104	190	6.3	33	671	36.1
9	ICPL 87088	119	203	7.9	30	473	58.3
10	ICPL 87089	116	201	8.1	34	464	66.7
2	ICPL 332 (Check)	122	206	5.0	35	265	70.6
7	ICPX 81167-E22-E1-E2-E0	110	201	7.0	34	210	73.2
6	ICPX 81300-E0-E1-E0-E0	118	206	6.3	34	138	74.2
5	ICPX 81300-E0-E1-E1-E0	114	196	7.1	33	127	63.9
8	ICPX 81580-E7-E1-E1-E0	119	184	6.6	34	81	85.2
3	BDW 1 (Check)	112	168	8.6	31	41	94.2
4	C 11 (Check)	126	182	10.7	30	40	99.6
1	ICPL 270 (Check)	114	177	7.9	33	28	95.1
		SE _d	0.9	4.9	0.36	1.4	86.8
		MEAN	114.6	192.5	7.38	32.7	269.0
		CV(%)	2	5	10	0	64

(ix) Pigeonpea Insect Resistant Lines Yield Observation Nursery (PIRYN-87P33): Sixty-two progenies found promising in F5 generation for yield and less borer damage in 1986 were tested with ICPL 332 (resistant) and C 11 controls in 8x8 single lattice design in pesticide-free field. Observations on days to flower, plant height, plant stand, yield, and % borer damaged pods were recorded. Based on % borer damage, 23 progenies were selected and statistically analyzed in RBD. The yield of test lines ranged between 304 kg/ha to 730 kg/ha as compared to 539 kg/ha for resistant control ICPL 332 and 11 kg/ha only for C 11 control. Twelve progenies were higher yielding than the resistant control (Table 43). The % borer damage ranged between 26 to 67% as compared to 67% in resistant control and 96% in C 11 control. Based on seed size, yield and % borer damaged pods, 17 progenies (entry nos. 3321, 15, 22, 23, 3, 17, 19, 2, 10, 20, 14 and 18) were selected for 1988 PIRYT.

1988 Yield Tests:

(i) Wilt Resistant Advanced Lines Test (88P25): Eighteen wilt resistant lines (F6 generation) derived from eight crosses were tested for their yield potential in wilt-free condition with C 11 and BDN 1 controls. The trial was sown in RBD with three replications. Each plot consisted of 4 m long 4 rows. The observations on days to flower, maturity, plant height, 100-seed weight, plant stand and grain yield were recorded in the test and wilt incidence was recorded in the wilt screening nursery. The yield of test entries ranged between 1780 kg to 2988 kg/ha with mean yield of 2442 kg/ha. The yield of C 11 and BDN 1 controls was 2411 and 2210 kg/ha respectively (Table 44). Fourteen entries yielded more than BDN 1 and 11 more than C 11 control. Except one (entry No. 2501) all entries were

Table 43. Performance of entries in PIMM (Unsprayed)(87P33) grown at ICRISAT Center, Patancheru, rainy season 1987.

Entry No.	Name	Days to flower	Plant height (cm)	100-seed weight (g)	Plant stand	Grain Yield (kg/ha)	% Borer damaged pods
9	ICPX 02045-E1-E2-EB	99	197	9.3	31	730	59.9
21	ICPX 02042-E17-E5-EB	119	193	9.7	36	721	43.3
15	ICPX 02052-E1-E1-EB	103	195	10.4	29	706	37.3
22	ICPX 02045-E20-E1-EB	114	197	8.6	27	649	50.6
23	ICPX 02051-E5-E3-EB	122	207	9.2	34	600	48.6
3	ICPX 02041-E3-E4-EB	114	205	9.4	32	596	36.3
17	ICPX 02045-E10-E3-EB	114	217	9.4	29	595	46.0
19	ICPX 02050-E12-E2-EB	106	218	9.2	33	582	26.1
2	ICPX 02041-E2-E4-EB	116	203	10.1	35	582	51.6
10	ICPX 02045-E6-E1-EB	108	214	9.9	35	571	47.4
20	ICPX 02042-E5-E1-EB	115	198	9.8	28	550	51.1
14	ICPX 02046-E1-E7-EB	103	206	8.4	36	543	53.7
25	ICPL 332 (Check)	120	220	7.7	36	539	67.3
13	ICPX 02045-E7-E2-EB	103	208	8.8	32	533	59.8
8	ICPX 02043-E3-E4-EB	116	206	9.6	32	488	42.9
6	ICPX 02042-E1-E6-EB	119	219	9.2	35	484	31.3
5	ICPX 02042-E1-E4-EB	120	217	9.2	36	484	36.4
18	ICPX 02046-E2-E3-EB	108	229	8.8	29	477	27.1
1	ICPX 02041-E1-E1-EB	107	198	10.1	35	477	50.9
4	ICPX 02042-E1-E2-EB	118	207	9.7	28	452	69.0
16	ICPX 02053-E5-E3-EB	114	201	9.8	29	447	31.1
12	ICPX 02045-E6-E3-EB	117	225	10.1	34	426	64.5
11	ICPX 02045-E6-E2-EB	107	207	8.4	31	388	48.7
7	ICPX 02043-E1-E4-EB	103	205	8.7	34	384	57.8
24	C 11 (Check)	124	191	8.5	30	11	95.7
		SE _d	0.4	5.6	0.30	1.7	236.2
		MEAN	112.1	207.1	9.26	32.1	517.3
		CV(%)	0.5	4	5	7	64

Note: Originally this trial was in 8x8 Simple Lattice. Most of the entries were rejected due to severe Heliothis damage.

Table 44. Performance of entries in WRALT-88P251 grown at ICRISAT Center Patancheru, rainy season 1988

Entry	No.	Name	Days to Flower	Plant height (cm)	100 seed weight (g)	Plant stand (kg/ha)	Grain Yield (kg/ha)	Wilt in nursery
	7	ICPX 01203F4B-W6-WB	132	198	8.7	46	2980	2
	1	ICPX 01190F4B-W3-WB	131	198	11.0	43	2721	47
	11	ICPX 01203F4B-W19-WB	131	197	8.5	44	2772	3
	3	ICPX 01202F4B-W1-WB	137	204	9.3	41	2742	2
	10	ICPX 01203F4B-W18-WB	132	197	9.0	41	2737	7
	15	ICPX 01195F4B-W5-WB	134	203	9.5	41	2694	6
	4	ICPX 01202F4B-W7-WB	137	202	9.9	43	2674	9
	16	ICPX 01195F4B-E8-WB	133	196	9.1	40	2522	5
	17	ICPX 01195F4B-W11-WB	128	197	9.9	42	2513	1
	8	ICPX 01203F4B-W7-WB	132	195	9.5	43	2492	3
	6	ICPX 01202F4B-W15-WB	139	204	10.2	41	2461	5
	20	C 11(Chock)	136	197	9.2	43	2431	-
	14	ICPX 01205F4B-W1-WB	143	206	9.9	45	2379	8
	18	ICPX 01193F4B-W7-WB	136	197	9.3	45	2312	2
	13	ICPX 01204F4B-W15-WB	142	206	9.2	43	2227	5
	19	BDN 1(Chock)	128	202	10.5	39	2210	-
	12	ICPX 01203F4B-W5-WB	138	203	8.7	46	2171	5
	2	ICPX 01201F4B-W7-WB	143	207	10.2	42	2053	1
	5	ICPX 01201F4B-W12-W2	142	204	10.2	41	1950	3
	9	ICPX 01203F4B-W14-WB	139	205	9.4	45	1700	1
		SE±	1.1	0.9	0.1	0.18	2.2	198.0
		MEAN	135.5	200.9	233.9	9.55	42.7	2441.9
		CV(%)	1.4	0.0	6.0	3.31	0.0	14.1

resistant (less than 10% wilt incidence) in the nursery.

On the basis of yield and wilt resistance four entries (nos. 2507, 2511, 2503, 2510) were selected for 1989 MPAY trial and another two wilt resistant entries (2504 and 2517) which were almost free (0 and 1% wilt) were selected for yield testing in 1989.

(ii) Sterility Mosaic Resistant Advanced Lines Test (88P26): Twenty-six lines (20 in F6 generation and six in F7) that showed resistance to SM in 1987 were tested for yield with two control cultivars (C 11 and BDN 1). The entries were sown in RBD with three replications in SM-free condition. Each entry consisted of 4 m long 4 rows. The observations were recorded on days to flower, maturity, plant height, 100-seed weight, plant stand, grain yield and wilt incidence. The yield of test entries ranged between 1096 kg/ha to 3242 kg/ha with mean yield of 2082 kg/ha (Table 45). Three entries were higher yielding than C 11 and 25 higher than BDN 1 control. None were significantly better than C 11 but six entries had significantly higher yield than BDN 1 control. The entries were also monitored for wilt in the wilt screening nursery. As expected wilt incidence was high since they were not bred for this trait.

On the basis of yield, SM and wilt resistance and 100-seed weight, two entries (2620 and 2604) were found promising and will be tested in 1989 MPAY trial. In addition five entries (2611, 2608, 2609, 2618 and 2610) yielding more than 2000 kg/ha and tolerant to SM were selected for further testing.

(iii) Wilt and SM Resistant Advanced Lines Yield Test (88P24): In this test 34 wilt and SM resistant lines were tested for yield with C 11 and

Table 45. Performance of entries in SMALT (BBF26) grown at ICRISAT Center, Patancheru, rainy season 1988

Entry No.	Name	Days to		Plant height (cm)	100-seed weight (g)	Plant stand (kg/ha)	Grain Yield (kg/ha)	Wilt in nursery
		Flower	Mature					
20	ICPX 02179F4B-S6-SB	136	198	232	11.0	45	3242	7
4	ICPX 01192F4B-S5-SB	132	197	240	9.9	44	3150	22
12	ICPX 02172F4B-S3-SB	134	196	208	9.0	44	2761	66
28	C 11(Check)	136	197	222	9.5	47	2644	-
5	ICPX 01192F4B-S7-SB	136	201	227	9.6	49	2543	92
11	ICPX 02172F4B-S2-SB	135	198	217	8.9	39	2318	27
8	ICPX 01192F4B-S16-SB	139	201	243	9.6	47	2335	23
9	ICPX 01192F4B-S17-SB	139	204	242	8.8	47	2232	20
7	ICPX 01192F4B-S15-SB	136	199	245	8.8	44	2249	77
18	ICPX 02179F4B-S3-SB	138	202	247	10.4	62	2282	42
2	ICPX 01192F4B-S3-SB	137	198	240	9.6	35	2158	65
22	ICPX 0023F5B-S6-SB	132	195	213	8.7	38	2094	71
15	ICPX 02172F4B-S9-SB	130	195	223	9.1	41	2086	88
10	ICPX 01192F4B-S18-SB	141	206	242	8.6	44	2018	67
16	ICPX 02172F4B-S11-SB	137	196	202	7.1	46	2004	71
21	ICPX 0023F5B-S2-SB	136	198	220	9.7	39	1988	70
26	ICPX 0023F5B-S17-SB	130	196	223	10.5	42	1981	82
13	ICPX 02172F4B-S4-SB	125	197	213	8.6	43	1965	77
1	ICPX 02172F4B-S5-SB	135	199	202	9.7	41	1907	49
17	ICPX 02172F4B-S12-SB	129	194	260	8.6	38	1896	61
6	ICPX 01192F4B-S12-SB	141	204	208	9.6	43	1875	76
24	ICPX 0023F5B-S14-SB	139	203	205	10.9	40	1841	82
3	ICPX 01192F4B-S4-SB	139	201	238	8.2	46	1788	88
1	ICPX 01192F4B-S2-SB	137	197	243	8.6	45	1672	32
19	ICPX 02179F4B-S5-SB	136	198	215	9.5	44	1535	82
25	ICPX 0023F5B-S16-SB	136	195	225	9.7	40	1399	89
27	BDM 1(Check)	125	197	210	9.7	39	1377	-
23	ICPX 0023F5B-S9-SB	135	196	223	8.5	40	1056	83

SE _e	1.2	1.4	8.8	0.29	2.4	311.6
MEAN	135.0	198.5	225.2	9.26	42.2	2082.2
CV(%)	1.5	1.2	6.8	5.37	9.7	25.9

Note: In some plots the Wilt incidence was very severe.

BDN 1 controls in the disease-free condition. The test was sown in 6x6 TL and each plot consisted of 4 m long 4 rows. The observations were recorded for days to flower, maturity, plant height, seed weight, plant stand, and grain yield. Wilt incidence was recorded in wilt-sick nursery. All 34 lines showed less than 10% wilt and SM incidence in combined wilt and SM screening nursery in 1987.

The yield of test entries ranged between 1978 kg to 3199 kg/ha with mean yield of 2681 kg/ha (Table 46). The yield of C 11 was 3051 kg and 2574 kg/ha for BDN 1. Most entries had similar or larger seed than control varieties. Except one entry (2429) all had upto 11% wilt incidence. Considering overall performance, six entries (2417, 2429, 2401, 2422, 2424 and 2406) were selected for MPAY trial and 12 for further testing in 1989.

(iv) BDN 1 BC3F7 Advanced Lines Test (88P28): Due to severe Helicoverpa damage in 1986 proper yield evaluation of BDN1 backcross progenies could not be done, therefore, nine lines were selected for retesting. In this test nine BDN 1 BC3F7 lines and two SM resistant lines were tested for yield with BDN 1 control in disease-free condition. All the lines had higher seed weight and yield than BDN 1 control (Table 47). The yield of test entries ranged between 2151 kg/ha to 2688 kg/ha as compared to 2039 kg/ha for BDN 1 control. Five lines (entry nos. 2806, 2804, 2805 and 2803 and 2801) were significantly higher yielding than BDN 1. On the basis of yield, seed size and wilt reaction in the nursery two entries (2806 and 2804) were identified for multilocation testing in 1989.

(v) Kenyan Lines Test (88P27): Fifteen lines obtained by Dr. Laxman Singh from Kenya were tested for yield with C 11 as control. The test was sown

Table 46. Performance of entries in MSNALT 88P24 grown at Patancheru, India, season 1988

Entry No.	Name	Days to		Plant height (cm)	100-seed weight (g)	Plant stand (kg/ha)	Grain yield (kg/ha)	Milt in nursery
		Flower	Mature					
17	ICPX 82195-B-59-SMB*-SMB	130	197	239	11.3	45	2199	3
20	ICPX 80004-B-B-B-SM2-SMB	131	198	234	9.1	52	3152	48
1	ICPX 82169-B-S1-SMB*-SMB	131	205	242	9.3	46	2124	1
36	C 11(Check)	134	199	225	4.7	43	3951	26
22	ICPX 82372-SB-S3-SMB*-SMB	133	199	227	8.7	41	3049	7
24	ICPX 82372-SB-S7-SMB*-SMB	130	198	235	8.4	46	3246	9
6	ICPX 82181-B-S2-SMB*-SMB	128	197	242	9.9	45	2952	0
9	ICPX 82181-B-S7-SMB*-SMB	131	198	230	11.3	49	2883	2
14	ICPX 82181-B-S25-SMB*-SMB	131	192	242	11.1	47	2818	1
5	ICPX 82169-B-S21-SMB*-SMB	137	202	238	7.2	45	2931	1
32	ICPX 80004 F6B-SM6-SMB	129	198	237	4.1	47	2811	4
7	ICPX 82181-B-S3-SMB*-SMB	130	197	224	11.3	53	2819	6
16	ICPX 82184-B-S1-SMB*-SMB	128	196	228	10.7	46	2768	4
12	ICPX 82181-B-S15-SMB*-SMB	131	198	225	9.2	45	2742	2
11	ICPX 82181-B-S14-SMB*-SMB	129	196	257	9.7	47	2717	6
15	ICPX 82182-B-S7-SMB*-SMB	139	197	230	11.5	45	2712	4
33	ICPX 80021 F6B-SM6-SMB	130	196	256	10.9	42	2697	4
4	ICPX 82169-B-S19-SMB*-SMB	132	201	226	8.8	47	2679	51
3	ICPX 82169-B-S5-SMB*-SMB	129	197	239	10.0	47	2678	4
27	ICPX 82372-SB-S16-SMB*-SMB	139	205	249	7.6	48	2674	2
30	ICPX 80006 F5B-SM4-SMB	129	197	250	8.9	50	2625	3
2	ICPX 82169-B-S4-SMB*-SMB	135	207	235	9.6	44	2619	0
31	ICPX 80004 F6B-SMB-SMB	131	198	235	10.1	47	2616	13
28	ICPX 82372-SB-S1-SMB*-SMB	131	199	240	8.4	49	2580	2
35	BDM 1(Check)	128	197	207	19.1	42	2574	52
21	ICPX 82372-SB-S2-SMB*-SMB	133	202	239	8.1	48	2556	0
25	ICPX 82372-SB-S11-SMB*-SMB	130	199	235	7.6	48	2547	0
8	ICPX 82181-B-S6-SMB*-SMB	129	201	238	10.2	46	2490	1
34	ICPX 80021 F6B-SM10-SMB	131	201	237	10.4	39	2458	11
13	ICPX 82181-B-S19-SMB*-SMB	129	197	233	9.5	50	2457	5
18	ICPX 82372-SB-S17-SMB*-SMB	136	205	237	8.3	50	2417	0
28	ICPX 82369-SB-S1-SMB*-SMB	137	205	222	7.6	42	2330	3
10	ICPX 82181-B-S8-SMB*-SMB	132	205	234	9.9	46	2324	4
26	ICPX 82372-SB-S14-SMB*-SMB	135	204	229	8.0	46	2316	4
19	ICPX 82369-SB-S2-SMB*-SMB	139	207	228	7.9	44	2134	2
23	ICPX 82372-SB-S6-SMB*-SMB	136	205	223	8.1	49	1978	0
	SE*	1.0	1.5	7.0	0.19	2.2	235.3	
	MEAN	131.7	199.7	234.4	9.39	46.1	2681.0	
	CV(%)	1.3	1.3	5.2	3.49	0.4	15.2	

Note: In this trial both the checks were affected by Milt.

Table 47. Performance of entries in BDW 1 BC3F7 Progenies test (88P28) grown at ICRISAT Center, Patancheru, rainy season 1988.

Entry No.	Name	Days to		Plant height (cm)	100-seed weight (g)	Plant stand (kg/ha)	Grain Yield (kg/ha)	Milt in nursery
		Flower Mature	Maturity					
6	BDW 1 BC3F2-2*-S6*-S3*-SB*-B	123	205	210	11.1	50	2688	23
4	BDW 1 BC3F2-16*-S4*-S5*-SB*-B	121	203	220	13.3	40	2613	34
5	BDW 1 BC3F2-2*-S7*-S2*-SB*-B	121	201	218	11.1	44	2399	31
3	BDW 1 BC3F2-16*-S4*-S1*-SB*-B	122	206	211	12.3	50	2390	24
1	ICPL 88048	121	200	210	12.9	40	2389	41
11	BDW 1 BC3F2-16*-S4*-S6*-SB*-B	119	204	218	12.5	43	2329	36
9	BDW 1 BC3F2-2*-S1*-S4*-SB*-B	121	203	209	11.2	43	2295	52
2	ICPL 88049	122	206	208	10.6	47	2289	23
7	BDW 1 BC3F2-16*-S5*-S1*-SB*-B	121	205	219	11.5	44	2285	62
10	BDW 1 BC3F2-S4*-S2*-SB*-B	122	205	210	11.9	46	2163	81
8	BDW 1 BC3F2-16*-S10*-S2*-SB*-B	119	201	216	11.8	43	2151	54
12	BDW 1 (Check)	120	201	210	10.3	45	2039	73
	SE±	1.0	1.2	5.5	0.15	3.0	130.2	
	MEAN	121.0	203.2	213.1	11.72	44.4	2336.4	
	CV(%)	1.6	1.2	5.2	2.59	13.5	11.1	

in three replicate RBD. Each plot consisted of 4 m long four rows. The observations were recorded on days to flower, days to maturity, plant height, 100 seed weight, plant stand and grain yield. Lines were also monitored in wilt-sick nursery for their reaction to wilt. All the test entries flowered and matured later than C 11 control. Except one line (KATPP-878) all lines had higher seed weight. Because of long-duration these lines did not perform well. The yield of best entry was 1351 kg/ha as compared to 3038 kg/ha for C 11 control. The lines also were susceptible to wilt (Table 48). Hence, no line was selected for further evaluation.

(vi) Hybrids Yield Test (88P43): Fifteen hybrids made between ms ICP 3783 and 15 wilt resistant lines were tested for yield with C 11 control in two replicate RBD. The grain yield of a few hybrids was remarkably high.

The yield of hybrids ranged between 3047 kg/ha to 4352 kg/ha with mean yield of 3597 kg/ha (Table 49). Eleven hybrids were significantly higher yielding than C 11 control. All hybrids had more seeds/pod than control cultivar C 11. The wilt incidence in these hybrids ranged between 0 to 64% as compared to 90% in control.

This test was also conducted under rainfed condition at ICRISAT Center. In this test also all hybrids yielded more than C 11 and had more no. of seeds/pod. The yield of hybrids ranged between 1332 kg to 1936 kg/ha as compared to 1332 kg/ha for C 11 control. Two hybrids (IPH 481 and IPH 488) were significantly superior than C 11 for yield (Table 50).

Table 40. Performance of Kenyan lines (88P27) grown at ICRISAT Center, Patancheru, rainy season 1988.

Entry No.	Name	Days to		Plant height (cm)	100-seed weight (g)	Plant stand (kg/ha)	Grain Yield (kg/ha)	Wilt in nursery
		Plover Mature	anthesis					
16	C 11(Check)	132	197	233	9.0	49	3030	36
2	ICP 8006	148	205	223	10.8	40	1351	74
8	Med.Sol-2	148	210	233	11.9	44	1073	69
10	60/8	143	201	238	11.2	39	831	91
3	Early.Sol.	152	208	230	11.6	43	745	89
1	823/11	151	208	235	11.1	38	734	93
5	Germpiasm.Sol.	152	215	242	10.5	40	719	85
13	KATPP-078	150	207	225	9.8	46	664	92
6	WPP-670	156	213	240	14.8	35	585	83
4	Med.Sol-1	154	213	238	12.6	39	450	90
15	KATPP-01/3/3	164	220	248	13.5	43	404	50
14	KATPP-118A	147	202	223	10.6	37	383	92
7	Kambi-Ye-Mave Sol	158	215	237	12.6	39	369	89
12	KATPP-69/6	163	220	242	14.4	38	153	51
9	KATPP-8-31/4	169	223	233	13.8	38	137	72
11	KATPP-777	197	255	230	14.5	37	119	62
	SE±	2.2	2.5	9.1	0.42	1.8	117.4	
	MEAN	155.4	213.3	231.5	12.03	40.3	734.7	
	CV(%)	2.4	2.0	6.8	6.11	7.9	27.7	

Table 49. Performance of entries in MPPHT-Irrigated(80P43)-grown at ICRISAT Center, Patancheru, rainy season 1988.

Entry No.	Name	Percentage	Days to Flower Mature	Plant height (cm)	Seeds per pod	100-seed weight (g)	Plant stand	Grain Yield (kg/ha)		Wilt in Nursery
								Irrigated	Unirrigated	
11	IPM 487	ms 3783 x ICPL 87119	140	199	245	3.5	9.8	4352	1445	42
3	IPM 479	ms 3783 x ICPL 227	132	194	247	3.5	8.9	4181	1631	20
6	IPM 482	ms 3783 x ICPL 84008	135	193	258	3.6	8.9	4013	1817	58
7	IPM 483	ms 3783 x ICPL 8356	136	196	257	3.8	8.6	3903	1614	0
4	IPM 480	ms 3783 x ICPL 8357	136	196	243	3.7	8.3	3775	1740	13
14	IPM 490	ms 3783 x ICPL 85067	140	199	258	3.6	9.4	3758	1631	59
10	IPM 486	ms 3783 x ICPL 8362	143	200	254	3.5	8.4	3677	1458	0
9	IPM 485	ms 3783 x ICPL 8363	142	198	252	3.4	8.9	3663	1713	25
8	IPM 484	ms 3783 x ICP 8863	132	193	249	3.6	8.8	3656	1767	27
15	IPM 491	ms 3783 x ICPL 85049	139	192	241	3.4	9.3	3649	1565	11
5	IPM 481	ms 3783 x ICPL 85046	134	196	242	3.7	8.2	3525	1916	33
2	IPM 478	ms 3783 x ICPL 335	142	198	261	3.5	8.6	3283	1498	25
13	IPM 489	ms 3783 x ICPL 86034	140	198	247	3.7	9.6	3278	1332	58
1	IPM 477	ms 3783 x ICPL 270	131	192	256	3.7	8.8	3186	1887	64
12	IPM 488	ms 3783 x ICPL 87121	143	201	247	3.7	9.1	3067	1829	62
16	C 11(Check)		135	195	202	3.3	9.3	2688	1332	96
			SE*	1.2	9.3	0.07	0.19	291.5	166.8	
			MEAN	137.3	196.6	247.2	3.56	3596.8	1631.5	
			CV(%)	1.5	0.8	5.3	2.74	3.06	11.5	

Date of sowing: 18-6-1988
 Date of harvesting: 9-1-1989
 No of Reps : 2, No of ents: 16
 No of Rows/plot: 4 (Hybrid was in 2 middle rows flanked by 2 check rows)
 Net Plot size: 3.6 x 0.6 x 2 = 4.32 sqm.
 No of irrigations : 2 (12-11-88 9-12-88)
 Pesticides sprayed : Date Kind

18-10-88	Shalax
18-11-88	Lannate
19-11-88	Shalax
1-12-88	Shavacron
17-12-88	Lannate

Table 50. Performance of entries in MPPHT, Unirrigated (B0P44) grown at ICRISAT Center, Patancheru, rainy season 1988.

Entry No.	Name	Percentage	Days to		Plant height (cm)	Seeds per pod	100-seed weight (g)	Plant stand	Grain Yield (kg/ha)	
			Flower Mature	Harvest						
5	IPH 481	MS 3783 X ICPL 85066	126	181	189	3.4	7.4	34	1936	
12	IPH 488	MS 3783 X ICPL 87121	130	185	197	3.5	8.5	33	1829	
6	IPH 482	MS 3783 X ICPL 84008	125	180	184	3.5	8.3	35	1817	
1	IPH 477	MS 3783 X ICPL 270	124	178	182	3.6	8.3	33	1807	
8	IPH 484	MS 3783 X ICP 8863	124	180	193	3.5	8.5	34	1767	
4	IPH 480	MS 3783 X ICPL 83057	127	180	178	3.5	8.1	33	1740	
9	IPH 485	MS 3783 X ICPL 8363	130	186	197	3.4	8.1	34	1713	
3	IPH 479	MS 3783 X ICPL 227	127	182	195	3.5	7.4	38	1631	
14	IPH 490	MS 3783 X ICPL 85067	131	186	198	3.4	8.4	34	1631	
7	IPH 483	MS 3783 X ICPL 8356	126	180	186	3.5	7.5	36	1614	
15	IPH 491	MS 3783 X ICPL 85069	133	187	193	3.5	8.3	37	1565	
2	IPH 478	MS 3783 X ICPL 335	132	183	196	3.4	7.2	35	1490	
10	IPH 486	MS 3783 X ICPL 83062	135	188	195	3.4	7.9	35	1458	
11	IPH 487	MS 3783 X ICPL 87119	131	184	185	3.5	8.4	34	1445	
13	IPH 489	MS 3783 X ICPL 86034	131	185	190	3.3	9.1	35	1332	
16	C 11 (Check)		128	184	157	3.3	8.9	32	1332	
			SE+	1.2	1.2	1.2	0.08	0.18	1.5	166.8
			MEAN	128.5	182.9	188.0	3.44	8.15	34.2	1631.5
			CV(%)	1.3	0.9	3.1	3.27	3.09	6.3	14.5

Date of sowing: 4-7-1988
 Date of harvesting: 17-1-1989
 No. of Reps : 2, No. of entries: 16
 No. of Rows/plot: 4 (Hybrid was in 2 middle rows flanked by 2 check rows)
 Net plot size : 3.6 x 0.6 x 2 = 4.32 sqm
 Pesticides sprayed : Date Kind

18-10-88	Ethelux
10-11-88	Lannate
19-11-88	Ethelux
1-12-88	Muvsoron
17-12-88	Lannate

The results of test conducted at Tamilnadu Agricultural University, Coimbatore have been summarized. IPH 489 was significantly higher yielding hybrid at Coimbatore. It yielded 757 kg as compared to 326 kg/ha for C 11 control.

On the basis of mean yield over three locations, IPH 479 produced 2120 kg, IPH 487 produced 2053 kg and IPH 482 yielded 2041 kg/ha as compared to 1422 kg/ha for C 11 control. Based on overall performance four hybrids (ICPH 487, -479, -482 and IPH 483) were considered promising. We plan to remake them in 1989 for multilocation testing.

(vii) Determinate Advanced Lines Test (88P32): In this test 11 determinate lines were tested in RBD with C 11, BDN 1 and ICPL 211 as controls. The yield of determinate lines ranged between 784 kg to 2179 kg/ha. The yield of C 11 control (indeterminate) was the highest (2210 kg/ha). BDN 1 produced 1937 kg/ha and determinate control yielded 1202 kg/ha (Table 51). None of the entries was better than C 11. One entry (No. 3205) was marginally better than BDN 1 and one line (ICPX 82134-28-DT1-B-B) was significantly higher yielding than determinate control ICPL 211.

(viii) Pigeonpea Insect Resistant Lines Yield Test (PIRYT): This test was conducted with pesticide protection and without pesticide protection. Thirteen Helicoverpa tolerant lines with C 11, BDN 1 and Helicoverpa tolerant control ICPL 332 were tested in 4x4 Triple Lattice Design. The yield of entries in protected test (88P23) ranged between 686 kg/ha to 1630 kg/ha as compared to 2903 kg for C 11, 1755 kg for ICPL 332 and 1659 kg/ha for BDN 1 controls (Table 52). The yield of many lines was affected due to severe wilt incidence and resulted in high cv (45%).

Table 51. Performance of entries in DTADLT108P32 grown at ICRISAT Center, Patancheru, rainy season 1988.

Entry No.	Name	Flower	Days to Mature	Plant height (cm)	100-seed weight (g)	Plant stand (kg/ha)	Grain Yield (kg/ha)	Wilt in nursery
13	C 11 (Check)	119	175	165	9.6	98	2210	79
5	ICPX 82134-28-DT1-B-B	107	168	130	9.3	92	2179	71
12	BDN 1 (Check)	108	163	148	10.2	94	1937	31
4	ICPX 82134-32-DT3-B-B	102	164	122	9.3	88	1897	77
2	ICPX 82143-46-DT3-B-B	101	165	128	9.6	93	1861	58
7	ICPX 78227-1-1-1-15-B	105	167	135	12.4	83	1761	9
8	ICPX 78227-1-1-3-10-B	109	170	135	11.9	81	1407	15
3	ICPX 82135-16-DT2-B-B	115	171	127	7.2	81	1367	88
11	(B-12 X ICP 6997)F2-1-1-B-B	105	168	133	11.7	66	1361	52
10	(T-15-15 X HY 3A)F2-4-1-B-B	110	169	120	12.5	65	1277	14
14	ICPL 211 (Check)	115	166	117	11.7	60	1202	60
6	ICPX 78227-1-1-1-1-B	94	161	112	9.4	63	1118	74
1	ICPX 82134-13-DT1-B-B	106	171	123	8.0	60	1080	94
9	ICPX 78227-1-1-1-1-B-B	96	162	105	10.5	55	784	61
		SE+	1.7	1.5	4.6	0.21	9.0	241.8
		MEAN	106.6	167.1	128.6	10.23	77.1	1531.4
		CV(%)	2.8	1.5	6.3	3.50	20.1	27.3

Table 51. Performance of entries in PIRYT (88P23) grown at Patancheru, rainy season 1988.

Entry No. Name	Days to Flower Mature	Plant height (cm)	100-seed weight (g)	Plant stand (kg/ha)	Grain Yield (kg/ha)	Wilt in nursery	Heliothis in damage in nursery	
15 C 11(Check)	133	195	247	9.5	41	2903	67	31.7
16 ICPL 332(Check)	119	178	270	7.0	46	1755	86	23.4
14 BDM 1 (Check)	120	184	250	9.6	39	1659	35	47.8
12 ICPX 82046-E1-E7-EB	105	177	272	8.4	43	1630	91	44.4
10 ICPX 82045-E6-E1-EB	119	180	279	9.0	24	1557	67	28.2
5 ICPX 82031-E5-E3-EB	121	180	244	7.9	42	1417	90	18.8
7 ICPX 82045-E10-E3-EB	115	178	270	8.5	42	1278	100	30.8
4 ICPX 82045-E20-E1-EB	109	178	258	9.1	44	1226	97	28.8
8 ICPX 82050-E12-E2-EB	114	179	275	9.1	39	1214	97	27.8
3 ICPX 82052-E1-E1-EB	114	176	249	9.6	41	1098	90	28.9
1 ICPX 80324-E31-E1-EB-EB	109	179	268	8.3	41	1083	38	35.8
11 ICPX 82042-E5-E1-EB	119	181	255	8.5	35	1080	98	32.2
9 ICPX 82041-E2-E4-EB	117	177	271	9.0	45	901	98	29.0
13 ICPX 82046-E2-E3-EB	110	177	257	8.7	39	849	89	33.7
2 ICPX 82042-E17-E5-EB	115	177	252	9.1	39	841	98	18.5
6 ICPX 82041-E3-E4-EB	110	174	273	9.1	41	686	96	24.0
	SE±	2.2	1.6	7.2	0.51	1.9		341.2
	MEAN	115.6	179.5	261.9	8.78	39.9		1323.5
	CV(%)	3.3	1.5	4.8	10.13	8.2		44.7

Note: In this trial the Wilt incidence was very severe.

In unsprayed test (88P30) the yield of test entries ranged between 573 kg to 1308 kg/ha as compared to 1220 kg/ha for C 11, 1088 kg for Helicoverpa tolerant control, ICPL 332 and 915 kg/ha for BDN 1 control. Borer damaged pods (%) ranged between 19 to 44% as compared to 32% in C 11, 23% in ICPL 332 and 48% in BDN 1 (Table 53).

On the basis of yield and Helicoverpa reaction, ICPX 820042-B17-E5-EB was selected for multilocation testing (MPAY) and another line (ICPX 82051-E5-E3-EB0) for PIRYT in 1989.

(ix) Pigeonpea Insect Resistant Lines Yield Observation Nursery (PIRYN-88P31): In this nursery 46 progenies (F5 generation) selected from 14 crosses were evaluated in 7x7 Simple Lattice Design with two replications. C 11, BDN 1 and Helicoverpa tolerant line were included as controls in the nursery. All the progenies were evaluated for borer damage. Only twentytwo progenies were found promising and harvested. These progenies with three controls were statistically analyzed in RBD for days to flower, 100 seed weight, plant stand, yield and % borer damage. C 11 control was later maturing (about 10 days) than most entries and therefore escaped Helicoverpa damage (21%). The yield of test entries ranged between 789 kg to 1709 kg/ha as compared to 2129 kg for C 11, 1481 for ICPL 332 and 891 kg/ha for BDN 1 controls (Table 54). The yield of C 11 was highest as it escaped Helicoverpa damage. The incidence of borer damage (% borer damaged pods) ranged between 17 to 42% as compared to 18% for ICPL 332 and 51% for BDN 1.

Table 53. Performance of entries in PIRYT (Unsprayed) (00P30) grown at ICRISAT Center, Patancheru, rainy season 1988.

Entry	Days to flower	100-seed weight (g)	Plant stand	Grain Yield (kg/ha)	Heliothis in nursery
2 ICPX 020042-E17-E5-EB	123	9.9	29	1308	18.5
15 C-11 (Check)	132	11.2	31	1220	31.7
16 ICPX 332 (Check)	123	7.4	32	1088	23.4
7 ICPX 020045-E10-E3-EB	118	9.5	23	1081	30.8
9 ICPX 020041-E2-E4-EB	120	9.6	25	996	29.0
5 ICPX 020051-E5-E3-EB	123	9.2	25	964	18.8
3 ICPX 020052-E1-E1-EB	120	10.3	23	963	28.9
12 ICPX 020046-E1-E7-EB	113	8.9	25	933	44.4
14 BDM-1 (Check)	119	11.3	29	915	47.8
1 ICPX 000324-E31-E1-EB-EB-EB	119	9.3	16	789	35.8
13 ICPX 020046-E2-E3-EB	119	10.1	25	779	33.7
4 ICPX 020045-E20-E1-EB	113	9.2	23	774	28.8
11 ICPX 020042-E5-E1-EB	123	9.0	20	773	32.2
6 ICPX 020041-E3-E4-EB	122	10.1	23	749	24.0
10 ICPX 020045-E6-E1-EB	120	10.2	9	714	28.2
8 ICPX 020050-E12-E2-EB	118	9.0	11	573	27.8

	1.1	0.32	2.4	200.2	
SE±	120.4	9.65	23.0	913.6	
MEAN	1.6	5.66	18.1	37.9	
CV(%)	-----				

Table 54. Performance of entries in PIRYM (Unsprayed) (88P31) grown at ICRISAT Center, Patancheru, rainy season 1988.

Entry	Days to flower	100-seed weight (g)	Plant stand	Grain Yield (kg/ha)	Heliethis in Nursery
24 C-11(Check)	130	11	40	2129	21.4
18 ICPX 830122-E18-E1-EB	114	10	29	1709	28.3
9 ICPX 830102-E30-E4-EB	125	10	37	1704	30.4
2 ICPX 830122-E45-E3-EB	123	9	34	1585	24.3
20 ICPX 830122-E18-E3-EB	122	11	34	1555	17.4
10 ICPX 830102-E33-E1-EB	118	11	35	1537	18.6
25 ICPX 332(Check)	128	7	36	1481	18.5
22 ICPX 830122-E21-E1-EB	125	9	35	1438	22.1
7 ICPX 830101-E14-E1-EB	113	9	33	1318	31.0
16 ICPX 830122-E14-E4-EB	109	10	29	1314	24.7
14 ICPX 830108-E17-E2-EB	118	11	26	1267	29.7
11 ICPX 830105-E6-E5-EB	109	9	23	1266	24.9
21 ICPX 830122-E18-E4-EB	122	11	28	1261	27.0
12 ICPX 830107-E8-E4-EB	126	10	29	1222	31.5
17 ICPX 830122-E17-E3-EB	117	11	30	1214	28.1
19 ICPX 830122-E18-E2-EB	113	10	29	1166	28.7
8 ICPX 830102-E30-E2-EB	112	10	34	1133	39.2
4 ICPX 830094-E2-E1-EB	115	9	32	1039	28.4
13 ICPX 830108-E11-E3-EM	114	11	32	1016	32.3
3 ICPX 830094-E1-E5-EB	125	10	21	940	29.2
5 ICPX 830099-E3-E3-EB	109	9	31	921	30.4
23 BDM-1(Check)	120	10	31	891	51.4
15 ICPX 830108-E18-E6-EB	123	10	34	878	44.2
1 ICPX 830107-E30-E1-EB	122	8	27	790	35.2
6 ICPX 830099-E3-E5-EB	110	9	34	789	26.3
SE+	1.5	0.3	3.0	210.5	
MEAN	118.3	9.7	31.0	1262.3	
CV(%)	1.8	3.8	13.5	23.6	

On the basis of grain yield and Helicoverpa tolerance, eight progenies (entry nos. 3134, 3116, 3103, 3136, 3117, 3138, 3132 and 3119) were found promising. Selected progenies will be tested in PIRYT during 1989.

H. COOPERATIVE YIELD TRIALS

1987

1. Medium-duration Pigeonpea Adaptation Yield Trial (MPAY): In this trial 13 best entries from 1986 station trials were yield tested with three controls (C 11, ICPL 270 and BDN 1). The trial was also sent to eight cooperators in India but the data were received from Gulbarga, Keonjhar and Anand locations only. Many locations indicated failure of the trial due to heavy Helicoverpa incidence.

At ICRISAT Center, the observations were recorded on days to flower, maturity, plant height, 100 seed-weight, plant stand, yield, wilt and SM incidence. The yield of the test entries ranged between 403 kg/ha to 2307 kg/ha as compared to 1428 kg/ha for C 11 and 329 kg/ha for BDN 1 control. The heavy incidence of Helicoverpa could not be controlled even after several pesticide sprays and caused greater variation in yield. However, ICPL 85063 was the highest yielding line in the test followed by ICPL 87088, ICPL 87089 and ICPL 87119 (Table 55). ICPL 87088 and ICPL 87089 showed susceptibility to wilt.

At Gulbarga ICPL 87120 was the highest yielding line whereas at Keonjhar (Orissa State), ICPL 87119 was the best followed by ICPL 87123. At Anand another line ICPL 87123 was the highest yielding line followed by ICPL 85063 (Table 55).

Table 55. Mean performance of MPAY entries during 1987.

Entry	At ICRISAT				Locations (yield kg/ha)				Overall	
	DF	DM	PH	SW	ICRISAT (1)	Gulbarga (2)	Keonjhar (3)	Anand (4)	mean	Mean of 2nd loc
ICPL 07120	134	210	217	13.3	764(13)	2066(1)	1076(6)	735(16)	1160	2066
ICPL 07088	118	170	216	8.9	1950(2)	1980(2)	772(12)	1538(3)	1560	1980
ICPL 07089	120	174	229	9.6	1732(3)	1966(3)	893(10)	1470(4)	1515	1966
ICPL 05063	118	195	212	12.8	2307(1)	1341(4)	1085(5)	1623(2)	1739	1941
ICPL 07119	126	210	227	12.2	1531(4)	1917(5)	1504(1)	1107(12)	1515	1917
ICPL 05070	127	210	223	13.8	1139(9)	1761(7)	1246(3)	1292(9)	1360	1761
ICPL 07090	124	210	230	13.9	967(11)	1695(8)	1225(4)	1080(13)	1242	1695
ICPL 07122	132	210	236	10.6	1445(7)	1509(10)	719(13)	1269(10)	1256	1589
MPL 40	119	195	198	10.3	623(14)	1553(11)	412(15)	1413(8)	1000	1553
ICPL 04008	118	195	201	10.6	832(12)	1529(12)	791(11)	1460(5)	1153	1529
ICPL 07123	119	195	209	10.3	1478(5)	1525(13)	1395(2)	1825(1)	1556	1525
ICPL 05061	121	206	204	10.5	1447(6)	1414(15)	1008(8)	1207(11)	1269	1414
ICPL 07121	127	210	195	10.7	403(15)	1390(16)	586(14)	1046(15)	856	1390
<u>Controls</u>										
C 11	120	210	225	10.9	1428(8)	1910(6)	1054(7)	1448(6)	1460	1910
ICPL 270	118	195	191	12.1	980(10)	1504(14)	936(9)	1442(7)	1216	1504
BDW 1	115	195	196	11.7	329(16)	1640(9)	412(16)	1047(14)	857	1640
SE ±	0.3	1.0	7.2	0.12	279.7	115.3	274.1	204.2		
Mean	122.2	199.4	212.4	11.37	1209.6	1711.3	944.7	1312.6		
CV(%)	0.5	1.0	6.8	2.05	46.2	11.7	50.2	31.1		

DF=Days to 50% flower, DM=Days to 75% maturity, PH=Plant height (cm) and SW=100 seed weight (g)

On the basis of mean performance over four locations, ICPL 85063, ICPL 87088, ICPL 87123 were found promising. However, based on yield, wilt and SM resistance, ICPL 85063 (SM resistant) and ICPL 87119 (wilt and SM resistant) were identified for ACT-2 testing.

2. Arhar Regional Trial (ART): ART was conducted in cooperation with Regional Research Station, Lam (Guntur), Agricultural Research Station, Badnapur (Maharashtra State) and Agricultural Research Station, Gulbarga, Karnataka. The trial included seven entries from ICRISAT, two each from our cooperators in Maharashtra and Andhra Pradesh and three control varieties. This trial was conducted at six Vertisol (Patancheru, Jalna, Dharwad, Madhira, Nandyal and Gulbarga) and four Alfisol (ICRISAT, Anantapur, Palem and Warangal) locations.

At ICRISAT Center in Vertisol field the trial was severely attacked by Helicoverpa. The % cv for yield was 63%, therefore no reliable conclusion can be made. However, a Helicoverpa tolerant line ICPL 84060 was the highest yield entry producing 713 kg/ha as compared to 648 kg/ha for BDN 1, 560 kg/ha for Hy 4, and 67 kg/ha for C 11 controls.

On the basis of mean performance over six locations ICPL 95 was the highest yielding line followed by ICPL 84060 (Table 56). The coefficient of variation (%) was high at Patancheru and Madhira. Even after deleting these two locations ICPL 95 was the highest yielding entry. It yielded 1106 kg/ha as compared to 910 kg/ha for Hy 4, 822 kg/ha for BDN 1 and 760 kg/ha for C 11 controls.

Table 56: Mean performance of ART entries in Vertisol locations during 1987.

Entry	At ICRISAT				Locations (yield kg/ha)						Overall mean	Mean of locs. 2,3,5,6
	DF	DM	PH	SV	ICRISAT (1)	Jalna (2)	Dharwad (3)	Madhira (4)	Nandyal (5)	Gulbarga (6)		
ICPL 95	111	163	162	9.3	701	1040	732	476	1081	1563	933	1106
MTB 19	113	195	169	9.5	433	992	628	587	852	1910	900	1090
HY 14	106	155	164	10.8	708	1020	732	135	1151	1401	858	1076
ICPL 270	119	195	158	11.5	246	853	833	297	859	1685	796	1058
BDW 12	111	188	172	10.4	568	754	774	455	722	1924	866	1044
ICPL 332	123	195	199	7.8	441	901	572	719	415	2108	859	929
ICPL 84060	118	195	176	8.9	713	940	757	948	204	2007	928	977
NRG 53	126	195	195	11.0	109	774	701	849	278	2007	786	940
ICP 8863	115	195	180	10.4	569	706	774	113	426	1702	715	907
ICPL 86033	131	195	199	10.8	35	552	712	410	56	1732	583	761
ICPL 85066	127	195	192	10.4	99	476	698	375	37	1539	537	688
Controls												
HY 4	99	152	178	11.1	560	1032	857	107	407	1342	718	910
BDW 1	111	188	165	11.2	648	833	617	191	252	1584	688	822
C 11	129	195	186	10.7	67	563	534	566	102	1841	612	760
SE ±	1.0	2.6	4.0	0.25	152.9	115.0	38.4	115.0	25.8	86.8		
Mean	117.0	185.8	178.2	10.26	421.2	816.9	709.2	444.8	488.6	1738.9		
CV(%)	1.5	2.4	3.9	4.28	62.9	14.0	9.4	44.8	9.1	8.6		

DF=Days to 50% flower, DM=Days to 75% maturity, PH=Plant height (cm), SV=100 seed weight (g).

From Alfisol locations data from ICRISAT Center, Anantapur, Palam and Warangal were received and are reported in Table 57. At ICRISAT Center, ICPL 84060 recorded the highest yield (1875 kg/ha) as compared to 954 kg/ha for BDN 1, the highest yielding control in the trial. MTB 19 at Anantapur, MRG 53 at Palam, ICPL 332 at Warangal had highest grain yield. Based on overall mean performance ICPL 332 was the highest yielding entry producing 1282 kg/ha grain yield followed by ICPL 84060 (1205 kg/ha). The yield of BDN 1, C 11 and Hy 4 controls was 852, 662 and 572 kg/ha respectively.

3. Medium-duration Pigeonpea Unselected Bulk Populations Trial (MPUB):

The populations were advanced by SPD method to retain a sample of the complete range of variability in each cross with the purpose to help the breeder to select the desirable SM resistant genotypes best suited to his environment.

This year MPUB trial was sent to nine cooperators but data were received from three locations. Ten populations advanced through Single Pod Descent (SPD) method in F5 generation of crosses made for sterility mosaic resistance constituted this test. At Akola, ICPX 82194-B-B-B was the highest yielding population producing 920 kg/ha grain yield as compared to 900 kg/ha for C 11 and 738 kg/ha for BDN 1 control (Table 58). Another population, ICPX 82169-B-B-B was most suited at Kanke (Ranchi) whereas ICPX 82186-B-B-B was found suitable at Sehore (M.P.)

Breeders at these locations should grow promising populations to select locally adapted genotypes.

4. ACT 2:

Table 57 : Mean performance of ART entries in Alfisol locations during 1987.

Entry	At ICRISAT				Locations (yield kg/ha)				Overall mean	Mean of 2nd loc
	DF	DM	PH	SV	ICRISAT (1)	Anantapur (2)	Palem (3)	Warangal (4)		
MTH 19	94	192	218	10.5	1189	1353	812	590	986	1353
ICPL 85066	128	192	222	10.6	578	1286	618	126	652	1286
ICPL 332	125	192	230	8.1	1682	1179	842	1425	1282	1179
HY 14	83	175	194	11.5	1128	1176	414	424	786	1176
ICPL 270	128	192	211	12.2	751	1145	618	249	691	1145
MRG 53	128	192	241	9.9	1407	1117	1060	864	1112	1117
ICPL 84060	121	192	211	9.1	1875	1116	799	1028	1205	1116
ICPL 86033	133	192	249	11.1	516	1097	945	307	716	1097
ICPL 95	85	175	182	9.4	1096	1088	397	743	831	1088
ICP 8863	127	192	230	10.9	804	933	558	628	731	933
BDN 12	124	192	215	11.6	1076	867	983	533	865	867
Controls										
BDN 1	93	192	200	11.9	954	1534	471	447	852	1534
C 11	130	192	219	10.9	318	1039	838	452	662	1039
HY 4	84	175	215	11.9	782	942	414	150	572	942
SE †	1.0	0.0	7.0	0.21	253.7	122.5	165.3	90.5		
Mean	113.1	188.4	216.9	10.68	1011.2	1133.7	697.8	569.0		
CV(%)	1.5	0.0	5.6	3.42	43.5	18.7	41.0	27.6		

DF=Days to 50% flower, DM=Days to 75% maturity, PH=Plant height (cm) and SV=100 seed weight (g).

Table 56. Mean performance of NPUB entries during 1987.

Entry	At Akola				Location (Yield Kg/ha)				Overall Mean
	DF	DM	PH	SW	Akola (1)	Kanke (2)	Sohore (3)		
ICPX 02186-B-B-B	125	100	145	10.4	833(5)	690(4)	1732(2)	1085	
ICPX 02184-B-B-B	120	177	151	10.7	857(4)	690(3)	1534(5)	1027	
ICPX 02170-B-B-B	130	164	153	10.4	894(3)	768(2)	1407(7)	1023	
ICPX 02169-B-B-B	132	190	147	10.2	793(6)	885(1)	1279(10)	986	
ICPX 02194-B-B-B	123	178	159	10.4	920(1)	391(11)	1560(3)	957	
ICPX 02181-B-B-B	127	189	151	10.3	741(8)	601(6)	1492(6)	945	
ICPX 02182-B-B-B	132	188	149	10.6	400(12)	487(7)	1534(4)	834	
ICPX 02190-B-B-B	121	180	161	10.4	729(10)	378(12)	1342(8)	816	
ICPX 02183-B-B-B	124	185	149	11.5	614(11)	469(8)	1334(9)	806	
ICPX 02195-B-B-B	122	179	156	10.8	781(7)	430(9)	1105(11)	772	
Controls									
DDM 1	110	178	142	10.1	738(9)	404(10)	1740(1)	961	
C 11	129	185	150	11.0	900(2)	602(5)	962(12)	821	
SE+	2.7	0.7	4.5	0.37	52.9	14.0	114.9		
MEAN	125.1	102.6	150.9	10.55	773.2	566.1	1410.4		
CV(%)	1.0	0.7	6.0	6.96	13.7	15.5	16.2		

A total of 24 entries with C 11 control were sown in four replicate RBD. In this trial two ICRISAT entries (ICPL 8357 and ICPL 85066) were also included. The trial was severely attacked by Helicoverpa. Even after several pesticide sprays, Helicoverpa damage could not be controlled. The coefficient of variation for grain yield was very high (56%), therefore no logical conclusion can be drawn. The observations recorded for days to flower, maturity, plant height, 100 seed weight and grain yield are reported in Table 59.

1988 Trials:

1. Medium-duration Pigeonpea Adaptation Yield Trial (MPAY): Ten best entries from 1987-88 tests conducted at ICRISAT Center, Patancheru were yield tested with two controls (C 11 and BDN 1). The trial included three Helicoverpa tolerant lines, two wilt and SM resistant lines, three wilt resistant and two SM resistant lines. In addition, the trial was sent to nine cooperators in India. The results were obtained from seven locations (Keonjhar, Badnapur, Anand, Coimbatore, Ranchi, Vadodara and Bansvara). Failure of trial was reported from Lam (Guntur) and Sehore locations.

At ICRISAT Center the observations on days to flower, maturity, plant height, 100 seed-weight, plant stand and grain yield were recorded. Wilt and Helicoverpa screening was done in respective nurseries. The data on above observations are reported in Table 60. The yield of test entries ranged between 1722 kg to 3180 kg/ha as compared to 2662 kg for C 11 and 1908 kg/ha for BDN 1 controls. ICPL 88046 was the highest yielding entry (3180 kg/ha) followed by ICPL 88047 (2828 kg/ha). Five lines had less than 5% wilt and two had about 20% wilt incidence. Three Helicoverpa tolerant

Table 59. Performance of entries in ACT 2 (87P31) grown at ICRISAT Center, Patancheru, rainy season 1987.

Entry No.	Name	Days to		Plant height (cm)	100-seed weight (g)	Plant stand	Grain Yield (kg/ha)	
		Flower	Mature					
9	MTH 12	119	193	188	8.6	70	1160	
20	BWR 370	117	194	172	10.3	73	929	
21	AKT 6	117	193	167	10.9	74	918	
13	SPMA 53	125	195	201	11.1	70	899	
19	ICPL 8357	125	195	182	10.9	74	769	
12	PT 20	113	191	173	10.8	69	755	
5	SPMA 2	124	195	165	10.0	73	750	
11	BDN 20	119	195	162	10.7	70	731	
3	PUSA 5	131	195	191	8.7	75	685	
6	SPMA 3	125	195	167	9.9	70	676	
24	C 11 (Check)	125	195	186	10.3	70	674	
17	CORG 14	132	195	209	8.8	71	654	
8	MTH 9	120	194	182	10.3	72	563	
10	BDN 13	117	191	167	11.4	73	562	
4	SPMA 1	119	193	155	11.0	75	530	
18	ICPL 85066	126	195	192	10.3	72	513	
23	VR 3	130	195	194	8.5	74	501	
7	SPMA 4	125	195	166	9.9	73	443	
26	CORG 12	125	200	209	10.0	70	422	
14	SA 1	135	195	216	9.0	72	383	
15	CORG 11	138	217	208	8.7	71	252	
2	PUSA 4	141	224	197	10.0	70	217	
1	PUSA 3	144	224	204	9.4	68	213	
22	VR 2	139	224	204	9.0	71	190	
		SE+	0.9	2.4	4.5	0.14	2.5	166.6
		MEAN	126.2	199.0	184.7	9.98	71.6	599.5
		CV(%)	1	2	5	3	7	56

Note : This trial was severely damaged by Heliothis.

Table 60. Mean performance of MPAY entries during 1988 rainy season.

S.No.	Entry	At ICRISAT Centre												Overall Mean	Mean of locations 1, 2 and 6
		DF	DM	PHT	SW	ICRISAT (1)	Keonjhar (2)	Bednapur (3)	Anand (4)	Coimbatore (5)	Vadodra (6)	Overall Mean			
1	ICPL 88047	128	189	231	8.5	2828	2939	951	1570	511	2139	1823	11	2635	
2	C-11 (Check)	134	196	230	9.1	2662	2967	1066	1422	510	2149	1796	III	2593	
3	ICPL 88046	134	198	236	9.5	3180	2916	878	2033	771	1649	1985	I	2502	
4	ICPL 88045	139	205	234	8.9	2425	2893	757	1599	896	1795	1728		2371	
5	ICPL 88044	138	206	228	8.1	2377	2967	833	1218	719	1750	1644		2365	
6	ICPL 88043	138	204	236	8.7	2063	2692	1038	1626	729	2271	1737		2342	
7	ICPL 87088	128	189	239	7.6	1980	3004	979	1649	423	1990	1671		2328	
8	ICPL 88041	127	185	230	8.5	2513	2600	1170	1829	820	1524	1742		2213	
9	ICPL 88049	127	197	235	10.8	2281	2190	747	1370	410	2146	1516		2206	
10	ICPL 88048	126	196	225	11.9	2231	2446	854	1511	427	1726	1533		2135	
11	BDW 1 (Check)	127	194	218	9.6	1908	2316	1004	1524	378	1969	1517		2064	
12	ICPL 88042	113	185	238	6.9	1722	2158	667	1091	309	1431	1229		1770	
	SE±	0.8	1.9	7.5	0.19	195.0	358.7	126.8	213.8	91.7	210.6				
	MEAN	129.8	195.1	231.6	9.01	2347.7	2674.0	912.0	1532.5	575.2	1870.5				
	(CV%)	1.3	2.0	6.5	4.14	16.6	20.1	27.8	27.9	31.9	15.3				

DF : Days to 50% Flowering, DM = Days to 75% maturity, PHT = Plant height in cms, SW = g/100 seeds.

lines showed upto 27% pod borer damage as compared to 46% both in C 11 and BDN 1 controls.

At Keonjhar ICPL 87088, a Helicoverpa tolerant line, was the highest yielding entry (3004 kg/ha). ICPL 88041 gave highest yield of 1170 kg/ha at Badnapur whereas ICPL 88046 was best entry at Anand. It yielded 2033 kg/ha as compared to 1422 kg/ha for C 11 control. Moisture stress caused low yield at Coimbatore location, however, ICPL 88046 was again the best entry at Coimbatore producing 771 kg/ha as compared to 510 kg/ha for C 11 control. ICPL 88043 at Vadodara, ICPL 88042 at Bansvara and ICPL 88045 at Ranchi were highest yielding entries in the trial.

On the basis of mean yield and disease resistance, ICPL 88046 and ICPL 88047 were identified for ACT 2 testing.

2. ACT 2: In this trial 17 entries were tested with C 11 control in four replicate RBD. Four out of five top yielding entries were from ICRISAT. ICPL 87119 was the highest yielding line followed by ICPL 85066. Both lines were significantly higher yielding than C 11 control. ICPL 87119 produced 1750 kg/ha and ICPL 85066 yielded 1738 kg/ha as compared to 1419 kg/ha for C 11 control (Table 61).

During 1988-89 in southern zone of All India Coordinated Pulses Improvement Project trials first three ranks were occupied by the entries (ICPL 87119, ICPL 85066 and ICPL 85063) contributed by ICRISAT.

I. MISCELLANEOUS

(i) Seed Multiplication and Maintenance: Five lines/varieties (ICPL 84060,

Table 61. Performance of entries in ACT 2 (88P29) grown at ICRISAT Center, rainy season 1988.

Entry	Days to Flower Mature	Plant height (cm)	100-seed weight (g)	Plant stand	Grain Yield (kg/ha)	
17 ICPL 87119	123	178	9.8	64	1750	
1 ICPL 85066	121	176	8.9	74	1738	
9 AKT 6	111	174	10.0	72	1587	
7 ICPL 8357	118	175	9.5	72	1495	
18 ICPL 85063	117	172	10.7	72	1426	
6 C 11(Check)	116	173	8.9	70	1419	
2 BDM 20	113	170	9.7	74	1381	
13 BMR 369	119	182	10.3	72	1363	
14 BMR 251	115	172	10.2	69	1262	
16 2377	125	179	8.6	72	1352	
10 BMR 175	108	171	9.7	71	1216	
12 MRG 66	117	169	7.1	74	1150	
3 PUSA 5	127	179	6.7	71	1697	
15 PT 20	115	175	10.7	71	1082	
8 PDA 86-1	133	187	8.0	78	1068	
4 CORG 14	129	181	7.3	71	1034	
5 CORG 12	122	179	7.6	74	976	
11 BMR 253	113	178	11.7	71	935	
SE+	1.1	1.6	6.2	0.19	1.7	90.1
MEAN	118.9	176.2	109.0	9.19	71.6	1301.7
CV(%)	1.8	1.8	6.5	4.04	4.8	13.8

-270, ICP-8863, C11 and BDN 1) in 1987-88 and nine lines (ICPL 227, -270, -8357, -85063, -85066, -87119, 87088, -87089 and ICP 8863) were grown in isolation blocks to produce pure seed to cater to the needs of different cooperators. Roguing at appropriate stages of crop growth was done to avoid impurity.

(ii) Temperature and Rainfall: Tables 62 and 63 give the minimum and maximum temperatures and rainfall patterns for both the years i.e. 1987-88 and 1988-89.

(iii) New ICRISAT Pigeonpea Lines (ICPL): Nine advanced lines found superior in 1987-88 tests at Patancheru were given ICPL numbers (Table 64). These lines were tested in 1988 MPAY trial and 14 newly numbered lines (ICPL 89042 to ICPL 89055) will be tested in multilocation MPAY trial in 1989 (Table 65).

J. SEED SUPPLY TO COOPERATORS

A large number of requests were received from the cooperators. The details will appear in the progress of project P-101(85)IC.

Table 62. Average climatic data for the year 1987-88

MONTH	RAIN mm	EVAP mm	THAX C	THIN C	RH07 %	RH14 %	WIND kphr	SUNSHINE hr	SOLRAD MJ/m ² /D
1987									
June	142.7	299.4	35.5	24.5	78.7	41.6	17.3	7.7	20.5
July	143.9	175.0	30.5	23.1	97.1	61.9	15.7	4.3	15.3
Aug	98.0	144.1	29.6	22.6	90.3	67.5	10.9	6.3	14.8
Sep	62.1	161.1	31.9	22.5	90.5	53.3	6.7	7.1	16.3
Oct	149.1	142.5	30.3	20.2	93.8	51.4	6.5	7.8	16.8
Nov	240.0	109.4	27.5	18.0	92.8	56.6	7.1	4.1	13.6
Dec	0.0	118.1	26.9	14.2	91.5	45.0	6.0	8.5	15.1
1988									
Jan	0.0	142.6	28.4	14.1	93.3	36.9	6.5	9.7	17.5
Feb	4.0	177.5	32.0	17.4	87.4	31.0	8.4	9.8	17.5
Mar	0.0	261.5	35.0	20.0	70.2	25.1	8.5	9.7	16.9
Apr	99.5	263.6	36.2	22.2	71.6	26.4	9.3	9.0	20.9
May	15.6	389.5	40.1	26.4	54.6	21.1	11.8	9.6	23.2
Total	955.7								

Please note that rainfall and evaporation data are totals, not means.

Table 63. Average climatic data for the year 1988-89

MONTH	RAIN mm	EVAP mm	TMAX C	TMIN C	PH07 %	PH14 %	WIND kphr	SUNSHINE hr	SOLRAC MJ m ² /D
1988									
June	122.1	283.3	34.7	24.4	77.5	48.8	17.4	6.9	19.5
Jul	255.7	139.1	29.4	23.0	91.0	47.6	14.0	3.3	13.9
Aug	273.1	113.7	28.8	22.6	93.8	44.4	9.6	3.4	14.1
Sep	247.0	106.4	29.4	22.2	94.5	43.2	7.0	5.1	15.3
Oct	2.3	158.4	30.4	19.1	88.7	41.2	5.4	9.2	19.5
Nov	0.0	162.2	29.0	14.2	85.7	31.9	6.2	10.3	17.6
Dec	6.7	133.5	27.2	17.4	80.2	27.4	4.1	8.9	15.3
1989									
Jan	0.0	156.2	28.7	14.0	92.1	31.2	6.7	9.8	17.2
Feb	0.0	194.2	32.2	13.8	67.8	28.4	6.5	10.7	20.3
Mar	75.7	226.7	33.0	18.9	75.2	26.9	8.5	9.2	20.3
Apr	5.9	305.7	38.0	22.2	55.2	20.9	8.1	10.3	23.2
May	30.7	391.1	40.3	25.4	53.8	19.6	12.6	10.0	23.4
Total 1988-89									

Please note that rainfall and evaporation data are totals, not means.

Table 65. Characteristics of promising lines IFL numbers identified during 1958-59 season at ICRISAT Center, Patancheru.

Source 1988 K No. B.No.	ICPL Pedigree (ICPX)	Parentage	Days to flower mature	Days to seed	100 Seed wt (g)	Yield (kg/ha)	Wilt Borer Damage	Remarks			
									Line	Check	
2417	09042 020195-B-59-SWB*-SWB	ICPL 228 X ICP 11157	130	197	11.3	3199	3051	2574	3	-	Wilt and SM resistant
2429	09043 00004-B-B-SW2-SWB	ICPL-6-1641-SWB* X ICP2376	131	190	9.1	3152	3051	2574	40	-	.
2401	09044 020169-B-51-SWB*-SWB	ICPL 131 X ICP 335	131	205	9.4	3124	3051	2574	3	-	.
2422	09045 020372-SB-53-SWB*-SWB	ICP 11164 X ICPL 131	133	199	8.7	3049	3051	2574	7	-	.
2424	09046 020372-SB-57-SWB*-SWB	ICP 11164 X ICPL 131	130	190	8.4	3046	3051	2574	0	-	.
2406	09047 020181-B-52-SWB*-SWB	ICPL 270 X ICP 335	128	197	9.9	2952	3051	2574	0	-	.
2620	09051 020179F4B-56-SB	LRG 36 X ICP 11157	136	190	11.0	3242	2664	1377	7	-	.
2604	09052 010192F4B-55-SB	LRG 30 X ICP 6997	132	197	9.9	3150	2664	1377	22	-	.
2507	09048 010203F4B-W6-WB	C 11 X ICP 8863	132	190	8.7	2900	2411	2210	2	-	Wilt resistant
2511	09049 010203F4B-W19-WB	C 11 X ICP 8863	131	197	8.5	2772	2411	2210	2	-	.
2512	09050 010203F4B-W18-WB	C 11 X ICP 8863	132	197	9.0	2737	2411	2210	7	-	.
2806	09053 BDM1 BC3F2-21-S6*- S3*-SB*-B	BDM1 X 730054 P5 Line	123	205	11.1	2688	-	2039	23	-	SM resistant
2304	09050 BDM1 BC3F2-21-S6*- S3*-SB*-B	BDM 1 X 730054 P5 Line	121	200	13.3	2612	-	2019	34	-	.
3002	09055 ICPX020042-E17-S5-EB	PPE-45-2-B* X ICP3009-E1-EB	123	-	9.9	1300	1000	915	-	10.5	Bollicoverpa tolerant

C-11 BDM-1