Pulse Pathology
Progress Report-30

Pulse Pathology (Pigeonpea) Report of Work

(June 1982-May 1983)

ICRISAT

International Crops Research Institute for the Semi-Arid Tropics
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PULSE PATHOLOGY SUB-PROGRAM (PIGEONPEA)

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PULSE PATHOLOGY SUB-PROGRAM (PIGEONPEA)

LIST OF APPROVED PROJECTS
(1981-83)

SUB-PROGRAM LEADER : Y.L. NENE
(On sabbatic leave from
April 1982 to March 1983)

ACTING SUB-PROGRAM LEADER : S.P.S. BENIWAL
(April 1982 to March 1983)

No.	Title	Project Scientist	Cooperators
PP-PATH-7	Studies on pigeonpea wilt and Phytophthora blight	J. Kannaiyan	M. Natarajan
PP-Path-2	Studies on sterility mosaic of pigeonpea	S.P.S. Beniwal	L.J. Reddy D. Sharma S. Sithanantham M. Natarajan R. Jambunathan
PP-Path-5	Development of techniques to screen for resistance to potentially serious diseases of pigeonpea	J. Kannaiyan S.P.S. Beniwal	-
PP-Path-6	Identification of multiple disease resistance in pigeonpea	Y.L. Nene	J. Kannaiyan S.P.S. Beniwal

CONTENTS

PROJECT: PP-PATH-7(81): STUDIES ON PIGEONPEA WILT AND PHYTOPHTHORA BLIGHT

PROJECT: PP-PATH-2(81): STUDIES ON STERILITY MOSAIC OF PIGEONPEA

PROJECT: PP-PATH-5(81): DEVELOPMENT OF TECHNIQUES TO SCREEN FOR RESISTANCE TO POTENTIALLY SERIOUS DISEASES OF PIGEONPEA

PROJECT: PP-PATH-6(81): IDENTIFICATION OF MULTIPLE DISEASE RESISTANCE IN PIGEONPEA

PROJECT: PP-PATH-7(81): STUDIES ON PIGEONPEA WILT AND PHYTOPHTHORA BLIGHT

I. SUMMARY

1. A large amount of breeding material, including F_4 single plant progeny bulks, F_4 bulks, F_5 to F_{10} advanced progenies, early maturity selections from Hissar, entries of Medium-maturity Pigeonpea Wilt Resistant lines Yield Test (MPWRY) and Late-maturity Pigeonpea Adaptation Yield Test (LPAY), inbreds and converted male sterile lines, were screened in the wilt sick plot. Promising materials were advanced for further testing.

2. We also initiated wilt screening to study the inheritance of wilt resistance in four crosses in the sick plot and in two crosses in the sick pots in greenhouse.

3. Additional 693 new germplasm accessions were screened against wilt. Of these, 92 accessions showed 20% or less wilt. Another set of 468 germplasm selections from 1981K was screened for the second year in the Alfisol sick plot. Of these, only seven: ICP-4784, -6654, -7806, -11308, -11324, -11368, -11405 showed 10% or less wilt. Of the 31 advanced germplasm selections tested for the third year, 21 showed 10% or less wilt.

4. Of the 77 sterility mosaic resistant lines screened in the sick plot, only six showed 20% or less wilt. Another set of 52 sterility mosaic resistant lines was screened for wilt and seven lines were found to show 10% or less wilt.

5. Of the 28 entomologically promising lines screened, only PI-397668 showed no wilt. The remaining lines were found susceptibile to wilt. In another test, 19 entomologically promising lines were screened for wilt for the second time and only three were found to show 10% or less wilt.

6. Thirty-six entries from Extra-early Arhar Coordinated Trial (EXACT), Early Arhar Coordinated Trial (EACT) and Arhar Coordinated Trial-1 (ACT-1) were screened for wilt reaction. Of these, 18 showed 20% or less wilt.

7. Thirty entries (24 from ICRISAT) were screened at 11 locations (2 at ICRISAT Center) through the ICAR-ICRISAT Uniform Trial for Pigeonpea Wilt Resistance (IIUTPWR) in cooperation with the All India Coordinated Pulses Improvement Program. Of these 11 locations, at two places, viz., Baroda and Palem all the test entries showed above 20% wilt. Of the 30 entries tested, only ICP-8863 and ICP-9168 did well across 9 locations (20% or less wilt).

8. Twenty-eight ICRISAT wilt resistant lines were screened in a wilt sick plot at Katumani, Kenya. Of these, seven lines; ICP-9142, -9145, -9177, -10957, -11291, -11297 and MAU-E-175 selection were free from wilt.

9. Of the 31 lines screened in a wilt sick plot at Bvumbwe, Malawi 24 showed 20% or less wilt. Ten lines were free from wilt. ICP-9145 was free from wilt in both the places during 1980 and 1981 screenings. It was also free from root-knot nematode in Bvumbwe, Malawi.

10. For the 1982-83 season, we have formulated an 'International Pigeonpea Wilt Nursery' (IPWN) comprising 60 entries. The nursery will be tested in ICRISAT, Kenya and Malawi.

11. A 4-year collaborative field experiment with cropping system scientists to study the effect of crop rotation and intercropping on wilt was concluded. The wilt was significantly less in the sorghum/pigeonpea intercrop (28%) than in the sole pigeonpea (91%). It was also reduced significantly in 3 years' break between pigeonpea by growing sorghum. Fallowing also showed similar effects.

12. In monthly planting experiment done like last year, all the five wilt susceptibile lines showed above 76.7% wilt in June, July and August plantings, and thereafter (September and October) the wilt incidence decreased in the 1982-83 season also.

13. Application of nitrogenous fertilizers did not affect wilt incidence. However, application of 100 kg P_2O_5 tended to increase wilt incidence.

14. Results of a study on variation in the wilt pathogen by using 6 isolates of *F. udum* indicated that isolates from Dholi (Bihar), Varanasi (Uttar Pradesh) and IARI (Delhi) were similar. Only ICP-8863 was resistant to five of the six isolates used.

15. *Fusarium udum* was not internally seed-borne in any of the five wilt susceptible lines tested.

16. Additional 4168 germplasm accessions were screened against the P3 isolate of Phytophthora in pots. None of the lines showed resistance.

17. Four hundred and twelve early-maturity lines, nine promising breeding lines, 85 entomologically promising lines, 27 Arhar Coordinated Trial (ACT) entries and 19 LPAY entries were also screened against the P3 isolate. None of these lines showed resistance.

18. A *Phytophthora* isolate from the IARI (Delhi) showed more blight incidence (range 78.5% to 100%) than the BHU (Varanasi) isolate (range 39.2% to 100%) on some of the P2 isolate resistant pigeonpea lines in pots.

19. One spray of matalaxyl (500 ppm) or a combination of spray and seed treatment was found to be more effective in reducing the blight incidence under field conditions.

20. One hundred entries (mostly P2 isolate resistant lines) and one blight susceptible cultivar, Hy-3C were tested at four locations through the ICAR-ICRISAT Uniform Trial for Phytophthora Blight Resistance (IIUTPBR) in cooperation with the All India Coordinated Pulses Improvement Program. Fifteen entries at BHU (Varanasi) and 14 entries at IARI (New Delhi) showed 20% or less blight. All the entries were found susceptible at ICRISAT against P3 isolate in field. At Pantnagar the overall blight incidence was very low.

II. INTRODUCTION

During the 'In-house Review-1980', two projects, 'Studies on pigeonpea wilt' and 'Studies on Phytophthora blight of pigeonpea', were reviewed. Since the major objectives of these projects, viz., development of screening techniques and identification of resistant sources, were achieved, we merged the above two projects into one, 'Studies on pigeonpea wilt and Phytophthora blight'. The objectives of this revised project are as follows:

a) Identify additional sources of resistance to wilt and blight

b) Study biology of the pathogens

c) Study epidemiology of the diseases

d) Share resistant material with cooperators in different countries through disease nurseries

We screened a large number of breeding materials, germplasm accessions, ACT entries, IIUTPWR entries, wilt and sterility mosaic resistant lines in the wilt sick plots. We initiated an 'International Pigeonpea Wilt Nursery' to test our lines in Kenya and Malawi where wilt is the major disease problem. We continued studies on the effect of crop rotation and intercropping on wilt.

For Phytophthora blight, a large number of germplasm accessions, early-maturity materials from Hissar, late-maturity pigeonpea adaptation trial entries, ACT entries and entomological promising selections were screened under greenhouse conditions by following the 'drench inoculation' technique. We continued field studies on the effect of metalaxyl (Ridomil) seed treatment + spray on the blight control. Initiated an 'ICAR-ICRISAT Uniform Trial for Pigeonpea Phytophthora Blight Resistance' with the help of the All India Coordinated Pulses Improvement Program.

III. WILT:FIELD STUDIES

The screening for wilt resistance was carried out in Vertisol. ('A' & 'B') and Alfisol ('A' & 'B') sick plots at ICRISAT Center. These plots received the following inputs:

Sick plot	Fertilizer	Irrigation	No. of insecticide sprays
Vertisol A and B	100 kg N	Given one irrigation after sowing	3
Alfison A and B	20 kg N 40 kg P_2O_5	Life saving irrigations only	1

We applied 100 kg N as urea in two equal split doses to enhance the crop growth in Vertisol wilt sick plots. This applications of a high dose of nitrogen helped in getting good crop growth.

A. Screening for Resistance

Sowing was done on 22, 23, 29 and 30 June, 1982 in Alfisol A and B and Vertisol A and B sick plots, respectively. Monthly counts were recorded on susceptible lines, ICP-2376 and LRG-30 in all the four wilt sick plots. The results are presented in Table 1. The final wilt

Table 1. Monthly incidence of wilt in the wilt sick plots at Patancheru during 1982-83[a]

Month	Percent wilt incidence						
	Vertisol 'A'		Vertisol 'B'		Alfisol 'A'	Alfisol 'B'	
	ICP-2376	LRG-30	ICP-2376	LRG-30	ICP-2376	ICP-2376	LRG-30
1981							
August	1.0	1.1	1.4	1.1	13.8	8.3	6.5
September	17.9	16.7	17.3	18.4	75.2	58.5	55.9
October	51.1	56.1	38.9	52.7	95.6	83.6	87.0
November	79.1	81.5	74.7	82.3	97.3	96.1	99.0
December	90.3	92.9	85.3	91.2	99.2	98.5	99.9
1982							
January	92.8	93.0	90.0	94.8	99.8	99.8	100.0

[a]Sowing was done on 22, 22, 29 and 30 June 1982 in Alfisol 'A' & 'B' and Vertisol 'A' & 'B' sick plots, respectively.

incidence was about 100 percent in both the Alfisol sick plots. In the Vertisol sick plots we recorded wilt incidence of 90% and above on both the check lines, which is much higher than the previous year's observations. This may be due to application of 100 kg N/ha in this season. We also planted ICP-8860, a wilt resistant check line, in 2 to 3 places in each sick plot and it remained resistant.

During the 1982-83 season, we screened breeding materials, germplasm accessions, IIUTPWR-1982 entries, IPWN entries, ACT entries, wilt promising germplasm selections, SM resistant lines and entomologically promising lines in the sick plots.

In all the screening tests, the criterion used for selecting promising progenies was based on low wilt incidence; 20% or less wilt in the first year of testing and 10% or less in the subsequent testings. In advancing the selected materials, agronomically desirable characters were also considered in consultation with breeders and such plants were selfed to collect pure seeds for further studies.

1. Breeders' material

Materials received from the Pigeonpea Breeding subprogram of ICRISAT were screened in sick plots and the results are presented below:

(a) F_4 Single plant progenies (SPP)

Eight hundred and seventy-seven F_3 SPP from 72 crosses selected from the sick plot in 1981 K (Kharif) were again screened in the Vertisol sick plots during 1982 K. Each progeny was sown in one to two, 4 m rows. One hundred and fifty-seven SPP bulks were selected based on wilt incidence and grain yield/ha (Table 2). Of these, 15 SPP bulks showing less than 20% wilt yielded 2000 kg grain/ha. One progeny bulk (78185-W14-WB) was free from wilt and yielded 2500 kg grain/ha. Some of these promising progeny bulks are being tested by the breeders in a replicated yield trial under the normal field situation.

(b) F_4 bulks

Thirty-eight promising F_3 bulks were screened for the third time in the vertisol sick plot 'B'. The wilt incidence varied from 6.1% in 78132-WB-WB to 64.1% in 78162-WB-WB (Table 3). Of these, nine bulks showed 20% or less wilt. The promising bulks are being tested for their yielding ability.

Table 2. Wilt reaction and yielding ability of some promising F_4 single plant progeny bulks in the Vertisol sick plot 'B'

S.No.	Pedigree	No. of plants	Percent wilt	Yield kg/ha
1	2	3	4	5
1.	627-B 78120-W4-WB (15-3-3 x BDN-1)	55	5.5	1617
2.	629-B 78120-W8-WB	57	14.0	1500
3.	630-B 78120-W10-WB	47	0.0	1817
4.	631-A 78120-W11-WB	55	3.6	1933
5.	631-B 78120-W12-WB	52	15.4	1650
6.	632-B 78120-W14-WB	43	20.9	1750
7.	633-A 78120-W15-WB	50	6.0	1967
8.	636-A 78120-W24-WB	64	1.6	1767
9.	638-B 78120-W29-WB	58	10.3	900
10.	639-B 78139-W1-WB (15-3-3 x AS-71-37)	75	13.3	2083
11.	640-A 78139-W3-WB	57	7.0	1950
12.	643-A 78139-W11-WB	60	1.7	2017
13.	643-B 78139-W12-WB	77	10.4	1917
14.	646-A 78139-W19-WB	84	3.6	1700
15.	646-B 78139-W20-WB	75	2.7	2267
16.	647-B 78139-W23-WB	84	10.7	1333
17.	650-B 78139-W29-WB	25	16.0	1167
18.	657-A 78153-W12-WB (15-3-3 x C-11)	31	19.4	1567
19.	657-B 78153-W13-WB	75	34.7	750
20.	658-A 78153-W14-WB	50	16.0	767
21.	660-B 78153-W20-WB	53	7.6	1892
22.	662-B 78153-W24-WB	100	10.0	1917
23.	664-A 78153-W27-WB	90	8.9	2333
24.	665-A 78153-W29-WB	84	16.7	1783
25.	670-B 78164-W10-WB (15-3-3 x LRG-30)	56	23.2	1000
26.	677-B 78164-W25-WB	62	4.8	1728
27.	698-A 78179-W9-WB (15-3-3 x 6524)	21	0.0	883
28.	700-A 78179-W13-WB	29	3.5	700
29.	701-A 78179-W15-WB	62	4.8	1250
30.	705-B 78179-W24-WB	23	13.0	800
31.	706-A 78179-W25-WB	42	14.3	917
32.	708-A 78179-W29-WB	45	8.9	1400
33.	709-B 78191-W2-WB (15-3-3 x 7894)	29	24.1	650
34.	711-A 78191-W5-WB	58	12.1	2117
35.	713-B 78191-W11-WB	60	1.7	1400
36.	715-A 78191-W14-WB	63	0.0	1708

Table 2. Contd.

1	2	3	4	5
37.	728-B	78203-W12-WB (15-3-3 x 7952)	60	18.3	1400
38.	761-A	78165-W23-WB (8864 x LRG-30)	63	12.7	1417
39.	810-B	78178-W11-WB (8864 x 6523)	91	14.3	1300
40.	812-B	78178-W15-WB	46	21.7	883
41.	813-B	78178-W18-WB	37	13.5	633
42.	827-A	78180-W18-WB	64	3.1	1100
43.	829-B	78180-W24-WB	85	35.3	1333
44.	859-B	78223-W4-WB [8864 x (73081-40D_2-1[illegible]-1[illegible])]	93	30.1	1183
45.	860-A	78223-W5-WB	93	32.3	717
46.	861-A	78223-W7-WB	62	3[illegible].3	933
47.	862-A	78223-W9-WB	58	51.7	1233
48.	862-B	78223-W10-WB	76	23.7	1142
49.	863-A	78223-W11-WB	87	26.4	1583
50.	864-A	78223-W13-WB	70	68.6	1385
51.	888-A	78138-W1-WB (6443-W2[illegible]-W14[illegible]-SW1[illegible] x AS-71-37)	56	10.7	1078
52.	896-A	78138-W17-WB	71	16.9	873
53.	897-A	78138-W19-WB	80	8.8	1005
54.	897-B	78138-W20-WB	100	14.0	963
55.	898-B	78138-W22-WB	80	1.3	1155
56.	900-A	78138-W25-WB	76	14.5	1062
57.	902-A	78138-W29-WB	58	22.4	833
58.	903-B	78152-W2-WB (6443-W3[illegible]-W14[illegible]-SW1[illegible] x C-11)	38	5.3	1193
59.	908-A	78152-W11-WB	44	4.5	1310
60.	912-A	78152-W19-WB	31	16.1	1307
61.	915-B	78152-W26-WB	74	12.2	1345
62.	919-B	78162-W4-WB (6443 x W2[illegible]-W14[illegible]-SW1[illegible] x LRG-30)	45	20.0	968
63.	925-B	78162-W16-WB	79	1.3	870
64.	931-A	78162-W27-WB	53	15.1	867
65.	936-A	78175-W7-WB (6443-W2[illegible]-W14[illegible]-SW1[illegible]) x ICP-6523)	58	3.4	793
66.	938-A	78175-W11-WB	25	12.0	847
67.	940-B	78175-W16-WB	34	5.9	937
68.	944-B	78175-W24-WB	20	5.0	817
69.	945-B	78175-W26-WB	23	4.3	1253

Table 2. Contd.

70.	950-A	78189-W6-WB (6443-W2[illegible]-W14[illegible]-SW1[illegible] x ICP-6524)	84	25.0	1098
71.	960-B	78189-W30-WB	38	10.5	1060
72.	964-B	78201-W9-WB (6443-W2[illegible]-W14[illegible]-SW1[illegible] x ICP-7894)	18	5.6	1563
73.	973-A	78201-W26-WB	87	11.5	1340
74.	994-B	78225-W12-WB (6443-W2[illegible]-W14[illegible]-SW1[illegible] x 73081-40D_2-1[illegible]-1[illegible])	67	25.4	852
75.	997-B	78225-W18-WB	57	14.0	1217
76.	1003-B	78234-W2-WB (6443-S2[illegible]-W14[illegible]-SW1[illegible] x T-7)	72	8.3	2178
77.	1019-A	78117-W3-WB [(ICP-1-6-W2[illegible]-W1[illegible]) x BDN-1]	61	1.6	1517
78.	1022-A	78117-W9-WB	84	3.6	1650
79.	1024-A	78117-W13-WB	59	13.6	1317
80.	1024-B	78117-W14-WB	71	2.8	2117
81.	1025-A	78117-W15-WB	68	1.5	2000
82.	1026-A	78117-W17-WB	77	2.6	2233
83.	1027-B	78117-W20-WB	53	11.3	1367
84.	1029-A	78117-W23-WB	99	14.1	1255
85.	1029-B	78117-W24-WB	57	17.5	1117
86.	1030-A	78117-W25-WB	86	4.7	1633
87.	1030-B	78117-W26-WB	74	4.1	2400
88.	1031-A	78117-W27-WB	72	11.1	1467
89.	1032-A	78117-W29-WB	76	1.3	1917
90.	1033-A	78130-W1-WB (ICP-1-6-W3[illegible]-W1[illegible] x AS-71-37)	86	1.2	1870
91.	1035-B	78130-W6-WB	93	3.2	1850
92.	1037-A	78130-W9-WB	65	1.5	1983
93.	1037-B	78130-W10-WB	73	6.8	1200
94.	1038-B	78130-W12-WB	65	13.8	1583
95.	1039-A	78130-W13-WB	81	7.4	1748
96.	1040-A	78130-W16-WB	73	8.2	2317
97.	1043-B	78130-W25-WB	56	3.6	1782
98.	1049-A	78143-W7-WB (ICP-1-6-W3[illegible]-W1[illegible] x C-11)	88	22.7	1750
99.	1051-B	78143-W12-WB	53	3.8	1813
100.	1054-A	78143-W17-WB	23	4.3	1217
101.	1055-A	78143-W19-WB	43	11.6	1667
102.	1057-B	78143-W24-WB	11	18.8	800
103.	1062-A	78156-W4-WB (ICP-1-6-W3[illegible]-W1[illegible] x LRG-30)	38	2.6	1200
104.	1062-B	78156-W5-WB	59	16.9	1117
105.	1069-A	78156-W18-WB	52	13.5	2208
106.	1069-B	78156-W19-WB	35	11.4	997

Table 2. Contd.

107.	1078-A	78227-W6-WB (ICP-1-6-W3Ø-W1Ø x ICP-6523)	64	12.5	1900
108.	1080-A	78227-W10-WB	25	28.0	1400
109.	1149-A	78231-W29-WB (ICP-1-6-W3Ø-W1Ø x 73081-40D_2-1Ø-1Ø)	44	11.4	800
110.	1176-A	78145-W24-WB (7336-W6Ø x C-11)	33	24.2	1483
111.	1208-B	78185-W3-WB	63	1.6	1512
112.	1213-A	78185-W14-WB	48	0.0	2500
113.	1225-A	78196-W10-WB	35	2.9	1683
114.	1328-A	78202-W25-WB (7942-SW6Ø x ICP-7894)	64	5.0	1100
115.	1365-A	78235-W10-WB (7942-SW6Ø x T-7)	61	1.6	1200
116.	1366-B	78235-W13-WB	65	16.9	1173
117.	1367-A	78235-W14-WB	59	0.0	952
118.	1449-B	78193-W14-WB (Purple-1 x ICP-7894)	53	18.9	2180
119.	1464-B	78205-W24-WB (Purple-1 x ICP-7952)	67	13.4	1383
120.	1503-B	78213-W15-WB (7336-W5Ø x BDN-1)	73	4.1	900
121.	1505-A	78150-W17-WB (7336-W5Ø x C-11)	21	14.3	1333
122.	1519-B	78150-W20-WB	54	9.3	1500
123.	1519-B	78158-W24-WB (7336-W5Ø x LRG-30)	41	2.4	1333
124.	1523-B	78172-W4-WB (7336-W5Ø x ICP-6525)	51	2.0	1275
125.	1526-B	78172-W13-WB	52	0.0	700
126	1530-A	78184-W5-WB (7336-W5Ø x ICP-6524)	40	7.5	1000
127.	1538-A	78200-W9-WB (7336-W5Ø x ICP-7894)	66	3.0	833
128.	1540-B	78200-W14-WB	33	15.2	883
129.	1563-A	78220-W11-WB (7336-W5Ø x 73081-40D_2-1Ø-1Ø)	24	8.3	667
130.	1586-B	78129-W1-WB (AS-79-37 x ICP-7424-W5Ø)	85	14.1	783

Table 2. Contd.

1		2	3	4	5
131.	1588-A	78129-W5-WB	56	14.3	708
132.	1591-B	78129-W12-WB	50	4.0	868
133.	1592-A	78129-W14-WB	48	2.1	633
134.	1593-A	78129-W16-WB	86	3.5	950
135.	1593-B	78129-W17-WB	87	2.3	758
136.	1594-A	78129-W18-WB	72	0.0	650
137.	1597-A	78129-W24-WB	67	1.5	858
138.	1599-A	78129-W28-WB	56	5.4	1167
139.	1601-A	78142-W2-WB (C-11 x 7424-W5⊠)	62	3.2	1517
140.	1602-A	78142-W4-WB	38	5.3	1317
141.	1603-A	78142-W6-WB	54	9.3	1100
142.	1603-B	78149-W7-WB	66	4.5	1850
143.	1604-B	78142-W9-WB	64	0.0	1833
144.	1605-B	78142-W11-WB	47	4.3	1083
145.	1606-A	78142-W13-WB	83	1.2	2250
146.	1608-B	78142-W18-WB	74	5.4	1533
147.	1610-A	78142-W21-WB	75	0.0	967
148.	1610-B	78142-W22-WB	38	0.0	1367
149.	1611-A	78142-W23-WB	70	0.0	1467
150.	1611-B	78142-W24-WB	51	9.8	1058
151.	1614-B	78142-W30-WB	77	13.0	1467
152.	1627-B	78161-W29-WB (LRG-30 x 5174-W5⊠)	73	0.0	1300
153.	1644-B	78199-W5-WB	83	13.3	1067
154.	1652-A	78199-W22-WB	67	25.4	833
155.	1658-A	78206-W6-WB	62	16.1	833
156.	1668-B	78206-W28-WB	43	27.9	1000
157.	1669-A	78206-W29-WB	64	14.1	1467

Table 3. Results of screening of 38 F_4 single pod bulks of pigeonpea lines to wilt in the Vertisol sick plot 'B'

S.No.	Pedigree	No. of plants	Percent wilt
1.	78120-WB-WB	456	54.82
2.	78121-WB-WB	365	35.07
3.	78122-WB-WB	473	10.57
4.	78123-WB-WB	260	10.38
5.	78125-WB-WB	400	22.75
6.	78130-WB-WB	452	12.17
7.	78132-WB-WB	394	6.09
8.	78134-WB-WB	426	13.15
9.	78139-WB-WB	350	7.43
10.	78140-WB-WB	440	18.64
11.	78142-WB-WB	415	6.75
12.	78143-WB-WB	504	6.35
13.	78148-WB-WB	445	33.71
14.	78150-WB-WB	499	31.66
15.	78152-WB-WB	305	51.48
16.	78153-WB-WB	442	55.43
17.	78159-WB-WB	425	35.76
18.	78162-WB-WB	502	64.14
19.	78163-WB-WB	500	46.00
20.	78165-WB-WB	319	62.07
21.	78166-WB-WB	410	50.49
22.	78167-WB-WB	334	34.74
23.	78172-WB-WB	355	30.99
24.	78177-WB-WB	327	56.88
25.	78178-WB-WB	430	50.23
26.	78179-WB-WB	254	33.07
27.	78180-WB-WB	445	35.28
28.	78191-WB-WB	350	33.14
29.	78204-WB-WB	512	63.87
30.	78213-WB-WB	380	37.89
31.	78223-WB-WB	426	40.61
32.	78225-WB-WB	507	47.34
33.	78226-WB-WB	356	37.92
34.	78227-WB-WB	432	24.77
35.	78228-WB-WB	493	22.31
36.	78231-WB-WB	313	24.60
37.	78234-WB-WB	443	38.37
38.	78235-WB-WB	494	62.75

(c) TC-F_5 progenies

Forty-one TC-F_5 progenies were screened in the Vertisol sick plot 'B'. Of these, only nine TC-F_5 progenies showed 10% or less wilt (Table 4).

Table 4. List of nine TC-F_5 progenies which showed 10% or less wilt incidence in the Vertisol sick plot 'B'

S.No.	Pedigree	No. of plants	Percent wilt
1.	77128-VINDT4-W7Ø-W2Ø-WBØ	36	8.3
2.	77128-VINDT4-W7Ø-W8Ø-WBØ	36	5.6
3.	77128-VINDT8-W20-W3Ø-WBØ	32	0.0
4.	77128-VINDT8-W31-W4Ø-WBØ	14	7.1
5.	77128-VINDT8-W35-W3Ø-WBØ	24	8.3
6.	77128-VINDT8-W35-W4Ø-WBØ	32	9.4
7.	77128-VINDT8-W35-W5Ø-WBØ	33	6.1
8.	77128-VINDT8-W35-W7Ø-WBØ	1	0.0
9.	77128-VINDT8-W19-W5Ø-WBØ	22	9.1

(d) F_6 progenies

Of the 11 F_6 progenies screened, only three showed 10% or less wilt (Table 5).

Table 5. List of three F_6 progenies which showed 10% or less wilt incidence in the Vertisol sick plot 'B'

S.No.	Pedigree	No. of plants	Percent wilt
1.	76101-VINDT6-W2-4-WBØ	16	6.3
2.	76101-VIIINDT118-VINDT4Ø-W4Ø-WB	35	2.9
3.	76101-VIIINDT120-VINDT-WBØ-W2Ø-WBG	25	8.0

(e) F_8 progenies

Ten F_8 progenies were screened for wilt resistance in the sick plot. Of these, only three showed 10% or less wilt (Table 6).

Table 6. List of three F_8 progenies which showed 10% or less wilt incidence in the Vertisol sick plot 'B'

S.No.	Pedigree	No. of plants	Percent wilt
1.	74430-W25Ø-VIIINDT2G3-IXNDT-W3Ø-WBØ-WBØ	20	5.0
2.	74430-W25Ø-VIIINDT2G3-IXNDT-W7Ø-WBØ-WBØ	24	8.3
3.	74430-W26Ø-VIIINDT1G1-IXNDT-W3Ø-WBØ-WBØ	31	6.5

(f) F_9 and F_{10} progenies

Of the seven F_9 and F_{10} progenies screened, only two F_9 progenies showed 10% or less wilt (Table 7).

Table 7. List of two F_9 and F_{10} progenies which showed 10% or less wilt incidence in the Vertisol sick plot 'B'

S.No.	Pedigree	No. of plants	Percent wilt
1.	74258-W25Ø-VNDT4-1-1-VINDTW1Ø-WBØ-WBØ	37	8.1
2.	74258-W25Ø-VNDT4-1-2-VINDTW2Ø-WBØ-WBØ	36	9.7

(g) Wilt promising progenies

Of the 14 wilt promising progenies screened, four showed 10% or less wilt (Table 8).

Table 8. List of four wilt promising progenies which showed 10% or less wilt incidence in the Vertisol sick plot 'B'

S.No.	Pedigree	No. of plants	Percent wilt
1.	C-11-5Ø-3Ø-BØ-B-W3Ø-WBØ-WBØ	29	6.9
2.	C-11-83Ø-1Ø-BØ-W3Ø-WBØ-WBØ	30	10.0
3.	KWR-1-W3Ø-W1Ø-W6Ø-W3Ø-WBØ-W3Ø	29	10.3
4.	KWR-1-W3Ø-W6Ø-W4Ø-WBØ-WBØ-WBØ	42	2.4

(h) Early-maturity material

Four hundred and twelve early-maturity lines received from our subcenter at Hissar were screened for their wilt reaction for the first time. Of these, 116 showed 20% or less wilt (Table 9).

Another set of eight entries which showed promise against wilt in earlier tests (less than 20% wilt) was screened again in 1982 K. Of these, three showed 10% or less wilt (Table 10)

(i) MPWRY (Medium-maturity Pigeonpea Wilt Resistant Lines Yield Test) entries

Eighteen entries from the Medium Maturity Pigeonpea Wilt Resistant Yield Test (MPWRY) were screened in the Vertisol sick plot. The results are presented in Table 11. Of these, nine showed 20% or less wilt. These lines were also tested for yield potential at ICRISAT center and elsewhere.

(j) LPAY (Late Maturing Pigeonpea Adaptation Yield Test) entries

Of the 19 Late Maturing Pigeonpea Adaptation Yield Test (LPAY) entries screened, none showed promise against wilt (Table 12).

(k) Inbred lines

Thirty-five inbred lines were screened in the Vertisol sick plot. Of these, 14 showed 20% or less wilt (Table 13).

(l) Wilt resistant advanced lines

Twenty-three medium-maturity wilt resistant advanced lines were tested to monitor wilt incidence. The same lines were tested for their yield potential at ICRISAT Center by pigeonpea breeders. The results of screening are presented in Table 14. Of the 23 lines tested, 14 showed 20% or less wilt. Surprisingly two lines showed above 60% wilt incidence.

(m) Male sterile lines

One hundred MS-3A, 100 MS-4A and 40 male sterile -Sterility mosaic (SM) resistant back cross pigeonpea lines were screened in the Vertisol sick plot. Of these, only nine SM resistant back crosses showed promise against wilt (Table 15).

Table 9. List of 116 early-maturity pigeonpea lines from our sub-center at Hissar which showed 20% or less wilt in the Vertisol sick plot 'B'

S.No.	Pedigree	No. of plants	Percent wilt
1	2	3	4
1.	ICPL-82	7	0.0
2.	ICPL-83	20	0.0
3.	82H02-1 ICPL-151	39	5.1
4.	82H02-2 ICPL-87	33	6.1
5.	82H02-3 ICPL-148	34	17.6
6.	82H02-4 ICPL-267	24	8.3
7.	82H02-6 ICPL-184-H1-HB	32	18.8
8.	82H02-10 ICPL-288	32	9.4
9.	82H03-2 ICPL-87	35	2.9
10.	82H03-4 ICPL-269	33	9.1
11.	82H03-6-75001-b-B	31	6.5
12.	82H03-7-75080-39-B-H6	36	2.8
13.	82H03-8-74092-B-H110	35	8.6
14.	82H03-9-74205-1-104-H1-B[illegible]	40	5.0
15.	82H03-11-74174-B-1-2-H2-B[illegible]	21	4.8
16.	82H03-12-74146-DTB-23	29	0.0
17.	82H03-15-75149-DTlB-33	18	11.1
18.	82H03-17-74149-DTB-18-1	34	8.8
19.	82H03-18-74146-NDTII-B-18	33	12.1
20.	82H04-7 ICPL-170	14	7.1
21.	82H04-8 ICPL-171	14	0.0
22.	82H04-10 ICPL-287	27	7.4
23.	82H04-11 ICPL-294	24	12.5
24.	82H04-12 Comp - 1-ODT-H10-B[illegible]-HB-HB	33	6.1
25.	82H04-13 Comp - 1-ODT-H1-HB	34	2.9
26.	82H04-14 Comp - 1-ODT-H4B-HB	24	8.3
27.	82H04-15 Comp - 1-ODT-H7-HB	31	12.9
28.	82H04-16 Comp - 1-ODT-H11-HB	18	11.1
29.	82H04-24 77007-H4-H4	34	17.6
30.	82H05-3 ICPL-95	29	0.0
31.	82H05-8 ICPL-165	18	11.1
32.	82H05-9 ICPL-177	16	0.0
33.	82H05-13 Comp-1-ODT-H14	33	6.1
34.	82H05-14 Comp-1-ODT-H2-HB	37	0.0
35.	82H05-15 Comp-1-ODT-H2-H7-HB	31	6.5
36.	82H05-16-Comp-1-ODT-H6	39	2.6
37.	82H05-18 Comp-1-ODT-H15	5	20.0
38.	82H05-19 Comp-1-ODT-H21-HB	17	11.8
39.	82H05-20 Comp-1-ODT-H23	27	3.7
40.	82H05-21 QP-242-HB	18	11.1

Table 9. Contd.

41.	82H05-22-QP-262-HB	32	6.2
42.	82H05-24 E-708	26	0.0
43.	82H05-25 E-709	31	12.9
44.	82H05-26 E-710	32	15.6
45.	82H05-29 E-714	43	9.3
46.	82H05-32 E-723	15	6.7
47.	82H05-33 E-724	34	8.8
48.	82H05-39 E-826	31	12.9
49.	82H05-42 E-832	20	20.0
50.	82H05-43 E-841	33	15.2
51.	82H05-44 E-912	28	7.0
52.	82H09-5 ICPL-154	40	10.0
53.	82H09-7 ICPL-165	29	6.9
54.	82H09-11 ICPL-140	25	8.0
55.	82H09-13 ICPL-177	28	7.1
56.	82H09-11 P-2914	11	18.2
57.	82H10-14 P-2968	13	7.7
58.	82H10-15 P-3075	29	3.4
59.	82H10-18 P-3112	27	7.4
60.	82H10-24 P-3251	35	8.6
61.	82H11-13 E-519	42	14.3
62.	82H11-14 ICPL-268	15	0.0
63.	82H11-16 E-604	44	4.5
64.	82H11-17 E-608	31	6.5
65.	82H11-18 Comp-1-LS	39	12.8
66.	82H11-19 E-605	37	10.8
67.	82H11-21 E-621	30	20.0
68.	82H11-22 E-630	35	11.4
69.	82H11-23 P-2909	32	12.5
70.	82H12-3 P-522	39	5.1
71.	82H12-4 P-1378	34	11.8
72.	82H12-5 P-1403	14	7.1
73.	82H12-6 P-1406	34	8.8
74.	82H12-7 P-1430	11	9.1
75.	82H12-8 P-1438	38	7.9
76.	82H12-9 P-1755	35	14.3
77.	82H12-10 P-2240	40	10.0
78.	82H12-14 P-3041	33	15.2
79.	82H12-19 P-3550	28	0.0
80.	82H12-20 P-3714	31	12.9
81.	82H12-21 P-3729	13	15.4
82.	82H12-22 P-3734	11	18.2

Table 9. Contd.

83.	82H12-23	P-6191	43	4.7
84.	82H12-24	P-6250	26	7.7
85.	82H13-5	E-710	32	9.4
86.	82H13-13	E-524	34	8.8
87.	82H13-16	P-1413	29	20.7
88.	82H13-20	P-1553	31	19.4
89.	82H13-22	P-1591	9	11.1
90.	82H13-24	P-1600	39	15.4
91.	82H13-32	P-2253	30	10.0
92.	82H13-33	P-2937	29	0.0
93.	82H13-38	P-3175	44	13.6
94.	82H13-43	P-3911	4	0.0
95.	82H13-45	P-4132	24	8.3
96.	82H13-49	P-6153	40	7.5
97.	82H15-3	P-1262	25	8.0
98.	82H15-8	P-3017	14	14.3
99.	82H15-9	P-3021	31	6.5
100.	82H15-10	P-3310	37	18.9
101.	82H15-18	P-3442	33	15.2
102.	82H15-21	P-3557	40	10.0
103.	82H15-22	P-3588	37	8.1
104.	82H15-26	P-3839	39	5.1
105.	82H15-33	P-4337	39	12.8
106.	82H16-6	E-909	43	7.0
107.	82H16-14	E-933	36	16.7
108.	82H16-16	P-537	17	11.8
109.	82H16-17	P-1416	39	15.4
110.	82H17-4	ICPL-87	33	18.2
111.	82H17-20	P-4201	19	10.5
112.	82H18-17	P-3747	25	20.0
113.	82H20-23	P-4884	42	11.9
114.	82H21-4	ICPL-142	13	15.4
115.	82H21-5	E-805	35	11.4
116.	82H21-12	E-724	14	7.1

Table 10. List of three early-maturity pigeonpea lines from our sub-center at Hissar which showed 10% or less wilt in the Alfisol sick plot

S.No.	Pedigree	No. of plants	Percent wilt
1.	74209-W29[illegible]-III NDT 2-B[illegible]-1-B-W3[illegible]-WB[illegible]	39	10.3
2.	74209-W29[illegible]-III NDT 6-B[illegible]-1-B-W1[illegible]-WB[illegible]	54	9.3
3.	74209-W29[illegible]-III NDT 6-B[illegible]-1-B-W2[illegible]-WB[illegible]	47	8.5

Table 11. Results of screening of 18 MPWRY (Medium-maturity Pigeonpea Wilt Resistant Yield Test) entries of pigeonpea lines to wilt in the Vertisol sick plot

S.No.	Pedigree	No. of plants	Percent wilt
1.	ICPL-227	29	3.5
2.	ICPL-270	30	3.3
3.	ICPL-295	40	32.5
4.	ICPL-333	40	10.0
5.	ICPL-334	35	5.7
6.	ICPL-335	10	10.0
7.	ICPL-336	20	15.0
8.	ICPL-337	44	22.7
9.	ICPL-338	15	33.3
10.	ICPL-339	33	27.3
11.	ICPL-340	7	57.1
12.	AKT-1	28	39.3
13.	AKT-3	28	50.0
14.	C 11 (ICP^2-B^1)	14	28.6
15.	ICP-2376	8	100.0
16.	DT-230	34	0.0
17.	MAU-E-175	31	19.4
18.	15-3-3	23	8.7

Table 12. Results of screening of 19 Late-maturity Pigeonpea Adaptation Yield Test (LPAY) entries of pigeonpea to wilt in the Vertisol sick plot

S.No.	Pedigree	No. of plants	Percent wilt
1.	ICPL-354	21	95.2
2.	ICPL-355	23	78.3
3.	ICPL-356	4	50.0
4.	ICPL-357	25	92.0
5.	ICPL-358	24	58.3
6.	ICPL-359	15	60.0
7.	ICPL-360	35	80.0
8.	ICPL-361	27	63.0
9.	ICPL-362	24	87.5
10.	ICPL-363	24	87.5
11.	ICPL-364	25	80.0
12.	ICPL-365	32	46.9
13.	ICPL-366	15	66.7
14.	ICPL-367	19	73.7
15.	ICPL-368	12	100.0
16.	ICPL-369	8	87.5
17.	ICPL-370	30	53.3
18.	ICPL-371	18	83.3
19.	ICPL-372	33	81.8

Table 13. Results of screening of 35 inbred pigeonpea lines to wilt in the Vertisol sick plot

S.No.	Pedigree	No. of plants	Percent wilt
1	2	3	4
1.	ICPL-130	40	15.0
2.	ICPL-131	35	14.3
3.	ICPL-132	33	54.5
4.	ICPL-133	38	94.7
5.	ICPL-134	1	0.0
6.	ICPL-135	1	0.0
7.	ICPL-136	19	5.3
8.	ICPL-137	23	8.7
9.	ICPL-138	40	32.5
10.	ICPL-139	29	48.3

Table 13. Contd.

11.	ICPL-228	41	12.2
12.	ICPL-229	25	56.0
13.	ICPL-230	41	7.3
14.	ICPL-231	43	11.6
15.	ICPL-232	37	100.0
16.	ICPL-233	39	100.0
17.	ICPL-234	44	50.0
18.	ICPL-235	41	43.9
19.	ICPL-236	43	100.0
20.	ICPL-237	38	100.0
21.	ICP-7120-94⊠-4⊠-1⊠-B⊠-B	43	3.9
22.	ICP-7120-94⊠-4⊠-3⊠-3⊠-B⊠-B	33	12.1
23.	ICP-7120-94⊠-5⊠-5⊠-6⊠-B⊠-B	38	7.9
24.	ICP-7855-11⊠-3⊠-B⊠-B	48	6.3
25.	ICP-7855-33⊠-4⊠-B⊠-B	22	40.9
26.	ICP-7855-49⊠-2⊠-B⊠-B	16	75.0
27.	ICP-1-38⊠-1⊠-3⊠-3⊠-B⊠-B	25	100.0
28.	ICP-1-99⊠-1⊠-2⊠-3⊠-B⊠-B	2	100.0
29.	ICP-1-164⊠-3⊠-2⊠-2⊠-B⊠-B	14	92.9
30.	ICP-2624-33⊠-5⊠-3⊠-6⊠-B⊠-B	18	88.9
31.	ICP-2624-56⊠-2⊠-1⊠-6⊠-B⊠-B	25	12.0
32.	ICP-2624-56⊠-2⊠-2⊠-5⊠-B⊠-B	11	72.7
33.	ICP-102-12⊠-1⊠-1⊠-5⊠-B⊠-B	37	100.0
34.	ICP-102-12⊠-1⊠-1⊠-15⊠-B⊠-B	48	100.0
35.	ICP-102-12⊠-5⊠-1⊠-4⊠-B⊠-B	36	100.0

Table 14. Results of screening of 23 wilt resistant advanced pigeonpea lines to wilt in the Vertisol sick plot

S.No.	Pedigree	No. of plants	Percent wilt
1.	ICP-7118-WB0-WB0	27	0.0
2.	ICP-8863 (15-3-3) WB0-WB0	30	3.3
3.	74243-B-B-S50-W10-SWB0-VINDT-WB0-WB0	33	9.1
4.	No.148-W1310-W10-W10-WB0-B-WB0	7	0.0
5.	NO.148-W1700-W10-W30-WB0-BWB0-WB0	38	2.6
6.	C-11-W130-W20-W10-WB0-WB0-WB0	6	50.0
7.	ICP-7626-W10-W160-W20-W30-WB-WB0	36	0.0
8.	ICP-7626-W10-W160-W30-W10-WB-B-WB0	22	0.0
9.	ICP-7626-W20-W130-W20-W30-WB-B-WB0	27	3.7
10.	76101-VINDT1-W10-WB0-WB0	14	64.3
11.	C-11-70-50-B0-B-W10-WB0-WB0	34	64.7
12.	C-11-230-20-B0-B-W10-WB0-WB0	19	36.8
13.	77128-VI NDT1-W20-WB0-WB0	25	44.0
14.	77128-VI NDT1-W70-WB0-WB0	40	35.0
15.	77128-VI NDT_4-W10-WB-WB0	29	27.6
16.	77128-VI NDT6-W10-WB-WB0	35	28.6
17.	77128-VI NDT6-W90-WB-WB0	38	15.8
18.	77128-VI NDT8-W240-WB-WB0	22	9.1
19.	77128-VI NDT10-W50-WB-WB0	12	41.7
20.	77128-VI NDT11-W240-WB-WB0	32	18.8
21.	74243-B-B-S300-W80-SW10-V NDT-SW10-WB	32	3.1
22.	74243-B-B-S300-W80-SW20-V NDT-SW10-WB0	35	5.7
23.	74243-B-B-S300-W90 SW10-V NDT-SW10-WB0	34	0.0

Table 15. List of nine male sterile sterility mosaic resistant back-cross pigeonpea lines which showed 20% or less wilt in the Vertisol sick plot 'B'

S.No.	Pedigree	No. of plants	Percent wilt
1.	MS-3A x [MS-3A x (MS-3A x 3783)-W95-SB]-B	37	18.9
2.	MS-3A x [MS-3A x (MS-3A x 3783)-W99-SB]-B	27	18.5
3.	MS-3A x (MS-3A x 3783)-W68-SB-B	30	10.0
4.	MS-3A x (MS-3A x 3783)-W85-SB-B	35	5.7
5.	MS-3A x (MS-3A x 3783)-W99-SB]-B	32	3.1
6.	MS-3A x [(MS-3A x 3783)-W123-SB]-B	40	17.5
7.	MS-4A x [(MS-4A x 3783]-W4-SB-B	31	12.9
8.	MS-4A x [MS-4A x 3783]-W6-SB-B	30	20.0
9.	MS-4A x [MS-4A x 3783]-W37-SB-B	26	15.4

(n) Studies on inheritance of wilt resistance

Parents (P1 & P2), F_1s, F_2s, BC_1s and BC_2s of four crosses were tested in the sick plot and of two crosses in sick pots in greenhouse for their wilt resistance and susceptibility. The results are given in Tables 16 and 17.

Table 16. Reaction of parents, F_1s, F_2s, BC_1s and BC_2s of four crosses to wilt in the sick plot under field conditions in 1982 K

S.No.	Cross number	R_1		R_2		R_3	
		No. of wilted	No. of healthy	No. of wilted	No. of healthy	No.of wilted	No. of healthy
1.	80139 (2376 x 8860)						
	P_1 ICP-2376	15	0	5	1	6	0
	P_2 ICP-8860	0	25	0	4	0	28
	F_1 C.No 80139	13	2	9	0	3	12
	F_2 C.No.80139	324	310	304	291	175	385
	BC_1 C.No.80139	13	8	10	3	12	8
	BC_2 C.No.80139	3	46	6	24	4	32
2.	80141 (2376 x 8869)						
	P_1 ICP-2376	4	1	15	0	7	0
	P_2 ICP-8869	0	23	0	26	1	21
	F_1 C.No.80141	1	14	16	0	11	0
	F_2 C.No.80141	379	45	447	11	371	9
	BC_1 C.No.80141	34	1	28	0	21	2
	BC_2 C.No.80141	14	5	19	3	19	5
3.	80142 (6997 x 8860)						
	P_1 ICP-6997	19	13	17	4	10	11
	P_2 ICP-8860	0	25	0	23	0	18
	F_1 C.No.80142	3	33	3	25	4	22
	F_2 C.No.80142	68	228	58	223	35	280
	BC_1 C.No.80142	21	20	37	39	35	40
	BC_2 C.No.80142	2	9	4	30	4	28
4.	80144 (6997 x 8869)						
	P_1 ICP-6997	15	0	6	0	11	1
	P_2 ICP-8869	0	20	0	5	0	12
	F_1 C.No.80144	14	1	8	0	6	9
	F_2 C.No.80144	142	74	82	53	55	71
	BC_1 C.No.80144	64	2	15	10	64	4
	BC_2 C.No.80144	3	24	0	15	1	26

Table 17. Reaction of parents, F_1s, F_2s, BC_1s and BC_2s of two crosses to wilt in the sick pots under greenhouse conditions

S.No.	Pedigree	Wilt reaction			
		45 days		60 days	
		Susceptible	Resistant	Susceptible	Resistant
1.	80143 (6997 x 8863)				
	P_1 ICP-6997	89	11	90	10
	P_2 ICP-8863	13	87	14	86
	F_1 C.No.80143	75	25	88	12
	F_2 C.No.80143	513	195	553	155
	BC_1 C.No.80143	51	24	57	18
	BC_2 C.No.80143	57	43	66	34
2.	80140 (2376 x 8863)				
	P_1 ICP-2376	73	14	81	6
	P_2 ICP-8863	7	93	8	92
	F_1 C.No.80140	14	13	18	9
	F_2 C.No.80140	460	140	512	88
	BC_1 C.No.80140	22	12	26	8
	BC_2 C.No.80140	61	17	74	4

The data have been passed on to breeders for analysis and drawing conclusions.

(o) Vegetable type selections

Of the three vegetable type pigeonpea lines tested, two showed 10% or less wilt (Table 18).

Table 18. List of two vegetable type pigeonpea selections which showed 10% or less wilt in the Alfisol sick plot

S.No.	Pedigree	No. of plants	Percent wilt
1.	ICPL-31-WB⊠	29	10.3
2.	ICPL-108-W1⊠	44	9.0

(p) Dwarf lines

Five dwarf lines were screened for the second time in the sick plot. Of these, D_2 and D_3 lines showed 10% or less wilt (Table 19).

Table 19. List of 2 dwarf pigeonpea lines which showed 10% or less wilt in the Alfisol sick plot

S.No.	Pedigree	No. of plants	Percent wilt
1.	D_2-73081-40D_2-3Ø-BØ-1Ø-BØ-BØ-WBØ	118	7.5
2.	D_3-73081-16D_3-3Ø-BØ-9Ø-BØ-BØ-W1Ø	44	9.1

(q) Elite pigeonpea entries

Of the 19 ICPL entries screened for wilt, 11 showed 20% or less wilt (Table 20).

Table 20. Result of screening of 19 elite pigeonpea entries to wilt in the Vertisol sick plot 'A'

S.No.	Pedigree	No. of plants	Percent wilt
1.	ICPL- 5	41	12.2
2.	ICPL- 81	36	22.2
3.	ICPL-131	57	21.1
4.	ICPL-133	23	13.0
5.	ICPL-139	15	13.3
6.	ICPL-222	4	50.0
7.	ICPL-224	10	10.0
8.	ICPL-234	25	8.0
9.	ICPL-235	16	12.5
10.	ICPL-240	6	50.0
11.	ICPL-243	12	0.0
12.	ICPL-247	2	50.0
13.	ICPL-251	3	33.3
14.	ICPL-274	10	40.0
15.	ICPL-276	41	9.8
16.	ICPL-277	14	14.3
17.	ICPL-279	14	28.6
18.	ICPL-295	25	16.0
19.	ICPL-207	25	20.0

2. New germplasm

Additional 693 new germplasm accessions from Tanzania, Philippines, Ghana, Kerala and Maharashtra were screened in the Vertisol sick plot. Each accession was sown (about 40 seeds) in one, 4-meter row. As in the previous years, one or two wilt-free plants from each of the 92 germplasm accessions showing 20% or less wilt were selected and selfed to collect pure seeds for further testing (Table 21).

Table 21. List of 92 pigeonpea new germplasm accessions which showed 20% or less wilt in the Vertisol sick plot

PR-5266, 82-2, 94, 5341-3, 63, 78-1, 99, 5428-1, 62, 64, 67-1, 5523, 43, 44, ICP-6524, 82, 6906, 08, 09, 12, 17, 19, 20, 24, 30, 36, 43, 61, 69, 86, 89, 90, 91, 7003, 07, 7217, 67, 86, 7372, 82, 85, 7403, 38, 45, 90, 7585, 7619, 27, 7727, 89, 7869, 7980, 83, 84, 88, 89, 11330, 38, 49, 52, 53, 54, 57, 58, 59, 60, 62, 69, 70, 76, 80, 81, 82, 86, 91, 11400, 17, 20, 56, 57, 59, 61, 65, 76, 77, 80, 81, 89, 90, 91, 11886, 89.

3. Germplasm selections

A total of 468 germplasm selections from 1981 K were screened in the Alfisol sick plot 'B'. Of these, only seven showed promise against wilt (Table 22). These selected lines will be further tested in 1983 K.

Table 22. List of seven germplasm selections which showed 10% or less wilt in the Alfisol sick plot 'B'

S.No.	Pedigree	No. of plants	Percent wilt
1.	ICP-4784-W1[illegible]	27	11.1
2.	ICP-6654-WB	19	10.5
3.	ICP-7806-W1[illegible]	18	0.0
4.	ICP-11308-W1[illegible]	30	0.0
5.	ICP-11324-WB	11	9.1
6.	ICP-11368-WB[illegible]	24	8.3
7.	ICP-11405-WB	16	6.3

Another set of 18 germplasm selections from 1979 K was tested in the Alfisol sick plot 'B'. Nine wilt resistant lines (10% or less wilt) were identified (Table 23).

Table 23. List of nine germplasm selections which showed 10% or less wilt in the Alfisol sick plot 'B'

S.No.	Pedigree	No. of plants	Percent wilt
1.	ICP-238-W2Ø-W2Ø	58	1.7
2.	ICP-673-W2Ø-W2Ø	56	8.9
3.	ICP-2812-W1Ø-WBØ	62	9.7
4.	ICP-2812-W2Ø-WBØ	44	4.5
5.	ICP-3461-W1Ø-W2Ø	58	1.7
6.	ICP-3461-W2Ø-W1Ø	58	8.6
7.	ICP-3465-W1Ø-W1Ø	62	4.8
8.	ICP-3465-W2Ø-WBØ	43	2.3
9.	ICP-10517-W3Ø-W1Ø	60	0.0

A third set of 13 germplasm selections from 1979 K and 1980 K was screened in the Vertisol sick plot 'A'. Of these, 12 selections showed 10% or less wilt (Table 24).

Table 24. List of 12 pigeonpea germplasm selections (1980) which showed 10% or less wilt in the Vertisol sick plot 'A'

S.No.	Pedigree	No. of plants	Percent wilt
1.	ICP-9126-SWBØ-WBØ	33	0.0
2.	ICP-9134-SW1Ø	11	9.1
3.	ICP-9149-SW1Ø	23	8.7
4.	ICP-9155-SW1Ø-WBØ	21	0.0
5.	ICP-9155-SW2Ø-WBØ	13	7.7
6.	ICP-9156-SW1Ø-WBØ	12	0.0
7.	ICP-9156-SW2Ø-WBØ	20	10.0
8.	ICP-9174-SW1Ø-WBØ	21	0.0
9.	ICP-9179-SW1Ø-WBØ	41	9.8
10.	PI-394568-SW1Ø-W2Ø	55	1.8
11.	PI-395272-SW1Ø-W1Ø	42	0.0
12.	PI-394954-SW1Ø-W1Ø	45	6.7

4. Sterility mosaic resistant material

Of the 77 sterility mosaic resistant germplasm lines tested, only 6 showed 20% or less wilt (Table 25).

Table 25. List of six sterility mosaic resistant germplasm selections which showed 20% or less wilt in the Vertisol sick plot

S.No.	Pedigree	No. of plants	Percent wilt
1.	ICP-7227-1-1-1-1-S1Ø VII NDT	5	0.0
2.	ICP-8316-1-1-2-S1Ø VIII NDT-RS	26	11.5
3.	ICP-8325-1-1-1-2-S1Ø IX NDT	49	6.1
4.	ICP-5151-1-1-2-2-1-S1Ø IX NDT-RS	45	20.0
5.	ICP-7371-2-2-1-2-1-S1Ø VIII NDT	2	0.0
6.	ICP-7371-2-2-1-2-2-S1Ø VIII NDT	16	6.3

In another test 39 sterility mosaic resistant material (1980 K) were screened in the Alfisol sick plot 'B'. Of these, only four showed 10% or less wilt (Table 26).

Table 26. List of four sterility mosaic resistant material (1980 K) which showed 10% or less wilt in the Alfisol sick plot 'B'

S.No.	Pedigree	No. of plants	Percent wilt
1.	ICP-4765-1-1-S2Ø VIII NDT-SWBØ-W3Ø	73	5.5
2.	ICP-7202-S1Ø-W1Ø-WBØ	30	6.7
3.	ICP-7251-1-S5Ø-W1Ø-W1Ø	30	10.0
4.	74041-1-1-S4 VI NDTØ-7-3-9Ø-SW2Ø	18	5.6

We also screened 13 sterility mosaic resistant germplasm lines for the second time in the sick plot. Of these, three lines showed 10% or less wilt (Table 27).

Table 27. List of three sterility mosaic resistant germplasm selections which showed 10% or less wilt in the Alfisol sick plot 'A'

S.No.	Pedigree	No. of plants	Percent wilt
1.	ICP-7197-5-3-S1Ø VIII NDT-W3Ø	51	9.9
2.	JM-2412-S1Ø IX NDT-SW2Ø	62	9.6
3.	ICP-1644-6-2-S1Ø IX NDT-SW3Ø	62	8.0

5. Selected lines for wilt reaction

Forty-three selected lines were tested in the Vertisol sick plot. Sixteen lines showed 10% or less wilt (Table 28).

Tablw 28. List of 16 selected pigeonpea lines which showed 10% or less wilt in the Vertisol sick plot

S.No.	Pedigree	No. of plants	Percent wilt
1.	C-11 (BDN)-SWB0-(White)-W10	48	4.2
2.	C-11 (BDN)-SWB0-(Brown)-W10	61	8.2
3.	MDN-1	18	5.6
4.	MDN-4	37	2.7
5.	MDN-5	40	0.0
6.	BWSMR-10	30	3.3
7.	BWSMR-1(OP)	13	0.0
8.	ICP-7197-SW10	30	10.0
9.	ICP-7197-SW20	42	0.0
10.	ICP-7197-SW30	37	8.1
11.	ICP-7197-SW40	25	8.0
12.	ICP-7197-SW50	25	8.0
13.	ICP-7197-SW60	38	0.0
14.	ICP-7197-SW70	20	0.0
15.	MAU-E-175-WB0	28	10.7
16.	G-15 (Brown specks)	21	0.0

6. Entomologically promising lines

Twenty-eight lines found promising against *Heliothis* pod borer and pod fly by our Pulse Entomology subprogram were screened for wilt reaction. Except, PI-397668, which remained free from wilt, all other lines were found wilt susceptible (Table 29).

In another test, 19 entomologically promising lines selected in a wilt sick plot in 1981 K season, were also screened. Of these, only three lines showed 10% or less wilt (Table 30).

Table 29. Results of screening of 28 entomologically promising pigeonpea lines to wilt in the Vertisol sick plot

S.No.	Pedigree	No. of plants	Percent wilt
1.	ICP-8094-2	35	71.4
2.	FH-2294-77-RE2	31	93.5
3.	FH-2307-77-R-E1	12	83.3
4.	Prabhat x 3193-12-E1	29	86.2
5.	Prabhat x 3193-12-E2	26	96.2
6.	PI-397336	23	95.7
7.	PI-397576	15	100.0
8.	PI-397577	18	100.0
9.	PI-397602	25	100.0
10.	PI-397656	16	37.5
11.	PI-397596	12	33.3
12.	AGR-20-B	14	78.6
13.	ICP-10362	15	86.7
14.	BDN-1 x PPE-37-3	25	100.0
15.	PI-397175	54	100.0
16.	PI-397383	27	92.6
17.	PI-397471	31	100.0
18.	PI-397677	32	100 0
19.	PI-396940	17	94.1
20.	PI-397536	9	66.7
21.	PI-397668	18	0.0
22.	PI-395580	22	90.0
23.	ICP-10531	21	100.0
24.	ICP-10466	33	100.0
25.	ICP-4745-9-E2	33	93.9
26.	PI-396986	35	91.4
27.	ICP-8134-1-S1Ø	17	82.4
28.	ICP-6588-E1	37	67.6

Table 30. List of three entomologically promising pigeonpea lines which showed 10% or less wilt in the Vertisol sick plot

S.No.	Pedigree	No. of plants	Percent wilt
1.	ICP-8606-E1-3EB-W2Ø	34	2.9
2.	ICP-8583-E1-3EB-W2Ø (Olive green mottled)	20	10.0
3.	PPE-38-2-3EB-W2Ø	30	10.0

7. Entries included in Arhar Coordinated Trials

Thirty-six entries included in Extra-early Arhar Coordinated Trial (EXACT), Early Arhar Coordinated Trial (EACT), Arhar Coordinated Trial-1 (ACT-1) of the All India Coordinated Pulses Improvement Program were screened against the wilt in a sick plot. The results are presented in Table 31. Eleven EXACT entries, five EACT entries and two ACT-1 entries showed 20% or less wilt.

Table 31. Performance of entries included in the Extra-early Arhar Coordinated Trial (EXACT), Early Arhar Coordinated Trial (EACT) and Arhar Coordinated Trial-1 (ACT-1) of the All India Coordinated Pulses Improvement Project against wilt at ICRISAT Center during the 1982-83 season

S.No.	Pedigree	No. of plants	Percent wilt
	EXACT		
1.	TAT-9	33	18
2.	AL-1	10	10
3.	AL-15	24	33
4.	DL-78-1	35	20
5.	DL-82	31	7
6.	H-76-51	30	7
7.	H-76-11	32	6
8.	H-76-44	20	10
9.	H-76-65	33	3
10.	H-81-1	25	28
11.	ICPL-4	41	12
12.	ICPL-267	26	4
13.	Prabhat	24	4
14.	UPAS-120	28	46
	EACT		
1.	H-76-20	14	36
2.	H-77-208	27	26
3.	H-77-216	37	11
4.	ICPL-1	30	13
5.	ICPL-81	22	5
6.	ICPL-87	17	0
7.	ICPL-151	15	13
8.	ICPL-142	15	33
9.	ICPL-161	21	24
10.	PUSA-78	18	33
11.	PUSA-33	7	43
12.	VL-23	30	43
13.	TAT-10	34	21
14.	UPAS-120	30	43

Table 31. Contd.

	ACT-1		
1.	TT-5	29	10
2.	TT-6	9	0
3.	ICPL-150	4	100
4.	ICPL-189	24	21
5.	H7-6	30	73
6.	H7-8	14	50
7.	T-21	13	69
8.	ICPL-6	9	33

8. Entries from our cooperator in Bihar state

We received 10 late maturing pigeonpea lines from our cooperator in Sabour, Bihar state to test against the wilt. The results of screening of these lines are presented in Table 32. Except three lines, WR-81-24, -34 and -46, which showed 20% or less wilt incidence, all the others were found susceptible.

Table 32. Results of screening of 10 pigeonpea entries from our cooperator from Sabour (Bihar state) to the wilt in the Vertisol sick plot 'A'

S.No.	Pedigree	No. of plants	Percent wilt
1.	WR-81-13	40	65.0
2.	WR-81-14	38	47.4
3.	WR-81-19	43	60.5
4.	WR-81-23	50	44.0
5.	WR-81-24	62	12.9
6.	WR-81-33	37	35.1
7.	WR-81-34	55	0.0
8.	WR-81-45	42	45.2
9.	WR-81-46	59	5.1
10.	WR-81-48	53	56.6

B. Multilocation testing

1. India

Twenty-four lines identified as resistant at ICRISAT Center along with six other lines from Kanpur and Badnapur were tested at 11 different locations in India through the Fifth ICAR-ICRISAT Uniform Trial for Pigeonpea Wilt Resistance (IIUTPWR). Along with these entries, a susceptible indicator line ICP-2376 was also included in test. The detailed results have been presented in a separate Pulse Pathology Progress Report No.26. The summary of results are given in Table 33. Of the 11 locations tested, at two locations, viz., Baroda and Palem all the test entries showed above 20% wilt and we are surprised to note the susceptibility of all the entries. Of the 30 entries tested only ICP-8863 and ICP-9168 did well across 9 locations (20% or less wilt). Additional four entries, viz., ICP-8795, -10958, K-70 sel and MAU-E-175 sel performed well across 8 locations. Of the remaining, seven entries did well across 7 locations, six entries at 6 locations, four entries at 5 locations, two entries at 4 locations, one entry at 2 locations, and four entries at 1 location.

We also sent a separate set of 20 wilt resistant lines and a susceptible line to our cooperator in Kalyani (West Bengal) for screening against the local isolate of *F. udum* in pot culture conditions. The results received from the cooperator are presented in Table 34. Of these, eight lines showed 20% or less wilt.

2. Africa

As last year, we sent some ICRISAT wilt resistant lines for testing both in Kenya and Malawi during the 1981-82 season. The results received from them are presented below:

Our cooperator is Dr. Abdul Shakoor, Plant Breeder, UNDP/FAO, The Dryland Farming Research and Development Project, Katumani, Machakos, Kenya. Twenty-eight wilt resistant lines and two susceptible lines (ICP-2376, ICP-6997) were screened in the wilt sick plot at Katumani. Th results are presented in Table 35. Of the 28 lines screened, 21 showed 20% or less wilt. Seven lines, ICP-9142, -9145, -9177, -10957, -11291, -11297 and MAU-E-175 sel were free from wilt. ICP-9145 was also free from wilt in 1980-81 screening at this location.

2. Malawi

Dr. V.W. Saka, Senior Plant Nematologist, Agricultural Research Station, Bvumbwe, Malawi is our cooperator. Thirty-one wilt resistant lines and two susceptible lines (ICP-2376 and -6997) were

Table 33. Performance of 1982-83 IIUTPWR entries against wilt at 11 different locations in India

Entry No.	Percent wilt										
	ICRISAT Vertisol	ICRISAT Alfisol	Palem	Dholi	Ranchi	IARI	Rajendranagar	Berhampore	Baroda	Anantapur	Kanpur
1	2	3	4	5	6	7	8	9	10	11	12
ICP-5701	51	61	85	24	7	54	31	26	79	6	55
ICP-7855	35	57	95	31	9	12	31	7	85	1	56
ICP-8464	6	3	53	26	5	21	13	36	80	2	42
ICP-8795	9	8	82	10	4	13	15	5	89		25
ICP-8798	5	7	49	33	4	31	18	26	97		50
ICP-8848	7	8	33	32	9	62	5	34	85		41
ICP-8863	2	0	22	7	0	9	6	5	92	12	1
ICP-9120	7	8	51	15	2	8	5	25	88	45	12
ICP-9144	10	6	69	17	10	22	8	36	80		14
ICP-9168	2	8	30	18	4	12	2	12	81	4	4
ICP-9175	7	9	40	10	2	16	3	24	82	43	13
ICP-9177	9	5	50	19	6	56	7	14	85	46	0
ICP-9213	4	10	33	30	4	21	10	49	81	9	7
ICP-9229	5	11	21	17	3	43	14	51	88	12	8
ICP-9255	6	10	43	37	17	12	16	38	86	3	11
ICP-9758	12	18	54	44	3	61	13	19	81	13	51
ICP-10269	11	11	67	13	7	51	9	11	72	4	22
ICP-10958	7	6	68	25	5	4	18	7	96	15	5
ICP-10960	8	4	24	22	10	14	1	26	83	21	58
ICP-11287	10	9	67	17	6	18	24	38	89	4	52
ICP-11290	12	10	85	13	5	12	48	37	86	12	59
C.No.74360	6	6	54	24	3	6	7	7	92	24	41
K-70	8	9	65	17	6	9	15	19	85	7	42
MAU-E-175	6	8	49	9	11	5	7	9	76		41
AWR-74/16	15	25	65	16	10	16	27	10	-	22	0
79-7	66	93	-	-	-	-	53	52	-	-	0
P-76-56	73	-	-	-	-	-	71	79	-	-	0
91-1	86	-	-	-	-	-	78	83	-	-	0
79-15	-	-	-	-	-	-	-	-	-	-	0
BDN-3	46	92	40	15	3	22	54	16	85	19	67
ICP-2376[a]	93	100	100	59	26	53	94	79	85	86	79

[a]Wilt susceptible check.

Table 34. Reaction of ICRISAT's pigeonpea wilt resistant lines to the local isolate of *Fusarium udum* in Kalyani West Bengal under pot culture conditions

S.No.	Pedigree	Percent wilt
1.	ICP-8863	0.0
2.	ICP-10957	0.0
3.	ICP-10958	0.0
4.	ICP-11290	0.0
5.	ICP-11292	0.0
6.	ICP-11294	0.0
7.	ICP-11299	5.0
8.	ICP-11289	20.0
9.	ICP-8860	25.0
10.	ICP-11291	25.0
11.	ICP-11287	45.0
12.	ICP-8861	50.0
13.	ICP-8859	60.0
14.	ICP-8868	60.0
15.	ICP-11295	60.0
16.	ICP-11293	65.0
17.	ICP-8869	75.0
18.	ICP-8862	90.0
19.	ICP-8858	100.0
20.	ICP-11286	100.0
21.	ICP-2376 (susceptible check)	75.0

Table 35. Results of screening of ICRISAT wilt resistant lines in wilt sick plots at Katumani (Kenya) and Bvumbwe (Malawi) during 1981-82

S. No.	Entry	Kenya		Malawi		
		No. of plants	Percent wilt	No. of plants	Percent wilt	Root-knot score*
1	2	3	4	5	6	7
1.	ICP-8858	-	-	50	6	4
2.	ICP-8860	-	-	50	0	0
3.	ICP-8861	-	-	50	6	0
4.	ICP-8862	-	-	50	52	0
5.	ICP-8863	-	-	50	0	0
6.	ICP-8864	19	5	50	0	1
7.	ICP-8866	25	8	50	100	4
8.	ICP-8867	-	-	50	6	0
9.	ICP-8869	-	-	50	0	1
10.	ICP-9141	16	6	-	-	-
11.	ICP-9142	13	0	50	14	1
12.	ICP-9145	7	0	50	0	0
13.	ICP-9147	13	31	-	-	-
14.	ICP-9149	7	29	-	-	-
15.	ICP-9155	25	20	-	-	-
16.	ICP-9156	13	8	50	8	1
17.	ICP-9177	8	0	50	10	0
18.	ICP-10957	10	0	50	6	5
19.	ICP-10958	21	29	50	2	1
20.	ICP-10960	22	9	50	0	0
21.	ICP-11287	25	16	50	32	0
22.	ICP-11288	21	5	50	2	1
23.	ICP-11290	21	29	50	46	0
24.	ICP-11291	24	0	50	20	1
25.	ICP-11292	28	14	50	0	4
26.	ICP-11293	19	5	50	62	0
27.	ICP-11294	19	26	50	2	1
28.	ICP-11295	21	33	50	0	3
29.	ICP-11297	14	0	50	2	0
30.	ICP-11299	24	8	50	2	1
31.	ICPL-270	18	6	50	0	0
32.	GP-125D-SWB⊠-SWB⊠	17	24	50	8	1
33.	MAU-E-175 Sel	17	0	50	0	0

Table 35. Contd.

1	2	3	4	5	6	7
34.	C.No.74360	19	21	50	78	5
35.	C.No.74363	17	6	50	24	5
36.	ICP-2376	21	43	50	100	5
37.	ICP-6997	10	10	50	100	1
38.	Local checks	-	78	-	-	-

*Root-knot score: 0 - No attack
1 - Up to 20% attack
2 - Up to 40% attack
3 - Up to 60% attack
4 - Up to 80% attack
5 - Up to 100% attack

screened at Bvumbwe against wilt and root-knot nematode during the 1981-82 season. The results are presented in Table 35. Both the wilt susceptible lines showed 100% wilt incidence. Of the 31 lines screened, 24 showed 20% or less wilt. Ten lines were completely free from wilt. Here again ICP-9145 was found free from wilt and root-knot in 1980-81 test. Fifteen out of 31 lines were found free from root-knot nematodes. Six lines, ICP-8860, -8863, -9145, -10960, ICPL-270 and MAU-E-175 sel were found free from the wilt and rootknot nematode.

For the 1982-83 season, we have formulated an 'International Pigeonpea Wilt Nursery' comprising 60 lines with frequent wilt susceptible check. The nursery entries will be tested in ICRISAT, Kenya and Malawi against the wilt in the 1982-83 season.

C. Effect of crop rotation and intercropping on wilt incidence

A 4-year experiment on the crop rotation and intercropping on the incidence of pigeonpea wilt in the Vertisol sick plot 'B' was started in 1979-80 in collaboration with Cropping Systems scientists (see pulse pathology (Pigeonpea) Report of Work 1979-80 for more details). Here we are presenting the fourth (final) year results (1982-83).

The wilt incidence in different treatments was recorded at monthly intervals. The average final wilt data at the time of harvest are presented in Table 36. The wilt was 28% in the continuous sorghum/pigeonpea intercropped treatment in comparison to 91% in the continuous sole pigeonpea. Least wilt incidence (15%) was recorded where there was a

Table 36. Effect of crop rotation and intercropping on the incidence of pigeonpea wilt at the time of harvest in a wilt sick plot

Treatment[a]	Average percent wilt[b]
ICP-6997	
P + P + P + (P)	91
S + P + S + (P)	16
P + S + P + (P)	62
S + S + P + (P)	24
S + S + S + (P)	15
T + P + T + (P)	87
F + P + F + (P)	31
S/P + S/P + S/P + (S/P)	28
ICP-1	
P + P + (P)	98
S/P + S/P + (S/P)	20
ICP-1	
P + (P)	98
C + (P)	98
RP + (P)	95
M/P + (M/P)	80

[a]The year of the trial in each treatment is marked with circle.

[b]Average of four replications.

P - Pigeonpea; RP - ICP-8863; S - Sorghum;
C - Cotton; M - Maize; T - Tobacco;
F - Fallow.

3-year break between pigeonpea by growing sorghum. It was also observed that one year's break between pigeonpea by fallowing, or by growing crops like sorghum or tobacco, showed the wilt incidence of 31%, 16%, and 87%, respectively. In case of ICP-1, the average wilt incidence in sorghum/pigeonpea treatment was 20% in comparison to 98% in continuous pigeonpea. When pigeonpea (ICP-1) was intercropped with maize for the second time, we observed as much as 80% wilt against 98% in sole pigeonpea. Both cotton and wilt resistant pigeonpea (ICP-8863) rotation treatments failed to reduce the wilt incidence in the subsequent ICP-1 pigeonpea.

Like previous years, we also estimated the *Fusarium* propagules and *Heterodera* cyst populations in all the treatments at the time of sowing and after harvest of crops. The summarized results are presented in Table 37. After the harvest of crops, the average number of *Fusarium* propagules/g of dry soil decreased (48 to 98 propagules) in S+P+S+P, P+S/P+S/P+S/P, M/P+M/P and RP+P treatments. The average number of *Heterodera* cysts/250 ml soil also decreased in many treatments.

D. Wilt observations in the cropping system trials

Sixteen different genotypes were tested for their yield potentials under sole and sorghum/pigeonpea intercropping system by our Cropping System Agronomists in RP-4 field. Nearing harvest time most of the experimental area showed typical *Fusarium* wilt disease in pigeonpea. We recorded wilt incidence in both sole and intercropped pigeonpea in all the three replications. The average wilt incidence data are presented in Table 38. Four wilt resistant lines (ICP-1-6, Hy-3C, BDN-1 and C-11) showed 20% or less wilt in both the systems. However, in the remaining 12 lines we observed very less wilt in sorghum/pigeonpea intercrop system than the sole pigeonpea. This again confirms our results obtained from our 4-year studies in the wilt sick plot.

E. Effect of monthly planting on wilt incidence

Five wilt susceptible lines (ICP-2376, -6997, -7065, T-21 and No.1258) were sown in June, July, August, September, and October 1982 in the Alfisol sick plot 'A' to study the wilt incidence. Monthly average wilt incidence data are summarized in Table 39. All the five lines showed above 76.7% wilt in June, July and August sowing and thereafter the wilt incidence gradually decreased. Similar results were obtained in the previous year also. This helps in cultivation of even susceptible lines in September-October sowings with less wilt incidence.

F. Effect of fertilizer applications on wilt incidence

The experimental details were given in our Pulse Pathology (Pigeonpea) Report of Work 1981-82. The same treatments were repeated in

Table 37. Influence of crop rotation and intercropping on the *Fusarium* and *Heterodera* cyst population in sick plot

Treatment[a]	No. of *Fusarium* propagules per g of dry soil			No. of *Heterodera* cyst per 250 ml soil		
	At the time of sowing (June 1982)	After the harvest (Jan 1983)	Increase (+) or Decrease (-)	At the time of sowing (June 1982)	After the harvest (Jan 1983)	Increase (+) or Decrease (-)
ICP-6997						
P + P + P + (P)	757	856	+ 99	17	24	+8
S + P + S + (P)	729	681	- 48	20	17	-3
P + S + P + (P)	666	807	+141	15	12	-3
S + P + P + (P)	695	803	+108	15	10	-5
S + S + S + (P)	643	645	+ 2	23	14	-9
T + P + T + (P)	643	666	+ 23	18	23	+5
P + P + P + (P)	617	700	+ 83	16	19	+3
S/P + S/P + S/P + (S/P)	624	665	+ 41	28	12	-16
ICP-1						
P + P + (P)	764	782	+ 18	9	18	+9
P + S/P + S/P + (S/P)	744	648	- 96	12	7	-5
ICP-1						
P + (P)	899	882	- 17	3	32	+29
C + (P)	797	826	+ 29	12	11	-1
RP + (P)	946	848	- 98	10	9	-1
M/P + (M/P)	970	914	- 56	10	10	0

[a] The year of the trial in each treatment is marked with circle.

[b] Average of 4 reps. In each rep 5 g dry soil powder was distributed into 20 petri plates (50 mg/plate) containing Nash and Snyder medium

[c] Average of 4 reps. In each rep a 250 ml soil sample was analysed for the presence of cysts. We thank Dr. A. Jaya Prakash (ICRISAT, Patancheru, Hyderabad for estimating the number of *Heterodera* cysts.

Table 38. Reaction of different pigeonpea genotypes to wilt under sole and sorghum intercropped system in RP-4 field in 1982 K

S.No.	Pigeonpea genotype	Percent wilt[1]	
		Sole pigeonpea	Sorghum/ pigeonpea
1.	GS-1	73	24
2.	ICPH-2	65	17
3.	ICPL-297	61	16
4.	ICP-1	51	21
5.	7559-F_4-B_1-B	43	22
6.	LRG-30	42	21
7.	ICP-185-9	42	21
8.	IGDT-1	38	7
9.	ICPL-296	36	13
10.	ICPL-234	31	5
11.	ICPL-304	23	6
12.	Hy-4	21	8
13.	C-11[2]	20	12
14.	BDN-1[2]	13	5
15.	Hy-3C[2]	9	6
16.	ICP-1-6[2]	1	2

SE for sole vs intercrop within genotype = 10
SE for genotypes within sole and within intercrop systems =11

[1]Average of three replications.
[2]Wilt resistant lines.

Table 39. Effect of monthly planting of five susceptible pigeonpea lines on wilt incidence in the Alfisol wilt sick plot 'A'

Cultivar/ line	Percent wilt*				
	June	July	August	September	October
ICP-2376	100.0	100.0	92.2	69.3	40.2
ICP-6997	100.0	100.0	89.8	67.7	40.6
ICP-7065	97.7	98.8	76.7	63.7	32.6
T-21	96.6	98.0	78.5	66.4	48.6
No.1258	98.1	94.8	80.8	71.2	60.3

*Average of four replications.

1982 K also in the Vertisol sick plot. The results are presented in Table 40.

Table 40. Effect of fertilizer application on pigeonpea wilt incidence in ICP-2376 and BDN-1 lines in the Vertisol sick plot

Treatment	Wilt incidence (%)			
	R-1	R-2	R-3	Average
ICP-2376 100 kg N	100.0	95.7	93.8	96.5
100 kg P	100.0	100.0	93.5	97.8
100 kg K	83.7	96.3	95.5	91.8
5 kg B	92.6	97.7	94.6	95.0
5 kg Mn	97.6	95.9	100.0	97.8
5 kg Zn	92.0	100.0	97.4	96.5
Non treated check	100.0	95.7	95.0	96.9
BDN-1 100 kg P	97.2	90.5	90.2	92.6
Non treated check	97.6	56.5	78.0	77.4

ICP-2376 showed more or less same level of wilt in all the treatments including non-treated check. Application of 100 kg P_2O_5 increased wilt incidence in BDN-1 (a wilt tolerant cultivar) over the non-treated check. The experiment was concluded.

G. Demonstration trial

The reaction of 10 wilt resistant or tolerant lines along with a susceptible check (ICP-2376) included in the demonstration trial are presented in Table 41.

Nine lines showed less than 10% wilt whereas ICPL-270 showed 24.6% wilt. The susceptible ICP-2376 showed 96.3% wilt incidence. ICP-8858 (ICP-1-6 sel) yielded 2123 kg grain/ha.

IV. WILT:LABORATORY/GREENHOUSE STUDIES

A. Further studies on variation in the wilt pathogen

During the 1982-83 season, we collected *F. udum* isolates from Kanpur, Varanasi, Dholi, IARI, Kalyanpur and Jagdishpur locations. We tested the pathogenicity of these isolates on 10 pigeonpea lines in pots under greenhouse conditions. Ten seedlings of each line were used for testing against each isolate. The summarised results are presented in Table 42.

Table 41. Results of screening of pigeonpea wilt resistant lines in demonstration to wilt at ICRISAT Center during 1982 K

S.No.	Pedigree	Total plants	Percent wilt	Grain yield kg/ha
1.	ICP-8858	196	0.0	2123
2.	ICP-8859	172	4.1	990
3.	ICP-8863	193	0.0	1733
4.	ICP-8866	178	1.7	880
5.	ICP-9120	193	2.1	990
6.	ICP-9213	176	5.1	803
7.	ICP-11287	190	6.3	750
8.	ICPL-270	179	24.6	1120
9.	ICPL-295	196	0.0	1977
10.	D2-73081-40D2-3Ø-BØ-1Ø-BØ-BØ-WBØ	188	1.6	1137
11.	ICP-2376* (susceptible check)	188	96.3	129

*Average of 10 plots.

Table 42. Reaction of 10 pigeonpea lines to six isolates of *Fusarium udum*[a]

Isolate	Reaction of pigeonpea lines[b]									
	ICP-2376	ICP-6997	No. 1258	ICP-8859	ICP-8860	ICP-8863	ICP-8869	ICP-9142	ICP-10958	ICP-10960
Kanpur	S	M	S	S	R	R	S	S	-	R
Varanasi	S	S	S	S	S	R	S	S	S	S
Dholi	S	S	S	S	S	R	S	S	S	S
IARI	S	S	S	S	S	R	S	S	S	S
Kalyanpur	S	S	S	S	S	S	S	S	S	S
Jagdishpur	M	S	S	S	S	R	S	S	R	R

[a]Observations were recorded 60 days after inoculation, 10 seedlings for each line were used.

[b]R = Resistant (0 to 20% wilt)

M = Moderately resistant (21 to 50% wilt)

S = Susceptible (51 to 100% wilt)

Isolates from Varanasi, Dholi and IARI showed an identical reaction on all the 10 pigeonpea lines. Only ICP-8863 was found resistant to five of the six isolates tested. The Kalyanpur isolate caused susceptible

reaction on all the 10 lines. The Kanpur and Jagdishpur isolates were different from each other.

B. Non-seed borne nature of *F. udum*

Seed transmission of the wilt fungus has been reported/ suspected by several workers. On the contrary, Mohanty (1946, Indian J. Agrl. Sciences 16:379-390) reported that *F. udum* was not carried within the seed. The recent report on internal seed-borne nature *F. udum* (Jeswani and Gemawat, 1981. 3rd International Symposium on Plant Path; New Delhi, Dec. 14-18) was not conclusive because the pathogenecity of *F. udum* isolated was not proven. Since we at ICRISAT are involved in considerable international exchange of pigeonpea seed, we investigated internal seed-borne nature of the wilt fungus.

Seeds of five wilt susceptible lines, ICP-1, -231, -2376, -6997 and LRG-30, grown in a wilt sick plot at ICRISAT center were used in all the studies. Four hundred seeds of each line were tested by the blotter test and also on a modified Czapek-Dox agar medium. Seeds were surface sterilized by dipping for 3 min in 2-5% sodium hypochlorite and plates were incubated at 25°C for 1 week in a cycleof 12 hr of near UV light followed by 12 hr of darkness. Numbers of seeds germinated and colonized by *F. udum* were recorded. We also conducted the growing-on test in a greenhouse. Germination was recorded 15 days after sowing and seedlings were observed for wilt symptoms up to 60 days.

Fusarium udum was not present either in the blotter or in the modified Czapek-Dox tests. In the blotter test the percent seed germination in ICP-6997 (58%) and ICP-2376 (74%) was lower than other three lines (range 88-93%). In the growing-on test also, no wilting was observed in any of the five lines. However, there was a reduction in the percent germination of seeds collected from wilted plants (range 72 to 91%) in all the five lines in comparison to seeds from healthy plants (range 95 to 100%). The possible reason for the poor germination of seeds from wilted plants may be due to wrinkled seeds present in the pods of diseased plants.

Eventhough, there have been contradicting reports on the internal seed-borne nature of *F. udum*, our detailed studies clearly indicate that the pigeonpea wilt pathogen is not internally seed-borne. The pigeonpea seed mycoflora including the externally-borne *F. udum* can be effectively controlled by seed dressing with Benlate T @ 3g/kg seed. Further work on seed-borne nature of *F. udum* in pigeonpea is in progress.

V. PHYTOPHTHORA BLIGHT

A. Screening for resistance in pots

In this technique, planting, inoculation, and recording observations were done as described in Pulse Pathology (Pigeonpea) Report

of Work 1977-78. We used only the P3 (Kanpur) isolate to screen the breeding materials and germplasm accessions.

1. Germplasm

Additional 4168 germplasm accessions were screened against the P3 isolate in pots under greenhouse conditions. None was found resistant. However, germplasm accessions showing less than 50% blight incidence were selfed for further testing.

2. Breeders' material

Four hundred and twelve early-maturity materials from our Hissar sub-center were screened in pots. None of the lines showed resistance to the P3 isolate. The blight incidence ranged from 44.4% to 100%.

Another set of 9 lines received from breeders' was also screened against the P3 isolate and none showed resistant reaction (Table 43).

Table 43. Results of screening of some breeder's selections for Phytophthora blight resistance by the pot culture technique

S.No.	Pedigree	No. of plants	Percent blight
1.	ICP-7065-73[illegible]-2[illegible]-2[illegible]-B-B	8	100.0
2.	ICP-7065-40[illegible]-2[illegible]-3[illegible]-3[illegible]-B[illegible]-B	3	66.7
3.	ICP-7065-33[illegible]-7[illegible]-1[illegible]-B[illegible]-B	19	100.0
4.	ICP-7065-2[illegible]-2[illegible]-1[illegible]-B[illegible]-B	7	100.0
5.	ICP-7065-1[illegible]-2[illegible]-1[illegible]-B[illegible]-B	15	93.3
6.	ICPL-132	16	100.0
7.	ICPL-133	20	100.0
8.	ICPL-138	15	100.0
9.	ICPL-139	18	100.0

3. Late-maturity Pigeonpea Adaptation Yield Test (LPAY) entries

Nineteen entries from the Late-maturity Pigeonpea Adaptation Yield test were also tested against the P3 isolate. None showed resistant reaction (Table 44).

Table 44. Results of screening of Late-maturity Pigeonpea Adaptation Yield Test (LPAY) entries for Phytophthora blight resistance by the pot culture technique

S.No.	Pedigree	No. of plants	Percent blight
1.	ICPL-354	17	100.0
2.	ICPL-355	5	100.0
3.	ICPL-356	16	100.0
4.	ICPL-357	18	100.0
5.	ICPL-358	13	84.6
6.	ICPL-359	14	100.0
7.	ICPL-360	22	86.4
8.	ICPL-361	13	92.3
9.	ICPL-362	28	100.0
10.	ICPL-363	17	100.0
11.	ICPL-364	13	100.0
12.	ICPL-365	19	94.7
13.	ICPL-366	19	94.7
14.	ICPL-367	4	100.0
15.	ICPL-368	7	100.0
16.	ICPL-369	11	100.0
17.	ICPL-370	15	100.0
18.	ICPL-371	17	88.2
19.	ICPL-372	10	80.0

4. Entomologically promising lines

Twenty-eight lines from the Test-I and 57 lines from the Test-II were screened in pots. None of the lines showed resistant reaction to the P3 isolate (Table 45 and 46).

5. Entries included in Arhar Coordinated Trials

Twenty-seven entries included in Extra Early Arhar Coordinated Trial (EXACT), Early Arhar Coordinated Trial (EACT) and Arhar Coordinated Trial-1 (ACT-1) of the All India Coordinated Pulses Improvement Program were screened against the P3 isolate. All the entries showed susceptible reaction (Table 47).

6. Reaction of the P2 resistant lines to IARI and BHU isolates

The *Phytophthora* isolates collected from IARI and BHU centers were tested on 18 and 16 P2 isolate resistant lines in pots, respectively.

Table 45. Results of screening of entomologically promising pigeonpea lines (Test-I) Phytophthora blight resistance by the pot culture technique

S.No.	Pedigree	No. of plants	Percent blight
1.	ICP-8094-2	21	100.0
2.	FH-2294-77-R-E2	23	100.0
3.	FH-2307-77-R-E1	21	100.0
4.	Prabhat x 3193-12-E1	22	95.4
5.	Prabhat x 3193-12-E2	29	89.6
6.	PI-397336	21	90.5
7.	PI-397576	24	95.8
8.	PI-397577	21	95.2
9.	PI-397602	26	76.9
10.	PI-397656	25	100.0
11.	PI-397596	24	95.8
12.	AGR-20-B	25	96.0
13.	ICP-10362	18	94.4
14.	BDN-1 x PPE-37-3	22	86.4
15.	PI-397175	25	96.0
16.	PI-397383	26	92.3
17.	PI-397471	20	100.0
18.	PI-397677	23	95.6
19.	PI-396940	23	95.6
20.	PI-397536	25	100.0
21.	PI-397668	23	100.0
22.	PI-395580	24	100.0
23.	ICP-10531	22	95.4
24.	ICP-10466	21	100.0
25.	ICP-4745-9-E2	25	100.0
26.	PI-396986	29	100.0
27.	ICP-8134-1-S1	25	100.0
28.	ICP-6588-E1	27	100.0

Table 46. Results of screening of entomologically promising pigeonpea lines (Test-II) Phytophthora blight resistance by pot the culture technique

S.No.	Pedigree	No. of plants	Percent blight
1.	1918 (IG) E4-3EB	25	100.0
2.	ICP-8325-E1-2EB	20	100.0
3.	BDN-1 (check)	20	100.0
4.	ICP-8606-E1-EB	22	90.9
5.	PI-395920-E3-2EB	14	100.0
6.	PI-394440-E3-2EB	20	100.0
7.	PI-395420-E3-2EB	23	95.6
8.	PI-396278-E3-2EB	20	100.0
9.	PI-395344-E3-2EB	23	100.0
10.	PI-395864-E3-2EB	25	96.0
11.	PI-395871-E3-2EB	21	100.0
12.	PI-396588-E3-2EB	25	100.0
13.	ICP-10466	13	100.0
14.	ICP-7035 (check)	9	100.0
15.	ICP-1925 (IG)-2-3EB	19	100.0
16.	ICP-1903-E1-4EB	20	100.0
17.	ICP-7050-4EB-BS	20	100.0
18.	8010-E1-4EB	22	100.0
19.	GS-1	21	100.0
20.	ICP-5036-E1-3EB	16	100.0
21.	ICP-5766-E1-4EB	20	100.0
22.	ICP-8595-1-PS	22	100.0
23.	ICP-810	18	94.4
24.	PPE-36-E2-3EB-PS	21	71.4
25.	ICP-4640-E1-EB	23	86.9
26.	ICP-7041-E1-3EB	22	100.0
27.	PPE-38-1-PS-4B	24	100.0
28.	ICP-7496-E1-2EB	20	100.0
29.	ICP-8583	21	100.0
30.	ICP-8571-E1-2EB	16	100.0
31.	ICP-8130-E1-3EB	13	84.6
32.	ICP-8127-E1-2EB	25	92.0
33.	PPE-45-E2-3EB	22	100.0
34.	ICP-7203-E1-BS-3EB	16	100.0
35.	ICP-3615	21	100.0
36.	PPE-37-3-3EB-PS	22	90.9
37.	PPE-50-E1-3B-BS	19	100.0

Table 46. Contd.

38.	PPE-38-2-4EB	21	100.0
39.	ICP-4745-2-.E8-4EB	12	66.7
40.	ICP-7176-5-E1-3EB-BS	13	84.6
41.	ICP-7176-18-E2-4EB	10	100.0
42.	ICP-6840-E1-4EB	19	100.0
43.	ICP-2223-1-E8-4EB	20	95.0
44.	C-11	18	100.0
45.	1691-E1-4EB	13	92.3
46.	ICP-4745-E1-3EB	18	100.0
47.	ICP-7946-E1-3EB	23	100.0
48.	ICP-3940-E1-3EB	17	76.5
49.	NP(WR)-15 (check)	13	100.0
50.	ICP-3228-E1-3EB	20	95.0
51.	Sehore-197-3EB	17	100.0
52.	T-21	15	100.0
53.	APAU-2208-4EB	20	100.0
54.	ICP-7941-E1-4EB	19	100.0
55.	ICP-6982-6-E8-4EB	23	95.6
56.	ICP-1914 (IG) E2	22	100.0
57.	ICP-7537-E1-4EB	23	86.9

Table 47. Results of screening of Extra Early Arhar Coordinated Trial (EXACT), Early Arhar Coordinated Trial (EACT) and Arhar Coordinated Trial-1 (ACT-1) entries for Phytophthora blight resistance by the pot culture technique

S.No.	Pedigree	No. of plants	Percent blight
	EXACT		
1.	AL-15	25	100.0
2.	DL-78-1	21	100.0
3.	DL-82	27	100.0
4.	H76-51	25	96.0
5.	H76-44	23	100.0
6.	H81-1	26	100.0
7.	ICPL-4	25	96.0
8.	ICPL-267	19	100.0
9.	Prabhat	25	100.0
10.	UPAS-120	21	100.0

Table 47. Contd.

	EACT		
1.	H76-20	24	96.0
2.	H77-208	17	100.0
3.	ICPL-1	17	100.0
4.	ICPL-81	21	100.0
5.	ICPL-87	22	95.0
6.	ICPL-142	25	100.0
7.	ICPL-151	21	100.0
8.	ICPL-161	24	92.0
9.	Pusa-78	26	100.0
10.	Pusa-33	21	95.0
	ACT-1		
1.	TT-5	21	100.0
2.	TT-6	17	100.0
3.	ICPL-150	18	83.0
4.	ICPL-189	23	100.0
5.	HY-8	19	90.0
6.	T-21	20	95.0
7.	ICPL-6	22	95.0

The results are presented in Table 48.

In general, the IARI isolate resulted in more blight incidence (range 78.5% to 100%) than the BHU isolate (39.2% to 100%) Further studies on this aspect are in progress.

B. FURTHER STUDIES WITH METALAXYL

We continued our studies on the efficacy of metalaxyl on Phytophthora blight incidence during the 1982 rainy season. This season we applied three sprays of metalaxyl (500 ppm of CGA 48988 solution 25%) at monthly intervals starting from 15 days after sowing in addition to seed treatments (1.75, 3.50 and 7.00 g a.i.kg/seed). The test was carried out in the multiple disease nursery. The natural incidence on non-treated check plots was 56% and 83% at 60 and 90 days

Table 48. Reaction of some P_2 resistant pigeonpea lines to the IARI and BHU isolates of *Phytophthora* in the pot culture technique

S.No.	Pedigree	IARI		BHU	
		No. of plants	Percent blight	No. of plants	Percent blight
1.	ICP-28	25	84.0	27	51.8
2.	ICP-113	18	100.0	25	40.0
3.	ICP-231	25	100.0	-	-
4.	ICP-339	28	78.5	-	-
5.	ICP-580	21	90.4	29	79.3
6.	ICP-752	25	88.0	28	50.0
7.	ICP-1258	27	96.2	29	55.1
8.	ICP-1529	23	100.0	22	50.0
9.	ICP-1535	27	100.0	28	39.2
10.	ICP-1586	25	92.0	-	-
11.	ICP-1788	20	100.0	23	43.4
12.	ICP-2673	19	100.0	24	70.8
13.	ICP-3753	22	100.0	25	92.0
14.	ICP-6974	-	-	25	52.0
15.	ICP-7065	17	94.1	22	31.8
16.	ICP-7182	20	100.0	21	100.0
17.	ICP-6997	19	94.7	14	100.0
18.	ICP-2376	13	100.0	18	100.0
19.	HY-3C	14	100.0	11	100.0

after sowing, respectively (Table 49). Spray treatment alone or a

Table 49. Efficiency of metalaxyl seed and spray treatments on the incidence of Phytophthora blight under field conditions during the 1982 rainy season

Metalaxyl g/a.i/kg seed	Percent Emergence	Percent blight [a]	
		60 DAP	90 DAP
Only spray treatment[b]	73	4	21
1.75[b]	75	13	35
1.75	72	3	18
3.50[b]	59	36	52
3.50	65	4	19
7.00[b]	64	39	56
7.00	56	9	24
Non-treated	68	56	83

[a] Average of four replications.
[b] Sprayed thrice at monthly intervals with metalaxyl (CGA 48988) solution 25%.

combination of spray and seed treatment resulted in less than 25% blight incidence in comparison to 83% in the check plot at 90 days after sowing. We are planning to conduct this experiment with new formulations of metalaxyl in the next rainy season.

C. MULTILOCATION TESTING

The ICAR-ICRISAT Uniform Trial for Pigeonpea Phytophthora Blight Resistance (IIUTPPBR) was proposed and organized by the participating Pathologists at the All India Kharif Pulses Workshop held at Jabalpur in April 1982. One hundred test entries (mostly ICRISAT-P2 isolate resistant lines) and one blight susceptible cultivar, Hy-3C (ICP-7119) were included. The entries were tested at ICRISAT center, IARI, Kanpur and BHU locations. The results are presented in Table 50.

All the lines showed susceptible reaction at ICRISAT center in field screening. In BHU, Varanasi, the following lines showed 20% or less blight incidence in a field test : ICP-7657, -7701, -7837, -8087, -8141, -8214, -8248, -8258, -8282, -8287, -8289, AW-1, KPBR-80-2, KPBR-80-3 and KPBR-80-1-4. In Pantnagar, overall disease incidence was less even in the susceptible line in the field screening. The results are not considered for evaluating the test lines. Since the natural incidence was low at IARI, New Delhi all the test and susceptible entries (10 plants/entry) were inoculated with a pure culture of *Phytophthora* by stem injury method. The following lines showed 20% or less blight incidence : ICP-339, -580, -913, -934, -1151, -1950, 2153, -2673, -3753, -7754, -8103, -8282, KPBR-80-2 and KPBR-80-3.

Table 50. Performance of entries included in the first ICAR-ICRISAT Uniform Trial for Pigeonpea Phytophthora Blight Resistance (IIUTPPBR) against the Phytophthora blight at four locations in India

S.No.	Entry No.	Percent blight			
		ICRISAT	BHU	Pantnagar	IARI
		3	4	5	6
1.	ICP-28	100	75	6	100
2.	ICP-113	98	75	2	40
3.	ICP-231	98	-b	8	100
4.	ICP-339	100	100	21	20
5.	ICP-580	95	75	19	10
6.	ICP-752	100	83	33	80
7.	ICP-913	83	88	2	10
8.	ICP-934	88	100	13	20

Table 50. Contd.

9.	ICP-1088	96	91	37	80
10.	ICP-1090	93	87	17	60
11.	ICP-1120	97	90	0	60
12.	ICP-1123	100	100	0	30
13.	ICP-1149	100	100	5	30
14.	ICP-1150	97	100	8	40
15.	ICP-1151	100	91	2	10
16.	ICP-1258	100	100	0	100
17.	ICP-1321	100	100	0	80
18.	ICP-1529	100	100	0	100
19.	ICP-1535	100	100	0	100
20.	ICP-1586	95	38	5	50
21.	ICP-1788	83	94	0	100
22.	ICP-1950	93	63	6	0
23.	ICP-2153	100	80	8	0
24.	ICP-2376	100	100	6	100
25.	ICP-2505	88	89	0	100
26.	ICP-2673	100	93	0	10
27.	ICP-2682	100	90	3	80
28.	ICP-2719	85	92	3	100
29.	ICP-2736	84	100	0	100
30.	ICP-2974	95	100	0	100
31.	ICP-3008	100	100	10	80
32.	ICP3259	88	100	0	100
33.	ICP-3367	100	100	6	40
34.	ICP-3741	97	100	0	60
35.	ICP-3753	88	100	0	20
36.	ICP-3840	91	100	0	60
37.	ICP-3861	89	100	3	70
38.	ICP-3867	100	100	0	60
39.	ICP-3868	93	88	0	70
40.	ICP-3891	97	30	0	40
41.	ICP-3899	81	43	8	100
42.	ICP-3937	93	40	0	60
43.	ICP-3945	96	58	0	60
44.	ICP-4135	86	56	0	60
45.	ICP-4141	86	75	8	60
46.	ICP-4168	88	59	3	100
47.	ICP-4699	100	33	0	50
48.	ICP-4752	100	47	2	80
49.	ICP-4866	86	43	0	100
50.	ICP-4882	82	71	3	100

Table 50. Contd

51.	ICP-5450	88	100	3	80
52.	ICP-5656	68	100	0	30
53.	ICP-5860	89	91	0	100
54.	ICP-6865	93	100	0	100
55.	ICP-6952	91	82	4	100
56.	ICP-6953	77	100	0	80
57.	ICP-6956	83	100	4	100
58.	ICP-6974	67	100	0	-[b]
59.	ICP-5057	100	88	4	60
60.	ICP-7065	100	100	0	60
61.	ICP-7151	100	92	0	40
62.	ICP-7182	82	92	0	60
63.	ICP-7185	81	80	0	100
64.	ICP-7200	79	77	6	60
65.	ICP-7232	86	100	0	100
66.	ICP-7269	100	100	27	80
67.	ICP-7273	73	100	0	100
68.	ICP-7533	97	100	0	-
69.	ICP-7624	94	56	0	100
70.	ICP-7657	100	0	0	60
71.	ICP-7701	100	0	0	100
72.	ICP-7754	100	81	0	20
73.	ICP-7795	96	43	0	100
74.	ICP-7798	95	23	6	40
75.	ICP-7810	100	39	3	100
76.	ICP-7837	75	0	7	100
77.	ICP-7910	97	21	4	100
78.	ICP-8087	73	0	0	100
79.	ICP-8103	98	24	5	10
80.	ICP-8104	100	40	5	100
81.	ICP-8131	81	82	2	100
82.	ICP-8132	97	25	0	80
83.	ICP-8141	89	0	0	80
84.	ICP-8214	81	0	3	60
85.	ICP-8236	94	50	0	100
86.	ICP-8248	90	0	0	100
87.	ICP-8258	95	0	0	50
88.	ICP-8282	100	0	6	10
89.	ICP-8287	79	0	0	30
90.	ICP-8289	78	0	0	60

Table 50, Contd.

1	2	3	4	5	6
91.	ICP-8328	100	100	4	80
92.	ICP-8332	100	27	0	100
93.	ICP-8466	74	24	8	40
94.	AW-1 (KPR)	65	20	0	-
95.	RL-2 (KPR)	82	24	0	-
96.	KPBR-80-2	81	0	2	10
97.	KPBR-80-3	76	0	0	10
98.	KPBR-80-1-4	83	0	12	80
99.	KPBR-80-2-1	53	-[b]	-	-
100.	KPBR-80-2-2-	58	-	-	-
101.	ICP-7119[a]	96	100	16	100

[a]The susceptible check

[b]Not tested

PROJECT: PP-PATH-2(81): STUDIES ON STERILITY MOSAIC OF PIGEONPEA

I. SUMMARY

1. Emphasis continued on large scale screening of germplasm and breeding materials for resistance to sterility mosaic (SM), and isolation of the causal agent of the disease.

2. By following various purification procedures long, thin flexuous rods were consistently observed in the partially purified preparations but only in very low numbers.

3. Long, thin flexuous, virus-like particles were also observed in ultrathin sections of leaves of *Scopolia sinensis* infected with sterility mosaic. However, no such particles were observed in ultrathin, sections from the pathogen-carrying eriophyid mites, *Aceria cajani*.

4. Attempts on sap transmission of the causal agent of SM disease by using different methods were unsuccessful on pigeonpea and *S. sinensis*; Mosaic symptoms developed on *Nicotiana benthamiana*, however, back inoculations to *N. benthamiana* and susceptible pigeonpea were negative

5. A healthy (Pathogen-free) colony of the mite *Aceria cajani*, the vector of sterility mosaic pathogen, was raised and maintained on BDN-1, a susceptible variety, without production of SM symptoms. Thus, we ruled out the possibility of the sterility mosaic disease as the case of mite toxemia, as suspected in the literature.

6. Results of pathogen-vector relations indicated that: (i) a single mite can transmit the pathogen, and (ii) mites require a minimum of 5-min acquisition access period to acquire the pathogen and a minimum of 30-min inoculation access period to transmit the pathogen.

7. Mites were unable to multiply on 21 of the 24 SM-resistant and three of the 10 SM-tolerant accessions tested. However, these were detected in low numbers on leaves of three SM-resistant, five ringspot and four mild mosaic pigeonpea accessions. All the four SM-susceptible pigeonpea leaves and *Atylosia cajanifolia* tested supported mite multiplication.

8. Multiplication of mites on SM-affected BDN-1 plants showed an 11-fold increase over healthy BDN-1 plants.

9. Mites survived up to 72 hours on detatched leaves of susceptible BDN-1, up to 3 hrs on the SM-resistant ICP-3783 and up to 22 hrs on *A. scarabaeoides*.

10. Mites were observed on leaves of *A. scarabaeoides* growing in the pigeonpea multiple disease nursery in December but not in March 1982. However, these mites were not infective. Mites were not observed on leaves of *A. sericea*, *A. cajanifolia*, and any of the six weed species in the SMD nursery.

11. Mites could not transmit the SM pathogen to *N. benthamiana* and *Scopolia sinensis*.

12. In an attempt to locate an acaricide(s) with differential effectiveness against eriophyid and *Tetranychus* mites, we found that all the three acaricides, tetradifon (Tedion), quinomethionate (Morestan), and dicofol (Kelthane), were highly effective in controlling *A. cajani* in addition to *Tetranychus* sp.

13. Results of the studies on the spread of sterility mosaic in the field confirmed last year's results that the wind played an important role in the spread of the mite vector and ultimately the disease. The pattern and rate of disease spread was determined by the wind direction; the disease spread up to 2000 m in the downwind direction but only up to 25 m against the wind.

14. Screening of germplasm accessions and breeding material was done, through field and pot screening. Like last year, the infector-hedge technique was followed for the 3rd year and found very effective for large scale field screening as the average incidence of the disease in the SMD nursery was 99.9% (range of 99.7 to 100%). The leaf-stapling was adopted for pot screening.

15. A large amount of germplasm accessions and breeding material was screened in the SMD nursery.

16. The 100 single plant progenies from 12 resistant and 41 segregating accessions that have been selected since the 1976/77 season were screened, and 27 progenies from 11 accessions and 32 progenies from 28 accessions showed uniform resistance (disease-free).

17. Nine progenies from five 1979 resistant accessions and 32 progenies from 13 segregating lines showed uniform resistance. From 1980 germplasm selections, 107 progenies from 71 accessions were uniformly resistant.

18. Out of 470 new germplasm accessions mostly belonging to the late-maturity group, 89 were uniformly resistant.

19. Of the 12 progenies from six accessions with mild mosaic symptoms, one was uniformly resistant, two showed a mixture of SM + MM symptoms, whereas the remaining 9 progenies showed uniform MM symptoms.

20. Thirteen of the 14 progenies from 1980 BDN-1 selections and three of the 13 progenies from 1981 BDN-1 selections were uniformly resistant.

21. Out of 58 progenies selected from the *Heliothis* and podfly resistant lines of 1980 and 1981 tested, 24 progenies of 15 lines showed uniform resistance. But none of the 28 new entomologically promising lines tested was resistant to sterility mosaic.

22. Out of 10 progenies selected from three All India Coordinated Trials (ACT) in 1980 and 24 progenies selected from 13 ACT lines in 1981 screened, all the four progenies from ICPL-87 and four from ICPL-86, and lines AL-15, ICPL-234 and MA-97 showed uniform resistance.

23. Only two entries (Bahar and MA-97 of ACT-3) were resistant out of 74 entries included in different 1982 ACTs.

24. A large amount of breeding material screened included early-maturity material (Hissar), lines from the University of Queensland, entries of MPSRY, BDN-1 and C-11 back cross F_2 material, male-sterile lines, SMD-resistant and tolerant F_4 progenies and bulks, medium-maturity advance lines and late-maturity progenies from ICP-6997.

25. Out of 135 progenies selected from resistant and segregating lines screened, 106 progenies (48 from 12 lines of 1980 and 58 of 28 lines of 1981) showed uniform resistance. Of an additional 412 early-maturity lines from Hissar tested, 15 lines showed uniform resistance and 12 lines showed <10% disease.

26. Only one advance line, ICPL-83, of the 49 ICPL entries screened showed uniform resistance; three others (ICPL-82, -146 and -315) showed <10% disease. Another line, ICPL-262 of Medium-maturity Pigeonpea Adaptation Yield Trial (MPAY) and a progeny of ICPX 77125 showed uniform resistance; three progenies of ICPX 77125 and MSP 4 showed <10% disease. Out of 19 Late-maturity Pigeonpea Adaptation Yield Trial (LPAY) entries tested, only one (ICPL-359) showed uniform resistance; three (ICPL-360, -366 and -371) showed <10% disease.

27. Out of 33 progenies of nine SM-resistant medium-maturity advance lines tested, 10 progenies of four (ICP-504, 73076, 74041 and 75268) advance lines were uniformly resistant.

28. Of the 66 lines from the University of Queensland, Australia, tested, none was uniformly resistant; however two lines (QPL-56-B and -59-B) showed 14 and 10% disease, respectively.

29. Of the 23 entries included in Medium-maturity Pigeonpea Sterility Mosaic Resistant Lines Yield Test (MPSRY) tested, nine entries

showed uniform resistance. Two progenies from ICPX 75268 uniform resistance.

30. All the 14 progenies of two BDN-1 back crosses(BC_2F_2 of ICPX 79248 and -79249) showed more than 70% disease. Similarly, all the four progenies of a C-11 back cross (BC_1F_2 of ICPX 74243) showed more than 60% disease.

31. Out of 240 male sterile lines tested, only three showed <25% disease; all the remaining 237 showed more than 70% disease.

32. A total of 15 out of 41 F_4 bulks of crosses involving agronomically good lines and SM-resistant and -tolerant accessions/lines screened were selected for further screening.

33. Out of 140 F_4 SM-resistant progenies from 12 crosses screened 106 showed uniform resistance. From these, 94 were selected for further use by breeders. Similarly, 93 F_4 tolerant (RS symptom) progenies showing uniform resistance (No RS this year) were selected for further use.

34. None of the six dwarf lines tested showed <10% disease.

35. Out of 41 entries included in the 1982 ICAR-ICRISAT Uniform Trial for Pigeonpea Wilt Resistance (IIUTPWR) tested, 10 entries (ICP-8158, -8848, -9120, -9175, -9213, -9255, -11290, and -11296 and two strains of *A. lineata*, JM-3366 and NKR-76) were resistant.

36. Out of 84 progenies of ICPL-155, 100 of ICPL-146 and 105 of ICPL-269 tested, only eight from ICPL-155 were uniformly resistant, others showed disease ranging from 27 to 100%.

37. Seed treatment with carbofuran (Furadan 40 FP) improved emergence whereas Temik 10 G reduced emergence. Both the pesticides protected the plants from sterility mosaic well up to 45 days after sowing (DAS). At 70 DAS, only 1% of both the pesticides provided some protection to plants from sterility mosaic; higher doses were infective. There was no treatment effect apparent at 90 DAS. All the doses of Furadan 40 FP and 1% of Temik 10 G did affect pigeonpea yields; 2, 3, and 5% Temik 10 G reduced yields as compared with the untreated check.

38. Results of testing of 25 resistant or tolerant (ringspot symptom) lines at 10 locations through the ICAR-ICRISAT Uniform Trial for Pigeonpea Sterility Mosaic Resistance (IIUTPSMR) showed one (ICP-1097 to be resistant (<10% disease) at all the 10 locations; two lines (ICP-10984 and -11049) at eight locations; and four at seven locations. This year again, the data indicated existance of strain(s) of the pathogen/vector. Similar conclusions could be drawn from the results of a Pigeonpea Sterility Mosaic Differentials' Test grown at seven locations in India.

II. INTRODUCTION

The project' Studies on sterility mosaic of pigeonpea' has been in operation since 1981 to carry out work on:

(a) Biology of the pathogen

(b) Epidemiology of the disease

(c) Identification of sources of resistance

(d) Identification of strains of the pathogen, if any

(e) Multilocation testing of resistant lines

(f) Disease situation under different crop management conditions.

The work done on different aspects of the disease under the project during 1982-83 is reported here.

III. BIOLOGY OF THE PATHOGEN

Efforts to determine the nature of the causal agent of the disease were continued. Different extraction media and purification procedures were tried to isolate the causal agent. Partially purified preparations of the diseased and healthy leaves were observed in the electron microscope.

A. Purification and electron microscopy

Different extraction media tried and purification procedures followed to isolate the causal agent are summarised below:

1. Leaves were extracted in 0.05M KPO_4 buffer PH 8.0 + 0 01M $MgCl_2$ after adjusting the final pH to 8.0 in Waring blender. For initial clarification bentonite preparation was added to the the leaf extract in 1:5 (v/v). This was clarified by low speed centrifugation, 3,000 rpm/5 min. To the supernatant bentonite preparation was added drop by drop while stirring on cold till flocculation occurred. It was kept for 10 min and then clarified by low speed centrifugation, 8,000 rpm/ 10 min. The supernatant was sharp yellow in color. Supernatant was precipitated by 4% PEG + 0.02 M NaCl and was dissolved by constant stirring for 2 hrs on ice. The precipitate, collected by 10000 rpm/10 min, was dissolved in 0.01M phosphate buffer, pH 8.0. The supernatant was subjected to high speed centrifugation, 28000 rpm/3 hrs. The pellet was soaked in 1 ml of 0.01 M PO_4 buffer, pH 8.0, overnight at 4°C and was resuspended in more buffer. The supernatant was collected by low speed centrifugation, 10000 rpm/10 min. This was observed in the electron microscope after staining with PTA and UA but no virus-like particles

were observed. The material was run on 10-40% sucrose gradients in 0.01 M PO_4 buffer, pH 8.0, at 25000 rpm/3 hrs. No zone was observed.

Bentonite preparation: Ten g of bentonite (Fisher Bentonite powder, USP) was suspended in 200 ml of distilled water in Waring blender. The preparation was subjected to low speed centrifugation, 3000 g/2 min. The supernatant was subjected to another cycle of low speed centrifugation, 6000 g/15 min. Pellets were suspended in one half of original volume of 0.01 M PO_4 buffer at pH 8.0 by blending again and kept for 24 hrs at $4^{o}C$. Again 2 cycles of centrifugation, 3000 g/2 min and 6000 g/15 min and resuspension procedure were followed. The final suspension will have about 40 mg/ml bentonite.

2. Leaves frozen in liquid nitrogen were powdered and extracted in 0.05 M KPO_4 buffer pH 8.0 + 0.02 M Mercaptoethanol + 0.01 M Na DIECA + 0.01 M $MgCl_2$ (1:4, ω/ν) in a Waring blender. Bentonite preparation from procedure number (1) was added to the extract (1:5, ν/ν). After 10 min it was subjected to low speed centrifugation, 3000 rpm/2 min. Bentonite preparation was added s and cautiously drop by drop to swirling supernatant till flocculation occurred. After keeping it for 10 min the extract was clarified by low speed centrifugation, 5000 rpm for 5 min. The supernatant, which was sharp yellow in color, was precipitated by 4% PEG (carbowax 6000) + 0.02 M NaCl by constant stirring for 2 hrs. The precipitate was collected by 10000 rpm/15 min, and was dissolved in 0.01 M borate buffer pH 8.3. This was clarified by low speed centrifugation, 5000 rpm/5 min. One half of the extract was layered on 30% sucrose pad of borate buffer + 4% PEG; the other half was subjected to high speed centrifugation, 28000 rpm/3 hr without sucrose padding. Pellets were collected in 0.01 M borate buffer pH 8.3 and observed in the electron microscope after staining with PAT and UA. Only a few long flexuous thin virus-like particles were observed

3. Frozen 10-day-old infected leaves were ground in 0.05 M KPO_4 buffer pH 8.0 + 0.02 M Mercaptoethanol + 0.01 M Na DIECA + 0.01 M $MgCl_2$. One vol of CCL_4 to 3 vol of extract was mixed in Waring blender for 2 min. Filtered extract was stirred for 10 min. To the supernatant from low speed, 4000 rpm/10 min, 4% PEG + 0.02 M NaCl was added and stirred till dissolved. The suspension was incubated at $4^{o}C$ for 100 min. The pellet was collected by low speed contrifugation, 10000 rpm/10 min and was dissolved in 0.01 M borate buffer and clarified by low speed centrifugation, 5000 rpm/5 min. One half of the extract was layered on 30% sucrose pad and run for 28000 rpm/3 hrs. The other half was subjected to the direct high speed without any sucrose pad. Pellets were dissolved in 0.01 M borate buffer pH 8.3 and observed in electron microscope after staining with PTA and UA. A few long thin virus-like particles were observed

B. ULTRATHIN SECTIONING

i) *Scopolia sinensis*

Ultrathin sections of diseased and healthy leaves of *Scopolia sinensis*, prepared by Mr. Manohar of our Electron Microscope unit, were observed in the electron microscope. Thin virus-like particles were observed in sections from infected leaves.

ii) Eriophyid mites

Similarly the ultrathin sections of eriophyid mites, *Aceria cajani*, carrying the causal agent were prepared by Mr. Manohar. These sections did not reveal the presence of any flexuous rod-shaped virus-like particles that were observed in sections from infected leaves of *Scopolia sinensis*. This work will be continued next year.

C. Attempts on sap transmission of the causal agent

Attempts to transmit the causal agent through sap were made by following different methods which are described below:

1. Inoculum from leaves. Seven-day-old seedlings of BDN-1, a susceptible variety, were infected by inoculating them with the leaf-stapling method Leaf samples, collected from these seedlings at 4, 5, 6, 7, 8, 9, 10 days after inoculation, were ground in 0.05 M PO_4 buffer pH 8 4 + 2% Nicotine sulphate + 0.02 M Mercaptoethanol and filtered through 2-layered cheesecloth. Celite was added to the inoculum (1:100, w/v). Eight-day-old BDN-1 seedlings raised in the glasshouse were inoculated on the primary leaves by (a) painters' brush (Sears 3HP portable gasoline powered sprayer, model 106.154670) at 60 psi; (b) pin-prick method (using stainless steel headless pins, El ≅ 0.0124" dia); (c) the broad-end of the pestle. The inoculated leaves were washed with deionized water. The inoculated seedlings were observed for symptom development. No SM symptoms developed.

2. Inoculum from roots and shoots. Inocula were separately prepared as above from roots and shoots of SM-affected BDN-1 seedlings. Inoculations were done on roots and shoots of 8-day-old BDN-1 seedlings raised in sand in polythene bags. The following combinations were tried: (a) root inoculum on roots, (b) leaf inoculum on leaves, (c) leaf inoculum on roots, and (d) leaf inoculum on leaves by inoculations through painters brush, pin-prick-method and broad-end of the pestle. The seedlings after inoculations were transplanted in red soil in pots and observed for symptom development. No SM symptoms developed.

3. Use of additives in inoculum. Sap transmission was also attempted on 8-day-old BDN-1 seedlings from leaf inoculum prepared in

0.1 M glycine + 0.05 M K_2HPO_4 + 0.3 M NaCl buffer, pH 9.5. In another attempt on sap transmission the leaf inoculum was prepared in 2.5% Bentonite in 0.6 M phosphate buffer, pH 8.0. The results on sap transmission were negative.

4. Influence of keeping plants in darkness

i) Infected source plants. SM-affected BDN-1 pigeonpea seedlings from which inoculum (leaves) was to be prepared were kept in complete darkness for 24 hr. The inoculum was prepared in 0.05 M phosphate buffer, pH 8.0 + 0.01 M $MgCl_2$ (5 g leaves in 10 ml buffer) and inoculated on to 10-and 20-day-old BDN-1 seedlings with broad-end of the pestle. In another attempt the same procedure as above was followed except for addition of 2.5% bentonite in the inoculum at the time of preparation. The results on sap transmission were negative-

ii) Test plants pre-and post-inoculation. BDN-1 healthy seedlings to be used as test plants were kept in complete darkness for 24 hr before and after inoculations. The procedure for inoculum preparation and inoculation was the same as in Nc.1 above. The results on sap transmission were negative.

5. Use of incubator-grown test seedlings. Sap transmission was also attempted from inoculum prepared from SM-infected BDN-1 seedlings raised in an incubator (Percival) at 30°C with 12/12 day/night light. The inoculum from leaf was prepared in 0.1 M phosphate buffer, pH 7.8 + 0.1% ME. Sap transmission was attempted on 8-day-old BDN-1 seedlings raised in an incubator at 30°C with 12/12 day/night light according to the procedure as in 1 above. The seedlings after inoculation were kept in the same incubator for observing the symptom development. No SM symptoms developed, however a non-specific reaction, where vein enations (outgrowths) developed on the lower surface of the leaf, was observed even in buffer inoculated seedlings.

6. Use of *Scopolia sinensis* as a test plant

Scopolia plants were raised in 10-cm plastic pots with soil: FYM mixture in the glasshouse and the Percival incubator at 25°C with 12/12 light/darkness. The inoculum from leaves was prepared in the following way:

i) SM-infected leaves from 10 to 12-day old infected seedlings were extracted in 0.05 M potassium phosphate buffer, pH 8.4 + 2% nicotine sulphate + 0.02 M ME.

ii) Same procedure as in the 6 (i) above except that 2% nicotine sulphate was eliminated from the extraction buffer. The SM-infected leaves were separately collected from 60-day-old infected seedlings in the

SM nursery and 10-day-old infected seedlings raised in pots.

iii) Leaves as in the 6 (ii) above were extracted in 0.05 M potassium phosphate buffer, pH 7.8 + 0.02 M ME + 2% nicotine sulphate.

The inoculum was applied on 8 to 10-day-old *Scopolia* leaves with the help of the broad-end of the pestle. Healthy leaves inoculated with the inoculum from healthy leaves prepared as in the 6 (i), (ii) and (iii) above were also inoculated similarly to serve as controls. The plants after inoculation were kept in the glasshouse and the percival incubator for symptoms development. No symptoms developed in any of the treatments.

7. Use of *Nicotiana benthamiana* as a test plant

Leaves of the glasshouse grown 1-month-old plants of *N. benthamiana* were inoculated with the inoculum prepared from 3-week-old SM-infected leaves in 0.1 M phosphate buffer, pH 7.8 + 0.02 M ME + 2% nicotine sulphate with the broad-end of the pestle. The plants similarly inoculated with the inoculum from healthy pigeonpea leaves served as controls. The plants after inoculation were kept in the glasshouse. Mosaic symptoms developed on the plants inoculated with the inoculum from SM-infected leaves only. However, back inoculations to *N. benthamiana* and susceptible BDN-1 pigeonpea seedlings were negative.

IV. BIOLOGY OF THE MITE VECTOR, *Aceria cajani*

A. Ruling out mite toxemia

The possibility of SMD being a case of mite toxemia was ruled out by the following methods:

(a) Establishing healthy (pathogen-free) mite colony on BDN-1, a susceptible cv to SMD,

(b) successful and continuous maintenance of pathogen-free mite colony on BDN-1 without production of SM symptoms,

(c) Mite infestation of healthy BDN-1 plants under field conditions, and

(d) establishing the pathogen-free mites as vector of the SM pathogen.

Colonisation of mites was observed on some healthy BDN-1 plants that were artifically inoculated with SM-infected leaves carrying mites. Seven-day-old BDN-1 seedlings, kept in an isolated place, were inoculated with mite-infested leaves from the healthy BDN-1 plants by the 'leaf-stapling' method. After 3 weeks the inoculated plants did not show SM symptoms, eventhough they were colonised by mites. Thus we were able to raise a colony of pathogen-free mites on BDN-1 plants which were used as a source of pathogen-free

mites. These mites are maintained on BDN-1 seedlings (10 to 90-day-old) raised in alfisol in 6" plastic pots, kept in an illuminated incubator (30°C, 24 hrs light). The plants are free from SM infection.

Out of 15 SM-free BDN-1 plants from the indicator rows in RP-18 field (multiple disease nursery), leaves from two plants had mites. The mites were tested on BDN-1 for their infective nature. Plants inoculated with leaves from one out of the two healthy mite-infested plants, remained healthy and were colonised by mites. Seed was collected from the SM-free mite infested BDN-1 plant in the multiple disease nursery for further testing during 1983-84.

B. Pathogen-vector relationship

The pigeonpea sterility mosaic pathogen-vector relationship was studied on the following aspects.

1. Number of mites

Mites inhabiting sterility mosaic-infected leaves of BDN-1 were transferred onto one primary leaf of 7-to 9-day-old BDN-1 used as test seedlings. The number of mites per seedling tried were 1, 2, 3, 4, 5, 10, 20 and 0 (no mites). Each treatment had 10 replications. Observations were recorded up to 21 days after inoculation.

The results in Table 51 indicate that the numbers of mites per seedling influenced transmission efficiency. In both the trials,

Table 51. Influence of number of mites on transmission efficiency

Number of mites per seedling	Trial I			Trial II		
	No. of plants inoculated	No. infected	Percent SM infection	No. of plants inoculated	No. infected	Percent SM infection
1	10	4	40.0	10	2	20.0
2	10	8	80.0	10	7	70.0
3	10	7	70.0	10	7	70.0
4	10	7	70.0	9	5	55.6
5	10	10	100.0	8	3	37.5
10	10	10	100.0	8	4	50.0
20	10	10	100.0	10	10	100.0
0 (check)	10	0	0.0	10	0	0.0

a single mite per seedling was able to transmit the pathogen, though the

extent of transmission was very low; 40.0% in trial I, and 20.0% in trial 2. For 100% transmission a minimum of 5 mites per seedling were essential in trial I and a minimum of 20 mites per seedling in trial II. No transmission occurred where no mites were transferred.

2. Acquisition access period

The minimum acquisition access period required by *Aceria cajani* to acquire the pathogen causing sterility mosaic was studied using pathogen-free mites. Sterility mosaic-infected, mite-free leaves from the second flush of unsprayed, ratooned pigeonpea plants (BUS-5 field) were used for mite feeding. The leaves were examined under a stereo binocular microscope to make sure that there were no mites. The infected leaves used for feeding were held in acrylic, detached-leaf cages. Five mites per seedling with acquition access periods of 5 min, 15 min, 30 min, 1 hr, 2 hr, 4 hr and 6 hr were transferred onto 7 to 11-day-old BEN-1 seedlings. Each treatment had 10 replications. Observations on disease development were recorded after 25 days.

The results in Table 52 indicate that transmission can be obtained with 5 min acquisition access period. Only one plant each showed infection when the mites were given an acquisition feeding period of 5 min and 15 min. No transmission occurred in aquisition access periods of 30 min or more.

Table 52. Influence of acquisition access period on transmission of pigeonpea sterility mosaic by *Aceria cajani*

Acquisition access period	No. of plants inoculated	No. of plants infected	Percent infection
5 min	8		12.5
15 min	9		11.1
30 min	10		0.0
1 hr	8		0.0
2 hr	10		0.0
4 hr	10		0.0
6 hr	8		0.0
0 hr	10		0.0
Control (no mites)	10		0.0

3. Inoculation access period

Mites from SM-infected pigeonpea leaves were transferred onto 8-to 10-day-old BDN-1 seedlings. One mite per seedling was used.

The inoculation feeding periods allowed were 10 min, 20 min, 30 min, 1 hr, and continuous feeding. After the given access period per treatment the seedlings were sprayed with 0.1% Metasystox to kill the mites. Five mites per seedling with an inoculation access period of 30 min and continuous feeding were also tried. Each treatment had 10 replications. In case of continuous feeding the seedlings were not sprayed with the acaricide. Sprayed and unsprayed seedlings without mites were kept as controls. Observations on symptom development were recorded up to one month after inoculation. The results are presented in Table 53.

Table 53. Influence of inoculation access period on transmission of pigeonpea sterility mosaic by *Aceria cajani*

Inoculation access period	No. of plants inoculated	No. of plants infected	Percent infection
1 mite per seedling			
10 min	10	0	0.0
20 min	10	0	0.0
30 min	10	1	10.0
60 min	10	5	50.0
Continuous feeding	10	4	40.0
5 mites per seedling			
30 min	10	2	20.0
Continuous feeding	2	2	100.0
Check (no mites)			
Sprayed	10	0	0.0
Unsprayed	10	0	0.0

A minimum of 30 min inoculation access period was found necessary for a single mite to transmit the pathogen resulting in 10.0% infection (Table 53). In an inoculation access period of 30 min and continuous feeding, five mites per seedling produced 20.0% and 100.0% SM infection, respectively.

C. Mite vector multiplication

The reaction of 21 SMD-resistant, six tolerant (ring spot),

four tolerant (mild mosaic) and four susceptible pigeonpea lines, and eight *Atylosia* spp. (SMD-resistant and susceptible) in relation to mite multiplication was studied.

1. On resistant, tolerant and susceptible pigeonpea lines

Plants were raised in vertisol in 10" plastic pots, with one plant per pot, and kept 1 metre apart in an isolated open place. Each line had three-replications. Fifteen-day-old seedlings were inoculated with two mite-infested leaflets by leaf-stapling method.

The numbers of mites per cm^2 leaf area were estimated at 30, 60 and 90 days after inoculation. Five leaflets were collected at random from each plant and mites on each leaflet were counted using Wild M-5 Stereo-microscope (25 X) with external illumination. The leaf area was measured with Areameter Model LI-3100, and the average numbers of mites per cm^2 leaf area were calculated. The results are presented in tables 54, 55, 56, 57, 58 and 59.

Mites were observed in very low numbers only on three of the 21 resistant lines (ICP-7349, 8120, and -8136) tested in all the three observations (Table 54). On eight SMD-resistant lines, mites were present but only at certain intervals. The remaining 10 resistant lines, viz., ICP-3783, -7119, -7250, -7403, 7873, -7906, -7997, -8006, PI-394571, and Purple-1, were free from mites. The summarised results are presented in Table 55.

Mites were detected in low numbers on five of the six ring spot lines tested (Table 56). Only ICP-1833 a ring spot line was resistant to the vector. Three of four mild mosaic lines tested supported better mite multiplication than the ring spot lines except ICP-8105 which supported low mite population that to only up to 30 days (Table 56). All the four susceptible lines, ICP-1 (Sharda), ICP-26, T-21, -7118 (C-11) and -7182 (BDN-1), favored mite multiplication (Table 57). Increased multiplication of the mite vector on the susceptible lines was observed in subsequent observations. ICP-7491 (mild mosaic), T-21, and C-11 showed a maximum of 13.92, 12.69, and 23.75 mites per cm^2 leaf area, respectively, at 90 days after inoculation (Table 57).

2. On *Atylosia* species

Raising of plants, inoculation and recording observations on four SM-resistant and three SM-susceptible *Atylosia* spp. were carried out in a similar manner as was done in the case of pigeonpea lines. The four resistant lines, *A. volubilis*, *A. albicans*, *A. lineata*, and *A. sericea*, were found to be resistant to the pathogen and the mite vector (Table 58). Two susceptible lines, *A. scarabaeoides* (IC-7467) and *A. platycarpa*, were not infected and did not support the mite vector population.

Table 54. Assessment of eriophyid mites, *Aceria cajani* on some pigeonpea sterility mosaic resistant lines/cultivars

Pigeonpea line/ cultivar	Average number of mites per cm^2 leaf area estimated on days after inoculation[a]											
	30 days				60 days				90 days			
	R-I	R-II	R-III	Ave.	R-I	R-II	R-III	Ave.	R-I	R-II	R-III	Ave.
ICP-3782	0	0.01	0	0.003	0	0	0	0.00	0	0	0	0.00
ICP-3783	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00
ICP-7035	0.01	0	0	0.003	0	0	0	0.00	0	0	0	0.00
ICP-7119	0	-	0	0.00	0	-	0	0.00	0	-	0	0.00
ICP-7197	0.12	0	0	0.04	0	0	0	0.00	0	0	0	0.00
ICP-7201	0	0.05	0	0.02	0	0	0	0.00	0	0	0	0.00
ICP-7250	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00
ICP-7349	0.93	0.09	0.03	0.35	0.48	0.13	0.04	0.22	0.05	0	0	0.02
ICP-7403	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00
ICP-7867	0	0.08	0.05	0.05	0	0.02	-	0.01	0	0	-	0.00
ICP-7873	0	0	-	0.00	0	0	-	0.00	0	0	-	0.00
ICP-7906	0	-	0	0.00	0	-	0	0.00	0	-	0	0.00
ICP-7942	0	0	0	0.00	0	0	0	0.00	0.19	0.02	0	0.07
ICP-7997	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00
ICP-8006	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00
ICP-8051	0	0	0	0.00	0	0	0	0.00	0	0.03	0	0.01
ICP-8120	0	0.14	0	0.05	0.04	0.16	0	0.07	2.08	0.46	0	0.85
ICP-8136	0.07	0	0	0.02	0	0	0.13	0.04	-	0	0.44	0.22
ICP-8501	0	0	0.02	0.01	0	0	0	0.00	0	0	0	0.00
PI-394571	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00
Purple-1	0	-	-	0.00	0	-	-	0.00	0	-	-	0.00

[a]Average number of mites on 5 leaflets.

Table 55. Summarised results of assessment of eriophyid mites, *Aceria cajani*, on some resistant pigeonpea lines/cultivars

Pigeonpea line/ cultivar	Average number of mites per cm^2 leaf area on days after inoculation[a]		
	30	60	90
ICP-3782	0.003	0.00	0.00
ICP-3783	0.00	0.00	0.00
ICP-7035	0.003	0.00	0.00
ICP-7119	0.00	0.00	0.00
ICP-7197	0.04	0.00	0.00
ICP-7201	0.02	0.00	0.00
ICP-7250	0.00	0.00	0.00
ICP-7349	0.35	0.22	0.02
ICP-7403	0.00	0.00	0.00
ICP-7867	0.04	0.01	0.00
ICP-7873	0.00	0.00	0.00
ICP-7906	0.00	0.00	0.00
ICP-7942	0.00	0.00	0.07
ICP-7997	0.00	0.00	0.00
ICP-8006	0.00	0.00	0.00
ICP-8051	0.00	0.00	0.01
ICP-8120	0.05	0.07	0.85
ICP-8136	0.02	0.04	0.22
ICP-8501	0.01	0.00	0.00
PI-394571	0.00	0.00	0.00
Purple-1	0.00	0.00	0.00

[a]Average of 15 leaflets in three replications.

Table 56. Assessment of eriophyid mites, *Aceria cajani*, on some pigeonpea sterility mosaic tolerant and susceptible lines

Cultivar/line	Average number of mites per cm^2 leaf area estimated on days after inoculation[a]											
	30 days				60 days				90 days			
	R-I	R-II	R-III	Ave.	R-I	R-II	R-III	Ave.	R-I	R-II	R-III	Ave.
Tolerant (Ring Spot)												
ICP-1833	0	-	-	0.00	0	-	-	0.00	0	-	-	0.00
ICP-2376	0.05	0.03	0.03	0.04	0.02	0.06	0.21	0.10	0.14	0.33	0.20	0.22
ICP-3678	0	0.27	0	0.09	0	0.09	0	0.03	0	0.12	0	0.04
ICP-7874	0.13	0.02	0	0.05	0	0.07	0	0.02	0.06	1.28	0	0.45
ICP-8021	0	0	0	0.00	0.12	0	0	0.04	0.57	0	0	0.19
ICP-8317	0.03	-	-	0.03	0	-	-	0.00	0	-	-	0.00
Tolerant (Mild mosaic)												
ICP-7491	0.04	-	-	0.04	1.71	-	-	1.71	13.92	-	-	10.92
ICP-8105	-	0.03	0	0.02	-	0	0	0.00	-	0	0	0.00
ICP-8109	0.47	0.03	0	0.17	0.50	0	0	0.17	5.12	1.03	0.81	2.32
ICP-8161	-	-	0	0.00	-	-	0.36	0.36	-	-	2.58	2.58
Susceptible												
ICP-1 (Sharda)	0	0.05	0.06	0.04	0.10	0.83	0.21	0.38	4.99	1.65	3.94	3.53
ICP-26 (T-21)	0	0	0	0	0.22	0.07	0	0.10	12.26	8.77	0.59	12.69
ICP-7118 (C-11)	0.19	0	0	0.06	6.61	0.12	1.60	2.78	45.44	7.15	18.66	23.75
ICP-7182 (BDN-1)	0.07	0.06	0.05	0.06	0.18	0.18	4.48	1.61	2.18	0.05	19.14	7.14

[a]Average number of mites on five leaflets.

Table 57. Summarised results of assessment of eriophyid mites, *Aceria cajani*, on some tolerant and susceptible pigeonpea lines/ cultivars

Pigeonpea line/ cultivar	Average number of mites per cm^2 leaf area estimated on days after inoculation[a]		
	30	60	90
Tolerant - Ring spot			
ICP-1833	0.00	0.00	0.00
ICP-2376	0.04	0.10	0.22
ICP-3678	0.09	0.03	0.04
ICP-7874	0.05	0.02	0.45
ICP-8021	0.00	0.04	0.19
ICP-8317	0.03	0.00	0.00
Tolerant - Mild mosaic			
ICP-7491	0.04	1.71	13.92
ICP-8105	0.02	0.00	0.00
ICP-8109	0.17	0.17	2.32
ICP-8161	0.00	0.36	2.58
Susceptible - severe mosaic			
ICP-1 (Sharda)	0.04	0.38	3.53
ICP-26 (T-21)	0.00	0.10	12.69
ICP-7118 (C-11)	0.06	2.78	23.75
ICP-7182 (BDN-1)	0.06	1.61	7.14

[a]Average of 15 leaflets of three replications.

Table 58. Assessment of eriophyid mites, *Aceria cajani*, on some sterility mosaic resistant and susceptible *Atylosia* spp.

Atylosia spp.	Average number of mites per cm^2 leaf area estimated on days after inoculation[a]											
	30 days				60 days				90 days			
	R-I	R-II	R-III	Ave.	R-I	R-II	R-III	Ave.	R-I	R-II	R-III	Ave.
Resistant												
A. volubilis (JM 1984)	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00
A. albicans (JM 2337)	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00
A. lineata (IC 7225)	0	-	-	0.00	0	-	-	0.00	0	-	-	0.00
A. sericea (IC-7470)	0	-	-	0.00	0	-	-	0.00	0	-	-	0.00
Susceptible												
A. scarabaeoides (IC-7467)	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00
A. scarabaeoides (IC-7468)	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00
A. platycarpa (LJR coll.)	0	0	-	0.00	0	0	-	0.00	0	0	-	0.00
A. cajanifolia (JM-2739)	0.41	0.02	0.61	0.35	1.14	0.02	0.57	0.58	40.61	0.19	0.35	3.72

[a]Average number of mites on five leaflets.

Intrestingly, another susceptible collection of *A. scarabaeoides* (IC-7468) showed severe mosaic symptoms, but did not allow colonisation of mites. The susceptible *A. cajanifolia* showed severe mosaic symptoms in one replication and ring spot symptoms in the other two replications. Nevertheless, this *Atylosia* sp. supported a good population of the mite vector (13.72 mites per cm^2 leaf area). The summarised results are presented in Table 59.

Table 59. Summarised results of assessment of eriophyid mites, *Aceria cajani*, on some sterility mosaic resistant and susceptible *Atylosia* spp.

Atylosia species		Average number of mites per cm^2 leaf area assessed on days after inoculation[a]		
		30	60	90
Resistant				
A. volubilis	(JM-1984)	0.00	0.00	0.00
A. albicans	(JM-2337)	0.00	0.00	0.00
A. lineata	(IC-7225)	0.00	0.00	0.00
A. sericea	(IC-7470)	0.00	0.00	0.00
Susceptible				
A. scarabaeoides	(IC-7467)	0.00	0.00	0.00
A. scarabaeoides	(IC-7468)	0.00	0.00	0.00
A. platycarpa	(LJR coll.)	0.00	0.00	0.00
A. cajanifolia	(JM-2739)	0.35	0.58	13.72

[a]Average of 15 leaflets in three replications.

3. On infected and healthy susceptible pigeonpea

This experiment was conducted to understand the influence of the sterility mosaic infection on the multiplication of mites. The test variety used was BDN-1 (8-day-old), a cultivar highly susceptible to sterility mosaic. Ten infective mites from infected BDN-1 leaves were transferred onto one healthy BDN-1 seedling. The treatment was replicated five times. Ten pathogen-free mites from leaves of healthy BDN-1 plants were similarly transferred onto one healthy BDN-1 seedling and the treatment was replicated three times. Observations on five leaflets per replication were recorded at 15-day-interval up to 60 days after inoculation. The leaf area of each leaflet was measured and the numbers of mites per cm^2 leaf area were calculated. The results are presented in Table 60.

Table 60. Multiplication of eriophyid mites, *Aceria cajani*, on healthy and sterility mosaic-infected pigeonpea plants

Days after inoculation	Average number of mites per cm^2 leaf area[a]									
	Pathogen-free mites on healthy plants				Infective mites on SM-infected plants					
	Rep I	Rep II	Rep III	Ave.	Rep I	Rep II	Rep III	Rep IV	Rep V	Ave.
15	0.00	0.00	0.00	0.0	0.16	0.00	0.00	0.40	0.03	0.12
30	0.14	4.17	0.19	1.50	0.88	1.85	0.73	0.10	1.74	1.06
45	0.80	5.63	-[b]	3.22	104.55	11.68	10.14	21.06	33.87	36.26
60	0.39	15.99	0.00	5.46	132.64	30.15	21.98	21.89	101.48	61.63

[a]Average of five leaflets per replication.

[b]Observations not recorded.

The results indicate that sterility mosaic-infected plants supported a much better mite multiplication as compared with the healthy plants, which served as poor hosts for the mite vector. At 60 days after inoculation, the multiplication of infective mites on SM-infected BDN-1 plants showed an 11-fold increase over pathogen-free mites on healthy BDN-1 plants (61.63 mites on SM-infected versus 5.46 mites per cm^2 leaf area on healthy plants).

D. Survival of the mite vector

1. On detached leaves

The survival period of the mite vector was determined by transferring mites onto fresh, detached leaves maintained in acrylic, detached-leaf cages, and observing them at regular intervals until the mortality rate was 100%. Five mites were placed on the upper and lower surface of leaves of SM-susceptible lines, BDN-1 and C-11, with one replication per treatment. Ten mites were placed on the lower surface of leaves of SM-resistant line ICP-3783 and SM-susceptible *A. scarabaeoides* (IC-7468) with three replications per treatment. Mites survived for 52 to 72 hrs and 52 to 56 hrs, on detached leaves of BDN-1 and C-11, respectively. The survival period of mites was more than 56 hrs (observations could not be continued after 56 hrs), and 3 to 22 hrs on detached leaves of SM-resistant ICP-3783 and *A. scarabaeoides*, respectively.

2. On *Atylosia* species under natural conditions

In December 82, no mites were observed on leaves of *A. sericea*, *A. cajanifolia*, and *A. scarabaeoides* in BUS-7B (Pulse Entomology field). But few mites were observed on leaves of *A. scarabaeoides* collected from RP-18 field (multiple disease nursery). These leaves with mites were stapled onto primary leaves of BDN-1 seedlings to check if these mites were infective. No symptoms or mites were observed on BDN-1 seedlings after two months. In March 1983, no mites were observed on leaves of *A. scarabaeoides* collected from the same area of RP-18 field indicating the inability of the mites to survive on *A. scarabaeoides* during summer months under natural conditions.

3. On weed hosts under field conditions

To locate weed hosts of *A. cajani*, leaves of six weed species, viz., *Macroptilium atropurpureum*, *Desmodium* sp., *Corchorus oleturem*, *Cucumin callosus*, *Eclipta erecta*, and *Acalypha* sp., were collected from the SM nursery. No mites were observed on any of these common weeds in the SM nursery.

E. Transmission of the pathogen to other hosts through mites

Transmission of the SM pathogen to pigeonpea (BDN-1), *Nicotiana benthamiana* and *Scopolia sinensis* was tried through mites from pigeonpea leaves showing severe mosaic symptoms. Five mites per plant were transferred, with 10 replications for each of the plant species. Uninoculated plants were kept as controls. BDN-1 plants showed 100% SM infection; the other two plant species did not show any symptoms.

F. Control with *Acaricides*

1. On intact plants

SM-infected and mite-infested 3-month-old BDN-1 plants were sprayed with 0.1% of three acaricides-Tedion, Morestan and Kelthane. One plant per treatment was used. One plant was sprayed with water to serve as water-sprayed check whereas another plant was left unsprayed. The numbers of live mites per leaflet were recorded before treatment and 24 hr after treatment. The results are presented in Table 61a.

Table 61a. Efficacy of three acaricides in controlling eriophyid mites on pigeonpea

Treatment	Average number of live mites per leaflet		Percent mortality of mites
	Before treatment[a]	24 hr. after treatment[b]	
Tedion (Tetradifon)	398.6	14.0	96.5
Morestan (Quinomethionate)	62.4	0.1	99.8
Kelthane (Dicofol)	26.8	1.9	92.9
Water	82.6	24.8	70.0
Control (unsprayed)	6.8	10.3	51.5[c]

[a]Average of five replications.

[b]Average of 25 replications.

[c]Indicates increase in mite number.

All the three acaricides were equally and very highly effective in controlling eriophyid mites on pigeonpea as they caused 92.9 to 99.8% mortality. Interestingly, even water spray caused 70% mortality. There was 51.5% increase in eriophyid mites on plants kept as unsprayed controls

The experiment will be continued during the next year in order to locate an acaricide which would be ineffective against eriophyid mites but effective against spider mites.

2. On detached leaves

In this experiment SM-infested and mite-infested leaves, detached from the pigeonpea plants, were placed in the petri plate and then sprayed separately with each acaricide. After spray treatment each leaf was placed on a moistened filter paper in the petri plate. Five leaflets served as five replications. The number of five mites per leaflet were recorded before applying treatment and then 24 and 48 hr after the treatment. The results are presented in table 61b.

Table 61b. Efficacy of three acaricides on mortality of eriophyid mites using detached leaves

Treatment	Average number of live mites per leaflet[a]			Percent mortality of mites	
	Before treatment	24 hr after treatment	48 hr after treatment	24 hr after treatment	48 hr after treatment
Tedion	128.0	4.0	2.4	96.9	98.1
Morestan	233.0	2.4	1.6	99 0	99.3
Kelthane	127.0	0.4	1.2	99.7	99 1
Water	219.0	30.0	17.0	86.3	92.2
Control (unsprayed)	163.0	61.0	56.0	62.6	65.6

[a]Average of five replications.

Here again all the three acaricides were equally and very highly effective causing 98.1 to 99.3% mortality of mites after 48 hr of treatment. In detached leaf situation water spray caused 92.2% mortality. Even unsprayed control detached leaves showed 65.6% mortality indicating unsuitable situation in detached leaf for survival of mites.

V. Disease spread

The results of our study on disease spread for the past 2 years showed that the eriophyid mite , *Aceria cajani* carried by wind

currents spreads the disease. We continued this study during 1982-83 season also. Frequent observations on rows of susceptible cultivar (BDN-1) planted at different distances from the source of inoculum (Infection-hedge) and also in potted plants kept at different distances from the source, were recorded to obtain information on the extent and nature of the spread of the disease under field conditions during the crop season.

A. Source of Inoculum

Like last year a four-row, 100 m long 'Infector-hedge' of NP(WR)-15, planted on the west side of a 2.0 ha plot on 15 December 1981 and artificially inoculated by leaf-stapling method, served as the source of inoculum for the disease spread studies in the field. The percent disease incidence at the beginning of the experiment in the infector-hedge was 47%.

B. Spread as Monitored on the Indicator Rows Planted in the Field

BDN-1, a susceptible cultivar, was planted on 17 June 1982 at different distances from the Infector-hedge to serve as indicator row for the disease. The row length was 100 m which was equal to infector-hedge length. The wind direction at ICRISAT Center during June to September was Soutwest to Northeast. The distance of rows from source ranged from 1.5 m to 206.25 m at intervals of 9.75 meters (after every 12 test rows of pigeonpea). The observations were recorded at different intervals from 12 July 1982 to 27 January 1983. The 100 m rows of BDN-1 were divided into four parts of 25 m each (4 replications) and observations recorded separately. The average incidence of the disease in these rows at different intervals is presented in Table 62.

The disease could be observed up to 206.25 meters within 25 days after planting with the progressive decrease with increase in distance from the source. The disease incidence progressively increased with time and reached 100 percent in the last row, i.e. 206.25 m away from the source by 27 January 1983. These results confirm the results obtained on the disease spread last year.

C. Spread as Monitored on the Potted Plants in the Field in Four Directions

Plastic pots containing BDN-1 seedlings were placed at 100 m interval up to 2000 m from the 'Infector-hedge' in east direction, up to 100 m in west direction, and upto 500 m in north and south directions. Five pots with 20 seedlings each were placed at each distance. Observations on number of seedlings infected in these pots were recorded at 7-day-interval. At each observation, all the pots at a particular distance were removed even if a single plant was observed to be infected. The results are presented in Table 63. The results show that the disease spread upto 2000 m in the east of the infector hedge, which was in the downwind direction (Table 63). It could spread up to 25 m in the

Table 62. Pigeonpea sterility mosaic incidence in a susceptible cultivar (BDN-1) planted at different distances from the source (infector -hedge) at different intervals during 1982-83 season[1]

S.No.	Distance from the source (m)	Average disease incidence[2]					
		12 Jul	21 Jul	26 Aug	17 Sep	20 Oct	27 Jan
1.	1.50	59.7	96.0	100.0	100.0	100.0	100.0
2.	11.25	53.9	85.2	100.0	100.0	100.0	100.0
3.	21.00	36.9	63.8	100.0	100.0	100.0	100.0
4.	30.75	57.8	24.8	100.0	100.0	100.0	100.0
5.	40.50	31.1	54.2	100.0	100.0	100.0	100.0
6.	50.25	26.5	50.5	99.9	100.0	100.0	100.0
7.	60.00	23.1	37.9	100.0	100.0	100.0	100.0
8.	69.75	37.9	32.6	99.6	100.0	100.0	100.0
9.	79.50	14.9	27.3	99.8	100.0	100.0	100.0
10.	89.25	15.5	26.4	99.5	100.0	100.0	100.0
11.	99.00	13.6	21.4	98.2	100.0	100.0	100.0
12.	108.75	12.6	16.7	98.0	99.9	99.9	100.0
13.	118.50	11.8	16.0	95.6	99.3	99.7	99.9
14.	128.25	9.9	13.9	96.9	99.6	99.9	99.9
15.	138.00	5.1	9.2	95.8	99.8	100.0	100.0
16.	147.75	6.7	7.0	97.9	99.4	99 9	100.0
17.	157.50	4.5	8.2	96.4	99.1	99.8	100.0
18.	167.25	1.9	5.3	94.6	98.4	99.4	100.0
19.	177.00	1.3	4.6	93.7	98.5	99.0	100.0
20.	186.75	0.7	2.6	90.6	97.5	98.4	100.0
21.	196.50	4.4	6.5	85.7	93.5	95.6	99.7
22.	206.25	0.9	3.8	81.6	95.0	96.7	100.0

[1]BDN-1 was planted on 17 June 1982.

[b]Average of 4 replications.

west direction against the wind. No spread occurred in the north and south directions till 28 September 1982. However, later with the change in wind direction, the disease could spread up to 100 m in the north and 500 m in the south direction of the infector-hedge. These observations confirm our last year's results that wind plays an important role in the spread of eriophyid mites and thus the sterility mosaic.

Table 63. Pigeonpea sterility mosaic incidence in potted plants of a susceptible cultivar (BDN-1) kept at different distances and in the four directions from the source (Infector-hedge)

S. No.	Distance from the source (m)	Percent disease incidence at different intervals								
		7 Jul	15 Jul	22 Jul	2 Aug	10 Aug	18 Aug	26 Aug	9 Sep	16 Sep
1	2	3	4	5	6	7	8	9	10	11
	EAST									
1.	0	10.5	78.9	98.7	100.0	100.0	100.0	100.0	100.0	100.0
2.	100	1.2	11.9	20.3	28.6	59.5	83.3	96.4	97.6	97.6
3.	200	0.0	8.2	19.2	21.9	23.3	43.8	67.1	69.9	69.9
4.	300	0.0	2.5	3.8	5.1	8.9	11.4	13.9	13.9	25.3
5.	400	0.0	4.4	6.7	6.7	6.7	6.7	10.0	10.0	11.1
6.	500	0.0	6.6	9.0	9.0	9.0	12.0	12.0	12.0	14.0
7.	600	0.0	11.8	13.2	13.2	13.2	13.2	17.1	17.1	17.1
8.	700	0.0	7.1	7.1	8.3	8.3	8.3	8.3	8.3	13.1
9.	800	0.0	4.4	6.6	6.6	6.6	6.6	7.7	7.7	7.7
10.	900	0.0	4.5	4.5	5.7	5.7	5.7	6.8	6.8	6.8
11.	1000	0.0	6.3	7.8	9.4	9.4	9.4	9.4	9.4	9.4
12.	1100	0.0	3.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2
13.	1200	0.0	0.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0
14.	1300	0.0	1.2	1.2	1.2	2.4	2.4	2.4	2.4	2.4
15.	1400	0.0	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
16.	1500	0.0	0.0	0.0	0.0	0.0	0.0	4.7	4.7	4.7
17.	1600	0.0	2.5	2.5	3.8	3.8	3.8	3.8	3.8	3.8
18.	1700	0.0	0.0	0.0	2.8	2.8	2.8	2.8	2.8	2.8
19.	1800	0.0	0.0	0.0	0.0	1.1	1.1	1.1	1.1	1,1
20.	1900	0.0	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
21.	2000	0.0	1.1	1.1	2.3	2.3	2.3	3.4	4.6	5.7

Table 63. Contd.

1	2	3	4	5	6	7	8	9	10	11	12
	WEST										
22.	25	0.0	0.0	0.0	0.0	0.0	1.4	1.4	2.7	2.7	2.7
23.	50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24.	75	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25.	100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	NORTH										
26.	100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27.	200	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28.	300	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29.	400	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30.	500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	SOUTH										
31.	100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
32.	200	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33.	300	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34.	400	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35.	500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

V. SCREENING FOR RESISTANCE

A. Field screening

1. Screening nursery

Screening of various materials for resistance to sterility mosaic was carried out in a 2.0 ha Vertisol field under severe epiphytotic conditions. The 'infector-hedge' technique was adopted for creating the disease, the details of which are described in our 1980-81 Annual Progress Report on Pigeonpea (Pulse Pathology Progress Report-18).

This year a four-row, strip of NP(WR)-15 was planted on 15 December 1981 and inoculated by the leaf-stapling technique as last year. The test material was planted on 17 June 1982 with the inter-and intra-row spacings of 75 and 20 cm, respectively. A row of BDN-1, a susceptible cultivar, was planted every 12 test rows to serve as indicator row for the disease spread. This year also quite rapid and intensive spread of the disease was observed in the nursery as indicated by an average disease incidence of 99.9 percent (range 99.7 to 100%) in indicator rows after 7 months of planting (Table 62). Like last year, observations on disease incidence and symptom type (whether severe mosaic, ringspot or mild mosaic) in various materials were recorded at least twice. Observations on days to flowering and growth habit were also recorded in all the treatments. Yield data were recorded in selected materials.

2. Materials screened

The following materials were screened in the sterility mosaic nursery (SMN) during the 1982-83 season:

(a) Germplasm selections

i) From different years
ii) 1979 selections
iii) 1980 selections
iv) selections from mild mosaic (MM) lines

(b) 1982 germplasm accessions

(c) Missing lines

(d) Selections from ICP-2376 and BDN-1

i) 1980 selections
ii) 1981 selections

(e) Entomologically promising lines

(f) All India Arhar (Pigeonpea) Coordinated Trial (ACT) material

i) 1980 selections
ii) 1981 selections
iii) Extra-early Arhar Coordinated Trial (EXACT)-1982
iv) Early Arhar Coordinated Trial (EACT)-1982
v) ACT-1
vi) ACT-2
vii) ACT-3

(g) Early-maturity Hissar material

i) 1980 selections
ii) 1981 selections
iii) 1982 material
iv) ICPL entries

(h) Advance lines

i) Medium-maturity Pigeonpea Adaptation Yield Test (MPAY) and other entries
ii) Late-maturity Pigeonpea Adaptation Yield Test (LPAY) entries

(i) Resistant advance lines
(j) The University of Queensland lines
(k) Medium-maturity Pigeonpea Sterility Mosaic Resistant Lines Yield Test (MPSRY) entries
(l) Single Plant Progenies (SPP) from MPSRY and SM Resistant Lines Test (SMR Test) entries
(m) Single Plant Progenies from ICP-6997 and ICPLs
(n) BDN-1 BC_2F_2 material
(o) C-11 BC_1F_2 material
(p) Male sterile lines

i) MS-3A BC_1F_4
ii) MS-3A BC_2F_2
iii) MS-4A BC_1F_4
iv) MS-4A BC_2F_2

(q) SMD resistant and tolerant F_4 bulks
(r) SMD resistant F_4 SPP
(s) SMD tolerant F_4 SPP
(t) Dwarf lines
(u) Entries in the demonstration trial
(v) Entries of the ICAR-ICRISAT Uniform Trial for Pigeonpea Wilt Resistance (IIUTPWR).

a. Germplasm selections

i) From different years

From resistant plants: Thirty single progenies (SPP) from resistant plants selected since the 1976-77 season were screened (Table 64). Twenty-seven progenies from 11 germplasm accessions (ICP-70, -1901, -3761, 8111, -8853, -8856, JM-8867, PI-394531, -394559, -394571 and -397731) showed uniform resistance (0% infection) whereas three other progenies showed < 5% infection.

Table 64. Results of screening of single plant progenies selected from resistant plants in different years since 1976-77 for resistance to sterility mosaic during the 1982-83 season

S.No.	Particular	Total plants	Infected plants SM MM RS	Percent infection
1.	ICP-70-4-1-2-S1Ø	37	0,0,0	0.0
2.	ICP-70-4-1-2-S2Ø	25	0,1,0	4.0
3.	ICP-1901-2-S1Ø	31	0,0,0	0.0
4.	ICP-1901-2-S2Ø	27	0,0,0	0.0
5.	ICP-3761-1-1-2-S1Ø	44	2,0,0	4.5
6.	ICP-3761-1-1-2-S2Ø	42	0,0,0	0.0
7.	ICP-8111-1-3-2-S1Ø	50	0,0,0	0.0
8.	ICP-8111-1-3-2-S2Ø	32	0,0,0	0.0
9.	ICP-8853-2-S1Ø	22	0,0,0	0.0
10.	ICP-8856-2-S1Ø	18	0,0,0	0.0
11.	ICP-8856-2-S2Ø	31	0,0,0	0.0
12.	JM-8867-2-S1Ø	25	0,0,0	0.0
13.	JM-8867-2-S2Ø	35	0,0,0	0.0
14.	PI-394531-1-S1Ø	38	0,0,0	0.0
15.	PI-394531-1-S2Ø	34	0,0,0	0.0
16.	PI-394559-3-S1Ø	27	0,0,0	0.0
17.	PI-394571-1-S1Ø	16	0,0,0	0.0
18.	PI-394571-1-S2Ø	15	0,0,0	0.0
19.	PI-394571-2-S1Ø	25	0,0,0	0.0
20.	PI-394571-2-S2Ø	26	0,0,0	0.0
21.	PI-394571-3-S1Ø	23	0,0,0	0.0
22.	PI-394571-3-S2Ø	17	0,0,0	0.0
23.	PI-394571-4-S1Ø	21	0,0,0	0.0
24.	PI-394571-4-S2Ø	31	0,0,0	0.0
25.	PI-394571-5-S1Ø	21	0,0,0	0.0
26.	PI-394571-5-S2Ø	31	0,0,0	0.0
27.	PI-397731-1-S1Ø	28	0,0,0	0.0
28.	PI-397731-1-S2Ø	20	0,0,0	0.0
29.	PI-397731-3-S1Ø	27	1,0,0	3.7
30.	PI-397731-3-S2Ø	21	0,0,0	0.0

From segregating germplasm accessions: Seventy SPP from 41 segregating germplasm accessions were screened. Fifty-three progenies from 28 accessions showed uniform resistance (Table 65). Six SPP from six accessions showed < 10% infection. The accessions that showed uniform ringspot symptoms during the 1981-82 season did not show any ringspot symptoms during the 1982-83 season.

Table 65. Results of screening of 70 single plant progenies selected in different years from 41 segregating germplasm accessions to sterility mosaic at ICRISAT center during the 1982-83 season

S.No.	Particular
A.	SPP showing uniform resistance (0% infection)-53
1.	ICP-70-4-1-2-1-S1[illegible]
2.	ICP-70-4-1-2-2-S1[illegible]
3.	ICP-260-2-1-2-1-S1[illegible]
4.	ICP-260-2-1-2-2-S1[illegible]
5.	ICP-999-2-1-1-1-1-S1[illegible]
6.	ICP-999-2-1-1-1-2-S1[illegible]
7.	ICP-1946-4-1-1-1-S1[illegible]
8.	ICP-1946-4-1-1-2-S1[illegible]
9.	ICP-1963-2-1-1-1-S1[illegible]
10.	ICP-1963-2-1-1-2-S1[illegible]
11.	ICP-2013-3-2-1-1-S1[illegible]
12.	ICP-2013-3-2-1-2-S1[illegible]
13.	ICP-2020-3-1-1-1-S1[illegible]
14.	ICP-2020-3-1-1-2-S1[illegible]
15.	ICP-2045-1-1-1-S1[illegible]
16.	ICP-2158-1-2-2-S1[illegible]
17.	ICP-2209-3-2-2-1-S1[illegible]
18.	ICP-2380-1-1-2-S1[illegible]
19.	ICP-2732-1-1-2-1-S1[illegible]
20.	ICP-3259-1-2-1-1-S1[illegible]
21.	ICP-3259-1-2-1-2-S1[illegible]
22.	ICP-3426-1-1-2-2-1-S1[illegible]
23.	ICP-3426-1-1-2-2-2-S1[illegible]
24.	ICP-3521-1-2-1-1-S1[illegible]
25.	ICP-3521-1-2-1-2-S1[illegible]
26.	ICP-3689-1-1-1-1-S1[illegible]
27.	ICP-3689-1-1-1-2-S1[illegible]
28.	ICP-3755-1-1-1-1-S1[illegible]

Table 65. Contd.

29. ICP-3756-1-1-1-1-S1⊠
30. ICP-3920-2-2-2-1-S1⊠
31. ICP-4602-1-1-2-1-S1⊠
32. ICP-4602-1-1-2-2-S1⊠
33. ICP-4727-5-2-1-S1⊠
34. ICP-5151-1-1-2-2-1-S1⊠
35. ICP-5172-5-2-2-1-S1⊠
36. ICP-5838-1-1-1-1-S1⊠
37. ICP-5838-1-1-1-2-S1⊠
38. ICP-6223-3-3-1-1-2-S1⊠
39. ICP-6228-4-1-2-2-S1⊠
40. ICP-7227-1-1-1-1-S1⊠
41. ICP-7286-1-4-1-2-1-S1⊠
42. ICP-7286-1-4-1-2-2-S1⊠
43. ICP-7337-4-6-1-2-S1⊠
44. ICP-7371-2-2-1-2-1-S1⊠
45. ICP-7371-2-2-1-2-2-S1⊠
46. ICP-7802-2-2-2-1-S1⊠
47. ICP-7802-2-2-2-2-S1⊠
48. ICP-8107-1-3-2-1-1-S1⊠
49. ICP-8107-1-3-2-1-2-S1⊠
50. ICP-8304-2-2-2-1-S1⊠
51. ICP-8316-1-1-2-S1⊠
52. ICP-8325-1-1-1-1-S1⊠
53. ICP-8325-1-1-1-2-S1⊠

B. SPP showing less than 10% infection-6

1. ICP-2158-1-2-1-1-S1⊠
2. ICP-2732-1-1-2-1-S1⊠
3. ICP-3755-1-1-1-2-S1⊠
4. ICP-3756-1-1-1-1-S1⊠
5. ICP-7227-1-1-1-1-S1⊠
6. ICP-5151-1-1-2-2-S1⊠

ii) 1979 germplasm selections

Selections from resistant lines:

The results of screening of nine SPP of resistant plants selected from the segregating germplasm lines in 1979-80 season are presented in table 66.

Table 66. List of 1979 germplasm selections from resistant plants that showed no infection during the 1982-83 season

1.	ICP-8852-1-S1⊠
2.	ICP-8852-1-S2⊠
3.	JM-2389-1-S1⊠
4.	JM-2389-1-S2⊠
5.	JM-2392-1-S1⊠
6.	JM-2392-1-S2⊠
7.	JM-2496-1-S1⊠
8.	PI-396211-1-S1⊠
9.	PI-396211-1-S2⊠

Two SPP from ICP-8852 which showed uniform resistance last year also showed no disease this year. This year four other lines (JM-2389, -2392, -2496, and PI-396211), that showed uniform ringspot reaction during the 1981-82 season, showed uniform resistance instead of ringspot reaction.

Selections from segregating germplasm lines. Forty-four SPP from 14 segregating germplasm lines from 1979-80 selections were screened. Thirty-two progenies from 13 lines (ICP-8849, -8869, PI-394519, -394525, -394563, -394567, -394590, -394591, -394948, -394969, -395236, -396155, and -396819) showed uniform resistance (Table 67). Seven progenies showed < 10% infection (Table 67).

Table 67. Results of screening of single plant progenies (SPP), selected from segregating germplasm accessions in 1979, to sterility mosaic at ICRISAT center during the 1982-83 season

A. SPP showing uniform resistance-32

1.	ICP-8849-2-1-S1⊠
2.	ICP-8849-2-1-S2⊠
3.	ICP-8849-2-2-S1⊠
4.	ICP-8849-2-2-S2⊠
5.	ICP-8869-2-2-S1⊠
6.	ICP-8869-2-2-S2⊠
7.	PI-394519-1-1-S1⊠
8.	PI-394519-1-2-S1⊠
9.	PI-394519-1-2-S1⊠

Table 67. Contd.

10.	PI - 394525-2-2-S1[illegible]
11.	PI - 394525-2-2-S2[illegible]
12.	PI - 394563-1-2-S1[illegible]
13.	PI - 394563-1-2-S2[illegible]
14.	PI - 394567-2-2-S1[illegible]
15.	PI - 394567-2-2-S2[illegible]
16.	PI - 394590-2-1-S2[illegible]
17.	PI - 394590-2-2-S1[illegible]
18.	PI - 394591-1-1-S1[illegible]
19.	PI - 394591-1-1-S2[illegible]
20.	PI - 394591-1-2-S1[illegible]
21.	PI - 394591-1-2-S2[illegible]
22.	PI - 394948-2-1-S2[illegible]
23.	PI - 394948-2-2-S1[illegible]
24.	PI - 394948-2-2-S2[illegible]
25.	PI-394969-1-1-S2[illegible]
26.	PI-394969-1-2-S1[illegible]
27.	PI-394969-1-2-S2[illegible]
28.	PI-395236-2-2-S1[illegible]
29.	PI-395236-2-2-S2[illegible]
30.	PI-396155-2-1-S2[illegible]
31.	PI-396819-1-1-S1[illegible]
32.	PI-396819-1-1-S2[illegible]

B. SPP showing < 10% infection-7

1.	PI-394590-2-1-1-S1[illegible]
2.	PI-394590-2-1-2-S2[illegible]
3.	PI-394948-2-1-S1[illegible]
4.	PI-394969-1-1-S1[illegible]
5.	PI-396155-2-1-S1[illegible]
6.	PI-396819-1-2-S1[illegible]
7.	PI-396819-1-2-S2[illegible]

iii) 1980 germplasm selections

One hundred and seventy-one SPP from 95 accessions were screened for resistance to sterility mosaic. The summarised results are presented in table 68.

Table 68. Summary of results of screening of 1980 germplasm selections to sterility mosaic during the 1982-83 season

Percent Infection range	No. of progenies	Percent of total progenies
0	107	62.6
0.01 - 10.00	39	22.8
10.01 - 20.00	10	5.8
20.01 - 30.00	10	5.8
30.01 - 40.00	1	0.6
40.01 - 50.00	3	1.8
50.01 - 60.00	0	0.0
60.01 - 70.00	1	0.6
Total	171	100.0

One hundred and seven SPP from 71 accessions showed uniform resistance (Table 69), and 39 progenies showed < 10% infection. Many of these progenies were found to be susceptible to *Fusarium* wilt in the nursery (infection range of 0-100%).

Table 69. List of 107, 1980 pigeonpea germplasm selections that showed 0% sterility mosaic at ICRISAT center during the 1982-83 season

1.	PI-396928-1-S2Ø
2.	PI-396932-1-S1Ø
3.	PI-396932-1-S2Ø
4.	PI-396985-1-S1Ø
5.	PI-397122-1-S1Ø
6.	PI-397123-1-S1Ø
7.	PI-397125-1-S1Ø
8.	PI-397125-1-S2Ø
9.	PI-397126-1-S1Ø
10.	PI-397128-1-S1Ø
11.	PI-397128-1-S2Ø
12.	PI-397129-1-S2Ø
13.	PI-397130-1-S1Ø
14.	PI-397130-1-S2Ø
15.	PI-397131-1-S1Ø
16.	PI-397142-1-S1Ø

Table 69. Contd.

17.	PI-397142-1-S2⊠
18.	PI-397145-1-S1⊠
19.	PI-397149-1-S1⊠
20.	PI-397149-1-S2⊠
21.	PI-397150-1-S1⊠
22.	PI-397150-1-S2⊠
23.	PI-397151-1-S1⊠
24.	PI-397151-1-S2⊠
25.	PI-397154-1-S1⊠
26.	PI-397154-1-S2⊠
27.	PI-397157-1-S1⊠
28.	PI-397157-1-S2⊠
29.	PI-397159-1-S1⊠
30.	PI-397159-1-S2⊠
31.	PI-397161-1-S1⊠
32.	PI-397161-1-S2⊠
33.	PI-397175-1-S2⊠
34.	PI-397183-1-S1⊠
35.	PI-397184-1-S1⊠
36.	PI-397184-1-S2⊠
37.	PI-397187-1-S1⊠
38.	PI-397187-1-S2⊠
39.	PI-397188-1-S2⊠
40.	PI-397194-1-S2⊠
41.	PI-397200-1-S1⊠
42.	PI-397200-1-S2⊠
43.	PI-397208-1-S1⊠
44.	PI-397208-1-S2⊠
45.	PI-397222-1-S1⊠
46.	PI-397225-1-S1⊠
47.	PI-397225-1-S2⊠
48.	PI-397228-1-S1⊠
49.	PI-797228-1-S2⊠
50.	PI-397229-1-S1⊠
51.	PI-397229-1-S2⊠
52.	PI-397230-1-S2⊠
53.	PI-397235-1-S1⊠
54.	PI-397235-1-S2⊠
55.	PI-397237-1-S1⊠
56.	PI-397237-1-S2⊠
57.	PI-397246-1-S1⊠
58.	PI-397248-1-S1⊠
59.	PI-397248-1-S2⊠
60.	PI-397254-1-S1⊠

Table 69. Contd.

61.	PI-397256-1-S1⊠
62.	PI-397264-1-S2⊠
63.	PI-397268-1-S2⊠
64.	PI-397270-1-S1⊠
65.	PI-397270-1-S2⊠
66.	PI-397288-1-S1⊠
67.	PI-397298-1-S1⊠
68.	PI-397298-1-S2⊠
69.	PI-397304-1-S2⊠
70.	PI-397331-1-S1⊠
71.	PI-397331-1-S2⊠
72.	PI-397336-1-S1⊠
73.	PI-397336-1-S2⊠
74.	PI-397338-1-S1⊠
75.	PI-397338-1-S2⊠
76.	PI-397348-1-S1⊠
77.	PI-397348-1-S2⊠
78.	PI-397352-1-S1⊠
79.	PI-397352-1-S2⊠
80.	PI-397359-1-S1⊠
81.	PI-397367-1-S2⊠
82.	PI-397396-1-S1⊠
83.	PI-397396-1-S2⊠
84.	PI-397455-1-S1⊠
85.	PI-397456-1-S1⊠
86.	PI-397456-1-S2⊠
87.	PI-397461-1-S1⊠
88.	PI-397461-1-S2⊠
89.	PI-397539-1-S1⊠
90.	PI-397539-1-S2⊠
91.	PI-397541-1-S1⊠
92.	PI-397603-1-S1⊠
93.	PI-397603-1-S2⊠
94.	PI-397604-1-S1⊠
95.	PI-397606-1-S1⊠
96.	PI-397606-1-S2⊠
97.	PI-397614-1-S2⊠
98.	PI-397615-1-S1⊠
99.	PI-397630-1-S1⊠
100.	PI-397630-1-S2⊠
101.	PI-397636-1-S2⊠
102.	PI-397928-1-S1⊠
103.	PI-397942-1-S1⊠
104.	PI-397949-1-S1⊠
105.	PI-397949-1-S2⊠
106.	PI-397951-1-S1⊠
107.	PI-397951-1-S2⊠

iv) Selections from mild mosaic (MM) lines: The results of screening of 12 SPP from six accessions selected from MM plants in different years are presented in table 70. One SPP from ICP-8002 showed uniform resistance and another SPP from ICP-8276 showed 6.5% MM. All the other 10 progenies showed uniform mild mosaic reaction.

Table 70. Results of screening of 12 single plant progenies (SPP) from accessions, showing mild mosaic reaction, to sterility mosaic during the 1982-83 season

S.No.	Particular	Total plants	Infected plants SM MM RS	Percent infection	Symptom Type[1]
1.	ICP-4710-1-2-2-S1Ø	49	0, 46, 0	93.8	MM
2.	ICP-4710-1-2-2-S2Ø	46	0, 26, 0	56.5	MM
3.	ICP-5291-3-2-1-1-S1Ø	42	0, 14, 0	33.3	MM
4.	ICP-5291-3-2-1-1-S2Ø	50	1, 17, 0	34.0	SM, MM
5.	ICP-6683-2-1-1-S1Ø	33	0, 19, 0	57.6	MM
6.	ICP-6683-2-1-1-S2Ø	47	0, 27, 0	57.4	MM
7.	ICP-8002-2-2-1-S1Ø	37	0, 34, 0	91.9	MM
8.	ICP-8002-2-2-1-S2Ø	39	0, 0, 0	0.0	-
9.	ICP-8095-1-2-2-1-S1Ø	30	0, 27, 0	90.0	MM
10.	ICP-8095-1-2-2-1-S2Ø	33	1, 31, 0	96.9	SM, MM
11.	ICP-8276-2-1-1-S1Ø	47	0, 12, 0	25.5	MM
12.	ICP-8276-2-1-1-S2Ø	46	0, 3, 0	6.5	MM

[1]MM= Mild mosaic; SM= Severe mosaic

b. 1982 germplasm accessions

Additional 470 germplasm accessions that were provided by our Genetic Resources Unit (GRU) were screened. Summarised results of screening are presented in table 71. Eighty-nine lines were found free from infection (Table 72) and 37 lines showed < 10% infection. Many accessions showed moderate susceptibility to bacterial stem canker and 17 were killed due to severe canker infection.

c. Missing lines

Forty-nine SPP from 27 accessions that were selected from 1981-82 screening nursery were screened in 1982-83 season. Six accessions (ICP-5125, -5785, -6129, -6710, -7992, and -8111) showed uniform resistance whereas others showed segregation.

Table 71. Summary of results of screening of 470 new germplasm accessions to sterility mosaic during the 1982-83 season

Percent infection range	No. of accessions	Percent of total accessions
0.0	89	18.9
0.1 - 10.0	37	7.9
10.1 - 20.0	22	4.7
20.1 - 30.0	23	4.9
30.1 - 40.0	25	5.3
40.1 - 50.0	12	2.6
50.1 - 60.0	21	4.5
60.1 - 70.0	24	5.1
70.1 - 80.0	28	5.9
80.1 - 90.0	28	5.9
90.1 -100.0	144	30.7
	17[1]	3.6
Total	470	100.0

[1]Plants died due to severe bacterial stem canker

Table 72. List of 1982 germplasm lines that showed 0% and less than 10% infection to sterility mosaic at ICRISAT center during the 1982-83 season

A. Accession showing 0% infection - 89

PR-3605, -3623, -3630, -3656, -3666, Sri Lanka-477-1, May-May, PR-4969, -5106, -5108, -5110, -5113-1, -5114, -5118-1, -5126, -5131, -5139, -5140, -5145-1, -5145-2, -5146, -5147, -5149, -5152, -5155, -5166, -5173, -5144, -5266, -5271,-5280, -5294,-5350,-5378-1, -5413, -5462, -5465, -5471, -5506, -5523, ICP-11392, -11411, -11422, -11435, -11436, -11785, -11791, -11800, -11801, -11807, -11810, -11811, -11812, -11813, -11822, -11824, -11826, -11838,-11844,-11845,-11846, -11885, -11899, -11902, -11905, -11906, -11907, -11908, -11909, -11911, -11912, -11914, -11915, -11916, -11917, -11919, -11921,-11922, -11923, -11924, -11925, -11926, -11929, -11930, -11931, -11934, -11935, -11938, and -11940.

Table 72. Contd.

B. Accessions showing < 10% infection - 37

PR-3691, -4281, -4888, -4906-1, -5118, -5118-2, -5119, -5137-1, -5142, -5149-1, -5151, -5160-1, -5161, -5163-1, -5163-2, -5167, -5265, -5268, -5282-1, -5457, -5467-1, -5469, -5472, -5483, -5490, -5524, -5542, -5544, -5566, ICP-11424, -11438, -11795, -11796, -11857, -11927, -11932, -11936.

d. ICP-2376 and BDN-1 selections

i) 1980 selections

Four SPP of ICP-2376 and 14 SPP of BDN-1, selected from the resistant plants during the 1980-81 season were screened for sterility mocaic resistance. The results are presented in table 73. Two SPP from ICP-2376 and 11 from BDN-1 showed uniform resistance.

Table 73. Results of screening of 1980 K and 1981 K selections from ICP-2376 and BDN-1 plants against sterility mosaic disease during the 1982-83 season

S.No.	Particular	Total plants	Infected plants SM MM RS	Percent infection
A.	1980 K selections			
1.	ICP-2376-1(ST-2)-S1[illegible]	36	0, 0, 0	0.0
2.	ICP-2376-1-(ST-2)-S2[illegible]	20	0, 0, 0	0.0
3.	ICP-2376-2-(ST-2)-S1[illegible]	33	10, 15, 0	75.8
4.	ICP-2376-2-(ST-2)-S2[illegible]	34	22, 6, 0	82.4
5.	BDN-1-1-1 RS-S1[illegible]	41	0, 0, 0	0.0
6.	BDN-1-1-1 RS-S2[illegible]	53	0, 0, 0	0.0
7.	BDN-1-2 RS-1-S1[illegible]	31	0, 0, 0	0.0
8.	BDN-1-2 RS-1-S2[illegible]	44	0, 0, 1	2.3
9.	BDN-1-4(Nethouse)-1-S1[illegible]	40	0, 0, 0	0.0
10.	BDN-1-4(Nethouse)-1-S2[illegible]	38	2, 0, 0	5.3

Table 73. Contd.

1	2	3	4	5
11.	BDN-1-5(Nethouse)-S1⊠	49	0, 0, 0	0.0
12.	BDN-1-5(Nethouse)-S2⊠	40	0, 0, 0	0.0
13.	BDN-1-6(Nethouse)-S1⊠	39	0, 0, 0	0.0
14.	BDN-1-6(Nethouse)-S2⊠	23	0, 0, 0	0.0
15.	BDN-1-7-S1⊠	36	0, 0, 0	0.0
16.	BDN-1-7-S2⊠	34	0, 0, 0	0.0
17.	BDN-1-8-S1⊠	31	0, 0, 1	3.2
18.	BDN-1-8-S2⊠	43	0, 0, 0	0.0
B.	1981 K selections			
1.	BDN-1-9-S1	26	26, 0, 0	100.0
2.	BDN-1-10-S1	35	35, 0, 0	100.0
3.	BDN-1-11-S1	39	0, 0, 0	0.0
4.	BDN-1-12-S1	35	16, 0, 0	45.7
5.	BDN-1-13-S1	29	29, 0, 0	100.0
6.	BDN-1-14-S1	28	19, 0, 0	67.9
7.	BDN-1-15-S1	59	57, 0, 0	96.6
8.	BDN-1-16-S1	34	26, 0, 0	76.4
9.	BDN-1-17-S1	40	0, 0, 0	0.0
10.	BDN-1-18-S1	38	21, 0, 0	55.3
11.	BDN-1-19-S1	36	0, 0, 0	0.0
12.	BDN-1-20-S1	48	0, 0, 5	10.4
13.	BDN-1-21-S1	33	8, 0, 8	48.5

ii) 1981 selections

Of the 13 progenies selected from resistant BDN-1 plants during the 1981-82 season screened, three SPP showed uniform resistance (Table 73).

e. Entomologically promising lines

i) 1980 selections

The results of screening of 20 SPP of entomologically promising lines that were selected during the 1980 K season are presented in Table 74. Ten SPP of six lines showed uniform resistance whereas two SPP showed < 10% infection.

Table 74. List of entomologically promising lines that were selected in the sterility mosaic nursery during 1980 K and that remained free from sterility mosaic during the 1982-83 season

S.No.	Particulars	Total plants	Infected plants SM MM RS	Percent infection
	1980 K selections			
1.	ICP-3940-E1-3EB-1-S2@	37	0, 0, 0	0.0
2.	PPE-38-2-3EB-1-S1@	26	0, 0, 0	0.0
3.	PPE-38-2-3EB-1-S2@	30	0, 0, 0	0.0
4.	PPE-7537-E1-3EB-1-S2@	30	0, 0, 0	0.0
5.	PPE-8130-E1-2EB-1-S1@	35	0, 0, 0	0.0
6.	PPE-8130-E1-2EB-1-S2@	37	0, 0, 0	0.0
7.	PPE-8595-E1-2EB-1-S1@	30	0, 0, 0	0.0
8.	PPE-8595-E1-2EB-1-S2@	34	0, 0, 0	0.0
9.	PPE-8689-E1-EB-1-S1@	19	0, 0, 0	0.0
10.	PPE-8689-E1-EB-1-S2@	30	0, 0, 0	0.0

ii) 1981 selections

Three out of four entomologically promising lines that were selected during the 1981 K season in the sterility mosaic nursery showed uniform resistance (Table 75).

Table 75. List of entomologically promising lines that were selected in sterility mosaic nursery during 1981 K and that remained free from sterility mosaic during the 1982-83 season

S.No.	Particular	Total plants	Infected plants SM MM RS	Percent infection
1.	ICP-8325-E1-3EB-S1@	42	0, 0, 0	0.0
2.	PI-394440-EB-2-EB-S1@	37	0, 0, 0	0.0
3.	PI-396588-EB-2EB-S1@	37	0, 0, 0	0.0

iii) 1981 *Heliothis*-resistant selections

Thirty-four SMD-resistant lines from different years were screened against the *Heliothis* pod-borer during the 1981-82 season. Twelve progenies of six lines that were *Heliothis*-resistant were screened against SMD during the 1982-83 season. The results are presented in Table 76. Eleven progenies from five lines showed uniform resistance.

Table 76. The results of screening of 81 K pod-borer resistant lines to sterility mosaic at ICRISAT Center during the 1982-83 season

S.No.	Particular	Total plants	Infected plants SM MM RS	Percent infection
1.	ICP-8135-1-1-S2Ø-E1	21	0, 0, 0	0.0
2.	ICP-8301-1-2-S2Ø-E1	27	0, 0, 0	0.0
3.	ICP-8128-2-3-2-S2Ø-E1	47	0, 0, 1	2.1
4.	ICP-8860-S5Ø-E1	36	0, 0, 0	0.0
5.	PI-397731-S1Ø-E1	32	0, 0, 0	0.0
6.	PI-397731-S2Ø-E1	28	0, 0, 0	0.0
7.	PI-397731-S3Ø-E1	31	0, 0, 0	0.0
8.	PI-394571-S1Ø-E1	42	0, 0, 0	0.0
9.	PI-394571-S2Ø-E1	32	0, 0, 0	0.0
10.	PI-394571-S3Ø-E1	24	0, 0, 0	0.0
11.	PI-394571-S4Ø-E1	23	0, 0, 0	0.0
12.	PI-394571-S5Ø-E1	41	0, 0, 0	0.0

iv) 1982 K new lines

The results of screening of 28 new entomologically promising lines against SMD are presented in Table 77. None of the lines showed resistance to SMD.

Table 77. Results of screening of 1982 K entomologically promising lines to sterility mosaic disease during the 1982-83 season

S.No.	Particular	Total plants	Infected plants SM MM RS	Percent infection
1	2	3	4	5
1.	ICP-8094-2	34	34, 0, 0	100.0

Table 77. Contd.

2.	FH-2294-77-R-E2	34	34, 0, 0	100.0
3.	FH-2307-77-R-E1	33	23, 6, 2	93.9
4.	Prabhat x 3193-12-E1	40	33, 7, 0	100.0
5.	Prabhat x 3193-12-E2	30	24, 5, 1	100.0
6.	PI-397336	33	33, 0, 0	100.0
7.	PI-397576	30	29, 0, 1	100.0
8.	PI-397577	44	38, 2, 0	90.6
9.	PI-397602	37	33, 4, 0	100.0
10.	PI-397656	35	35, 0, 0	100.0
11.	PI-397696	38	38, 0, 0	100.0
12.	AGR-20-B	34	34, 0, 0	100.0
13.	ICP-10362	44	44, 0, 0	100.0
14.	BDN-1 x PPE-37-3	38	38, 0, 0	100.0
15.	PI-397275	42	35, 0, 0	83.0
16.	PI-397383	31	31, 0, 0	100.0
17.	PI-397471	27	27, 0, 0	100.0
18.	PI-397677	37	17, 7, 0	64.9
19.	PI-396940	36	36, 0, 0	100.0
20.	PI-397536	38	32, 3, 3	100.0
21.	PI-397668	35	34, 0, 1	100.0
22.	PI-395580	23	13, 2, 1	69.6
23.	ICP-10531	26	26, 0, 0	100.0
24.	ICP-10466	32	29, 0, 2	96.9
25.	ICP-4745-9-E2	25	22, 0, 0	88.0
26.	PI-396986	33	18, 5, 3	78.8
27.	ICP-8134-1-S1[illegible]	26	21, 0, 2	88.5
28.	ICP-8094-2-S1[illegible]	24	15, 0, 0	62.5

f. Arhar Coordinated Trial (ACT) material

i) 1980 ACT selections

Results of screening of 10 SPP from three ICPL entries (ICPL-85, -86, -87) are presented in table 78. ICPL-87 was found uniformily resistant, whereas one progeny each of ICPL-85 and ICPL-86 showed < 5% infection.

ii) 1981 ACT selections

Twenty-four SPP from 13 ACT lines that were selected during the 1981-82 season were screened and the results are

Table 78. Results of screening of 1980 K and 1981 K ACT selections to sterility mosaic during the 1982-83 season

S.No.	Particular	Total plants	Infected plants SM MM RS	Percent infection
1980 selections				
1.	ICPL-85-1-S1⊠	19	4, 0, 0	21.1
2.	ICPL-86-1-S1⊠	10	0, 0, 0	0.0
3.	ICPL-86-1-S2⊠	28	0, 0, 0	0.0
4.	ICPL-86-2-S1⊠	27	1, 0, 0	3.7
5.	ICPL-86-3-S1⊠	15	0, 0, 0	0.0
6.	ICPL-86-3-S2⊠	31	0, 0, 0	0.0
7.	ICPL-87-1-S1⊠	23	0, 0, 0	0.0
8.	ICPL-87-1-S2⊠	12	0, 0, 0	0.0
9.	ICPL-87-2-S1⊠	40	0, 0, 0	0.0
10.	ICPL-87-2-S2⊠	31	0, 0, 0	0.0
1981 selections				
1.	H-77-208-S1	31	25, 0, 0	80.6
2.	H-77-208-S2	9	9, 0, 0	100.0
3.	Pusa 33-S1	42	42, 0, 0	100.0
4.	Pusa 33-S2	30	26, 0, 0	86.7
5.	H-76-20-S1	35	34, 0, 0	97.1
6.	H-76-20-S2	47	46, 0, 0	97.9
7.	H-77-216-S1	27	27, 0, 0	100.0
8.	H-77-216-S2	25	25, 0, 0	100.0
9.	AL-15-S1	40	0, 0, 0	0.0
10.	AL-15-S2	33	33, 0, 0	100.0
11.	ICPL-81-S1	20	20, 0, 0	100.0
12.	ICPL-81-S2	34	34, 0, 0	100.0
13.	ICPL-179-S1	31	31, 0, 0	100.0
14.	ICPL-179-S2	14	14, 0, 0	100.0
15.	TT-5-BARC-S1	28	28, 0, 0	100.0
16.	HY-8-S1	23	14, 0, 0	60.9
17.	HY-8-S2	20	6, 0, 0	30.0
18.	ICPL-234-S1	35	0, 0, 0	0.0
19.	MA-2-S1⊠	35	30 SM+MM	85.7
20.	MA-2-S2⊠	40	34 SM+MM	85.0
21.	MA-95-2-S1⊠	35	0, 11, 0	31.4
22.	MA-95-2-S2⊠	24	13 SM+MM	54.2
23.	MA-97-S1⊠	31	0, 0, 0	0.0
24.	MA-97-S2⊠	38	0, 0, 0	0.0

presented in table 78, Four progenies from 3 lines (AL-15, ICPL-234, and MA-97) showed uniform resistance whereas others showed more than 30% infection.

iii). Extra-early Arhar Coordinated Trial (EXACT)-1982

Results of screening of 13 entries of Extra-early arhar coordinated trial to sterility mosaic are presented in table 79. All the entries were found to be highly susceptible.

Table 79. Results of screening of entries of arhar coordinated trials (ACTs) to sterility mosaic at ICRISAT Center during the 1982-83 season

S.No.	Particular	Total plants	Infected plants	Percent infection	Symptom type
EXACT					
1.	TAT-9	21	15	71.4	SM
2.	AL-1	31	27	87.1	SM
3.	DL-78-1	25	16	64.0	SM
4.	DL-82	27	21	77.8	SM
5.	H 76-51	32	29	90.6	SM
6.	H 76-11	29	25	86.2	SM
7.	H 76-44	27	19	70.3	SM
8.	H 76-65	29	25	86.2	SM
9.	H 81-1	29	26	89.7	SM
10.	ICPL-4	25	23	92.0	SM
11.	ICPL-267	25	25	100.0	SM
12.	Prabhat	18	15	83.3	SM
13.	UPAS-120	21	20	95.2	SM
EACT					
14.	H 76-20	9	9	100.0	SM
15.	H 76-208	23	22	95.7	SM
16.	ICPL-1	20	20	100.0	SM
17.	ICPL-81	30	29	96.7	SM
18.	ICPL-87	24	23	95.8	SM
19.	ICPL-151	20	20	100.0	SM

Table 79. Contd.

1	2	3	4	5	6
20.	ICPL-142	23	16	69.6	SM
21.	ICPL-161	24	19	79.2	SM
22.	Pusa-78	21	8	38.1	SM
23.	Pusa-33	34	29	85.3	SM
24.	VL-23	46	38	82.6	SM
25.	TAT-10	32	29	90.6	SM
26.	UPAS-120	28	26	92.9	SM
ACT-1					
27.	TT-5	26	26	100.0	SM
28.	TT-6	16	15	93.8	SM
29.	ICPL-150	27	22	81.5	SM
30.	ICPL-189	26	26	100.0	SM
31.	HY-6	20	17	85.0	SM
32.	HY-8	21	21	100.0	SM
33.	T-21	33	32	96.9	SM
34.	S-80	17	16	94.1	SM
35.	K-10	31	30	96.8	SM
36.	MPH-3	24	19	79.2	SM
ACT-2					
37.	JNA-421	53	53	100.0	SM
38.	PDA-3	63	15	23.8	SM
39.	PDA-5	68	62	91.2	SM
40.	PDA-6	37	37	100.0	SM
41.	MTH-1	43	43	100.0	SM
42.	MTH-2	67	67	100.0	SM
43.	ICPH-6	72	72	100.0	SM
44.	ICPH-7	75	75	100.0	SM
45.	ICPL-270	52	52	100.0	SM
46.	LRG-36	36	36	100.0	SM
47.	ICPH-2	54	54	100.0	SM
48.	ICPL-304	42	42	100,0	SM
49.	BDN-3	36	36	100,0	SM
50.	BDN-1	28	28	100.0	SM
51.	MA-162	32	32	100.0	SM
52.	C-11	47	47	100.0	SM
53.	LRG-30	48	48	100.0	SM
54.	K-64	40	39	97.5	SM

Table 79. Contd,

ACT-3

55.	Bahar	23	1	4.3	SM
56.	T-7	21	19	90.5	SM
57.	Gwalior-3	24	20	83.3	SM
58.	MA-2	17	6	35.3	SM
59.	MA-95-2	20	9	45.0	SM
60.	PDA-1	21	20	95.2	SM
61.	Comp-4	21	19	90.5	SM
62.	K-23	22	19	86.4	SM
63.	Sehore-364	22	22	100.0	SM
64.	73100-84-G1-VII NDT B-GB-GB-GB	17	13	76.5	SM
65.	ICPL-310	26	15	57.7	SM
66.	ICPL-311	24	6	25.0	SM
67.	JNAL-421	19	16	84.2	SM
68.	PDA-7	29	18	62.1	SM
69.	PDA-8	21	21	100.0	SM
70.	MA-97	29	1	3.4	SM
71.	Sehore-367	35	29	82.9	SM
72.	JA-13	35	6	17.1	SM
73.	JA-17	30	13	43.3	SM
	BDN-1 (Check)	22	22	100.0	SM

iv) Early Arhar Coordinated Trial (EACT) - 1982

Thirteen EACT entries were screened for sterility mosaic resistance (Table 79). One line (Pusa-78) showed 38.1% infection whereas all others showed > 70% infection.

v) Arhar Coordinated Trial-1 (ACT-1) - 1982

Out of 10 entries of Arhar Coordinated Trial-1 screened for sterility mosaic resistance, none were found promising as all the entries showed > 70% infection (Table 79).

vi) Arhar Coordinated Trial-2 (ACT-2) - 1982

Results of screening of 18 medium-maturity Arhar Coordinated Trial (ACT-2) entries to sterility mosaic are presented table 79. Only one entry (PDA-3) showed 23.8% wereas all others showed > 90% infection.

vii) Arhar Coordinated Trial-3 (ACT-3) - 1982

Nineteen Late-maturity Arhar Coordinated Trial (ACT-3) entries were screened against sterility mosaic (Table 79). Two entries, Bahar and MA-97, showed 4.3 and 3.4% infection, respectively; one entry JA-13 showed 17.1% infection. All other entries showed > 25% infection.

g. Early-maturity Hissar material

i) 1980 selections

Selections from resistant plants. The results of screening of 21 SPP selected from resistant lines during the 1980-81 season are presented in table 80. Twelve progenies from five lines showed uniform resistance.

Table 80. Results of screening of 21 single plant progenies of early pigeonpea plants selected in 1980-81 to sterility mosaic at ICRISAT Center during the 1982-83 season

S.No.	Particular	Total plants	Infected plants SM MM RS	Percent infection
1.	74205-1-NDTB-H 105-1-B-B-1-S1	21	1, 5, 0	28.6
2.	74205-1-NDTB-H 105-1-B-B-1-S2	18	1, 0, 0	5.6
3.	74205-1-NDTB-H 106-NDT2-B-B-1-B-1-S1	17	5, 0, 0	29.3
4.	74205-1-NDTB-H 106-NDT2-B-B-1-B-1-S2	26	1, 0, 0	3.8
5.	75001-4-B-HNDT1-B-2-B-1-S1	21	8, 0, 0	38.1
6.	75001-4-B-HNDT1-B-2-B-1-S2	27	6, 0, 0	22.2
7.	75001-24-B-HIVDT1-B-1-B-1-S1	17	1, 0, 0	5.9
8.	75001-24-B-HIVDT1-B-1-B-1-S2	25	2, 3, 0	20.0
9.	75001-29-HIVNDT1-B-1-B-1-S1	34	0, 0, 0	0.0
10.	75001-29-HIVNDT1-B-1-B-1-S2	28	0, 0, 0	0.0
11.	75001-32-B-HlDT1-B-1-B-1-S1	30	0, 0, 0	0.0
12.	75001-32-B-HlDT1-B-1-B-1-S2	35	0, 0, 0	0.0
13.	75002-lHDT1-B-3-B-1-S1	19	0, 0, 0	0.0
14.	75002-VNDT-38-IIINDT3-B-2-B-1-S1	26	0, 0, 0	0.0
15.	75002-VNDT-38-IIINDT3-B-2-B-1-S2	35	0, 0, 0	0.0
16.	75005-5-B-HIVNDT1-B-1-B-1-S1	17	0, 0, 0	0.0
17.	75005-5-B-HIVNDT1-B-1-B-1-S2	28	0, 0, 0	0.0
18.	75006-IVNDT-46-IIINDT2-B-1-B-1-S1	30	0, 0, 0	0.0
19.	75006-IVNDT-46-IIINDT2-B-1-B-1-S2	20	1, 0, 0	5.0
20.	75016-IVNDT-10-IIINDTB-1-B-1-S1	21	0,0, 0	0.0
21.	75016-IVNDT-10-IIINDTB-1-B-1-S2	29	0, 0, 0	0.0

Selections from segregating plants. Forty-six progenies of the resistant plants selected from the segregating lines (< 10% infection) during 1980-81 season were screened (Table 81). Thirty-seven progenies from six lines showed uniform resistance.

Table 81. Results of screening of 46 single plant progenies from plants of resistant early pigeonpea lines selected in 1980-81 to sterility mosaic at ICRISAT Center during the 1982-83 season

S.No.	Particular	Total plants	Infected plants SM MM RS	Percent infection
1.	74092-IINDT3-H110-IIINDT-B0-1-B-10-S10	33	2, 0, 0	6.1
2.	74092-IINDT3-H110-IIINDT-B0-1-B-10-S20	40	0, 0, 0	0.0
3.	74092-IINDT3-H110-IIINDT-B0-1-B-10-S30	32	0, 0, 0	0.0
4.	74092-IINDT3-H110-IIINDT-B0-1-B-10-S40	23	0, 0, 0	0.0
5.	74092-IINDT3-H110-IIINDT-B0-1-B-10-S50	24	0, 0, 0	0.0
6.	74146-DTB-23-1-HIIIDT-B0-B-B-10-S10	29	0, 0, 0	0.0
7.	74146-DTB-23-1-HIIIDT-B0-B-B-10-S20	34	0, 0, 0	0.0
8.	74146-DTB-23-1-HIIIDT-B0-B-B-10-S30	29	0, 0, 0	0.0
9.	74146-INDTB-H81-IIINDT-B0-1-B-10-S10	25	0, 0, 0	0.0
10.	74146-INDTB-H81-IIINDT-B0-1-B-1-S20	22	1, 18, 0	86.4
11.	74146-INDTB-H81-IIINDT-B0-1-B-1-S30	26	0, 4, 0	15.4
12.	74146-INDTB-H81-IIINDT-B0-1-B-1-S40	25	4, 0, 0	16.0
13.	74146-INDTB-H83-IIINDT3-B0-1-B-1-S10	22	0, 0, 0	0.0
14.	74146-INDTB-H83-IIINDT3-B0-1-B-1-S20	29	2, 0, 0	16.9
15.	74146-INDTB-H83-IIINDT3-B0-1-B-1-S30	38	1, 0, 0	2.6
16.	74146-INDTB-H83-IIINDT3-B0-1-B-1-S40	24	0, 0, 0	0.0
17.	74149-DTB-18-1HIVDT1-B0-1-B-10-S10	25	0, 0, 0	0.0
18.	74149-DTB-18-1HIVDT1-B0-1-B-10-S20	26	0, 0, 0	0.0
19.	74149-DTB-18-1HIVDT1-B0-1-B-10-S30	17	0, 0, 0	0.0
20.	74149-DTB-18-1HIVDT1-B0-1-B-10-S40	24	0, 0, 0	0.0
21.	74149-DTB-18-1HIVDT1-B0-1-B-10-S50	14	0, 0, 0	0.0
22.	74149-DTB-18-1HIVDT1-B0-1-B-10-S60	32	0, 0, 0	0.0
23.	74149-DTIB-33-IIINDT2-B0-1-B-S10	40	0, 0, 0	0.0
24.	74149-DT1B-33-IIINDT2-B0-1-B-S20	32	0, 0, 0	0.0
25.	74149-DT1B-33-IIINDT2-B0-1-B-S30	38	1, 0, 0	2.6
26.	74149-DT1B-33-IIINDT2-B0-1-B-S40	35	0, 0, 0	0.0
27.	74149-DTB-33-IIINDT2-B0-1-B-S50	35	0, 0, 0	0.0
28.	74205-NDTB-104-IDT1-B0-1-B-1-1-S10	42	0, 0, 0	0.0
29.	74205-NDTB-104-IDT1-B0-1-B-1-1-S20	27	0, 0, 0	0.0
30.	74205-NDTB-104-IDT1-B0-1-B-1-1-S30	27	0, 0, 0	0.0
31.	74205-NDTB-104-IDT1-B0-1-B-1-1-S40	28	0, 0, 0	0.0
32.	74205-NDTB-104-IDT1-B0-1-B-1-1-S50	39	0, 0, 0	0.0

Table 81. Contd.

33.	74216-NDTIB-21-IIINDT2-B0-1-B-10-S10	32	0, 0, 0	0.0
34.	74216-NDTIB-21-IIINDT2-B0-1-B-10-S20	27	0, 0, 0	0.0
35.	74216-NDTIB-21-IIINDT2-B0-1-B-10-S30	29	0, 0, 0	0.0
36.	74216-NDTIB-21-IIINDT2-B0-1-B-10-S40	25	1, 0, 0	4.0
37.	74216-NDTIB-21-IIINDT2-B0-1-B-10-S50	26	0, 0, 0	0.0
38.	74216-NDTIB-21-IIINDT1-1-B-20-S10	21	0, 0, 0	0.0
39.	74216-NDTIB-21-IIINDT1-1-B-20-S20	32	0, 0, 0	0.0
40.	74216-NDTIB-21-IIINDT1-1-B-20-S30	21	0, 0, 0	0.0
41.	74216-NDTIB-21-IIINDT1-1-B-20-S40	29	1, 0, 0	3.4
42.	74216-NDTIB-21-IIINDT1-1-B-20-S50	26	0, 0, 0	0.0
43.	75001-6B-HIVDT1-B0-1-B-10-S10	19	0, 0, 0	0.0
44.	75001-6B-HIVDT1-B0-1-B-10-S20	30	0, 0, 0	0.0
45.	75001-6B - HIVDT1-B0-1-B-10-S30	30	0, 0, 0	0.0
46.	75001-6B - HIVDT1-B0-1 - B-10-S40	30	0, 0, 0	0.0

ii) 1981 selections

Results of screening of 68 SPP of resistant plants that were selected during the 1981-82 season are presented in table 82. Fifty-eight SPP from 28 lines showed uniform resistance whereas 10 other SPP showed < 10% infection. Six lines (74149, 74205, 74092, 75001, 75025 and Comp I) were selected in collaboration with pigeonpea breeders to be included in 1983-84 Early-Maturity Multilocation SMD resistant lines observation nursery (ESR).

Table 82. Results of screening of 68 SPP of early pigeonpea plants selected in 1981-82 to sterility mosaic at ICRISAT Center during the 1982-83 season

S.No.	Particular	Percent infection
1.*	ICPL-154-S10	9.1
2.	ICPL-154-S20	3.1
3.*	ICPL-155-S10	4.7
4.	ICPL-155-S20	6.7
5.	ICPL-169-S10	0.0
6.*	ICPL-169-S20	0.0

Table 82, Contd.

7.*	ICPL-146-S1[illegible]	0.0
8.*	ICPL-146-S2[illegible]	0.0
9.	ICPL-269-S1[illegible]	8.3
10.*	ICPL-269-S2[illegible]	0.0
11.	ICPL-94-S1[illegible]	7.7
12.*	ICPL-94-S2[illegible]	0.0
13.	C.No.74076-6-B-1-B-HB-HB-HB-HB-S1[illegible]	0.0
14.*	C.No.74076-6-B-1-B-HB-HB-HB-HB-S2[illegible]	0.0
15.*	Comp-1-ODT-H17-HB-S1[illegible]	0.0
16.*	Comp-1-ODT-H17-HB-S2[illegible]	0.0
17.*	PQ-242-S2[illegible]	8.3
18.*	ICPL-289-S2[illegible]	0.0
19.*	75025-1-B-H1-B[illegible]-H1-HB-HB-S1[illegible]	0.0
20.*	75025-1-B-H1-B[illegible]-H1-HB-HB-S2[illegible]	0.0
21.	75075-10-1-1-1-B-B5-HB-HB-S1[illegible]	0.0
22.*	76115-H14-HB-HB-S1[illegible]	0.0
23.	76115-H14-HB-HB-S2[illegible]	0.0
24.*	ICPL-166-S1[illegible]	0.0
25.*	ICPL-166-S2[illegible]	0.0
26.*	ICPL-176-S1[illegible]	0.0
27.	ICPL-176-S2[illegible]	0.0
28.*	ICPL-145-S1[illegible]	0.0
29.*	ICPL-145-S2[illegible]	0.0
30.*	Comp-1-IDT-H4-H1-B[illegible]-HB-HB-S1[illegible]	0.0
31.*	Comp-1-IDT-H4-H1-B[illegible]-HB-HB-S2[illegible]	0.0
32.*	75080-39-B-H6-B[illegible]-B1-HB-HB-S1[illegible]	0.0
33.*	75080-39-B-H6-B[illegible]-B1-HB-HB-S2[illegible]	0.0
34.*	74092-B-38-1-H10B-HB-HB-HB-S1[illegible]	0.0
35.*	74092-B-38-1-H10B-HB-HB-HB-S2[illegible]	0.0
36.*	74092-B-38-1-H9B-B-HB-B[illegible]-HB-S1[illegible]	0.0
37.*	74092-B-38-1-H9B-B-HB-B[illegible]-HB-S2[illegible]	0.0
38.*	74092-B-27-B-H1-B[illegible]-H2-H1-HB-S1[illegible]	3.8
39.*	74092-B-27-B-H1-B[illegible]-H2-H1-HB-S2[illegible]	0.0
40.*	74092-B-27-B-H1-B[illegible]-H2-H4-HB-S1[illegible]	0.0
41.*	74092-B-27-B-H1-B[illegible]-H2-H4-HB-S2[illegible]	0.0
42.	ICPL-288-S1[illegible]	0.0
43.*	ICPL-288-S2[illegible]	2.7
44.*	74092-B-25-1-H1-B-HB-B-HB-S1[illegible]	0.0
45.*	74092-B-25-1-H1-B-HB-B-HB-S2[illegible]	0.0
46.*	Comp-1-IDT-B4-H1-B[illegible]-H2-HB-HB-S1[illegible]	0.0
47.*	Comp-1-IDT-B4-H1-B[illegible]-H2-HB-HB-S2[illegible]	0.0
48.	75080-1-B-H3-B[illegible]-H2-HB-HB-S1[illegible]	0.0
49.	75080-1-B-H3-B[illegible]-H2-HB-HB-S2[illegible]	0.0
50.*	(73081-4DT-4 x prabhat)-9-HB-HB-S1[illegible]	0.0

Table 82. Contd.

51.*	(73081-4DT-4 x prabhat)-9-HB-HB-S2⊠	0.0
52.*	ICPL-293-S1⊠	0.0
53.*	ICPL-293-S2⊠	0.0
54.*	74092-B-H110-H1-B⊠-H1-HB-HB-HB-S1⊠	0.0
55.*	74092-B-H110-H1-B⊠-H1-HB-HB-HB-S2⊠	0.0
56.*	76141-22-HB-HB-S1⊠	0.0
57.*	76141-22-HB-HB-S2⊠	0.0
58.*	74205-1-104-H1-B⊠-S1⊠	0.0
59.*	74205-1-104-H1-B⊠-S2⊠	0.0
60.*	74092-B-102-H2-B⊠-HB-H5-HB-S1⊠	0.0
61.*	74092-B-102-H2-B⊠-HB-H5-HB-S2⊠	0.0
62.*	74092-B-59-H1-B⊠-H1-H4-HB-S1⊠	0.0
63.*	74092-B-59-H1-B⊠-H1-H4-HB-S2⊠	0.0
64.	74149-B-38-B-H1-B⊠-H1-HB-HB-S1⊠	4.3
65.*	74075-1-B-H52-H4-B⊠-H1-HB-HB-S1⊠	0.0
66.*	74075-1-B-H52-H4-B⊠-H1-HB-HB-S2⊠	0.0
67.	74174-B-2-H2-B⊠-B-H4-HB-S1⊠	0.0
68.*	74174-B-2-H2-B⊠-B-H4-HB-S2⊠	0.0

*Lines selected for future use.

iii) 1982 material

An additional 412 early-maturity pigeonpea material provided by our pigeonpea breeders were screened for resistance to sterility mosaic during the 1981-82 season. The summarised results are presented in Table 83. Fifteen lines showed uniform resistance; 12 showed < 10% disease; and 14 showed < 20% disease (Table 84).

Table 83. Summary of results of screening of 1982 Hissar early-maturity material to sterility mosaic during the 1982-83 season

Percent infection range	Number of lines	Percent of total lines
0 - 0	15	3.6
0.01 - 10.00	12	2.9
10.01 - 20.00	14	3.4

Table 83. Contd.

20.01 - 30.00	18	4.4
30.01 - 40.00	17	4.1
40.01 - 50.00	17	4.1
50.01 - 60.00	10	2.4
60.01 - 70.00	10	2.4
70.01 - 80.00	29	7.0
80.01 - 90.00	62	15.0
90.01 -100.00	208	50.5
Total	412	100.0

Table 84. Results of screening of 1982 early-maturity material from Hissar for resistance to sterility mosaic at ICRISAT Center during the 1982-83 season

S.No.	Particular	Total plants	Infected plants SM MM RS	Percent infection
A.	Lines showing 0% infection			
1.	ICPL-83	21	0, 0, 0	0.0
2.	75001-6-B	26	0, 0, 0	0.0
3.	74205-1-104-H1-B	23	0, 0, 0	0.0
4.	74075-B-1-H52	32	0, 0, 0	0.0
5.	74174-B-1-2-H2-B	26	0, 0, 0	0.0
6.	74146-DTB-23	36	0, 0, 0	0.0
7.	75149-DTIB-33	32	0, 0, 0	0.0
8.	74146-NDTII-B-18	24	0, 0, 0	0.0
9.	74174-B-2	28	0, 0, 0	0.0
10.	75080-3-B	18	0, 0, 0	0.0
11.	E-832	22	0, 0, 0	0.0
12.	ICPL-146	18	0, 0, 0	0.0
13.	P-1395	29	0, 0, 0	0.0
14.	E-4144	32	0, 0, 0	0.0
15.	P-4884	24	0, 0, 0	0.0

Table 84. Contd.

1	2	3	4	5
B.	Lines showing < 10% infection			
1.	ICPL-82	27	1, 0, 0	3.7
2.	ICPL-146	35	1, 0, 0	2.9
3.	75080-39-B-H6	26	2, 0, 0	7.7
4.	74216-NDT-1B	33	1, 0, 0	3.0
5.	74149-DTB-181	30	2, 0, 0	6.7
6.	ICPL-315	10	1, 0, 0	10.0
7.	P-3199	20	2, 0, 0	10.0
8.	E-807	20	1, 0, 0	5.0
9.	P-3961	21	2, 0, 0	9.5
10.	P-1562	10	1, 0, 0	10.0
11.	P-4329	30	1, 0, 0	3.3
12.	E-3785	31	3, 0, 0	9.7
C.	Lines showing > 10% but < 20% infection			
1.	74092-B-H110	27	4, 0, 0	14.8
2.	74146-INDTB-H81	22	3, 0, 0	13.6
3.	73047-7-14-1	23	3, 0, 0	13.0
4.	E-712	34	6, 0, 0	17.6
5.	E-714	25	5, 0, 0	20.0
6.	E-829	17	3, 0, 0	17.6
7.	E-930	24	4, 0, 0	16.7
8.	E-316	19	2, 0, 0	10.5
9.	E-808	26	4, 0, 0	15.4
10.	P-524	12	2, 0, 0	16.7
11.	P-3459	27	5, 0, 0	18.5
12.	E-933	25	4, 0, 0	16.0
13.	P-3751	33	6, 0, 0	18.2
14.	P-6220	18	3, 0, 0	16.7

iv) ICPL entries

Forty-nine ICPL entries were screened and the results are presented in Table 85. Only one line, ICPL-83, showed uniform resistance whereas three others (ICPL-82, -146, -315) showed < 10% infection.

Table 85. **Results of screening of Early ICPL-entries to sterility mosaic at ICRISAT** Center during the 1982-83 season

S.No.	Entry No.	Total plants	Infected plants SM MM RS	Percent infection	Symptom type
1	2	3	4	5	6
1.	ICPL-1	36	36, 0, 0	100.0	SM
2.	ICPL-6	31	1, 30, 0	100.0	SM, MM
3.	ICPL-81	28	28, 0, 0	100.0	SM
4.	ICPL-82	27	1, 0, 0	3.7	SM
5.	ICPL-83	21	0, 0, 0	0.0	-
6.	ICPL-85	29	29, 0, 0	100.0	SM
7.	ICPL-87	34	24, 0, 0	70.6	SM
8.	ICPL-88	28	28, 0, 0	100.0	SM
9.	ICPL-92	18	16, 0, 0	88.9	SM
10.	ICPL-94	22	5, 0, 0	22.7	SM
11.	ICPL-95	26	26, 0, 0	100.0	SM
12.	ICPL-107	30	30, 0, 0	100.0	SM
13.	ICPL-140	18	10, 0, 0	55.6	SM
14.	ICPL-142	37	32, 0, 0	86.5	SM
15.	ICPL-143	7	4, 0, 0	57.1	SM
16.	ICPL-146	35	1, 0, 0	2.9	SM
17.	ICPL-147	20	19, 0, 0	95.0	SM
18.	ICPL-148	30	24, 0, 0	80.0	SM
19.	ICPL-149	37	37, 0, 0	100.0	SM
20.	ICPL-151	19	19, 0, 0	100.0	SM
21.	ICPL-154	20	7, 0, 0	35.0	SM
22.	ICPL-155	23	17, 0, 0	73.9	SM
23.	ICPL-158	37	37, 0, 0	100.0	SM
24.	ICPL-161	31	31, 0, 0	100.0	SM
25.	ICPL-163	30	30, 0, 0	100.0	SM
26.	ICPL-165	20	20, 0, 0	100.0	SM
27.	ICPL-169	34	30, 0, 0	88.2	SM
28.	ICPL-170	36	35, 0, 0	97.2	SM
29.	ICPL-171	31	31, 0, 0	100.0	SM
30.	ICPL-175	25	25, 0, 0	100.0	SM
31.	ICPL-177	28	26, 0, 0	92.9	SM
32.	ICPL-179	18	18, 0, 0	100.0	SM
33.	ICPL-184-1H-HB	32	31, 0, 0	96.9	SM
34.	ICPL-185	33	23, 0, 0	69.7	SM
35.	ICPL-186	35	33, 0, 0	94.3	SM
36.	ICPL-189-1H-HB	23	8, 0, 0	34.8	SM
37.	ICPL-267	34	32, 0, 0	94.1	SM
38.	ICPL-268	13	13, 0, 0	100.0	SM

Table 85. Contd.

39.	ICPL-269	30	26, 0, 0	86.7	SM
40.	ICPL-287	24	20, 0, 0	83.3	SM
41.	ICPL-288	23	9, 0, 0	39.1	SM
42.	ICPL-289	15	13, 0, 0	86.7	SM
43.	ICPL-292	28	12, 8, 0	71.4	SM, MM
44.	ICPL-294	22	22, 0, 0	100.0	SM
45.	ICPL-312	16	8, 0, 0	50.0	SM
46.	ICPL-314	23	11, 0, 0	47.8	SM
47.	ICPL-315	10	1, 0, 0	10.0	SM
48.	ICPL-316	19	2, 0, 0	10.5	SM
49.	ICPL-317	23	18, 0, 0	78.3	SM

h. Advance lines

i) MPAY and other entries. One hundred and seventy-five advance lines were screened against sterility mosaic during the 1982-83 season. The summarised results are presented in Table 86. One line (ICPL-262) and a progeny from a line (77125-VINDT7-3-3-B and ICPL-262) showed uniform resistance. Three other progenies (77125-VI NDT2-4-2-B, 77125-VI NDT8-1-2-B, and MSP4-VI NDT11-B) showed < 10% infection.

Table 86. Summary of results of screening of Advance lines to sterility mosaic in SM Nursery at ICRISAT Center during the 1982-83 season

Percent infection range	Number of lines	Percent of total lines
0 - 0	2	1.2
0.1 - 10.0	3	1.7
10.1 - 20.0	4	2.3
20.1 - 30.0	0	0.0
30.1 - 40.0	2	1.1
40.1 - 50.0	3	1.7
50.1 - 60.0	3	1.7

Table 86. Contd.

60.1 - 70.0	0	0.0
70.1 - 80.0	5	2.9
80.1 - 90.0	18	10.3
90.1 -100.0	135	77.1
Total	175	100.0

ii) LPAY entries

Of the 19 entries included in the Late Pigeonpea Adaptation Yield Test (LPAY) screened, one (ICPL-359) showed uniform resistance (Table 87). Three other entries, ICPL-360, -366 and -371 showed < 10% infection; ICPL-370 showed 13% infection; and all other 14 showed more than 30% infection.

Table 87. Results of screening of entries of Late-maturity Pigeonpea Adaptation Yield test (LPAY) to sterility mosaic at ICRISAT Center during the 1982-83 season

S. No.	ICPL No.	Pedigree	Total plants	Infected plants SM MM RS	Percent infection
1.	354	ICP-4745-6-GB-GB[illegible]-GB-GB	34	33, 0, 0	97.1
2.	355	ICP-7176-5-GB-GB[illegible]-GB-GB	15	15, 0, 0	100.0
3.	356	ICP-6443-W1[illegible]-W3[illegible]-W4[illegible]-WB[illegible]-GB-GB-GB	34	27, 0, 0	79.4
4.	357	74247-45-1-GB-GB[illegible]-GB-GB	25	25, 0, 0	100.0
5.	358	74367-49[illegible]-1-GB-GB[illegible]-GB-GB	26	24, 0, 0	92.3
6.	359	74429-W16[illegible]-1-G1-GB-GB-GB	33	0, 0, 0	0.0
7.	360	74367-W9[illegible]-1-G4-GB-GB-GB	50	1, 0, 0	2.0
8.	361	ICP-8301-B-B[illegible]-GB-GB	29	26, 0, 0	89.7
9.	362	ICP-4234-36[illegible]-7[illegible]-2[illegible]-5[illegible]-4[illegible]-GB[illegible]-GB-GB	38	38, 0, 0	100.0
10.	363	ICP-7175-69-6-5-4-G4[illegible]-GB[illegible]-GB-GB	34	34, 0, 0	100.0
11.	364	ICP-4780-10-1-1-1-G2[illegible]-GB[illegible]-GB-GB	33	33, 0, 0	100.0
12.	365	ICP-7105-48-35-6-2-G1[illegible]-GB[illegible]-GB-GB	43	42, 0, 0	97.7
13.	366	ICP-7105-12-22-2-2-G3[illegible]-GB[illegible]-GB-GB	41	1, 0, 0	2.4

Table 87. Contd.

14.	367	ICP-4780-59-3-3-3-G5[illegible]-GB[illegible]-GB[illegible]-GB	38	38, 0, 0	100.0
15.	368	74428-W8[illegible]-VIINDT2-GB-GB[illegible]-GB[illegible]-GB	24	24, 0, 0	100.0
16.	369	74428-W8[illegible]-VIINDT2-G4-G2-GB-GB	41	37, 0, 0	90.2
17.	370	ICP-3940-1-S2-IXNDT[illegible]-9-2-GB-GB	38	5, 0, 0	13.2
18.	371	ICP-8119-S2-IXNDT[illegible]-9-2-GB-GB	48	4, 0, 0	8.3
19.	372	74430-F5M-G18-GB-GB	55	17, 0, 0	30.9

1. Resistant advance lines and accessions

Thirty-three SPP of nine SM resistant medium-maturity advance lines and germplasm accessions were screened against sterility mosaic during the 1982-83 season. The results are presented in Table 88. Nine SPP of four advance lines and accessions (ICP-504, 73076, 74041, and 75268) showed uniform resistance.

Table 88. Results of screening of resistant advanced lines and accessions to sterility mosaic at ICRISAT Center during the 1982-83 season

S. No.	Particular	Total plants	Infected plants				Percent infection
			SM	MM	RS	Total	
1.	ICP-504-1-4-S17[illegible]-VIINDT1-2-3-B	23	5,	0,	0	5	21.7
2.	ICP-504-1-4-S17[illegible]-VIINDT1-3-4-B	28	0,	0,	0	0	0.0
3.	ICP-504-1-4-S17[illegible]-VIINDT1-3-5-B	29	0,	0,	0	0	0.0
4.	ICP-504-1-4-S17[illegible]-VIINDT4-4-4-B	26	0,	0,	0	0	0.0
5.	ICP-504-1-4-S17[illegible]-VIINDT6-4-1-B	24	3,	0,	0	3	12.5
6.	ICP-504-1-4-S17[illegible]-VIINDT6-4-3-B	29	2,	0,	0	2	6.9
7.	ICP-504-1-4-S21[illegible]-VIINDT4-1-3-B	28	8,	0,	0	8	28.6
8.	ICP-4152-1-S1-VIINDT[illegible]-3-1-5-B	15	4,	0,	0	4	26.7
9.	ICP-6491-1-S9-VINDTB[illegible]-VIINDT8-1-1-B	28	4,	0,	0	4	14.3
10.	ICP-7281-S6[illegible]-VIIINDT1-1-4-B	21	3,	0,	0	3	14.3
11.	ICP-7830-1-S1 VIINDT[illegible]-1-1-B	30	4,	0,	0	4	13.3
12.	73076-F4B-S80[illegible]-VIINDT1-3-2-B	34	2,	0,	2	4	12.5
13.	73076-F4B-S80[illegible]-VIINDT1-3-4-B	20	0,	0,	0	0	0.0
14.	73076-F4B-S80[illegible]-VIINDT3-1-1-B	21	4,	0,	0	4	19.0
15.	73076-F4B-S80[illegible]-VIINDT3-1-5-B	26	0,	0,	1	1	3.8

Table 88. Contd.

16.	74041-1-4-SVINDT3[illegible]-VIINDT3-4-1-B	24	10, 0, 0	10	41.7
17.	74041-1-4-SVINDT3[illegible]-VIINDT3-4-2-B	30	0, 0, 0	0	0.0
18.	74041-1-4-SVINDT3[illegible]-VIINDT3-4-3-B	30	1, 0, 0	1	3.3
19.	74041-1-4-SVINDT3[illegible]-VIINDT3-4-4-B	31	1, 0, 0	1	3.2
20.	74041-1-4-SVINDT3[illegible]-VIINDT3-4-5-B	34	0, 0, 0	0	0.0
21.	74041-1-4-S3VINDT[illegible]-10-5-B	38	1, 0, 0	1	2.6
22.	75268-F2B-S36[illegible]-VINDT1-1-B	32	0, 0, 0	0	0.0
23.	75268-F2B-S36[illegible]-VINDT1-2-B	29	0, 0, 0	0	0.0
24.	75268-F2B-S36[illegible]-VINDT3-5-B	30	1, 0, 0	1	3.3
25.	75268-F2B-S52[illegible]-VIINDT1-3-5-B	30	3, 0, 0	3	10.0
26.	75268-F2B-S52[illegible]-VIINDT1-4-2-B	32	1, 0, 0	1	3.1
27.	75268-F2B-S52[illegible]-VIINDT1-4-3-B	26	5, 0, 0	5	19.2
28.	75268-F2B-S52[illegible]-VIINDT1-4-5-B	26	4, 0, 1	5	19.2
29.	75258-F2B-S57[illegible]-VIINDT1-3-2-B	43	3, 0, 0	3	6.9
30.	75268-F2B-S57[illegible]-VIINDT1-3-4-B	29	4, 0, 1	5	17.2
31.	75268-F2B-S57[illegible]-VIINDT1-3-5-B	28	0, 0, 0	0	0.0
32.	75268-F2B-S57[illegible]-VIINDT2-5-2-B	25	3, 0, 0	3	12.0
33.	75268-F2B-S57[illegible]-VIINDT2-5-4-B	28	2, 0, 0	2	7.1

j. The University of Queensland lines

Sixty-six lines from the University of Queensland were screened against sterility mosaic. The summarized results are presented in Table 89. None of the lines showed resistance. Two lines, QPL-56-B and

Table 89. Summary of results of University of Queensland lines to sterility mosaic at ICRISAT Center during the 1982-83 season

Percent infection range	Number of lines	Percent of total lines
0 - 0	0	0.0
0.1 - 10.0	1	1.5
10.1 - 20.0	2	3.0
20.1 - 30.0	0	0.0
30.1 - 40.0	0	0.0
40.1 - 50.0	0	0.0
50.1 - 60.0	2	3.0

Table 89. Contd.

60.1 - 70.0	1	1.5
70.1 - 80.0	10	15.2
80.1 - 90.0	15	22.7
90.1 -100.0	35	53.1
Total	66	100.0

and QPL-59-B showed 14.3 and 9.8% infection respectively.

k. Medium-maturity Pigeonpea sterility mosaic resistant lines yield test (MPSRY) entries

The results of screening of 23 entries (including checks, C-11 and ICP-2376) of MPSRY to SMD are presented in Table 90. Ten entries (BSMR-1, BSMR-2, ICPL-345, -346, -347, -348, -349, -351, -349B, and -2376) showed uniform resistance and six entries (BWSMR-1, ICPL-341, -342, -343, -348B, and 351B) showed <10% infection.

l. Single plant progenies from MPSRY and SM resistant lines test (SMR Test) entries

Eight progenies from three MPSRY entries were screened for disease incidence and seed collection. Two progenies showed uniform resistance whereas all the other six progenies showed 1 to 6% sterility mosaic (Table 91).

m. Single plant progenies from ICP-6997 and two ICPLs

Five progenies from ICP-6997 and two ICPLs (ICPL-136 and -137) were screened against sterility mosaic. All the SPP showed uniform resistance (Table 92).

n. BDN-1, BC_2F_2 material

Results of screening of 14 SPP of two BDN-1 back crosses (79248 and 79249) to sterility mosaic are presented in Table 93. All the progenies showed > 70.0% infection. Resistant single plants in each progeny were selfed and bulked in collaboration with breeders.

Table 90. Results of screening of Medium-maturity Pigeonpea Sterility Mosaic Resistant Lines Yield Test (MPSRY) to sterility mosaic at ICRISAT Center during the 1982-83 season

S.No.	Particular	Total plants	Infected plants SM MM RS	Percent infection
1.	SV-6223-5	10	5, 0, 0	50.0
2.	BSMR-1	26	0, 0, 0	0.0
3.	BSMR-2	28	0, 0, 0	0.0
4.	BWSMR-1	27	1, 0, 0	3.7
5.	ICPL-341	34	2, 0, 0	5.9
6.	ICPL-342	34	3, 0, 0	8.8
7.	ICPL-343	31	3, 0, 0	9.7
8.	ICPL-344	27	12, 0, 0	44.4
9.	ICPL-345	39	0, 0, 0	0.0
10.	ICPL-346	26	0, 0, 0	0.0
11.	ICPL-347	22	0, 0, 0	0.0
12.	ICPL-348	34	0, 0, 0	0.0
13.	ICPL-349	34	0, 0, 0	0.0
14.	ICPL-350	15	3, 0, 0	20.0
15.	ICPL-351	22	0, 0, 0	0.0
16.	ICPL-348B	23	0, 0, 1	4.3
17.	ICPL-349B	35	0, 0, 0	0.0
18.	ICPL-351B	31	3, 0, 0	9.7
19.	Pant A-106	27	12, 0, 0	44.4
20.	Pant A-107	30	11, 0, 0	36.7
21.	Pant A-108	20	17, 0, 0	85.0
22.	C-11 (ICPL-131)	21	21, 0, 0	100.0
23.	ICP -2376	34	0, 0, 0	0.0

Table 91. Results of screening of single plant progenies of entries of Medium-maturity Pigeonpea Sterility Mosaic Resistant Lines Yield Test (MPSRY) and Sterility Mosaic Resistant Lines Test (SMR Test) for resistance to sterility mosaic during the 1982-83 season

S. No.	Particular	Total plants	Infected plants SM MM RS	Percent infection
1	2	3	4	5
1.	73076-F_4B-S200[illegible]-VIINDT1-4-1-SB	73	2, 1, 0	4.1

Table 91. Contd.

2.	73076-F_4B-S200Ø-VIINDT1-4-2-SB	78	1, 0, 0	1.0
3.	75268-F_2B-S57Ø-VIINDT1-5-2-SB	90	1, 0, 0	1.1
4.	75268-F_2B-S57Ø-VIINDT1-5-3-SB	86	4, 0, 0	4.7
5.	75268-F_2B-S57Ø-VIINDT1-5-4-SB	121	0, 0, 0	0.0
6.	75268-F_2B-S57Ø-VIINDT2-3-1-SB	94	6, 0, 0	6.4
7.	75268-F_2B-S57Ø-VIINDT2-3-3-SB	107	0, 0, 0	0.0
8.	75268-F_2B-S57Ø-VIINDT2-3-4-SB	94	2, 0, 0	2.1

Table 92. Results of screening of single plant progenies of ICP-6997 and two ICPLs to sterility mosaic during the 1982-83 season

S.No.	Particular	Total plants	Infected plants (SM MM RS)	Percent infection
1.	ICP-6997-125Ø-1Ø-3Ø-BØ-BØ-B-BØ	46	0, 0, 0	0.0
2.	ICP-6997-83Ø-1Ø-2Ø-1Ø-BØ-B-BØ	40	0, 0, 0	0.0
3.	ICP-6997-83Ø-1Ø-1Ø-3Ø-BØ-B	51	0, 0, 0	0.0
4.	ICP-6997-125Ø-3Ø-4Ø-4Ø-BØ-B	50	0, 0, 0	0.0
5.	ICP-6997-131Ø-2Ø-5Ø-3Ø-BØ-B	56	0, 0, 0	0.0
6.	ICPL-136 (Hy-3C)	29	0, 0, 0	0.0
7.	ICPL-137 (Hy-3C)	39	0, 0, 0	0.0

Table 93. Results of screening of BDN-1, BC_2F_2 material to sterility mosaic at ICRISAT Center during the 1982-83 season

S.No.	Particular	Total plants	Infected plants (SM MM RS)	Percent infection
1.	79248-2 [T-21 x JA-275]-55-1-VNDT1Ø-BØ] x BDN-1] x BDN-1]	169	141, 0, 0	83.4
2.	79249-5 [T-21 x JA-275]-55-1-VNDT3Ø-BØ] x BDN-1] x BDN-1]	100	70, 0, 0	70.0

Table 93. Contd.

3.	79249-6 [T-21 x JA-275]-55-1-VNDT3[illegible]-B[illegible]] x BDN-1] x BDN-1]	129	110, 0, 0	85.3
4.	79249-10 [T-21 x JA-275]-55-1-VNDT3[illegible]-B[illegible]] x BDN-1] x BDN-1]	162	139, 0, 0	85.8
5.	79249-11 [T-21 x JA-275]-55-1-VNDT3[illegible]-B[illegible]] x BDN-1] x BDN-1]	117	97, 0, 0	82.9
6.	79249-12 [T-21 x JA-275]-55-1-VNDT3[illegible]-B[illegible]] x BDN-1] x BDN-1]	128	97, 0, 0	75.8
7.	79249-13 [T-21 x JA-275]-55-1-VNDT3[illegible]-B[illegible]] x BDN-1] x BDN-1]	117	89, 0, 0	76.1
8.	79249-21 [T-21 x JA-275]-55-1-VNDT3[illegible]-B[illegible]] x BDN-1] x BDN-1]	85	72, 0, 0	84.7
9.	79249-22 [T-21 x JA-275]-55-1-VNDT3[illegible]-B[illegible]] x BDN-1] x BDN-1]	130	108, 0, 0	83.1
10.	79249-23 [T-21 x JA-275]-55-1-VNDT3[illegible]-B[illegible]] x BDN-1] x BDN-1]	59	45, 0, 0	76.3
11.	79249-24 [T-21 x JA-275]-55-1-VNDT3[illegible]-B[illegible]] x BDN-1] x BDN-1]	110	95, 0, 0	86.4
12.	79249-26 [T-21 x JA-275]-55-1-VNDT3[illegible]-B[illegible]] x BDN-1] x BDN-1]	93	75, 0, 0	80.6
13.	79249-27 [T-21 x JA-275]-55-1-VNDT3[illegible]-B[illegible]] x BDN-1] x BDN-1]	71	57, 0, 0	80.3
14.	79249-29 [T-21 x JA-275]-55-1-VNDT3[illegible]-B[illegible]] x BDN-1] x BDN-1]	95	84, 0, 0	88.4

o. C-11, BC_1F_2 material

Four C-11, BC_1F_2 crosses were screened against sterility mosaic. All the crosses showed > 60.0% disease (Table 94). Here also, resistant single plants in each progeny were selfed and bulked in collaboration with breeders.

Table 94. Results of screening of C-11, BC_1F_2 material to sterility mosaic at ICRISAT Center during the 1982-83 season

S.no.	Particular	Total plants	Infected plants SM MM RS	Percent infection
1.	74243 F_4B-75-B-12 x C-11	331	206, 0, 0	62.2
2.	74243-F_4B-75-B-19 x C-11	295	228, 0, 0	77.3
3.	74243-F_4B-679-B-5 x C-11	324	280, 0, 0	86.4
4.	74243-F_4B-897-B-4 x C-11	173	132, 0, 0	76.3

p. Male sterile lines

i) MS-3A, BC_1F_4s

Out of 10 MS-3A BC_1F_4's screened, three(MS-3A x [(MS-3A x 3783) -W95-SB]-B, -W142-SB-B, and -W47-SB-B) showed 16.7, 24.1, and 22.7 infection, respectively.

ii) MS-3A, BC_2F_2

None of the 10 MS-3A BC_2F_2's showed promise against sterility mosaic as all the F_2s showed > 70% infection.

iii) MS-3A lines

Out of 100 MS-3A lines screened none was found promising as all of them showed > 95% SM infection.

iv) MS-4A, BC_1F_4

All the 10 F_4's in MS-4A BC_1F_4's that were screened against sterility mosaic showed > 70% infection.

v) MS-4A BC_2F_2

All the 10 MS-4A BC_2F_2's showed > 90% infection.

vi) MS-4A lines

Out of 100 lines of MS-4A cross screened none was found promising. All the lines showed > 70% infection with the exception of two lines (MS-4A-7-2Ø-3Ø and MS-4A-7-1Ø-5Ø-1Ø-B) which showed 35.5 and 42.4% infection, respectively.

q. SMD-resistant and tolerant F_4 bulks

Forty-one F_4 bulks of crosses involving agronomically good lines and sterility mosaic-resistant germplasm accessions/lines and nine F_4 bulks of crosses involving agronomically good lines and SM tolerant (ringspot reaction) germplasm accessions/lines were screened. A total of 15 bulks, 11 resistant and 4 tolerant, were selected for further screening (Table 95).

Table 95. List of 15 sterility mosaic-resistant and tolerant F_4 bulks selected in sterility mosaic nursery during the 1982-83 season

S.No.	Particular
1.	78046-SB-SB-SB
2.	78047-SB-SB-SB
3.	78051-SB-SB-SB
4.	78052-SB-SB-SB
5.	78053-SB-SB-SB
6.	78064-SB-SB-SB
7.	78068-SB-SB-SB
8.	78069-SB-SB-SB
9.	78070-SB-SB-SB
10.	78071-SB-SB-SB
11.	78073-SB-SB-SB
12.	78053-S(T)B-S(T)B-SB
13.	78054-S(T)B-S(T)B-SB
14.	78070-S(T)B-S(T)B-SB
15.	78080-S(T)B-S(T)B-SB

r. SMD-resistant F_4 single plant progenies

One hundred and forty single plant progenies from 12 crosses were screened. Of the 106 SPP that showed uniform resistance, 94 listed in Table 96 were selected by breeders for further use.

Table 96. List of 94 SMD resistant F_4 single plant progenies selected in sterility mosaic nursery during the 1982-83 season

S.No.	Particular
1.	78041-S1-VINDTS1-S1Ø
2.	78041-S1-VINDTS1-S2Ø
3.	78041-S1-VINDTS3-S1Ø
4.	78041-S1-VINDTS4-S1Ø
5.	78041-S1-VINDTS4-S2Ø
6.	78041-S1-VINDTS5-S1Ø
7.	78041-S1-VINDTS5-S2Ø
8.	78041-S1-VINDTS5-S3Ø
9.	78041-S2-VIINDTS2-S1Ø
10.	78041-S2-VIINDTS2-S2Ø
11.	78041-S2-VIINDTS2-S3Ø
12.	78041-S2-VIINDTS4-S1Ø
13.	78041-S2-VIINDTS4-S2Ø
14.	78041-S2-VIINDTS4-S3Ø
15.	78041-S2-VIINDTS5-S1Ø

Table 96. Contd.

S.No.	Particular
16.	78041-S2-VIINDTS5-S2[illegible]
17.	78041-S2-VIINDTS5-S3[illegible]
18.	78044-S2-VIIINDTS1-S1[illegible]
19.	78044-S2-VIIINDTS2-S1[illegible]
20.	78044-S2-VIIINDTS2-S2[illegible]
21.	78044-S2-VIIINDTS2-S3[illegible]
22.	78044-S3-VIIINDTS2-S1[illegible]
23.	78044-S4-VIINDTS2-S1[illegible]
24.	78044-S4-VIINDTS4-S1[illegible]
25.	78044-S4-VIINDTS4-S2[illegible]
26.	78044-S4-VIINDTS4-S3[illegible]
27.	78045-S1-VIINDTS1-S1[illegible]
28.	78045-S1-VIINDTS1-S2[illegible]
29.	78045-S1-VIINDTS5-S1[illegible]
30.	78045-S2-VIINDTS1-S1[illegible]
31.	78045-S2-VIINDTS1-S2[illegible]
32.	78045-S2-VIINDTS1-S3[illegible]
33.	78045-S2-VIINDTS5-S1[illegible]
34.	78045-S2-VIINDTS5-S2[illegible]
35.	78045-S2-VIINDTS5-S3[illegible]
36.	78045-S3-VIINDTS1-S1[illegible]
37.	78045-S3-VIINDTS1-S2[illegible]
38.	78045-S3-VIINDTS1-S3[illegible]
39.	78046-S2-VIINDTS2-S1[illegible]
40.	78052-S3-VIINDTS1-S1[illegible]
41.	78052-S3-VIINDTS1-S1[illegible]
42.	78053-S1-VIINDTS4-S1[illegible]
43.	78053-S1-VIINDTS4-S2[illegible]
44.	78053-S1-VIINDTS4-S3[illegible]
45.	78053-S1-VIINDTS4-S4[illegible]
46.	78053-S1-VIINDTS4-S[illegible]
47.	78053-S1-VIINDTS4-S[illegible]
48.	78053-S1-VIINDTS4-S[illegible]
49.	78053-S3-VINDTS2-S1[illegible]
50.	78053-S3-VINDTS2-S2[illegible]
51.	78053-S3-VINDTS4-S1[illegible]
52.	78053-S3-VINDTS4-S2[illegible]
53.	78053-S3-VINDTS4-S3[illegible]
54.	78055-S2-VIIINDTS3-S1[illegible]
55.	78056-S2-VINDTS4-S1[illegible]
56.	78056-S2-VINDTS5-S1[illegible]
57.	78056-S2-VINDTS5-S2[illegible]
58.	78066-S4-VIINDTS5-S1[illegible]
59.	78066-S4-VIINDTS5-S2[illegible]
60.	78066-S4-VIINDTS5-S3[illegible]

Table 96. Contd.

S.No.	Particular
61.	78069-S2-VINDTS1-S1Ø
62.	78069-S2-VINDTS1-S2Ø
63.	78069-S2-VINDTS4-S1Ø
64.	78069-S2-VINDTS4-S2Ø
65.	78069-S2-VINDTS4-S3Ø
66.	78069-S3-VINDTS1-S1Ø
67.	78069-S3-VINDTS1-S3Ø
68.	78069-S3-VINDTS1-S4Ø
69.	78069-S3-VINDTS1-S5Ø
70.	78069-S3-VINDTS2-S1Ø
71.	78069-S3-VINDTS2-S2Ø
72.	78069-S4-VIINDTS2-S1Ø
73.	78069-S4-VIINDTS2-S2Ø
74.	78069-S4-VIINDTS2-S3Ø
75.	78069-S4-VIINDTS2-S4Ø
76.	78069-S4-VIINDTS2-S5Ø
77.	78069-S7-VIINDTS2-S2Ø
78.	78069-S7-VIINDTS2-S3Ø
79.	78069-S7-VIINDTS4-S1Ø
80.	78069-S7-VIINDTS4-S3Ø
81.	78070-S2-VIINDTS3-S1Ø
82.	78070-S2-VIINDTS3-S2Ø
83.	78070-S2-VIINDTS4-S1Ø
84.	78070-S2-VIINDTS4-S2Ø
85.	78070-S2-VIINDTS5-S1Ø
86.	78070-S2-VIINDTS5-S2Ø
87.	78070-S2-VIINDTS5-S3Ø
88.	78070-S3-VIINDTS3-S2Ø
89.	78070-S3-VIINDTS3-S3Ø
90.	78070-S3-VIINDTS4-S1Ø
91.	78070-S3-VIINDTS4-S2Ø
92.	78070-S3-VIINDTS5-S1Ø
93.	78070-S3-VIINDTS5-S3Ø
94.	78070-S3-VIINDTS5-S4Ø

s. SMD-tolerant F_4 single plant progenies

Out of 175 F_4 SPP screened, 132 showed uniform resistance and no RS reaction this year. Ninety-three of these lines were selected by breeders for further use (Table 97).

Table 97. List of 93 sterility mosaic tolerant (Ringspot) F_4 single plant progenies selected in sterility mosaic nursery during the 1982-83 season

S.No.	Particular
1.	78041-S(T)1-VIINDTS1-S1Ø
2.	78041-S(T)1-VIINDTS1-S2Ø
3.	78041-S(T)1-VIINDTS1-S3Ø
4.	78041-S(T)1-VIINDTS2-S1Ø
5.	78041-S(T)1-VIINDTS2-S2Ø
6.	78041-S(T)1-VIINDTS2-S3Ø
7.	78041-S(T)1-VIINDTS4-S1Ø
8.	78041-S(T)1-VIINDTS4-S2Ø
9.	78041-S(T)1-VIINDTS4-S3Ø
10.	78041-S(T)4 - VINDTS2-S1Ø
11.	78041-S(T)4 - VINDTS2-S2Ø
12.	78041-S(T)4-VINDTS2-S3Ø
13.	78041-S(T)4-VINDTS3-S1Ø
14.	78041-S(T)4-VINDTS3-S2Ø
15.	78041-S(T)4-VINDTS3-S3Ø
16.	78041-S(T)4-VINDTS5-S1Ø
17.	78041-S(T)4-VINDTS5-S2Ø
18.	78041-S(T)4-VINDTS5-S3Ø
19.	78041-S(T)6-VINDTS1-S1Ø
20.	78041-S(T)6-VINDTS1-S2Ø
21.	78041-S(T)6-VINDTS3-S3Ø
22.	78041-S(T)6-VINDTS4-S1Ø
23.	78041-S(T)6-VINDTS4-S2Ø
24.	78041-S(T)6-VINDTS4-S3Ø
25.	78041-S(T)7-VINDTS2-S1Ø
26.	78041-S(T)7-VINDTS2-S2Ø
27.	78041-S(T)7-VINDTS2-S3Ø
28.	78041-S(T)7-VINDTS2-S4Ø
29.	78041-S(T)7-VINDTS2-S5Ø
30.	78041-S(T)7-VINDTS2-S6Ø
31.	78041-S(T)9-VINDTS3-S1Ø
32.	78041-S(T)9-VIINDTS3-S2Ø
33.	78041-S(T)9-VIINDTS3-S3Ø
34.	78041-S(T)9-VIINDTS5-S1Ø
35.	78041-S(T)9-VIINDTS5-S2Ø
36.	78041-S(T)9-VIINDTS5-S3Ø
37.	78041-S(T)18-VINDTS2-S1Ø
38.	78041-S(T)18-VINDTS2-S2Ø
39.	78041-S(T)18-VINDTS2-S3Ø
40.	78041-S(T)18-VINDTS4-S2Ø
41.	78041-S(T)18-VINDTS4-S3Ø
42.	78041-S(T)18-VINDTS5-S1Ø
43.	78041-S(T)18-VINDTS5-S2Ø

Table 97. Contd.

S.No.	Particular
44.	78041-S(T)18-VINDTS5-S3⊠
45.	78043-S(T)1-VIINDTS2-S1⊠
46.	78043-S(T)1-VIINDTS2-S2⊠
47.	78043-S(T)1-VIINDTS2-S3⊠
48.	78043-S(T)3-VIINDTS3-S1⊠
49.	78043-S(T)3-VIINDTS3-S2⊠
50.	78043-S(T)3-VIINDTS3-S3⊠
51.	78043-S(T)3-VIINDT5-S1⊠
52.	78043-S(T)3-VIINDT5-S2⊠
53.	78043-S(T)3-VIINDT5-S3⊠
54.	78043-S(T)14-VIINDTS2-S1⊠
55.	78043-S(T)14-VIINDTS2-S2⊠
56.	78043-S(T)14-VIINDTS3-S1⊠
57.	78043-S(T)14-VIINDTS3-S2⊠
58.	78043-S(T)14-VIINDTS5-S1⊠
59.	78044-S(T)40-VIINDTS5-S1⊠
60.	78044-S(T)40-VIINDTS5-S2⊠
61.	78053-S(T)7-VINDTS1-S1⊠
62.	78053-S(T)9-VIINDTS2-S1⊠
63.	78053-S(T)9-VIINDTS2-S2⊠
64.	78053-S(T)9-VIINDTS4-S1⊠
65.	78068-S(T)18-VIINDTS1-S1⊠
66.	78068-S(T)18-VIINDTS1-S2⊠
67.	78068-S(T)18-VIINDTS1-S3⊠
68.	78068-S(T)18-VIINDTS1-S4⊠
69.	78068-S(T)18-VIINDTS1-S5⊠
70.	78068-S(T)18-VIINDTS2-S1⊠
71.	78068-S(T)18-VIINDTS2-S2⊠
72.	78068-S(T)18-VIINDTS5-S1⊠
73.	78068-S(T)18-VIINDTS5-S2⊠
74.	78068-S(T)20-VIINDTS2-S1⊠
75.	78068-S(T)20-VIINDTS5-S1⊠
76.	78068-S(T)23-VIINDTS3-S1⊠
77.	78068-S(T)23-VIINDTS3-S2⊠
78.	78068-S(T)23-VIINDTS3-S3⊠
79.	78068-S(T)23-VIINDTS4-S1⊠
80.	78068-S(T)23-VIINDTS4-S2⊠
81.	78068-S(T)23-VIINDTS4-S3⊠
82.	78068-S(T)24-VIINDTS5-S1⊠
83.	78068-S(T)25-VIINDTS4-S2⊠
84.	78068-S(T)25-VIINDTS4-S3⊠
85.	78068-S(T)26-VIINDTS5-S1⊠
86.	78068-S(T)26-VIINDTS5-S2⊠
87.	78068-S(T)27-VIINDTS2-S1⊠
88.	78068-S(T)27-VIINDTS2-S2⊠

Table 97. Contd.

S.No.	Particular
89.	78068-S(T)28-VIINDTS5-S1Ø
90.	78068-S(T)28-VIINDTS5-S2Ø
91.	78070-S(T)1-VIINDTS1-S1Ø
92.	78070-S(T)1-VIINDTS5-S1Ø
93.	78070-S(T)1-VIINDTS3-S1Ø

t. Dwarf lines

Of six progenies of four lines tested, none showed < 10% infection. However, five plants each were selfed from each of the two D_3 dwarf progenies (Table 98).

Table 98. Results of screening of dwarf pigeonpea lines to sterility mosaic at ICRISAT Center during the 1982-83 season

S.No.	Particular	Total plants	Infected plants SM MM RS	Percent infection
1.	D1-73081-4DT1-3Ø-BØ-7Ø-BØ-S1Ø	8	0, 8, 0	100.0
2.	D2-73081-40D2-3Ø-BØ-BØ-BØ-S1	28	12-SM+MM	42.8
3.	D3-73081-16D3-3Ø-BØ-9Ø-BØ-BØ-S1Ø	37	0, 8, 0	21.6
4.	D3-73081-16D3-3Ø-BØ-9Ø-BØ-BØ-S2Ø	30	0, 7, 0	23.3
5.	20(105) Berhampore-S1Ø	21	12, 0, 0	57.1
6.	20(105) Berhampore-S2Ø	39	13, 0, 0	33.3

u. Entries in the Demonstration Trial

Eleven pigeonpea lines including resistant (8), tolerant (2) and susceptible (1) were sown in six, 4-m rows as a Demonstration Trial in the nursery. The results on disease reaction and yield are presented in Table 99. All the SM resistant lines showed resistant reaction (< 10% infection). The ringspot line (ICP-2376) showed no RS reaction this season and remained free from disease. The MM line showed the expected reaction. BDN-1, a susceptible cultivar showed 100% infection. Only one entry yielded 2302 kg/ha of pigeonpeas.

Table 99. Disease reaction and yield performance of sterility mosaic resistant and tolerant pigeonpea lines in the demonstration trial in the sterility mosaic nursery at ICRISAT Center during the 1982-83 season

S.No.	Maturity/ growth habit	Particular[1]	Total plants	Infected[2] plants SM, MM, RS	Percent infection	Yield/ plot[3] g	Yield/ kg/ha
1.	Early DT	74205-NDT1B-104-IDT1-1-B0-B0 (R)	207	0, 0, 0	0.0	250	159
2.	Early NDT	75002-VNDT38-IIINDT3-B0-2-B (R)	199	9, 0, 0	4.5	427	271
3.	Medium DT	ICP-7169-3-3-S10-B (R)	204	3, 0, 0	1.5	1800	1143
4.	Medium NDT	ICP-5701-S10-B-B (R)	236	6, 0, 0	2.5	3625	2302
5.	Late NDT	NP(WR)-15 (R)	284	10, 0, 0	3.5	2440	1549
6.	Late NDT	ICP-5651-S10-B-B (R)	256	3, 1, 0	1.6	1260	799
7.	Medium NDT	ICP-2376 (RS)	201	0, 0, 0	0.0	1400	889
8.	Medium NDT	ICP-3801 (R)	184	0, 0, 0	0.0	1517	963
9.	Late NDT	ICP-8109-3-S10-B0 (MM)	171	3,167, 0	99.4	2000	1270
10.	Medium NDT	ICP-3227-2-2-1-S10 (R)	242	13, 0, 0	5.4	850	540
11.	Check	BDN-1 (S)	111	111, 0, 0	100.0	715	454

[1]R = Resistant line; RS = Ringspot line; MM = Mild mosaic line; and S = Susceptible line

[2]RS= Ring spot; MM = Mild mosaic; SM = Severe mosaic

[3]Plot size 18 m^2 (six, 4-m rows).

v. Entries of ICAR-ICRISAT Uniform Trial for Pigeonpea Wilt Resistance (IIUTPWR)-1982

Forty-one entries including one susceptible check were tested for their reaction to the sterility mosaic in wilt nursery in Alfisol-A where the disease was created through potted BDN-1 SM-infected plants kept on the west side of the field. There was excellent disease development and therefore recorded SM incidence in the entries of IIUTPWR which is presented in Table 100.

Table 100. Results of screening of the entries of ICAR-ICRISAT Uniform Trial for Pigeonpea Wilt Resistance to sterility mosaic in wilt nursery (Alfisol-A) at ICRISAT Center during the 1982-83 season

S.No.	Particular	Total plants	Infected plants SM, MM, RS	Percent infection
1.	ICP-5701	28	1, 0, 8	32.1
2.	ICP-7855	58	32, 0, 14	79.3
3.	ICP-8464	36	0, 23, 0	63.9
4.	ICP-8795	60	0, 1, 4	8.3
5.	ICP-8798	63	1, 0, 0	1.6
6.	ICP-8848	28	0, 0, 0	0.0
7.	ICP-8863	54	45, 0, 4	90.7
8.	ICP-9120	60	0, 0, 0	0.0
9.	ICP-9144	55	0, 30, 0	54.5
10.	ICP-9168	72	0, 0, 18	25.0
11.	ICP-9175	57	0, 0, 0	0.0
12.	ICP-9177	43	1, 0, 12	30.2
13.	ICP-9213	58	0, 0, 0	0.0
14.	ICP-9229	27	0, 0, 4	14.8
15.	ICP-9255	49	0, 0, 0	0.0
16.	ICP-9601	37	14, 0, 3	60.7
17.	ICP-10269	74	0, 0, 6	8.1
18.	ICP-10958	64	0, 7, 2	14.1
19.	ICP-10960	60	2, 6, 0	13.3
20.	ICP-11287	66	58, 0, 8	97.1
21.	ICP-11290	51	0, 0, 0	0.0
22.	C.No.74360	48	2, 0, 1	6.3
23.	K-70	57	8, 0, 1	15.8
24.	MAU-E-175	66	0, 0, 20	30.3
25.	AWR-74/16	47	4, 0, 2	12.8
26.	P-76-56	3	1, 0, 1	66.3

Table 100. Contd.

27.	BDN-3	31	19, 0, 5	77.4
28.	ICP-7197-5-3-S1⊠-VIIINDT-W3⊠	57	0, 0, 3	5.3
29.	ICP-7273-1-S5⊠-W3⊠	38	0, 0, 8	21.1
30.	ICP-8008-S3⊠ S2⊠-WB	19	4, 0, 2	31.6
31.	ICP-8077-S2⊠ IXNDT-W1⊠	8	0, 0, 1	12.5
32.	ICP-8129-S3⊠-S1⊠ IXNDT-W1⊠	28	15, 0, 1	57.1
33.	ICP-8158-S3⊠ IXNDT-W2⊠	21	0, 0, 0	0.0
34.	JM-2412-S1⊠ IXNDT-SW2⊠	52	0, 0,15	28.8
35.	ICP-1644-6-2-S1⊠ IXNDT-SW3⊠	61	0, 0,13	21.3
36.	ICP-2009-1-2-S1⊠RS VINDT-SW1⊠	40	0, 0,26	65.0
37.	ICP-7875	40	4, 0, 7	27.5
38.	*A. lineata* (JM-3366)	36	0, 0, 0	0.0
39.	*A. lineata* (NKR-76)	25	0, 0, 0	0.0
40.	ICP-11296	41	0, 0, 0	0.0
41.	ICP-2376 (check)	290	13, 0,97	38.0

Ten lines: ICP-8848, -9120, -9175, -9213, -9255, -11290, -8158, -11296, and two strains of *Atylosia lineata* (JM-3366 and NKR-76) showed Uniform resistance; five lines: ICP-8795, -8798 -10269 C.No.74360 and ICP-7197 showed < 10% infection; and six lines: ICP-9229, -10958, -10960, K-70, AWR-74/16, and ICP-8077 showed infection between 10 and 20%. The wilt susceptible check (ICP-2376) mostly showed the RS symptoms as expected. The remaining 20 entries showed more than 20% infection and are considered susceptible to SMD.

B. Pot Screening

1. Screening technique

The screening technique adopted was same as used in the past (Pulse Pathology Progress Report - 18).

2. Materials screened

a) Single plant progenies of ICPL-155

Out of 84 SPP of ICPL-155 screened, eight SPP (ICPL-155-2⊠, -8⊠, -10⊠, -41⊠, -43⊠, -45⊠, -60⊠, and -79⊠) showed no disease development; three showed < 20% disease; and the remaining 73 showed more than 20% disease (range of 27 to 100%).

b. Single plant progenies of ICPL-146

All the 100 SPP screened were susceptible to sterility mosaic with incidence range of 84 to 100%.

c. Single plant progenies of ICPL-269

All the 105 SPP screened were susceptible to sterility mosaic with incidence range of 21 to 100%.

VI. Disease control through seed treatment with pesticides

Last season, we found that carbofuran (Furadan 40 FP) as seed treatment (5 and 10%) significantly reduced sterility mosaic incidence but only up to 75 days after sowing. This year, we included four dosages (1, 5, 10, 20%) and four (1, 2, 3, 5%) of Temik 10G in the seed treatment trial, which was conducted, as in the past, in the sterility mosaic nursery wherein 'infector-hedge' technique was followed for uniform natural spread of the disease. A susceptible cv, BDN-1, was used in the trial with RBD with three replications. The plot size was 18 m^2 (six, 4-m rows). Observations on emergence, disease incidence and yield were recorded and are presented in Tables 101, 102, and 103.

A. Effect on seedling emergence

All the four seed treatment dosages of Furadan 40 FP increased seedling emergence as compared with the untreated check (Table 101), thus confirming our past two years' results. Contrarily, all the four dosages of Temik 10G reduced emergence with much more adverse effect by 2, 3, and 5% dosages.

B. Effect on disease incidence

The disease incidence recorded at different intervals after sowing is presented in Table 102. The effect of seed treatment was not visible much at 25 days after sowing (DAS). At 45 DAS, both the pesticides at all the four dosages significantly reduced sterility mosaic incidence compared with the untreated check. At 70 DAS, there was some reduction in disease incidence in 1% seed treatment with both Temik 10G and Furadan 40 FP; higher doses of both the pesticides were ineffective in reducing disease incidence. At 90 DAS, disease incidence in all the seed treatments including the untreated check was more than 98%.

Table 101. Effect of seed treatment with Temik 10G and Furadan 40 FP on emergence of pigeonpea during the 1982-83 season at ICRISAT Center

S.No.	Treatment with dose	No of seedlings emerge[1]			Percent emergence[2]			Average
		Rep I	Rep II	Rep III	Rep I	Rep II	Rep III	
1.	Control	197	211	182	82.1	87.9	77.9	70.8
2.	Temik 10G 1%	180	163	114	75.0	67.9	47.5	63.4
3.	2%	121	128	109	50.4	53.3	45.4	49.7
4.	3%	79	80	132	32.9	33.3	55.0	40.4
5.	5%	143	135	99	59.5	56.3	41.3	52.4
6.	Furadan 40 FP 1%	197	193	183	82.1	80.4	76.3	79.5
7.	5%	160	169	186	66.7	70.4	77.5	71.5
8.	10%	184	176	200	76.7	73.3	83.3	77.8
9.	20%	193	176	211	80.4	73.3	87.9	80.6
	SEM							5.0
	CV at 5%							15.1

[1]Out of 240 seed, sown per replication.

[2]Recorded at 25 days after sowing.

Table 102. Effect of seed treatment with Furadan and Temik on sterility mosaic incidence in pigeonpea at different intervals after planting in sterility mosaic nursery during the 1982-83 season

S.No.	Treatment with dose	Percent disease incidence at different days after sowing (DAS)[1]			
		25	45	70	90
1.	Control	4.4	26.4	88.0	99.6
2.	Temik 10G - 1%	2.6	18.4	64.1	99.1
3.	- 2%	1.8	7.5	77.1	99.4
4.	- 3%	3.0	18.5	84.1	98.6
5.	- 5%	4.0	5.8	72.3	98.7
6.	Furadan 40 FP- 1%	1.6	13.7	51.9	99.7
7.	- 5%	1.1	10.9	82.7	99.0
8.	-10%	1.0	13.4	91.0	99.6
9.	-20%	4.7	16.4	83.9	99.5
	SEM	0.6	4.5	7.2	0.5
	CV at 5%	1.9	13.6	21.7	1.5

[1]Average of three replications.

C. Effect on yield

The data on the effect of seed treatment with different dosages of Furadan 40P and Temik 10G on yield of pigeonpea in the SM nursery are presented in Table 103. The yield in seed treatment with 2, 3, and 5% Temik 10G was reduced as compared with the untreated check. In seed treatment with 1% Temik 10G and 1, 5, 10, and 20% Furadan 40 FP, the yield was as good as the untreated check. This limited effect on yield was probably due to pod borer infestation in the experiment.

VII. MULTILOCATION TESTING

A. ICAR-ICRISAT Uniform Trial for Pigeonpea Sterility Mosaic Resistance (IIUTPSMR)

Twenty-five resistant or tolerant lines (19 identified at ICRISAT Center, one at BHU, Varanasi, two at Badnapur and three at CSAUT, Kanpur) along with a susceptible check (BDN-1), were tested at 12 locations, in India through the IIUTSMR during the 1982-83 season. Results were received from 10 locations (Table 104). The detailed report on the results of this multilocation testing has been separately prepared (Pulse Pathology Progress Report No.27) and sent to all the cooperators. A summary of results is presented here.

Table 103. Effect of seed treatment with Temik 10G and Furadan 40 FP on yield of BDN-1 pigeonpea in the sterility mosaic nursery at ICRISAT Center during the 1982-83 season

S.No.	Treatment with dose	Yield/plot (g)[1]			Yield/ha (kg)			Average
		R1	R2	R3	R1	R2	R3	
1.	Control	840	1015	1200	533	644	762	646
2.	Temik 10G - 1%	1010	970	1130	641	616	717	658
3.	- 2%	415	750	985	517	476	625	540
4.	- 3%	855	795	810	543	505	514	521
5.	- 5%	900	800	725	571	508	460	513
6.	Furadan 40 FP- 1%	945	1200	1100	600	762	698	686
7.	- 5%	1010	1020	875	641	648	555	615
8.	-10%	995	1100	830	632	698	527	619
9.	-20%	1170	1040	950	743	660	603	669

[1]Plot size - 18 m^2 (six, 4-m rows).

Of the 25 entries tested, one (ICP-10976) was resistant (< 10% disease) at all the 10 locations tested (Table 104). Two genotypes (ICP-10984 and -11049) were resistant at eight locations; four (ICP-7353, -7867, -8129, and -10977) at seven locations; three (ICP-6630, -6986, and -8089) at six locations; eight at five locations; two at four locations; four at three locations; and one at two locations. These results indicated existence of a different strain of the pathogen/vector at atleast three of these locations.

B. Sterility Mosaic Differentials' Test

Considering the results of the IIUTSMR over the last several seasons, a new test with 10 genotypes to serve as differentials was started and conducted at seven different locations in India during the 1982-83 season. The susceptible check, ICP-7182, showed only 57 and 39% disease at Bangalore and Kanpur, respectively; therefore, the results from these two locations were not included for interpretation purposes. The results of all the seven locations are presented in Table 105 .

The reaction of most of the differentials at Badnapur and ICRISAT Center were similar. In the past, reactions of pigeonpea genotypes have been similar at Pantnagar and ICRISAT Center. However, in this test which was done in the glasshouse conditions, seven genotypes showed RS symptom at Pantnagar. This might be due to differences in the environmental conditions in the glasshouse as compared with field conditions

Table 104. Results of screening of entries of IIUTPSMR to sterility mosaic at 10 different locations in India during the 1982-83 season

S. No.	Entry No.	Badnapur		Bangalore		Dholi		Faizabad		ICRISAT		Kanpur		Ludhiana		Pantnagar		Vamban		Varanasi	
		%D[1]	ST[2]	%D	ST	%D	ST	%D	ST	%D	ST	%D	ST	%D	ST	%D	ST	%D	ST	%D	ST
1.	ICP-410	13	SM	100	SM+SM	91	SM	0	-	21	RS,SM	7	SM	0	-	12	SM	100	SM	83	SM
2.	ICP-999	8	RS	44	SM	22	SM	4	MM	16	SM	3	SM	0	-	0	-	71	MM+RS	18	SM
3.	ICP-2376	2	RS	100	SM	100	SM	64	SM	0	-	9	SM	0	-	8	SM	87	RS+SM	27	SM
4.	ICP-6630	3	RS	100	MM	69	SM	3	SM	9	SM	2	SM	0	-	18	SM	100	RS+SM	4	SM
5.	ICP-6986	21	SM	0	-	16	SM	0	-	10	SM	6	SM	0	-	5	SM	73	RS+SM	11	SM
*6.	ICP-7228	8	SM	40	SM	70	SM	48	SM	0	-	13	SM	0	-	3	SM	92	SM+MM	0	-
7.	ICP-7349	7	SM	100	SM	84	SM	23	SM	35	SM	8	SM	7	SM	18	SM	100	SM	48	SM
8.	ICP-7353	2	RS	25	SM	86	SM	6	SM	0	-	8	SM	0	-	6	SM	0	-	17	SM
9.	ICP-7867	10	SM	20	SM	0	-	0	-	0	-	0	-	0	-	0	-	78	MM	13	SM
*10.	ICP-8090	2	SM	33	SM	100	SM	2	SM	0	-	20	SM	0	-	0	-	71	MM	3	SM
11.	ICP-8105	10	SM	17	SM	94	SM	22	SM	56	MM	12	SM	0	-	6	SM	73	MM,SM	53	SM
12.	ICP-8129	4	RS	77	SM	94	SM	6	MM	3	SM	8	SM	0	-	0	-	100	SM	4	SM
13.	ICP-10976	5	SM	0	-	10	MM	0	-	0	-	5	SM	0	-	0	-	0	-	0	-
14.	ICP-10977	9	SM	0	-	24	MM	0	-	3	SM	12	SM	0	-	26	SM	0	-	0	-
15.	ICP-10984	0	-	0	-	81	SM	10	MM	16	SM	0	-	0	-	0	-	0	-	0	-
16.	ICP-11040	11	SM	60	SM+MM	10	SM	3	MM	55	SM	0	-	0	-	11	SM	100	SM+MM	37	SM
*17.	ICP-11047	2	SM	100	SM	99	SM	40	MM	0	-	0	-	0	-	7	SM	100	SM	35	SM
*18.	ICP-11049	4	RS	57	SM+MM	0	-	2	MM	0	-	0	-	0	-	7	SM	53	MM+RS	9	SM
*19.	ICP-11089	8	RS	100	SM	84	SM	65	MM	0	-	0	-	0	-	0	-	71	SM+MM	15	SM
20.	Purple-1	6	RS	0	-	NT[3]	-	11	SM	80	SM+RS	NT	-	0	-	0	-	0	-	71	SM
21.	BSMR-1	0	-	100	SM	100	SM	40	SM	4	SM+RS	20	SM	0	-	9	SM	100	SM	0	-
22.	BSMR-2	2	RS	100	SM	27	SM	20	MM	0	-	NT	-	0	-	33	SM	100	MM+SM	45	SM
23.	KSMR-80-1	50	SM,RS	50	SM	100	SM	NT	-	100	SM+MM	0	-	0	-	0	-	75	MM,SM	54	SM
24.	KSMR-80-2	8	RS	100	SM	73	SM	35	SM	3	SM+MM	0	-	0	-	4	SM	91	MM,SM	32	SM
25.	KSMR-80-3	13	RS	50	SM	90	SM	NT	-	9	SM+MM	4	SM	0	-	0	-	NT	-	63	SM
26.	ICP-7182(check)	90	SM	94	SM	91	SM	60	SM	100	SM+MM	28	MM	20	SM	47	SM	100	SM	100	SM

[1] %D - Percent infection;
[2] ST - Symptom type; SM - Severe mosaic; MM - Mild mosaic, and RS - ringspot.
[3] NT - Not tested
*1981-82 IIUTPSMR promising lines

Table 105. Reaction of 10 pigeonpea differentials to sterility mosaic at different locations in India during the 1982-83 season

S. No.	Particular	Badnapur		Bangalore		Dholi		ICRISAT Center		Kanpur PD		Pantnagar		Vamban	
		%D[1]	ST[2]	%D	ST	%D	ST	%D	ST	%D	ST	%D	ST	%D	ST
1.	ICP-2376	100.0	SM	100.0	SM	100.0	Mode-rate	60.9	RS	0.0		58.6	RS+SM	71.0	RS+SM
2.	ICP-7035	0.0		NT[3]		0.0	SM	0.0		0.0		30.8	RS	0.0	
3.	ICP-7182	100.0	SM	57.1	SM	100.0	SM	100.0	SM	89.4	SM	96.2	SM	100.0	SM
4.	ICP-7234	0.0		16.7	MM	8.3	SM	0.0		5.0	SM	25.9	RS	-[4]	RS+SM
5.	ICP-7378	0.0		80.0	SM	30.8	SM	51.2	SM,MM	20.7	SM	44.4	SM,MM	-	RS+MM
6.	ICP-7870	0.0		83.3	SM	93.8	SM	0.0		15.8	SM	96.4	SM	-	SM
7.	ICP-8094	0.0		18.8	SM	100.0	SM	0.0		16.7	SM	78.6	RS	-	MM
8.	ICP-8854	0.0		0.0		0.0		0.0		100.0	SM	25.9	RS	-	MM
9.	ICP-8862	0.0		0.0		30.4	SM	9.8	SM,MM,RS	4.8	SM	35.3	RS	-	SM,MM
10.	Purple-1	0.0		0.0		33.3		26.7	SM	0.0		65.2	RS+SM	0.0	

[1]%D - Percent Disease incidence.
[2]ST - Symptom type; SM - Severe mosaic; MM - Mild mosaic; and RS - Ringspot.
[3]NT - Not tested.
[4]- - Data not sent by the cooperator.

which is under study. Some genotypes showed differential reaction at Dholi and Vamban indicating presence of different strains of the pathogen/vector at these locations. Further testing is required during the next year to get a better picture of strain situation in the pathogen/vector of sterility mosaic in India.

PROJECT: PP-PATH-5(81): DEVELOPMENT OF TECHNIQUES TO SCREEN FOR RESISTANCE TO POTENTIALLY SERIOUS DISEASES OF PIGEONPEA

I. SUMMARY

1. Following a simple greenhouse screening technique, 170 sterility mosaic resistant lines, 137 Phytophthora blight resistant lines and 29 wilt resistant lines were screened against the powdery mildew. Of these, 31 lines showed rating of 5 and below in repeated tests.

2. A 'Knife-cut' technique was followed to screen 28 IPWN entries, 28 IIUTPWR entries and 24 sterility mosaic resistant lines against Macrophomina stem canker in field. Of these, 24 IPWN entries, 25 IIUTPWR entries and 22 sterility mosaic resistant lines showed disease rating of 3 and below.

3. Of the 587 germplasm accessions scored for bacterial leaf spot and stem canker, only ICP-8863 and -6524 were found resistant under field conditions.

4. A simple greenhouse techniques was developed to screen pigeonpea material for resistance to Alternaria blight.

5. About 400 lines including wilt, sterility mosaic, Phytophthora blight, multiple disease resistant lines and elite breeding lines were screened and identified above 50 resistant lines.

6. All the nine *Atylosia* spp. screened were resistant to Alternaria blight.

7. The yellow mosaic incidence in all the three field trials was low with a maximum of 9.4%. The maximum yellow mosaic incidence was observed in November 5 sowing, in 60 cm row to row spacing, and in sowings where leguminous hosts of the virus and vector (whitefly) were alternated with two indicator rows of a susceptible ICP-1 cultivar.

8. The yellow mosaic caused 42.7% reduction in yields of postrainy (Rabi)-season susceptible pigeonpea, which is close to 40.7% reported by us last year.

II. INTRODUCTION

During the 1982-83 season we screened pigeonpea materials against powdery mildew, Macrophomina stem canker, bacterial leaf spot and stem canker and Alternaria blight. We screened a large number of materials against Alternaria blight. An ICAR-ICRISAT Uniform Trial for Pigeonpea Alternaria Blight Resistance (IIUTPABR) was started in cooperation with the All India Coordinated Pulses Improvement Program. For yellow mosaic we attempted to find out information required for developing an efficient field screening technique.

III. POWDERY MILDEW

For this disease, planting, inoculation, and recording observations were done as described in Pulse Pathology (Pigeonpea) Report of Work 1981-82.

One hundred and seventy sterility mosaic resistant lines, 137 Phytophthora blight resistant lines and 29 wilt resistant lines were screened for powdery mildew under greenhouse conditions. Severe powdery mildew developed on susceptible lines. A total of 31 lines showed rating of 5 and below in repeated tests (Table 106).

Table 106. List of 31 pigeonpea lines which showed rating of 5 and below to powdery mildew in greenhouse

S.No.	Pedigree	Powdery mildew[a]
	A. Wilt resistant lines	
1.	ICP-8869	2
2.	ICP-9134	3
3.	ICP-9141	2
4.	ICP-9142	2.5
5.	ICP-9149	3
6.	ICP-9152	3
7.	ICP-9155	1.5
8.	ICP-9156	2.5
9.	ICP-9171	4
10.	ICP-9173	3
11.	ICP-9174	2
12.	ICP-9177	2.5
13.	ICP-9213	5
14.	ICP-11297	

Table 106. Contd.

	B. Phytophthora blight resistant lines	
15.	ICP-580	5
16.	ICP-1529	3.5
	C. Sterility mosaic resistant lines	
17.	ICP-7403	3
18.	ICP-7867	4
19.	ICP-9187	4
20.	ICP-10984	5
21.	ICP-11000	4
22.	ICP-11001	3
23.	ICP-11007	
24.	ICP-11052	2
25.	ICP-11085	2.5
26.	ICP-11095	3
27.	ICP-11119	2
28.	ICP-11150	4
29.	ICP-11168	2.5
30.	ICP-11171	5
31.	ICP-11196	2

[a]Average of 2 tests, based on a rating scale of 1-9.

IV. MACROPHOMINA STEM CANKER

A 'knife-cut' method was followed to screen 28 entries of the International Pigeonpea Wilt Nursery (IPWN), 28 of the ICAR-ICRISAT Uniform Trial for Pigeonpea Wilt Resistance (IIUTPWR) and 24 of the ICAR-ICRISAT Uniform Trial for Pigeonpea Sterility Mosaic Resistance (IIUTPSMR) in the respective disease nurseries. The inoculations and recording of observations were done as described in Pulse Pathology (Pigeonpea) Report of Work 1981-82.

Of the 28 IPWN lines tested, 24 showed rating of 3 and below (Table 107). Twenty-five IIUTPWR entries showed rating of 3 and below (Table 108). Of the 24 IIUTPSMR entries screened, 22 showed rating of 3 and below (Table 109).

Table 107. Reaction of entries included in International Pigeonpea Wilt Nursery to Macrophomina stem canker during the 1982-83 season[a]

S.No.	Pedigree	MSC[b]
1.	ICP-8861	3.0
2.	ICP-8862	3.0
3.	ICP-8864	2.6
4.	ICP-9126	2.4
5.	ICP-9134	2.2
6.	ICP-9139	3.0
7.	ICP-9141	3.0
8.	ICP-9142	2.4
9.	ICP-9147	1.8
10.	ICP-9148	3.0
11.	ICP-9149	3.0
12.	ICP-9155	3.4
13.	ICP-9156	2.6
14.	ICP-9159	2.3
15.	ICP-9171	3.0
16.	ICP-9173	3.0
17.	ICP-9174	2.4
18.	ICP-9179	3.0
19.	ICP-10957	3.0
20.	ICP-11292	4.6
21.	ICP-11294	3.0
22.	ICP-11295	3.0
23.	ICP-11296	3.3
24.	ICP-11297	3.0
25.	ICP-11298	3.2
26.	ICP-11299	2.3
27.	C.No.74363	3.0
28.	G.P.-125-D	2.0

[a]Tested by the 'knife-cut' method in the wilt nursery.

[b]Macrophomina stem canker based on 1-9 rating scale; average of five plants.

Table 108. Reaction of entries included in the ICAR-ICRISAT Uniform Trial for Pigenopea Wilt Resistance (IIUTPWR) to Macrophomina stem canker during the 1982-83 season[a]

S.No.	Pedigree	MSC[b]
1.	ICP-5701	1.2
2.	ICP-7855	2.2
3.	ICP-8464	3.0
4.	ICP-8795	3.0
5.	ICP-8798	2.2
6.	ICP-8848	3.4
7.	ICP-8863	2.0
8.	ICP-9120	2.2
9.	ICP-9144	2.2
10.	ICP-9168	2.6
11.	ICP-9175	1.8
12.	ICP-9177	1.2
13.	ICP-9213	2.2
14.	ICP-9229	3.4
15.	ICP-9758	2.6
16.	ICP-10269	1.6
17.	ICP-10958	2.6
18.	ICP-10960	3.2
19.	ICP-11287	3.0
20.	ICP-11290	1.4
21.	C.No.74360	3.0
22.	K-70	1.6
23.	MAU-E-175	2.2
24.	AWR-74/16	2.4
25.	79-7	2.8
26.	P-76-56	2.5
27.	91-1	1.3
28.	BDN-3	2.0

[a]Tested by the 'knife-cut' method in the wilt nursery.

[b]Macrophomina stem canker based on a 1-9 rating scale; average of 5 plants.

Table 109. Reaction of entries included in the ICAR-ICRISAT Uniform Trial for Pigeonpea Sterility Mosaic Resistance (IIUTPSMR) to Macrophomina stem canker during the 1982-83 season[a]

S.No.	Pedigree	MSC[b]
1.	ICP-40	2.7
2.	ICP-999	2.3
3.	ICP-2376	2.8
4.	ICP-6630	2.8
5.	ICP-6986	3.3
6.	ICP-7228	3.0
7.	ICP-7349	2.0
8.	ICP-7353	3.0
9.	ICP-7867	3.0
10.	ICP-8090	3.2
11.	ICP-8105	2.0
12.	ICP-8129	3.0
13.	ICP-10976	3.0
14.	ICP-10984	2.4
15.	ICP-11040	3.0
16.	ICP-11047	2.8
17.	ICP-11049	3.0
18.	ICP-11089	3.0
19.	Purple-1	2.6
20.	BSMR-1	2.0
21.	BSMR-2	3.5
22.	KSMR-80-1	2.2
23.	KSMR-80-2	3.0
24.	KSMR-8-3	1.0

[a]Tested by the 'knife-cut' method in the sterility mosaic nursery.

[b]Macrophomina stem canker based on a 1-9 rating scale; average of 5 plants.

V. BACTERIAL LEAF SPOT AND STEM CANKER

During the 1982-83 rainy season also, this disease appeared in a very severe form in our wilt nursery. A total of 587 germplasm accessions were scored for this disease based on eye judgement as low, moderate or severe. Of these, 391 lines showed low disease, 169 moderate disease and 26 severe disease under field conditions. Only line ICP-6524 was completely free from this disease. The following lines showed very low rating against this disease : ICP-8860, -7490, -7445, -7585, -7980, -6933,

-7217, PR-5490 and -5341-3. Again, ICP-8863 showed the least disease as in 1981 K.

VI. ALTERNARIA BLIGHT

A. Causal organism

Alternaria blight of pigeonpea is caused by *Alternaria tenuissima* This was a minor leaf disease and symptoms were confined to the older leaves. A new technology of growing pigeonpea as postrainy (rabi)-season crop (September planting) in north-east India was introduced in recent years. During the 1979-80 crop season, a severe incidence of Alternaria blight appeared and destroyed susceptible lines like Bahar and Basant in Bihar. This is another example of a minor disease that became major due to change in the cropping system.

The culture of *A. tenuissima* brought into pure culture and the identity was confirmed by the Commonwealth Mycological Institute, Kew, England. The growth rate of *A. tenuissima* was studied on V-8 juice agar at 10, 15, 20, 25, 30 and 35°C. The optimum temperature for growth of the fungus isolate was 25 to 30°C (Table 110). In greenhouse also we got good disease at this temperature range. In field conditions also the disease appears in early December and attains maximum by the middle of January. If the temperatures are low during this period, the severity is reduced as observed in the 1982-83 season in Dholi and Varanasi.

B. Screening technique and rating scale

A 5-mm disc of 1-week-old culture was transferred to each of the 250 ml flasks containing 100 ml of potato-dextrose broth. The cultures were incubated at 28°-30°C for 2 weeks. The fungal growth, collected along with spores by filtering, was macerated intermittently for 2-3 min in a Waring blendor with water (200 ml/mycelial mat) to get a final conidial concentration of 3.25×10^4/ml). This inoculum was sprayed onto 2-week-old pigeonpea seedlings in an Isolation Plant Propagator under greenhouse conditions. High humidity was maintained by covering the plants with plastic covers for 10 days. Ten days after inoculation, the percentage of blighted seedlings was calculated. Since cross pollination is common in pigeonpea, lines were classified into three groups:resistant (0-20% blight), moderately resistant (21 to 50% blight) and susceptible (51 to 100% blight).

C. Material screened

1. Elite lines

Of the eight elite pigeonpea lines from different centers

Table 110. Effect of temperature on colony diameter of *Alternaria tenuissima* on V-8JA

Temperature (°C)	Colony diameter[a] (in mm)
10	23.6
15	29.0
20	59.0
25	76.5
30	81.6
35	18.1

[a]Average of 10 replications (Petri plates).

screened, seven showed resistant reaction (Table 111).

Table 111. Reaction of some elite pigeonpea lines to Alternaria blight when tested in an Isolation Plant Propagator

Pedigree	Origin	Total plants	Disease[a] reaction
ICPL-6	ICRISAT	8	R
ICPL-87	ICRISAT	23	R
ICPL-146	ICRISAT	16	R
MA-128-1	BHU-Varanasi	31	R
MA-128-2	BHU-Varanasi	27	R
DA-2	Dholi-Bihar	33	R
20 (105)	Berhampore-West Bengal	9	R
NO.1258	Dholi-Bihar	20	S

[a]Tested twice : R - Resistant (0-20% blight)
S - Susceptible (above 50% blight)

2. Inbreds and advanced progenies

Ten inbred lines of ICP-7105 and five advanced lines from 74376 cross (ICP-4234 x -7105) were screened against Alternaria blight. Of these, two inbreds of ICP-7105 and one advanced

line from C.No.74376 showed resistant reaction (Table 112).

Table 112. Reaction of 10 inbreds of ICP-7105 and five advanced lines from cross 74376 (ICP-4234 x -7105) to Alternaria blight when tested in an Isolation Plant Propagator

S.No.	Pedigree	Total plants	Disease[a] reaction
1.	ICP-7105-12-20-2-2-G3Ø-GBØ-GBØ-GB	9	S
2.	ICP-7105-12-22-2-1-G1Ø-GBØ-GBØ-GB	13	S
3.	ICP-7105-12-22-2-2-G3Ø-GBØ-GBØ-GB	18	R[a]
4.	ICP-7105-12-22-2-4-G5Ø-GBØ-GBØ-GB	14	MR
5.	ICP-7105-12-23-1-1-G2Ø-GBØ-GBØ	8	S
6.	ICP-7105-12-25-2-3-G3Ø-GBØ-GBØ-GB	11	S
7.	ICP-7105-42-2-5-1-G4Ø-GBØ-GBØ-GB	6	S
8.	ICP-7105-42-9-4-4-G4Ø-GBØ-GBØ-GB	5	S
9.	ICP-7105-42-37-2-5-G1Ø-GBØ-GBØ	2	MR
10.	ICP-7105-48-35-6-2-G1Ø-GBØ-GBØ	23	R[a]
11.	74376-W12Ø-VII NDT2-G5-G2-G1	7	S
12.	74376-W12Ø-VII NDT2-G5-G3-G1	8	S
13.	74376-W12Ø-VII NDT2-G5-G4-G1	9	S
14.	74376-W40Ø-VII NDT1-GB-GB-GB-GB	6	S
15.	74376-W40Ø-VII NDT2-GB-GBØ-GBØ	26	R[a]
16.	20 (105) (Resistant check)	9	R
17.	No.1258 (Susceptible check)	7	S

[a]Tested twice: R - Resistant (0-20% blight)
MR - Moderately resistant (21-50% blight)
S - Susceptible (above 50% blight)

3. Multiple disease resistant lines

Of the 45 multiple disease resistant lines screened, 17 showed resistant reaction (Table 113)

4. ICP-7105 converted male sterile lines

All the 18 ICP-7105 converted male sterile lines showed susceptible reaction to Alternaria blight (Table 114).

Table 113. Reaction of 45 multiple disease resistant lines to Alternaria blight when tested in an Isolation Plant Propagator

S.No.	Source: MDN plot No.82K	Pedigree	Total plants	Disease[a] reaction
1	2	3	4	5
1.	3	ICP-5097-1-53⊠-W5⊠-SWPB-SWPB-SWP1⊠-SWP1⊠-SWPB⊠	12	R
2.	5	ICP-5097-1-53⊠-W5⊠-SWPB-SWPB-SWP1⊠-SWP7⊠-SWPB⊠	14	MR
3.	7	ICP-5097-1-53⊠-W5⊠-SWPB-SWPB-SWP11⊠-SWP2⊠-SWPB⊠	15	MR
4.	9	ICP-5097-1-53⊠-W5⊠-SWPB-SWPB-SWP17⊠-SWP1⊠-SWPB⊠	13	MR
5.	11	ICP-5097-1-53⊠-W5⊠-SWPB-SWPB-SWP17⊠-SWP3⊠-SWPB⊠	14	MR
6.	12	ICP-5097-1-53⊠-W5⊠-SWPB-SWPB-SWP17⊠-SWP4⊠-SWPB⊠	14	MR
7.	14	ICP-5097-1-53⊠-W5⊠-SWPB-SWPB-SWP17⊠-SWP6⊠-SWPB⊠	11	S
8.	15	ICP-5097-1-53⊠-W5⊠-SWPB-SWPB-SWP17⊠-SWP7⊠-SWPB⊠	15	MR
9.	16	ICP-5097-1-53⊠-W5⊠-SWPB-SWPB-SWP21⊠-SWP1⊠-SWPB⊠	14	MR
10	17	ICP-5097-1-53⊠-W5⊠-SWPB-SWPB-SWP21⊠-SWP2⊠-SWPB⊠	15	MR
11.	19	ICP-5097-1-53⊠-W5⊠-SWPB-SWPB-SWP21⊠-SWP7⊠-SWPB⊠	12	MR
12.	20	ICP-5097-1-53⊠-W5⊠-SWPB-SWPB-SWP24⊠-SWP2⊠-SWPB⊠	14	MR
13.	22	ICP-5097-1-53⊠-W5⊠-SWPB-SWPB-SWP30⊠-SWP4⊠-SWPB⊠	12	R
14.	23	ICP-5097-1-53⊠-W5⊠-SWPB-SWPB-SWP30⊠-SWP5⊠-SWPB⊠	15	MR
15.	27	ICP-5097-1-53⊠-W5⊠-SWPB-SWPB-SWP31⊠-SWP5⊠-SWPB⊠	13	R
16.	34	ICP-5097-1-53⊠-W5⊠-SWPB-SWPB-SWP34⊠-SWP9⊠-SWPB⊠	15	R
17.	44	ICP-5097-1-53⊠-W5⊠-SWPB-SWPB-SWP37⊠-SWP3⊠-SWPB⊠	14	R
18.	46	ICP-5097-1-53⊠-W5⊠-SWPB-SWPB-SWP37⊠-SWP5⊠- SWPB⊠	15	S
19.	47	ICP-5097-1-53⊠-W5⊠-SWPB-SWPB-SWP37⊠-SWP6⊠-SWPB⊠	14	R
20.	51	ICP-5097-1-53⊠-W5⊠-SWPB-SWPB-SWP39⊠-SWP5⊠-SWPB⊠	15	R
21.	53	ICP-5097-1-53⊠-W5⊠-SWPB-SWPB-SWP39⊠-SWP7⊠-SWPB⊠	15	R
22.	54	ICP-5097-1-53⊠-W5⊠-SWPB-SWPB-SWP39⊠-SWP7⊠-SWPB⊠	15	R
23.	57	ICP-5097-1-53⊠-W5⊠-SWPB-SWPB-SWP40⊠-SWP4⊠-SWPB⊠	15	R

Table 113. Contd.

1	2	3	4	5[a]
24.	59	ICP-5097-1-53⊠-W5⊠-SWPB-SWPB-SWP40⊠-SWP6⊠-SWPB⊠	15	R
25.	74	74360F4B-S218⊠-SWP5⊠-SWPB-SWP4⊠-SWP2⊠-SWPB⊠	17	R
26.	88	74360F4B-S235⊠-SWP7⊠-SWP3⊠-SWP2⊠-SWP3⊠-SWPB⊠	14	S
27.	90	74360F4B-S235⊠-SWP7⊠-SWP3⊠-SWP2⊠-SWP5⊠-SWPB⊠	15	S
28.	98	ICP-8094-1-S2⊠-P1⊠-SWP2⊠-SWP6⊠-SWP3⊠-SWPB⊠	11	S
29.	99	ICP-8094-1-S2⊠-P1⊠-SWP2⊠-SWP6⊠-SWP4⊠-SWPB⊠	12	S
30.	100	ICP-8094-1-S2⊠-P1⊠-SWP2⊠-SWP6⊠-SWP5⊠-SWPB⊠	12	S
31.	101	ICP-8094-1-S2⊠-P1⊠-SWP2⊠-SWP6⊠-SWP6⊠-SWPB⊠	11	S
32.	102	ICP-8094-1-S2⊠-P1⊠-SWP2⊠-SWP6⊠-SWP7⊠-SWPB⊠	8	S
33.	103	ICP-8094-1-S2⊠-P1⊠-SWP2⊠-SWP6⊠-SWP8⊠-SWPB⊠	13	S
34.	106	ICP-8094-1-S2⊠-P1⊠-SWP2⊠-SWP8⊠-SWP3⊠-SWPB⊠	13	S
35.	108	ICP-8094-1-S2⊠-P1⊠-SWP2⊠-SWP8⊠-SWP5⊠-SWPB⊠	14	S
36.	109	ICP-8094-1-S2⊠-P1⊠-SWP2⊠-SWP8⊠-SWP6⊠-SWPB⊠	13	S
37.	110	ICP-8094-1-S2⊠-P1⊠-SWP4⊠-SWP7⊠-SWP1⊠-SWPB⊠	10	S
38.	126	74360F4B-S235⊠-SWP7⊠-SWP2⊠-SWP2⊠-SWPB⊠	13	S
39.	127	74360F4B-S235⊠-SWP7⊠-SWP2⊠-SWP3⊠-SWP2⊠-SWPB⊠	5	S
40.	178	74360F4B-S218⊠-SWP5⊠-SWP1⊠-SWP8⊠-SWP1⊠-SWPB⊠	14	R
41.	239	74360F4B-S218⊠-SWP4⊠-SWP1⊠-SWP4⊠-SWP3⊠-SWPB⊠	11	R
42.	260	74360F4B-S218⊠-SWP8⊠-SWP3⊠-SWP6⊠-SWP1⊠-SWPB⊠	15	R
43.	262	74360F4B-S219⊠-SWP1⊠-SWP1⊠-SWP2⊠-SWP5⊠-SWPB⊠	12	R
44.	277	74363-P45⊠-VIIINDTP1⊠-SWPB⊠-SWP1⊠-SWP1⊠-SWPB⊠	15	S
45.	278	74363-P45⊠-VIIINDTP1⊠-SWPB⊠-SWP2⊠-SWP1⊠-SWPB⊠	14	R
	20(105)	(Resistant check)	14	R
	No.1258	(Susecptible check)	12	S

[a]R - Resistant (0-20% blight); MR - Moderately Resistant (21-50% blight);
S - Susceptible (above 50% blight).

Table 114. Reaction of 18 converted male sterile pigeonpea lines to Alternaria blight when tested in an Isolation Plant Propagator

S.No.	Pedigree	Total plants	Disease[a] reaction
1.	ICP-7105 x (MS-3A x 7105) x 7105 x 7105 x 7105 x 7105 BC_5F_1	18	S
2.	ICP-7105 x (MS-3A x 7105) x 7105 x 7105 x 7105 x 7105 BC_5F_1	19	S
3.	ICP-7105 x (MS-3A x 7105) x 7105 x 7105 x 7105 x 7105 BC_5F_1	18	S
4.	ICP-7105 x (MS-3A x 7105) x 7105 x 7105 x 7105 x 7105 BC_5F_1	20	S
5.	ICP-7105 x (MS-3A x 7105) x 7105 x 7105 x 7105 x 7105 BC_5F_1	20	S
6.	ICP-7105 x (MS-3A x 7105) x 7105 x 7105 x 7105 x 7105 BC_5F_1	20	S
7.	ICP-7105 x (MS-3A x 7105) x 7105 x 7105 x 7105 x 7105 BC_5F_1	20	S
8.	ICP-7105 x (MS-3A x 7105) x 7105 x 7105 x 7105 x 7105 BC_5F_1	20	S
9.	ICP-7105 x (MS-3A x 7105) x 7105 x 7105 x 7105 x 7105 BC_5F_1	20	S
10.	ICP-7105 x (MS-3A x 7105) x 7105 x 7105 x 7105 x 7105 BC_5F_1	19	S
11.	ICP-7105 x (MS-3A x 7105) x 7105 x 7105 x 7105 x 7105 BC_5F_1	20	S
12.	ICP-7105 x (MS-3A x 7105) x 7105 x 7105 x 7105 x 7105 BC_5F_1	20	S
13.	ICP-7105 x (MS-3A x 7105) x 7105 x 7105 x 7105 x 7105 BC_5F_1	19	S
14.	ICP-7105 x (MS-3A x 7105) x 7105 x 7105 x 7105 x 7105 BC_5F_1	20	S
15.	ICP-7105 x (MS-3A x 7105) x 7105 x 7105 x 7105 x 7105 BC_5F_1	19	S
16.	ICP-7105 x (MS-3A x 7105) x 7105 x 7105 x 7105 x 7105 BC_5F_1	20	S
17.	ICP-7105 x (MS-3A x 7105) x 7105 x 7105 x 7105 x 7105 BC_5F_1	20	S
18.	ICP-7105 x (MS-3A x 7105) x 7105 x 7105 x 7105 x 7105 BC_5F_1	20	S

[a] S - Susceptible (above 50% blight).

5. Medium-maturity Pigeonpea Adaptation Yield Trial (MPAY) entries

Of the 16 Medium-maturity Pigeonpea Yield Trial entries screened, only two showed moderate resistance (Table 115).

Table 115. Reaction of entries included in the Medium-maturity Pigeonpea Adaptation Yield Trial (MPAY) to Alternaria blgiht when tested in an Isolation Plant Propagator

S.No.	Pedigree	Total plants	Disease[a] reaction
1.	ICPL-276	18	S
2.	ICPL-281	19	S
3.	ICPL-306	20	S
4.	ICPL-332	17	S
5.	ICPH-2	18	S
6.	ICPL-329	20	S
7.	ICPL-8333	18	S
8.	ICPL-8334	19	S
9.	ICPL-8335	16	MR
10.	ICPL-8336	19	MR
11.	ICPL-8337	20	S
12.	ICPL-8338	19	S
13.	ICPL-8339	19	S
14.	ICPL-8340	20	S
15.	ICP-7775	18	S
16.	ICPL-8341	19	S

[a]MR - Moderately Resistant (21-50% blight).
S - Susceptible (above 50% blight).

6. Medium-maturity Pigeonpea Wilt Resistant lines Yield Trial (MPWRY) entries

Of the 22 MPWRY entries tested, only one (BWSMR-1) was found resistant (Table 116).

7. Medium-maturity Pigeonpea Sterility Mosaic Resistant lines Yield Trial (MPSRY) entries

Twenty-four MPSRY entries were screened for Alternaria blight. Of these, ICP-2376 was found resistant. Four other showed moderate resistance (Table 117).

Table 116. Reaction of entries included in Medium-maturity Pigeonpea Wilt Resistant Lines Yield Test (MPWRY) entries to Alternaria blight when tested in an Isolation Plant Propagator

S.No.	Pedigree	Total plants	Disease[a] reaction
1.	ICPL-131	20	S
2.	ICPL-227	20	S
3.	ICPL-270	20	S
4.	ICPL-295	20	S
5.	ICPL-333	19	S
6.	ICPL-335	20	S
7.	ICPL-337	20	S
8.	ICPL-338	20	S
9.	ICPL-8354	20	S
10.	ICPL-8355	20	S
11.	ICPL-8356	19	S
12.	ICPL-8357	19	S
13.	ICPL-8358	19	S
14.	ICPL-8359	19	S
15.	ICPL-8360	20	S
16.	ICPL-8361	19	S
17.	ICPL-8362	19	S
18.	ICPL-8363	16	S
19.	BWSMR-1	18	R
20.	BWSMR-2	20	MR
21.	DT-230	20	S
22.	BWR-370	20	S

[a] R - Resistant (0-20% blight).
MR - Moderately resistant (21-50% blight)
S - Susceptible (above 50% blight).

Table 117. Reaction of entries included in Medium-maturity Pigeonpea Sterility Mosaic Resistant Lines Yield Test (MPSRY) to Alternaria blight when tested in an Isolation Plant Propagator

S.No.	Pedigree	Total plants	Disease[a] reaction
1.	ICPL-1310	19	S
2.	ICPL-138	19	S
3.	ICPL-3410	19	S
4.	ICPL-3420	19	S
5.	ICPL-3430	20	MR
6.	ICPL-3450	18	S
7.	ICPL-3460	19	S
8.	ICPL-83420	19	S
9.	ICPL-83430	20	S
10.	ICPL-8344	18	S
11.	ICPL-83450	18	MR
12.	ICPL-8346	20	S
13.	ICPL-8347	19	S
14.	ICPL-8348	17	S
15.	ICPL-8349	19	MR
16.	ICPL-8350	19	S
17.	ICPL-8351	19	S
18.	ICPL-83520	19	S
19.	ICPL-83530	19	S
20.	BSMR-1	18	S
21.	BSMR-2	16	MR
22.	BDN-1 $BC_2F_2$0	18	S
23.	C-11 $BC_1F_2$0	20	S
24.	ICP-2376	20	R

[a]R - Resistant (0-20% blight); MR - Moderately Resistant (2-50% blight)
S - Susceptible (about 80% blight).

8. F_2 population

Four F_2 populations were screened against Alternaria blight. The data presented in Table 118 have been passed onto breeders to draw conclusions.

Table 118. Reaction of four F_2 populations to Alternaria blight when tested in an Isolation Plant Propagator

S.No.	Pedigree	Total plants	No. of diseased plants	No. of healthy plants
1.	81108 [(ICPL-81 x 74068 prog) x 20(105)]	48	42	6
2.	81110 [(ICPL-150 x 20(105)]	50	42	8
3.	81111 [(ICPL-179 x 20(105)]	49	42	7
4.	81112 [(ICPL-185 x 20(105)]	46	9	37

9. Parents, F_1s and F_2s

Three crosses parents, F_1s and F_2s were screened against Alternaria blight. The results are presented in Table 119. The data have been passed onto breeders to draw conclusions.

Table 119. Reaction of parents, F_1s and F_2s to Alternaria blight when tested in an Isolation Plant Propagator

Pedigree		Generation	Resistant	Susceptible
Sus x Res:	BDN-1 (P_1)	-	0	15
	JA-275 (P_2)	-	13	0
	C.No.78044	F_1	0	2
	C.No.78044	F_2	32	94
Sus x Res:	C-11 (P_1)	-	0	15
	JA-275 (P_2)	-	13	0
	C.No.78054	F_1	0	4
	C.No.78054	F_2	21	78
Sus x Res:	C-11 (P_1)	-	0	15
	ICP-7035 (P_2)	-	15	0
	C.No.78055	F_1	0	4
	C.No.78055	F_2	23	65
20(105) (Resistant check)		-	14	1
No.1258 (Susceptible check)		-	0	15

10. Atylosia spp.

All the nine *Atylosia* spp, tested were found resistant to Alternaria blight (Table 120).

Table 120. Reaction of various *Atylosia* species to *Alternaria tenuissima* isolated from pigeonpea when tested in an Isolation Plant Propagator[a]

Atylosia spp.	Number of plants tested	Disease[b] reaction
A. albicans (NKR-185)	12	R
A. cajanifolia (PR-4878)	16	R
A. lineata (JM-3366)	17	R
A. platycarpa (JM-2873)	13	R
A. scarabaeoides (JM-1985)	16	R
A. scarabaeoides (JM-1988)	14	R
A. sericea (EC-121208)	15	R
A. vicida	12	R
A. volubilis	14	R
20(105) (Resistant check)	15	R
No.1258 (Susceptible check)	12	S

[a]15 - day-old plants were sprayed with inoculum containing 3.25×10^4 conidia/ml. Final observations were recorded 10 days after inoculation.

[b]R - Resistant (0-20% blight) and S-susceptible (above 50% blight).

D. Host range

Chickpea (JG-62), broad bean, mothbean, urdbean, mungbean, cluster bean, winged bean, French bean, lima bean, soybean, sunnhemp, horse gram, berseem, lentil, alfalfa, cotton, methi, *Melilotus alba*, groundnut, cowpea, and sweet peas were tested against *A. tenuissima*. Only chickpea showed severe blight incidence. Broad bean and moth bean showed mild leaf spot symptoms and the remaining crop plants were free from disease.

E. Variation in pathogen

During the 1982-83 season we collected *Alternaria* isolates from BHU (Varanasi), Dholi (Bihar), Jagdishpur and Faizabad (Uttar Pradesh).

We tested pathogenicity of these isolates along with our isolate (collected from BHU in 1980) on five pigeonpea lines. The summarized results are presented in Table 121.

Table 121. Reaction of five pigeonpea lines to six isolates of Alternaria blight when tested in an Isolation Plant Propagator

Isolate	Reaction of pigeonpea lines[a]				
	C-11	No.1258	ICP-2376	ICP-8861	ICP-8862
ICRISAT (old BHU isolate)	S	S	R	R	R
BHU (new isolate)	S	S	R	R	R
Dholi	S	S	R	R	R
Jagdishpur-A	S	S	R	R	R
Jagdishpur-B	S	S	S	S	S
Faizabad	S	S	S	S	S

[a]Tested only once. R - Resistant and S - Susceptible reaction.

Isolates from BHU (both old and new), Dholi and Jagdishpur-A showed identical reaction on all the five pigeonpea lines; C-11 and No.1258 showing a susceptible reaction whereas ICP-2376, -8861, and -8862 a resistant reaction. Faizabad and Jagdishpur-B showed susceptible reactions on all the five lines.

F. Multilocation testing

One hundred and twenty-one lines identified as resistant to wilt, sterility mosaic and Phytophthora blight were tested at three locations in India through the ICAR-ICRISAT Uniform Trial for Pigeonpea Alternaria Blight Resistance (IIUTPABR). Along with these entries, a susceptible (No.1258) and a resistant [20(105)] were also included in the test. At ICRISAT these lines were screened in an Isolation Plant Propagator against the BHU isolate. Whereas at Dholi and BHU (Varanasi) the trials were conducted in fields. Of these, 22 entries (6 wilt resistant, 14 SM resistant and 2 Phytophthora blight resistant) were found resistant at ICRISAT center. More or less similar results were obtained from the other two centers (Table 122).

Table 122. Performance of wilt, SM and Phytophthora blight resistant lines against Alternaria blight at three locations in India

S.No.	Pedigree	Disease reaction[a]		
		ICRISAT[b]	Dholi[c]	BHU[c] (Varanasi)
1	2	3	4	5
	Wilt resistant lines			
1.	ICP-8858	S	S	S
2.	ICP-8859	S	S	S
3.	ICP-8860	S	S	MR
4.	ICP-8861	R[d]	R	R
5.	ICP-8862	R[d]	R	R
6.	ICP-8863	S	S	S
7.	ICP-8864	S	S	S
8.	ICP-8865	S	S	MR
9.	ICP-8866	S	S	MR
10.	ICP-8867	R[d]	MR	R
11.	ICP-8868	S	S	MR
12.	ICP-8869	R[d]	R	R
13.	ICP-10957	S	S	S
14.	ICP-10958	S	S	S
15.	ICP-10960	R[d]	R	R
16.	ICP-11286	S	S	S
17.	ICP-11287	S	S	S
18.	ICP-11289	S	S	S
19.	ICP-11290	S	S	MR
20.	ICP-11291	S	S	S
21.	ICP-11292	S	MR	S
22.	ICP-11293	S	S	S
23.	ICP-11294	S	S	S
24.	ICP-11295	S	S	S
25.	ICP-11297	S	S	MR
26.	ICP-11298	MR[d]	R	S
27.	ICP-11299	S	S	MR
28.	C.No.-74342	S	S	S
29.	C.No.-74363	R[d]	R	MR
30.	ICP-5701	S	S	MR
31.	ICP-8795	S	S	S
32.	ICP-9120	S	S	S
33.	ICP-9144	S	S	S
34.	ICP-9168	S	S	MR
35.	ICP-9175	S	S	S
36.	ICP-9229	S	S	S
37.	ICP-9255	S	S	S
38.	K-70	S	S	S
39.	K-73	S	S	S
40.	MAU-E-175	S	S	S
41.	ICPL-270	S	S	S

Table 122. Contd.

	Phytophthora blight resistant lines			
42.	ICP-28	S	S	MR
43.	ICP-113	S	S	MR
44.	ICP-231	S	S	MR
45.	ICP-339	S	MR	S
46.	ICP-580	S	S	MR
47.	ICP-752	S	S	MR
48.	ICP-913	S	S	MR
49.	ICP-934	S	MR	MR
50.	ICP-1120	S	S	MR
51.	ICP-1123	S	MR	S
52.	ICP-1150	S	MR	S
53.	ICP-1151	S	S	S
54.	ICP-1258	S	S	S
55.	ICP-1321	S	S	S
56.	ICP-1529	S	S	MR
57.	ICP-1535	MR[d]	MR	MR
58.	ICP-1586	S	S	MR
59.	ICP-2376	R[d]	R	R
60.	ICP-2682	S	MR	S
61.	ICP-2719	R[d]	MR	R
62.	ICP-3259	S	S	MR
63.	ICP-4752	S	S	MR
64.	ICP-6953	S	S	MR
65.	ICP-6974	S	S	S
66.	ICP-7065	S	S	R
67.	ICP-8131	S	S	S
	Sterility mosaic resistant lines			
68.	ICP-2630	R[d]	R	R
69.	ICP-3782	R[d]	R	R
70.	ICP-3783	R[d]	MR	R
71.	ICP-4344	S	S	S
72.	ICP-4725	R[d]	MR	S
73.	ICP-6630	S	S	MR
74.	ICP-6986	S	S	MR
75.	ICP-6997	S	MR	S
76.	ICP-7188	R[d]	MR	R
77.	ICP-7201	R[d]	MR	R
78.	ICP-7250	S	S	S
79.	ICP-7349	S	S	S

Table 122. Contd.

80.	ICP-7403	S	S	MR
81.	ICP-7428	S	S	S
82.	ICP-7480	S	MR	S
83.	ICP-7869	R[d]	MR	R
84.	ICP-7871	S	S	S
85.	ICP-7873	S	MR	S
86.	ICP-7898	S	S	S
87.	ICP-7904	R[d]	R	MR
88.	ICP-7906	R[d]	R	R
89.	ICP-7994	S	MR	MR
90.	ICP-7997	S	S	R
91.	ICP-8004	S	S	MR
92.	ICP-8006	S	S	MR
93.	ICP-8051	S	MR	R
94.	ICP-8077	S	S	MR
95.	ICP-8113	S	S	MR
96.	ICP-8120	S	S	MR
97.	ICP-8136	S	S	MR
98.	ICP-8145	S	S	R
99.	ICP-8466	S	S	MR
100.	ICP-8501	MR[d]	S	MR
101.	ICP-8850	R[d]	MR	R
102.	ICP-8852	R[d]	R	S
103.	ICP-8853	S	S	MR
104.	ICP-8856	R[d]	MR	MR
105.	ICP-8857	R[d]	MR	R
106.	ICP-9134	S	S	R
107.	ICP-9136	S	S	MR
108.	ICP-9139	S	S	R
109.	ICP-9140	S	S	R
110.	ICP-9142	S	S	MR
111.	ICP-9150	S	S	R
112.	ICP-9155	S	S	MR
113.	ICP-9166	S	S	MR
114.	ICP-9182	S	S	MR
115.	ICP-9183	S	S	MR
116.	ICP-9187	S	S	MR
117.	ICP-9189	S	S	R
118.	ICP-10222	S	S	MR

Table 122. Contd.

119.	ICP-10231	S	S	MR
120.	ICP-10235	S	S	R
121.	ICP-10505	S	S	MR
	20(105) Resistant check	R	MR	-
	No.1258 Susceptible check	S	S	-

[a]R - Resistant - (0-20% blight); MR - Moderately resistant (21-50% blight); and S - Susceptible (above 50% blight).

[b]Screened in an Isolation Plant Propagator under greenhouse conditions.

[c]Screened under field conditions.

[d]Tested twice.

[e]Not tested.

VII. YELLOW MOSAIC

During the recent years we have observed higher incidence (up to 11% in ICP-1) of yellow mosaic in Rabi (postrainy season) pigeonpea. Considering this, we would like to develop a field screening procedure for screening pigeonpea germplasm for resistance to yellow mosaic. We conducted three field trials to obtain preliminary information on incidence of this disease in Rabi season. Also, we studied the effect of this disease on the yield and its contributing factors in pigeonpea.

A. Influence of different dates of sowing on yellow mosaic incidence

A field trial to study the influence of different dates of soing on the incidence of yellow mosaic was conducted during the Rabi (postrainy)-season 1982-83. ICP-1 pigeonpea was sown at 15-day-interval starting from 19 September to 22 December 1982 at row to row and plant to plant distance of 37.5 and 10 cm, respectively. The plot size was 3.75 x 4 m. The experiment was conducted in the unsprayed area using RBD design with four replications. The results are presented in table 123.

The disease incidence in general remained very low with maximum being only 2.7% in 5 November planting. The lowest disease incidence was observed in the earliest (19 September) and the last (22 December) sowings. The experiment will be repeated next year.

Table 123. Influence of different dates of sowing on pigeonpea yellow mosaic incidence at ICRISAT center during the Rabi 1982-83 season

Date of sowing	Percent yellow mosaic				
	R_1	R_2	R_3	R_4	Ave
19 Sep 82	[illegible]	0.2	0.9	0.0	0.4
5 Oct 82	[illegible]	1.5	1.1	1.2	1.2
22 Oct 82	[illegible]	1.1	0.8	0.0	0.9
5 Nov 82	[illegible]	3.2	2.1	1.4	2.7
22 Nov 82	1.9	2.1	1.3	0.0	1.3
5 Dec 82	1.5	0.0	1.9	1.9	1.1
22 Dec 82	1.1	0.0	0.0	0.0	0.3
LSD at 0.05 level					0.95

B. Influence of different row to row spacings on yellow mosaic incidence

A field trial to study the influence of different row to row spacings on yellow mosaic incidence was conducted during 1982-83 Rabi (post-rainy)-season. ICP-1 pigeonpea was sown in 4 different row to row spacings of 30, 45, 60 and 75 cm with plant to plant distance of 10 cm on 5 October 1982. The plot size was 5 x 4 m. The design followed was RBD with four replications. Observations on disease incidence were recorded at monthly intervals. The results are presented in table 124.

A higher disease incidence (9.4%) was recorded in the treatment 60 cm row to row spacing. The other three spacings of 30, 45 and 70 cm showed 5.3, 4.0 and 3.2% disease incidence, respectively (Table 124).

C. Influence of different reservoir hosts of the virus and the vector (*Bemicia tabaci*) on pigeonpea yellow mosaic incidence

A mixture of different legume crops, viz., French bean, horsegram, mungbean, *Rhyncosia* sp., soybean and urdbean, which are known hosts of mungbean yellow mosaic virus and its vector, *Bemicia tabaci*, were planted in four rows, at a row to row distance of 37.5 cm around the plot and in different combinations within the plot to augment disease incidence. There were 4 treatments where one row of mixture hosts was planted after every 2, 4, 6 and 9 indicator rows of ICP-1 pigeonpea planted to monitor disease incidence. The legume mixture hosts were planted on 20 September 1982 in a plot size of 7.5 x 5 m in RBD design with four replications.

Table 124. Influence of different row spacings in pigeonpea on yellow mosaic incidence at ICRISAT during Rabi (postrainy) 1982-83 season

S.No.	Row to row distance	Percent yellow mosaic incidence				
		R_1	R_2	R_3	R_4	Ave
1.	30 cm	3.4	3.9	2.6	3.0	3.2
2.	45 cm	2.3	3.9	4.2	5.7	4.0
3.	60 cm	1.7	24.2	5.7	6.0	9.4
4.	75 cm	9.4	1.3	6.8	3.8	5.3
LSD at 0.05 level						9.3

ICP-1, a susceptible pigeonpea as indicator of the incidence of yellow mosaic, was planted in a row to row spacing of 37.5 cm on 5 October 1982. Observations on yellow mosaic incidence were recorded at monthly-interval. The results are presented in Table 125.

Table 125. Influence of different leguminous hosts[a] of mungbean yellow mosaic virus and *Bemisia tabaci* on the incidence of yellow mosaic in ICP-1 pigeonpea at ICRISAT Center during the 1982-83 Rabi (postrainy) season

S.No.	Treatment	Percent yellow mosaic incidence[b]				
		R_1	R_2	R_3	R_4	Ave
1.	Legume hosts sown after 2 pigeonpea rows	2.8	5.5	5.6	2.4	4.1
2.	Legume hosts sown after 4 pigeonpea rows	3.5	2.3	3.8	4.6	3.6
3.	Legume hosts sown after 6 pigeonpea rows	1.7	3.5	2.2	3.9	2.8
4.	Legume hosts sown after 9 pigeonpea rows	1.9	2.3	2.4	2.6	2.3
LSD at 0.05 level						1.9

[a]Leguminous hosts - soybean, urdbean, mungbean, French bean, horsegram, *Rhyncosia* sp.

[b]Last observation recorded on 29 December 1982.

Maximum incidence of yellow mosaic of 4.1% was observed in the treatment where the legume hosts were sown after two indicator rows of ICP-1 followed by 3.6% in the treatment where legume hosts were sown after every four rows of ICP-1 pigeonpea. Six and nine rows of pigeonpea planted after a row of legume hosts showed only 2.8 and 3.5% yellow mosaic incidence, respectively.

D. Effect of yellow mosaic on the pigeonpea yield and its contributing factors

Last year we had conducted a similar study and found that yellow mosaic caused 40% yield loss in Rabi-planted ICP-1 pigeonpea on per plant basis. This year we again conducted a similar study with ICP-1 to confirm our last year's results.

ICP-1 pigeonpea was planted in the first week of October 1982 with inter- and intra-row spacings of 37.5 and 10 cm, respectively. Ten plants affected with yellow mosaic were tagged in each replication on 15 December 1982. For controls, 10 healthy plants were similarly tagged in each replication. A total of 50 each of healthy and yellow mosaic-affected plants were harvested on 22 March 1983. Observations on number of pods per plant, number of seeds per pod, 100-seed weight and yield per plant are presented in Table 126.

Table 126. Effect of yellow mosaic on yield and yield contributing factors of ICP-1 pigeonpea during Rabi of 1982-83

Treatment	No. of pods per plant	No. of seeds/pod	100-seed weight	Yield g per plant	Yield % decrease over healthy
Healthy	18.4	2.6	9.6	42.2	42.7
Yellow mosaic-infected	13.3	1.9	8.7	24.4	
LSD at 0.05 level	9.9	0.5	1.1	26.6	

The yellow mosaic caused a significant reduction of 42.7% in yield of Rabi-planted pigeonpea which is close to an average loss of 40.7% reported by us last year. Interestingly, the three yield contributing factors, i.e., pod per plant, seeds per pod, and 100-seed weight were also significantly affected by the disease by causing 33.1, 25.9, and 9.4% reduction, respectively. These results confirm the results that we had reported in our last year's Annual Progress Report 23 and indicate that the yellow mosaic has potential to become a serious disease of the Rabi-planted pigeonpeas.

PROJECT: PP-PATH-6(81): IDENTIFICATION OF MULTIPLE DISEASE RESISTANCE IN PIGEONPEA

I. SUMMARY

1. A large number of pigeonpea material was screened for multiple disease resistance (wilt, sterility mosaic, and phytophthora blight) in multiple disease nursery during the 1982-83 season. These included demonstration trial, multiple disease resistance selections, selections from SM + wilt resistant lines, F_2 bulks and advance lines.

2. Selfed seed was collected from different lines/plants that showed multiple disease resistance and were selected in colloboration with our pigeonpea breeders.

II. INTRODUCTION

Work on the screening of breeding materials to identify lines with multiple disease resistance was carried out.

III. SCREENING IN THE MULTIPLE DISEASE NURSERY

Screening for multiple disease resistance was carried out in RP-18, a 1.2 ha Alfisol low-lying plot. The plot was made 'wilt-sick' by repeated incorporation of pigeonpea stubbles from wilted plants. For sterility mosaic, four-rows of susceptible cultivar [NP(WR)-15] were planted 2 months in advance on the west side of the plot and staple-inoculated to serve as an 'infector-hedge'.

Planting was done on 24 June 1982. Three rows of susceptible checks were planted after every 8 rows of test materials. The three check lines, one for each disease were:BDN-1 (sterility mosaic (SM) susceptible); ICP-2376 (wilt susceptible), and Hy-3C (Phytophthora blight susceptible). This year four rows of susceptible cultivar [NP(WR)-15] were planted only two months in advance instead of 6 months due to insecticidal sprays on peanut crop till March end in the adjoining plot. Due to high temperatures, the mite population in the infector-hedge was very low in June-July, therefore, BDN-1 susceptible check rows in the nursery were staple-inoculated to ensure high mite population and good disease spread in the nursery. For Phytophthora blight, lines showing less than 20% infection to all the three diseases and selected for further use were inoculated with the fungus by the 'knife-cut' method to ensure their resistance to this disease. The data on incidence of different diseases in susceptible checks are presented in table 127.

Table 127. Disease incidence in three susceptible checks in the multiple disease nursery during the 1981-82 season

Month	% Phytophthora blight incidence in Hy-3C	% SM incidence in BDN-1	% wilt incidence in ICP-2376
June	-	-	-
July	-	-	-
August	10.3	30.0	7.1
September	18.6	94.4	41.2
October	31.9	96.9	72.9
November	-	98.0	87.4
December	-	-	93.2
January	-	98.0	96.6
February	-	-	-

Phytophthora drechseleri f. sp. *cajani* was isolated from the infected plants in the multiple disease nursery and this isolate was called P_3 to differentiate it from the P_2 isolate. P_2 isolate was inoculated by the 'knife-cut' method.

A. Demonstration trial

Of the three lines planted in the demonstration trial, two lines ICP-5097 sel and C.No.74360 sel showed promise (< 20% infection) to all the three diseases (Table 128). The third line, C.No.74360 sel, was found susceptible to wilt.

B. Multiple disease resistant selections

1. Germplasm selections

Out of 77 single plant selections of three lines (ICP-5097, -7194 and -8094) screened, 41 progenies from ICP-5097 and 12 progenies from ICP-8094 showed low disease incidence (0 to 20% blight, wilt and sterility mosaic). The lines that showed promise (< 20% infection) to all the three diseases are listed in table 129. Thirty-four lines from ICP-5097 were selected for further screening.

2. Progenies from Cross Nos.74360 and 74363

Out of 199 single plant progenies of C.No.74360 screened, 140

Table 128. Results of screening of demonstration entries in the multiple disease nursery during the 1982-83 season

S.No.	Particular	Total plants	% SM	Total plants	% blight	Total plants	% wilt
1.	74360-F_4B-5218Ø-SWP5Ø-SWPBØ-SWPØ-SWP1Ø	160	2.5	148	2.5	156	42.3
2.	ICP-5097-1-S3Ø-W5Ø-SWPB-SWPBØ-SWP3Ø	144	0.0	174	5.8	164	3.0
3.	74360-F_4B-S235Ø-SWP7Ø-SWP3Ø-SWP2Ø-SWP2	266	0.0	242	3.3	234	11.5

Table 129. List of multiple disease resistant selections from ICP-5097 and -8094 that showed low incidence in the multiple disease nursery during the 1982-83 season[a]

S.No.	Particular	Total plants	% SM	Total plants	% blight	Total plants	% wilt
1	2	3	4	5	6	7	8
1.	ICP-5097-1-S3Ø-W5Ø-SWPB-SWPB-SWP1Ø-SWP1Ø	7	0.0	8	0.0(0.0)	8	0.0*
2.	ICP-5097-1-S3Ø-W5Ø-SWPB-SWPB-SWP11Ø-SWP2Ø	42	0.0	45	0.0(0.0)	45	11.1
3.	ICP-5097-1-S3Ø-W5Ø-SWPB-SWPB-SWP17Ø-SWP1Ø	14	0.0	14	7.1(9.0)	13	0.0
4.	ICP-5097-1-S3Ø-W5Ø-SWPB-SWPB-SWP17Ø-SWP2Ø	13	0.0	15	6.6	14	7.1
5.	ICP-5097-1-S3Ø-W5Ø-SWPB-SWPB-SWP17Ø-SWP3Ø	9	0.0	13	15.4(0.0)	11	9.1
6.	ICP-5097-1-S3Ø-W5Ø-SWPB-SWPB-SWP17Ø-SWP4Ø	11	0.0	13	0.0(0.0)	13	7.7
7.	ICP-5097-1-S3Ø-W5Ø-SWPB-SWPB-SWP17Ø-SWP5Ø	18	0.0	22	4.5	21	14.3
8.	ICP-5097-1-S3Ø-W5Ø-SWPB-SWPB-SWP17Ø-SWP7Ø	20	0.0	22	9.1(9.0)	20	5.0
9.	ICP-5097-1-S3Ø-W5Ø-SWPB-SWPB-SWP21Ø-SWP1Ø	30	0.0	33	9.1(0.0)	30	3.3
10.	ICP-5097-1-S3Ø-W5Ø-SWPB-SWPB-SWP21Ø-SWP4Ø	8	0.0	10	20.0	8	12.5
11.	ICP-5097-1-S3Ø-W5Ø-SWPB-SWPB-SWP21Ø-SWP7Ø	24	0.0	31	3.2(0.0)	30	6.7
12.	ICP-5097-1-S3Ø-W5Ø-SWPB-SWPB-SWP24Ø-SWP2Ø	21	0.0	24	8.3(0.0)	22	4.5
13.	ICP-5097-1-S3Ø-W5Ø-SWPB-SWPB-SWP24Ø-SWP3Ø	11	0.0	13	15.4	11	9.1
14.	ICP-5097-1-S3Ø-W5Ø-SWPB-SWPB-SWP3ØØ-SWP4Ø	21	0.0	26	7.7(0.0)	24	4.2
15.	ICP-5097-1-S3Ø-W5Ø-SWPB-SWPB-SWP3ØØ-SWP3Ø	19	0.0	23	17.4(0.0)	19	5.3
16.	ICP-5097-1-S3Ø-W5Ø-SWPB-SWPB-SWP3ØØ-SWP6Ø	17	0.0	20	10.0	18	5.6
17.	ICP-5097-1-S3Ø-W5Ø-SWPB-SWPB-SWP31Ø-SWP2Ø	1	0.0	1	0.0	1	0.0
18.	ICP-5097-1-S3Ø-W5Ø-SWPB-SWPB-SWP31Ø-SWP5Ø	15	0.0	17	11.8(0.0)	15	0.0
19.	ICP-5097-1-S3Ø-W5Ø-SWPB-SWPB-SWP31Ø-SWP6Ø	12	0.0	15	20.0	12	0.0
20.	ICP-5097-1-S3Ø-W5Ø-SWPB-SWPB-SWP34Ø-SWP4Ø	19	0.0	25	20.0	20	5.0
21.	ICP-5097-1-S3Ø-W5Ø-SWPB-SWPB-SWP34Ø-SWP5Ø	05	0.0	31	0.0	31	12.9
22.	ICP-5097-1-S3Ø-W5Ø-SWPB-SWPB-SWP34Ø-SWP6Ø	17	0.0	19	0.0	19	10.5
23.	ICP-5097-1-S3Ø-W5Ø-SWPB-SWPB-SWP34Ø-SWP7Ø	15	0.0	20	10.0	16	11.1
24.	ICP-5097-1-S3Ø-W5Ø-SWPB-SWPB-SWP34Ø-SWP9Ø	29	0.0	38	5.3(0.0)	36	8.3
25.	ICP-5097-1-S3Ø-W5Ø-SWPB-SWPB-SWP35Ø-SWP2Ø	8	0.0	13	15.4	11	18.2

Table 129. Contd.

1	2	3	4	5	6	7	8
26.	ICP-5097-1-S3⊠-W5⊠-SWPB-SWPB-SWP35⊠-SWP3⊠	24	0.0	31	0.0	31	9.7
27.	ICP-5097-1-S3⊠-W5⊠-SWPB-SWPB-SWP35⊠-SWP7⊠	20	0.0	25	20.0	20	0.0
28.	ICP-5097-1-S3⊠-W5⊠-SWPB-SWPB-SWP37⊠-SWP1⊠	12	0.0	18	11.1	16	12.5
29.	ICP-5097-1-S3⊠-W5⊠-SWPB-SWPB-SWP37⊠-SWP3⊠	22	0.0	27	7.4(0.0)	25	4.0
30.	ICP-5097-1-S3⊠-W5⊠-SWPB-SWPB-SWP37⊠-SWP4⊠	24	0.0	32	12.5	28	14.3
31.	ICP-5097-1-S3⊠-W5⊠-SWPB-SWPB-SWP37⊠-SWP5⊠	19	0.0	22	13.6(0.0)	19	5.3
32.	ICP-5097-1-S3⊠-W5⊠-SWPB-SWPB-SWP37⊠-SWP6⊠	32	0.0	35	8.6(0.0)	32	0.0
33.	ICP-5097-1-S3⊠-W5⊠-SWPB-SWPB-SWP39⊠-SWP1⊠	11	0.0	13	15.4	11	0.0
34.	ICP-5097-1-S3⊠-W5⊠-SWPB-SWPB-SWP39⊠-SWP2⊠	13	0.0	16	12.5	14	14.0
35.	ICP-5097-1-S3⊠-W5⊠-SWPB-SWPB-SWP39⊠-SWP5⊠	14	0.0	15	6.7(0.0)	14	7.0
36.	ICP-5097-1-S3⊠-W5⊠-SWPB-SWPB-SWP39⊠-SWP7⊠	17	0.0	19	5.3(7.7)	18	0.0
37.	ICP-5097-1-S3⊠-W5⊠-SWPB-SWPB-SWP40⊠-SWP1⊠	22	0.0	32	15.6	27	7.0
38.	ICP-5097-1-S3⊠-W5⊠-SWPB-SWPB-SWP40⊠-SWP4⊠	21	0.0	27	14.8(9.1)	23	4.0
39.	ICP-5097-1-S3⊠-W5⊠-SWPB-SWPB-SWP40⊠-SWP5⊠	14	0.0	21	4.8	20	5.0
40.	ICP-5097-1-S3⊠-W5⊠-SWPB-SWPB-SWP40⊠-SWP6⊠	19	0.0	21	0.0(0.0	21	9.0
41.	ICP-5097-1-S3⊠-W5⊠-SWPB-SWPB-SWP44⊠-SWP1⊠	15	0.0	19	0.0	19	15.0
42.	ICP-8094-1-S2⊠-P1⊠-SWP1⊠-SWP8⊠-SWP2⊠	25	0.0	28	0.0	28	17.0
43.	ICP-8094-1-S2⊠-P1⊠-SWP2⊠-SWP6⊠-SWP3⊠	23	4.3	26	11.5	23	0.0
44.	ICP-8094-1-S2⊠-P1⊠-SWP2⊠-SWP6⊠-SWP4⊠	29	0.0	30	6.7(0.0)	28	3.6
45.	ICP-8094-1-S2⊠-P1⊠-SWP2⊠-SWP6⊠-SWP5⊠	35	0.0	37	2.7(0.0)	36	2.2
46.	ICP-8094-1-S2⊠-P1⊠-SWP1⊠-SWP8⊠-SWP6⊠	25	0.0	27	0.0	27	3.0
47.	ICP-8094-1-S2⊠-P1⊠-SWP1⊠-SWP8⊠-SWP7⊠	24	0.0	25	4.0(10.0)	24	0.0
48.	ICP-8094-1-S2⊠-P1⊠-SWP1⊠-SWP8⊠-SWP8⊠	41	0.0	42	0.0(10.8)	42	4.0
49.	ICP-8094-1-S2⊠-P1⊠-SWP1⊠-SWP8⊠-SWP6⊠	28	0.0	28	0.0(0.0)	28	0.0
50.	ICP-8094-1-S2⊠-P1⊠-SWP2⊠-SWP7⊠-SWP1⊠	25	0.0	27	11.1(16.7)	24	4.2
51.	ICP-8094-1-S2⊠-P1⊠-SWP2⊠-SWP8⊠-SWP1⊠	32	0.0	36	11.1(0.0)	32	18.8
52.	ICP-8094-1-S2⊠-P1⊠-SWP2⊠-SWP8⊠-SWP3⊠	22	0.0	24	4.2(0.0)	23	13.0
53.	ICP-8094-1-S2⊠-P1⊠-SWP2⊠-SWP8⊠-SWP5⊠	17	0.0	23	17.4(0.0)	19	5.3

[a] < 20% blight, wilt and sterility mosaic.

progenies showed low disease incidence (Table 130). Only two out of four progenies screened from C.No.74363 showed low disease incidence. Nine progenies from C.No.74360 and two progenies from C.No.74363 were selected for further screening.

3. Single plant progenies from multiple disease resistant lines

Out of 64 progenies screened, 18 progenies (Table 131) that showed low incidence were selected.

C. F_2 bulks

Seventy F_2 bulks from multiple disease resistant crosses (crosses between multiple disease resistant parents) were screened for multiple disease resistance. No F_2 bulk from any of the crosses showed low disease incidence (< 20% infection). However, 38 bulks were selected for further screening during the 1983-84 season (Table 132).

D. Advance lines

One hundred and sixty-six advance lines, included in MPAY and ART lines, were screened in the multiple disease nursery. None of the lines was found resistant to all the three diseases (Table 133). However, one line, 77125-VINDT2-4-2-B, was found resistant to SM + blight but was highly susceptible to wilt.

E. SM + wilt resistant lines

Out of eight progenies from four lines screened only one progeny from ICP-4866 selection showed resistance to all the three diseases (Table 134).

F. List of lines showing multiple disease resistance

Plants selected by breeders were checked for resistance to Phytophthora blight by inoculating with P2 isolate by 'knife-cut' method. The plants which were found resistant and tolerant were checked for sterility mosaic and wilt resistance. Ten single plant progenies from MDR selections were found resistant (free from infection to all the three diseases) (Table 130). Thirty-seven single plant progenies were found resistant to SM and Phytophthora blight but showed low incidence (< 20% infection) to wilt.

Table 130. List of multiple disease resistant selections from Cross Nos.74360 and 74363 that showed low incidence in the multiple disease nursery during the 1982-83 season[a]

S.No.	Particular	Total plants	% SM	Total plants	% blight	Total plants	% wilt
1	2	3	4	5	6	7	8
1.	74360F_4B-S218⊠-SWP2⊠-SWPB-SWP1⊠-SWP4⊠	26	0.0	31	9.7	28	0.0
2.	74360F_4B-S218⊠-SWP2⊠-SWPB-SWP3⊠-SWP1⊠	16	0.0	19	15.8(8.3)	16	0.0
3.	74360F_4B-S218⊠-SWP2⊠-SWPB-SWP3⊠-SWP2⊠	18	0.0	26	19.2(0.0)	21	0.0
4.	74360F_4B-S218⊠-SWP2⊠-SWPB-SWP3⊠-SWP4⊠	20	0.0	21	4.8(5.0)	20	0.0
5.	74360F_4B-S218⊠-SWP2⊠-SWPB-SWP3⊠-SWP5⊠	14	0.0	15	6.7(0.0)	14	0.0
6.	74360F_4B-S218⊠-SWP2⊠-SWPB-SWP6⊠-SWP1⊠	13	0.0	15	6.7(0.0)	14	7.1
7.	74360F_4B-S218⊠-SWP2⊠-SWPB-SWP6⊠-SWP2⊠	32	0.0	40	12.5(7.7)	35	14.3
8.	74360F_4B-S218⊠-SWP2⊠-SWPB-SWP6⊠-SWP6⊠	13	0.0	17	11.8(0.0)	15	13.3
9.	74360F_4B-S218⊠-SWP2⊠-SWP1⊠-SWP7⊠-SWP1⊠	27	0.0	31	6.5(0.0)	29	3.4
10.	74360F_4B-S218⊠-SWP2⊠-SWP1⊠-SWP7⊠-SWP2⊠	22	0.0	24	4.2(10.0)	23	0.0
11.	74360F_4B-S218⊠-SWP2⊠-SWP2⊠-SWP1⊠-SWP1⊠	26	0.0	30	20.0(0.0)	24	4.2
12.	74360F_4B-S218⊠-SWP2⊠-SWP2⊠-SWP8⊠-SWP1⊠	18	0.0	22	4.5	22	4.5
13.	74360F_4B-S218⊠-SWP2⊠-SWP2⊠-SWP9⊠-SWP1⊠	14	0.0	15	6.7(0.0)	14	0.0
14.	74360F_4B-S218⊠-SWP2⊠-SWP2⊠-SWP10⊠-SWP1⊠	23	0.0	26	3.8(0.0)	25	0.0
15.	74360F_4B-S218⊠-SWP2⊠-SWP2⊠-SWP10⊠-SWP2⊠	19	0.0	19	0.0(0.0)	19	10.0
16.	74360F_4B-S218⊠-SWP2⊠-SWP1⊠-SWP10⊠-SWP4⊠	14	0.0	14	7.1(0.0)	13	7.7
17.	74360F_4B-S218⊠-SWP2⊠-SWP1⊠-SWP10⊠-SWP5⊠	24	0.0	25	4.0(0.0)	24	4.2
18.	74360F_4B-S218⊠-SWP2⊠-SWP4⊠-SWP1⊠-SWP1⊠	20	0.0	27	18.5	22	0.0
19.	74360F_4B-S218⊠-SWP2⊠-SWP4⊠-SWP2⊠-SWP1⊠	37	0.0	18	0.0(0.0)	18	0.0*
20.	74360F_4B-S218⊠-SWP2⊠-SWP4⊠-SWP1⊠-SWP2⊠	18	0.0	19	10.5(0.0)	17	0.0
21.	74360F_4B-S218⊠-SWP2⊠-SWP4⊠-SWP1⊠-SWP3⊠	18	0.0	20	5.0(0.0)	19	5.3
22.	74360F_4B-S218⊠-SWP2⊠-SWP4⊠-SWP1⊠-SWP4⊠	21	0.0	28	14.3	0	0.0
23.	74360F_4B-S218⊠-SWP2⊠-SWP4⊠-SWP3⊠-SWP2⊠	13	0.0	18	5.6	17	5.9
24.	74360F_4B-S218⊠-SWP2⊠-SWP4⊠-SWP3⊠-SWP3⊠	18	0.0	20	10.0	18	0.0
25.	74360F_4B-S218⊠-SWP2⊠-SWP4⊠-SWP3⊠-SWP4⊠	15	0.0	20	5.0(0.0)	19	0.0

Table 130. Contd.

1	2	3	4	5	6	7	8
26.	74360F_4B-S218⊠-SWP2⊠-SWP4⊠-SWP3⊠-SWP7⊠	12	0.0	12	16.7(0.0)	11	9.1
27.	74360F_4B-S218⊠-SWP2⊠-SWP4⊠-SWP3⊠-SWP8⊠	20	0.0	23	8.7	21	9.5
28.	74360F_4B-S218⊠-SWP2⊠-SWP4⊠-SWP4⊠-SWP1⊠	20	0.0	25	20.0	20	0.0
29.	74360F_4B-S218⊠-SWP2⊠-SWP4⊠-SWP4⊠-SWP3⊠	22	0.0	26	15.4	22	0.0
30.	74360F_4B-S218⊠-SWP2⊠-SWP4⊠-SWP4⊠-SWP4⊠	15	0.0	18	16.7	15	0.0
31.	74360F_4B-S218⊠-SWP2⊠-SWP4⊠-SWP4⊠-SWP5⊠	16	0.0	19	15.8(0.0)	16	0.0
32.	74360F_4B-S218⊠-SWP2⊠-SWP4⊠-SWP4⊠-SWP6⊠	17	0.0	24	16.7(0.0)	20	0.0
33.	74360F_4B-S218⊠-SWP2⊠-SWP4⊠-SWP7⊠-SWP1⊠	14	0.0	17	17.6(0.0)	14	0.0
34.	74360F_4B-S218⊠-SWP2⊠-SWP4⊠-SWP8⊠-SWP2⊠	19	0.0	27	14.8	23	0.0
35.	74360F_4B-S218⊠-SWP2⊠-SWP4⊠-SWP8⊠-SWP6⊠	24	0.0	31	12.9	27	7.4
36.	74360F_4B-S218⊠-SWP2⊠-SWP4⊠-SWP8⊠-SWP7⊠	20	0.0	27	14.8(0.0)	23	4.3
37.	74360F_4B-S218⊠-SWP2⊠-SWP4⊠-SWP9⊠-SWP1⊠	17	0.0	19	0.0	19	10.5
38.	74360F_4B-S218⊠-SWP2⊠-SWP4⊠-SWP9⊠-SWP2⊠	15	0.0	14	0.0	14	7.1
39.	74360F_4B-S218⊠-SWP2⊠-SWP4⊠-SWP9⊠-SWP4⊠	18	0.0	22	18.2	18	11.1
40.	74360F_4B-S218⊠-SWP2⊠-SWP4⊠-SWP9⊠-SWP5⊠	11	0.0	13	15.4	11	0.0
41.	74360F_4B-S218⊠-SWP2⊠-SWP4⊠-SWP9⊠-SWP6⊠	26	0.0	26	0.0(0.0)	26	7.7
42.	74360F_4B-S218⊠-SWP2⊠-SWP4⊠-SWP10⊠-SWP1⊠	14	0.0	14	0.0	14	0.0*
43.	74360F_4B-S218⊠-SWP2⊠-SWP4⊠-SWP10⊠-SWP4⊠	15	0.0	17	5.9(0.0)	16	6.3
44.	74360F_4B-S218⊠-SWP2⊠-SWP5⊠-SWP1⊠-SWP7⊠	25	0.0	28	3.6(0.0)	27	7.9
45.	74360F_4B-S218⊠-SWP2⊠-SWP5⊠-SWP2⊠-SWP1⊠	20	0.0	28	7.1	26	15.9
46.	74360F_4B-S218⊠-SWP2⊠-SWP5⊠-SWP4⊠-SWP1⊠	25	0.0	25	0.0(0.0)	25	12.0
47.	74360F_4B-S218⊠-SWP2⊠-SWP5⊠-SWP5⊠-SWP3⊠	30	0.0	30	0.0(0.0)	30	6.7
48.	74360F_4B-S218⊠-SWP3⊠-SWP1⊠-SWP1⊠-SWP1⊠	26	0.0	32	15.6	27	0.0
49.	74360F_4B-S218⊠-SWP3⊠-SWP1⊠-SWP9⊠-SWP2⊠	34	0.0	36	2.7(0.0)	35	0.0
50.	74360F_4B-S218⊠-SWP3⊠-SWP1⊠-SWP9⊠-SWP3⊠	29	0.0	31	6.5	29	0.0
51.	74360F_4B-S218⊠-SWP3⊠-SWP4⊠-SWP2⊠-SWP5⊠	49	0.0	49	0.0(0.0)	49	4.1
52.	74360F_4B-S218⊠-SWP3⊠-SWP4⊠-SWP5⊠-SWP1⊠	11	0.0	12	8.3	11	9.1
53.	74360F_4B-S218⊠-SWP3⊠-SWP4⊠-SWP5⊠-SWP3⊠	17	0.0	19	10.5	17	0.0
54.	74360F_4B-S218⊠-SWP3⊠-SWP4⊠-SWP5⊠-SWP3⊠	29	0.0	33	12.1(0.0)	44	9.1
55.	74360F_4B-S218⊠-SWP3⊠-SWP4⊠-SWP6⊠-SWP4⊠	46	0.0	46	10.9(0.0)	44	9.1
56.	74360F_4B-S218⊠-SWP3⊠-SWP4⊠-SWP6⊠-SWP5⊠	26	0.0	26	0.0(0.0)	26	0.0*
57.	74360F_4B-S218⊠-SWP3⊠-SWP4⊠-SWP7⊠-SWP3⊠	20	0.0	22	4.5	21	9.5

Tab 30 Contd

						6		8	
58.	74360F4B-S218☒-SWP2☒-SWP3☒-SWP1☒-SWP2☒	34	0.0	40	.0.0	36	8	3	
59.	74360F4B-S218☒-SWP2☒-SWP3☒-SWP1☒-SWP3☒	26	0.0	34	8.8	31	12	9	
60.	74360F4B-S218☒-SWP2☒-SWP3☒-SWP2☒-SWP2☒	29	0.0	27	0.0(0.0	27	7	4	
61.	74360F4B-S218☒-SWP2☒-SWP3☒-SWP3☒-SWP1☒	17	0.0	20	5.0(0.0	17	5	9	
62.	74360F4B-S218☒-SWP2☒-SWP3☒-SWP3☒-SWP2☒	26	0.0	31	9.7	28	17	9	
63.	74360F4B-S218☒-SWP2☒-SWP3☒-SWP5☒-SWP2☒	25	0.0	29	7.2(0.0	24	8	3	
64.	74360F4B-S218☒-SWP3☒-SWP5☒-SWP1☒-SWP2☒	18	0.0	21	9.5	19	0	0	
65.	74360F4B-S218☒-SWP3☒-SWP5☒-SWP2☒-SWP2☒	23	0.0	21	0.0(0.0	21	9	5	
66.	74360F4B-S218☒-SWP3☒-SWP5☒-SWP4☒-SWP2☒	16	0.0	17	5.9(0.0	16	12	3	
67.	74360F4B-S218☒-SWP3☒-SWP5☒-SWP5☒-SWP2☒	14	0.0	17	7.6(0.0	14	0	0	
68.	74360F4B-S218☒-SWP3☒-SWP5☒-SWP5☒-SWP4☒	28	0.0	31	6.5(5.6	30	13	3	
69.	74360F4B-S218☒-SWP3☒-SWP5☒-SWP5☒-SWP5☒	19	0.0	23	3.0(0.0	20	5	0	
70.	74360F4B-S218☒-SWP3☒-SWP5☒-SWP6☒-SWP1☒	40	0.0	30	6.7(0.0	28	3	6	
71.	74360F4B-S218☒-SWP3☒-SWP5☒-SWP6☒-SWP4☒	27	0.0	44	1.4(0.0	39	10	3	
72.	74360F4B-S218☒-SWP3☒-SWP5☒-SWP6☒-SWP7☒	31	0.0	30	0.0(0.0	30	.0	0	
73.	74360F4B-S218☒-SWP3☒-SWP5☒-SWP7☒-SWP5☒	55	0.0	60	1.7(0.0	59	.8	6	
74.	74360F4B-S218☒-SWP3☒-SWP5☒-SWP8☒-SWP3☒	19	0.0	21	4.8	20	0	0	
75.	74360F4B-S218☒-SWP3☒-SWP5☒-SWP8☒-SWP4☒	21	0.0	22	9.1	21	.4	3	
76.	74360F4B-S218☒-SWP3☒-SWP5☒-SWP8☒-SWP5☒	18	0.0	17	0.0(0.0	17	0	0	*
77.	74360F4B-S218☒-SWP3☒-SWP5☒-SWP8☒-SWP6☒	21	0.0	24	0.0(0.0	24	4		
78.	74360F4B-S218☒-SWP3☒-SWP5☒-SWP8☒-SWP7☒	16	0.0	21	4.3	18	.6		
79.	74360F4B-S218☒-SWP3☒-SWP5☒-SWP8☒-SWP10☒	5	0.0	6	3.8	25	8		
80.	74360F4B-S218☒-SWP3☒-SWP5☒-SWP8☒-SWP11☒	25	0.0	26	3.8(6.7)	25	.2		
81.	74360F4B-S218☒-SWP3☒-SWP5☒-SWP9☒-SWP1☒	19	0.0	19	5.3	19	.0		
82.	74360F4B-S218☒-SWP3☒-SWP5☒-SWP9☒-SWP3☒	19	0.0	18	0.0	18	.6		
83.	74360F4B-S218☒-SWP3☒-SWP5☒-SWP9☒-SWP5☒	14	0.0	16	0.0	16	0.	*	
84.	74360F4B-S218☒-SWP3☒-SWP5☒-SWP9☒-SWP6☒	11	0.0	11	0.0	11	9.		
85.	74360F4B-S218☒-SWP3☒-SWP5☒-SWP9☒-SWP9☒	22	0.0	24	8.3	22	4.		
86.	74360F4B-S218☒-SWP3☒-SWP5☒-SWP9☒-SWP10☒	32	0.0	31	0.0(0.0)	31	0.	*	
87.	74360F4B-S218☒-SWP3☒-SWP5☒-SWP10☒-SWP2☒	28	0.0	28	0.0(0.0)	28	0.		
88.	74360F4B-S218☒-SWP4☒-SWP1☒-SWP4☒-SWP3☒	22	0.0	26	7.7	24	8.		
89.	74360F4B-S218☒-SWP4☒-SWP1☒-SWP4☒-SWP9☒	22	0.0	27	1.1	24	0.		

Table 130. Contd.

1	2	3	4	5	6	7	8
90.	74360F$_4$B-S218Ø-SWP4Ø-SWP1Ø-SWP4Ø-SWP1ØØ	18	0.0	21	4.8	20	0.0
91.	74360F$_4$B-S218Ø-SWP4Ø-SWP1Ø-SWP5Ø-SWP1Ø	22	0.0	25	8.0	23	17.4
92.	74360F$_4$B-S218Ø-SWP4Ø-SWP1Ø-SWP5Ø-SWP3Ø	22	0.0	22	0.0(0.0)	22	9.1
93.	74360F$_4$B-S218Ø-SWP4Ø-SWP1Ø-SWP5Ø-SWP4Ø	14	0.0	15	6.7(7.7)	14	0.0
94.	74360F$_4$B-S218Ø-SWP4Ø-SWP2Ø-SWP6Ø-SWP3Ø	13	0.0	16	12.5	14	7.1
95.	74360F$_4$B-S218Ø-SWP4Ø-SWP2Ø-SWP6Ø-SWP4Ø	10	0.0	11	0.0	11	9.1
96.	74360F$_4$B-S218Ø-SWP4Ø-SWP2Ø-SWP6Ø-SWP5Ø	17	0.0	18	0.0	18	5.6
97.	74360F$_4$B-S218Ø-SWP4Ø-SWP3Ø-SWP5Ø-SWP3Ø	15	0.0	15	0.0	15	0.0*
98.	74360F$_4$B-S218Ø-SWP4Ø-SWP3Ø-SWP8Ø-SWP1Ø	18	0.0	30	10.0	27	3.7
99.	74360F$_4$B-S218Ø-SWP4Ø-SWP3Ø-SWP8Ø-SWP4Ø	25	0.0	27	7.4(0.0)	25	4.0
100.	74360F$_4$B-S218Ø-SWP4Ø-SWP3Ø-SWP8Ø-SWP5Ø	29	0.0	33	9.1(0.0)	30	10.0
101.	74360F$_4$B-S218Ø-SWP5Ø-SWPB-SWP4Ø-SWP2Ø*	17	0.0	23	17.4(0.0)	19	10.5
102.	74360F$_4$B-S218Ø-SWP5Ø-SWP1Ø-SWP4Ø-SWP1Ø	24	0.0	26	7.7(0.0)	24	8.3
103.	74360F$_4$B-S218Ø-SWP5Ø-SWP1Ø-SWP5Ø-SWP1Ø	24	0.0	25	0.0(0.0)	25	4.0
104.	74360F$_4$B-S218Ø-SWP5Ø-SWP1Ø-SWP6Ø-SWP1Ø	25	0.0	28	10.7(0.0)	25	0.0
105.	74360F$_4$B-S218Ø-SWP5Ø-SWP1Ø-SWP8Ø-SWP1Ø	15	0.0	16	0.0(0.0)	16	0.0*
106.	74360F$_4$B-S218Ø-SWP8Ø-SWP1Ø-SWP5Ø-SWP1Ø	24	0.0	31	9.7	28	10.7
107.	74360F$_4$B-S218Ø-SWP8Ø-SWP1Ø-SWP5Ø-SWP2Ø	25	0.0	39	7.7	36	2.8
108.	74360F$_4$B-S218Ø-SWP8Ø-SWP1Ø-SWP5Ø-SWP3Ø	46	0.0	48	4.2(0.0)	50	8.0
109.	74360F$_4$B-S218Ø-SWP8Ø-SWP2Ø-SWP1Ø-SWP3Ø	21	0.0	26	15.4(0.0)	22	18.2
110.	74360F$_4$B-S218Ø-SWP8Ø-SWP2Ø-SWP1Ø-SWP4Ø	26	0.0	27	0.0(0.0)	27	0.0*
111.	74360F$_4$B-S218Ø-SWP8Ø-SWP2Ø-SWP1Ø-SWP5Ø	24	0.0	27	11.1(0.0)	24	4.2
112.	74360F$_4$B-S218Ø-SWP8Ø-SWP3Ø-SWP6Ø-SWP1Ø	33	0.0	34	5.9(5.9)	32	15.0
113.	74360F$_4$B-S219Ø-SWP1Ø-SWP2Ø-SWP3Ø-SWP1Ø	10	0.0	11	9.1	10	20.0
114.	74360F$_4$B-S219Ø-SWP1Ø-SWP1Ø-SWP2Ø-SWP5Ø	19	0.0	22	13.6(0.0)	17	0.0
115.	74360F$_4$B-S219Ø-SWP1Ø-SWP1Ø-SWP2Ø-SWP7Ø	16	0.0	18	11.1	16	0.0
116.	74360F$_4$B-S219Ø-SWP3Ø-SWPB-SWP6Ø-SWP3Ø	29	3.4	39	15.4(12.5)	33	3.0
117.	74360F$_4$B-S218Ø-SWP3Ø-SWPB-SWP8Ø-SWP1Ø	27	0.0	32	15.6(4.3)	27	3.7
118.	74360F$_4$B-S219Ø-SWP3Ø-SWPB-SWP9Ø-SWP1Ø	23	0.0	25	8.0(12.5)	23	4.3
119.	74360F$_4$B-S219Ø-SWP3Ø-SWPB-SWP9Ø-SWP2Ø	8	0.0	9	0.0	9	11.1
120.	74360F$_4$B-S219Ø-SWP3Ø-SWPB-SWP9Ø-SWP3Ø	13	0.0	14	14.3	12	8.3

Table 130. Contd.

1	2	3	4	5	6	7	8
121.	74360F$_4$B-S219Ø-SWP3Ø-SWPB-SWP9Ø-SWP4Ø	17	0.0	19	10.5	17	11.8
122.	74360F$_4$B-S219Ø-SWP6Ø-SWP1Ø-SWP4Ø-SWP1Ø	21	0.0	23	4.3	22	13.6
123.	74360F$_4$B-S219Ø-SWP6Ø-SWP1Ø-SWP4Ø-SWP2Ø	28	0.0	32	12.5(0.0)	28	7.1
124.	74360F$_4$B-S219Ø-SWP6Ø-SWP1Ø-SWP4Ø-SWP3Ø	33	0.0	34	0.0(8.0)	34	14.7
125.	74360F$_4$B-S219Ø-SWP6Ø-SWP1Ø-SWP4Ø-SWP4Ø	25	0.0	29	13.8	25	16.0
126.	74360F$_4$B-S219Ø-SWP6Ø-SWP1Ø-SWP4Ø-SWP7Ø	34	0.0	34	0.0(0.0)	34	14.7
127.	74360F$_4$B-S219Ø-SWP6Ø-SWP2Ø-SWP1Ø-SWP2Ø	23	0.0	33	6.1(0.0)	35	8.6
128.	74360F$_4$B-S219Ø-SWP6Ø-SWP2Ø-SWP8Ø-SWP2Ø	26	0.0	28	7.1(0.0)	26	19.2
129.	74360F$_4$B-S219Ø-SWP6Ø-SWP3Ø-SWP8Ø-SWP1Ø	26	0.0	24	0.0(0.0)	24	8.3
130.	74360F$_4$B-S219Ø-SWP6Ø-SWP3Ø-SWP8Ø-SWP2Ø	17	0.0	19	5.3(0.0)	18	16.7
131.	74360F$_4$B-S219Ø-SWP6Ø-SWP3Ø-SWP8Ø-SWP3Ø	24	0.0	28	10.7(0.0)	25	12.0
132.	74360F$_4$B-S235Ø-SWP7Ø-SWP2Ø-SWP2Ø-SWP1Ø	27	0.0	27	0.0	27	11.1
133.	74360F$_4$B-S235Ø-SWP7Ø-SWP2Ø-SWP2Ø-SWP2Ø	19	0.0	20	0.0(0.0)	20	0.0*
134.	74360F$_4$B-S235Ø-SWP7Ø-SWP2Ø-SWP3Ø-SWP2Ø	19	0.0	21	0.0(0.0)	21	4.8
135.	74360F$_4$B-S235Ø-SWP7Ø-SWP4Ø-SWP9Ø-SWP1Ø	19	10.5	19	0.0(0.0)	19	5.3
136.	74360F$_4$B-S235Ø-SWP7Ø-SWP3Ø-SWP2Ø-SWP1Ø	13	0.0	17	5.9	16	18.8
137.	74360F$_4$B-S235Ø-SWP7Ø-SWP3Ø-SWP2Ø-SWP2Ø	17	0.0	19	10.5	17	17.6
138.	74360F$_4$B-S235Ø-SWP7Ø-SWP3Ø-SWP2Ø-SWP3Ø	21	0.0	24	0.0(0.0)	24	16.7
139.	74360F$_4$B-S235Ø-SWP7Ø-SWP3Ø-SWP3Ø-SWP3Ø	15	6.7	15	0.0	15	6.7
140.	74360F$_4$B-S235Ø-SWP7Ø-SWP3Ø-SWP9Ø-SWP3Ø	26	0.0	29	6.9(0.0)	27	18.0
141.	74363-P45Ø-VIIINDTP1Ø-SWPBØ-SWP1Ø-SWP1Ø	15	0.0	17	11.8(0.0)	15	13.3
142.	74363-P45Ø-VIIINDTP1Ø-SWPBØ-SWP2Ø-SWP1Ø	13	0.0	14	0.0(0.0)	14	14.3

[a]0-20% blight, SM and wilt.

*Lines that showed 0% infection to all the three diseases.

Table 131. Results of screening of 64 single plant progenies to multiple disease resistance during the 1982-83 season[a]

S.No.	Pedigree	Total plants	% SM	Total plants	% blight	Total plants	% wilt
1.	ICP-5097-1-53⊠-W5⊠-SWPB-SWPB⊠-SWP3⊠	18	0.0	31	32.3(53.8)	21	19.0
2.	ICP-5097-1-53⊠-W5⊠-SWPB-SWPB⊠-SWP5⊠	28	0.0	23	60.9(16.7)	37	32.4
3.	ICP-5097-1-53⊠-W5⊠-SWPB-SWPB⊠-SWP6⊠	12	0.0	52	61.5(0.0)	20	25.0
4.	ICP-5097-1-53⊠-W5⊠-SWPB-SWPB⊠-SWP8⊠	11	0.0	29	17.2(20.0)	24	25.0
5.	ICP-5097-1-53⊠-W5⊠-SWPB-SWPB⊠-SWP9⊠	27	0.0	45	22.2(40.0)	35	34.3
6.	ICP-5097-1-53⊠-W5⊠-SWPB-SWPB⊠-SWP10⊠	25	0.0	45	22.2(90.0)	35	25.7
7.	ICP-5097-1-53⊠-W5⊠-SWPB-SWPB⊠-SWP11⊠	24	0.0	41	21.9(0.0)	32	15.6
8.	ICP-5097-1-53⊠-W5⊠-SWPB-SWPB⊠-SWP12⊠	39	0.0	58	25.9(10.0)	43	13.9
9.	ICP-5097-1-53⊠-W5⊠-SWPB-SWPB⊠-SWP13⊠	29	0.0	44	29.5(0.0)	31	9.7
10.	ICP-5097-1-53⊠-W5⊠-SWPB-SWPB⊠-SWP14⊠	39	0.0	45	2.2(0.0)	44	20.5
11*	ICP-5097-1-53⊠-W5⊠-SWPB-SWPB⊠-SWP17⊠	40	0.0	39	7.7(0.0)	42	7.1
12*	ICP-5097-1-53⊠-W5⊠-SWPB-SWPB⊠-SWP19⊠	35	5.7	13	9.1(0.0)	36	5.6
13*	ICP-5097-1-53⊠-W5⊠-SWPB-SWPB⊠-SWP20⊠	36	0.0	40	0.0(0.0)	40	12.5
14*	ICP-5097-1-53⊠-W5⊠-SWPB-SWPB⊠-SWP21⊠	32	0.0	39	2.6(0.0)	38	10.5
15.	ICP-5097-1-53⊠-W5⊠-SWPB-SWPB⊠-SWP23⊠	29	0.0	48	29.2(0.0)	34	17.6
16.	ICP-5097-1-S3⊠-W5⊠-SWPB-SWPB⊠-SWP24⊠	30	0.0	35	2.9(0.0)	34	26.5
17.	ICP-5097-1-S3⊠-W5⊠-SWPB-SWPB⊠-SWP25⊠	41	0.0	35	20.0(35.0)	42	2.3
18*	ICP-5097-1-S3⊠-W5⊠-SWPB-SWPB⊠-SWP26⊠	26	11.5	28	0.0	28	10.7
19.	ICP-5097-1-S3⊠-W5⊠-SWPB-SWPB⊠-SWP27⊠	23	0.0	47	46.8(11.1)	25	12.0
20.	ICP-5097-1-S3⊠-W5⊠-SWPB-SWPB⊠-SWP28⊠	32	0.0	25	36.0(3.4)	24	5.9
21.	ICP-5097-1-S3⊠-W5⊠-SWPB-SWPB⊠-SWP30⊠	27	0.0	44	27.3(4.3)	32	15.6
22*	ICP-5097-1-S3⊠-W5⊠-SWPB-SWPB⊠-SWP31⊠	31	0.0	34	0.0(0.0)	34	8.8
23*	ICP-5097-1-S3⊠-W5⊠-SWPB-SWPB⊠-SWP33⊠	28	0.0	38	18.4(3.7)	31	9.7
24*	ICP-5097-1-S3⊠-W5⊠-SWPB-SWPB⊠-SWP35⊠	35	0.0	48	14.6(0.0)	41	12.2
25*	ICP-5097-1-S3⊠-W5⊠-SWPB-SWPB⊠-SWP36⊠	31	0.0	48	20.8(0.0)	38	7.9
26*	ICP-5097-1-S3⊠-W5⊠-SWPB-SWPB⊠-SWP38⊠	47	0.0	51	7.8(4.3)	47	0.0
27*	ICP-5097-1-S3⊠-W5⊠-SWPB-SWPB⊠-SWP42⊠	52	0.0	54	0.0(0.0)	54	9.2
28.	ICP-5097-1-S3⊠-W5⊠-SWPB-SWPB⊠-SWP43⊠	30	0.0	41	0.0(3.7)	41	34.1
29.	ICP-5097-1-S3⊠-W5⊠-SWPB-SWPB⊠-SWP44⊠	51	0.0	63	7.9(0.0)	58	22.4
30.	ICP-5097-1-S3⊠-W5⊠-SWPB-SWPB⊠-SWP46⊠	25	0.0	35	22.9(0.0)	27	14.8
31.	ICP-5097-1-S3⊠-W5⊠-SWPB-SWPB⊠-SWP1⊠	26	0.0	38	21.1(0.0)	30	20.0
32*	ICP-5097-1-S3⊠-W5⊠-SWPB-SWPB⊠-SWP2⊠	32	0.0	37	0.0(0.0)	37	18.9

Table 131. Contd.

1	2	3	4	5	6	7	8
33.	ICP-5097 -1-S3⊠-W5⊠-SWPB-SWPB⊠-SWP1⊠	42	14.3	73	21.9(10.7)	57	28.1
34*	ICP-5097-1-S3⊠-W5⊠-SWPB-SWPB⊠-SWP2⊠	32	15.6	37	0.0(0.0)	37	16.2
35.	ICP-5097-1-S3⊠-W5⊠-SWPB-SWPB⊠-SWP1⊠	39	92.3	41	0.0(0.0)	41	9.8
36.	C.No.74360F_4B-S235⊠-SWP7⊠-SWP1⊠-SWPB⊠-SWP2⊠	12	0.0	29	58.6(0.0)	12	0.0
37.	C.No.74360F_4B-S235⊠-SWP7⊠-SWP1⊠-SWPB⊠-SWP4⊠	15	0.0	28	39.3(0.0)	17	17.6
38*	74360F_4B-S219⊠-SWP6⊠-SWP1⊠-SWP7⊠-SWP1	22	0.0	25	4.0(0.0)	24	16.7
39.	74360F_4B-S219⊠-SWP6⊠-SWP1⊠-SWP7⊠-SWP2	26	0.0	38	31.6(0.0)	26	19.2
40*	74360F_4B-S219⊠-SWP6⊠-SWP1⊠-SWP7⊠-SWP3	17	0.0	18	5.6(2.5)	17	5.9
41.	74360F_4B-S219⊠-SWP6⊠-SWP1⊠-SWP7⊠-SWP4	14	0.0	35	28.6(0.0)	15	13.3
42*	74360F_4B-S219⊠-SWP6⊠-SWP2⊠-SWP2⊠-SWP1	12	0.0	15	13.3(0.0)	13	7.7
43.	74360F_4B-S219⊠-SWP6⊠-SWP2⊠-SWP4⊠-SWP1	30	0.0	39	20.5(0.0)	31	0.0
44.	74360F_4B-S219⊠-SWP6⊠-SWP2⊠-SWP6⊠-SWP1	27	0.0	45	37.8(8.3)	28	7.1
45.	74360F_4B-S219⊠-SWP6⊠-SWP2⊠-SWP6⊠-SWP3	7	0.0	34	76.4(0.0)	8	25.0
46*	74360F_4B-S219⊠-SWP6⊠-SWP3⊠-SWP7⊠-SWP1	35	0.0	43	18.6(4.2)	35	14.3
47.	74360F_4B-S219⊠-SWP6⊠-SWP-3⊠-SWP9⊠-SWP1	22	0.0	55	54.5(0.0)	25	20.0
48.	74360F_4B-S219⊠-SWP6⊠-SWP3⊠-SWP9⊠-SWP2	25	0.0	64	59.4(0.0)	26	19.2
49.	74360F_4B-S219⊠-SWP6⊠-SWP3⊠-SWP10⊠-SWP1	18	0.0	41	46.3(0.0)	20	15.0
50.	74360F_4B-S235⊠-SWP5⊠-SWP2⊠-SWP3⊠-SWP1	32	3.1	39	2.6(0.0)	38	42.1
51.	74360F_4B-S235⊠-SWP7⊠-SWP7⊠-SWP3⊠-SWP2	8	0.0	53	79.2(0.0)	11	54.5
52.	74360-P50⊠-VIIINDTP7⊠-SWPB⊠-SWP3⊠-SWP1	1	100.0	32	62.5(0.0)	12	100.0
53.	74360-P57⊠-VIIINDTP2⊠-SWPB⊠-SWP1⊠-SWP1	7	14.3	70	81.4(0.0)	13	100.0
54.	74360-P57⊠-VIIINDTP2⊠-SWPB⊠-SWP1⊠-SWP2	3	33.3	33	60.0(0.0)	13	100.0
55.	74360-P57⊠-VIIINDTP2⊠-SWPB⊠-SWP2⊠-SWP1	1	0.0	50	88.0(0.0)	4	100.0
56.	74360-P34⊠-VIIINDTP3⊠-SWPB⊠-SWP3⊠-SWP1	3	0.0	60	71.7(0.0)	17	100.0
57.	74360F_4B-S235⊠-SWP5⊠-SWP1⊠-SWP2⊠-SWP5	18	33.3	21	9.5(0.0)	19	36.8
58.	74360F_4B-S235⊠-SWP5⊠-SWP1⊠-SWP2⊠-SWP6	26	0.0	31	9.7(0.0)	28	57.1
59*	74360F_4B-S235⊠-SWP7⊠-SWP3⊠-SWP2⊠-SWP3	19	0.0	41	12.2(0.0)	36	8.3
60.	No.1258-1⊠	20	0.0	32	12.5(0.0)	28	57.1
61.	No.1258-2⊠	25	0.0	31	61.3(80.0)	31	38.7
62.	No.1258-3⊠	18	0.0	18	94.4(75.0)	18	5.6
63.	No.1258-4⊠	19	0.0	19	89.5(12.5)	19	0.0
64.	No.1258-5⊠	19	0.0	18	83.3(78.6)	18	16.7

[a]Lines showing low disease incidence (0 to 20% to all the three diseases) are marked with asterisk.

Table 132. List of F_2 bulks from multiple disease resistant crosses that were selected during the 1982-83 season for further screening

S. No.	Cross no.	Particular	Total plants	% SM	Total plants	% blight	Total plants	% wilt
1	2	3	4	5	6	7	8	9
1.	80053	ICP-4769-3-53⊠-W1⊠-WB⊠ x 2376	218	10.1	708	47.5(51.9)	372	61.8
2.	60054	ICP-4769-3-53⊠-W1⊠-WB⊠ x 7065-B⊠	263	60.8	714	44.7	395	37.2
3.	80056	ICP-7867-SW1⊠-SW1⊠-SWB⊠ x 7965-B⊠	204	34.8	735	57.2(45.7)	286	52.4
4.	80057	KWR-1-W1⊠-W2⊠-W8⊠-WB⊠ x 7867-SW1⊠-SW1⊠	306	54.6	485	34.0(85.7)	320	37.5
5.	80058	AWR 74/15-SW1⊠-WB⊠ x 2376	264	10.9	781	44.7(11.9)	432	57.2
6.	80060	Bandapalera-SW1⊠-SWB⊠ x 2376	366	9.8	660	24.5(0.9)	498	33.3
7.	80061	Bandapalera-SW1⊠-SWB⊠ x 7065-B⊠	511	32.8	776	28.7(7.5)	554	27.8
8.	80063	4769-3-53⊠-W1⊠-WB⊠ x 74363-P73⊠-W3⊠-WB⊠	452	6.6	783	29.8(87.4)	550	37.1
9.	80063	4769-3-53⊠-W1⊠-WB⊠ x 3753-P1⊠-P3⊠-WB⊠	345	57.1	680	27.6(54.1)	492	94.6
10.	80189	ICP-1-6-1641-SB⊠ x ICP-5097-1-53⊠-W5⊠-SWPB⊠	467	12.2	697	19.9(28.6)	538	55.6
11.	80190	ICP-1-6-1641-SB⊠ x 74360-S218⊠-SWP2⊠-SWPB⊠	336	14.6	426	43.2(15.9)	242	17.4
12.	80193	ICP-7942-SW1⊠-SWB⊠ x ICP-5097-1-53⊠-W5⊠-SWPB⊠	433	2.3	695	20.9(22.6)	550	48.9
13.	80194	ICP-7942-SW1⊠-SWB⊠ x 74360-S218⊠-SWP2⊠-SWPB⊠	472	5.1	558	15.4(11.3)	472	41.9
14.	80195	ICP-7942-SW1⊠-SWB⊠ x 74360-S218⊠-SWP5⊠-SWPB⊠	529	6.0	636	17.3(30.3)	526	41.4
15.	80196	ICP-7942-SW1⊠-SWB⊠ x 74360-S219⊠-SWP3⊠-SWPB⊠	313	1.9	438	21.5(18.5)	344	50.3
16.	80202	74363-P73⊠-53⊠-WB⊠ x 74360-S218⊠-SWP2⊠-SWPB⊠	389	8.5	640	25.0(14.7)	480	48.8
17.	80203	74363-P73⊠-53⊠-WB⊠ x 74360-S218⊠-SWP5⊠-SWPB⊠	296	5.7	606	38.9(6.9)	370	66.5
18.	80204	74363-P73⊠-53⊠-WB⊠ x 74360-S219⊠-SWP3⊠-SWPB⊠	319	5.3	438	21.0(10.4)	346	38.4
19.	80210	ICP-5656-1-52⊠ x 74360-S218⊠-SWP2⊠-SWPB⊠	238	2.9	609	34.3(15.3)	400	72.5
20.	80211	ICP-5656-1-52⊠ x 74360-S218⊠-SWP5⊠-SWPB⊠	230	4.3	686	30.8(15.8)	475	77.1
21.	80212	ICP-5656-1-52⊠ x 74360-S219⊠-SWP3⊠-SWPB⊠	405	7.9	702	21.7(29.5)	550	79.1
22.	80260	ICP-4765-3-54⊠ x C-11	214	98.6	680	25.0(37.5)	510	90.2
23.	80263	ICP-4866-1-56⊠ x NP(WR)-15	586	25.8	797	33.9(16.9)	527	17.1
24.	80265	ICP-4866-1-56⊠ x C-11	379	69.4	516	18.6(40.6)	420	23.8
25.	80267	ICP-4866-1-56⊠ x 6970	202	3.5	249	15.7(31.6)	210	14.3
26.	80269	ICP-5656-1-52⊠ x 15-3-(8863)	344	35.5	701	47.5(57.7)	368	58.4
27.	80270	ICP-5656-1-52⊠ x C-11	241	19.1	679	29.7(61.5)	477	13.8
28.	80277	ICP-7414-55⊠ x ICP-6970	279	8.2	595	16.6(32.7)	496	44.9
29.	80278	ICP-8101-5-51⊠ x NP(WR)-15	346	40.5	616	55.2(13.5)	276	31.2
30.	80279	ICP-8101-5-51⊠ x 15-3-3-(8863)	459	85.8	679	4.3	650	30.8

Table 132. Contd.

1	2	3	4	5	6	7	8	9
31.	80280	ICP-8101-5-51[redacted] x C-11	275	89.5	587	21.9	423	36.2
32.	80281	ICP-8101-5-51[redacted] x Purple-1	93	11.8	218	27.3(50.0)	175	62.3
33.	80282	ICP-8101-5-51[redacted] x ICP-6970	180	5.6	296	13.5(26.3)	256	44.8
34.	80283	ICP-8147-1-52[redacted] x NP(WR)-15	306	65.7	668	49.6(43.6)	337	13.1
35.	80284	ICP-8147-1-52[redacted] x 15-3-3	455	93.4	765	3.0(26.8)	742	31.9
36.	80287	ICP-8147-1-52[redacted] x ICP-6970	342	13.2	574	27.7(22.0)	415	30.6
37.	80288	ICP-8151-8-51[redacted] x NP(WR)-15	272	93.4	724	52.6(36.0)	343	33.8
38.	80292	ICP-8151-8-51[redacted] x 6970	517	17.4	702	17.4(20.1)	580	39.3

Table 133. Results of screening of advance lines in the multiple disease nursery during the 1982-83 season

S.No.	Particular	Total plants	% SM	Total plants	% blight	Total plants	% wilt
1	2	3	4	5	6	7	8
1.	ICPL-276	9	77.7	25	4.0	24	100.0
2.	ICPL-281	4	50.0	33	24.2	25	100.0
3.	ICPL-306	3	100.0	36	27.8	26	100.0
4.	ICPL-266	4	100.0	38	5.3	36	97.2
5.	ICPL-262	0	-	32	25.0	24	100.0
6.	ICPL-318	5	60.0	31	32.2	21	80.9
7.	ICPL-319	1	100.0	21	66.7	7	100.0
8.	ICPL-320	4	75.0	23	0.0	23	100.0
9.	ICPL-321	2	100.0	41	53.7	19	100.0
10.	ICPL-325	2	100.0	28	14.3	24	100.0
11.	ICPL-326	3	33.3	36	0.0	36	100.0
12.	ICPL-327	3	100.0	30	60.0	12	100.0

Table 133. Contd.

1	2	3	4	5	6	7	8
13.	ICPL-328	1	100.0	25	12.0	22	100.0
14.	ICPL-330	17	11.8	30	0.0	30	80.0
15.	ICPL-331	8	100.0	17	23.5	13	92.3
16.	ICPL-265	0	-	26	23.0	20	100.0
17.	ICPL-296	5	80.0	39	20.5	31	96.8
18.	ICPL-332	1	100.0	27	55.6	12	100.0
19.	ICPH-2	0	-	29	6.9	27	100.0
20.	ICPL-352	2	100.0	42	11.9	37	100.0
21.	ICPL-353	0	-	34	29.4	24	100.0
22.	ICPL-130	5	40.0	33	15.2	28	100.0
23.	ICPL-230	2	217.0	35	8.6	32	100.0
24.	ICPL-264	1	100.0	21	14.3	18	100.0
25.	ICPL-272	6	33.3	14	21.4	11	100.0
26.	ICPL-304	2	100.0	22	13.6	19	100.0
27.	ICPL-297	3	33.3	33	36.4	21	95.2
28.	MSP3-B	5	20.0	37	45.9	10	50.0
29.	MSP5-B(Wh)	5	40.0	38	36.8	24	91.7
30.	MSP5-B(Br)	4	25.0	52	30.8	36	100.0
31.	MSP1-VNDT29-B-B	3	100.0	41	46.3	22	100.0
32.	SMP22-33-B-B-B	14	71.4	38	26.3	28	89.3
33.	SMP26-VNDT1-5-B-B-B	5	40.0	29	20.7	23	86.9
34.	MSP5-25-B-B-B	0	-	13	30.8	9	100.0
35.	MSP7-VNDT36-B-B	12	25.0	17	11.8	15	100.0
36.	75079-43-VINDT1-3-2-B-B	12	50.0	25	4.0	24	95.8
37.	75023-101-VINDT1-2-2-B-B	10	40.0	28	39.3	17	70.6
38.	77125-VIINDT31-5-B-B	6	83.3	35	28.6	25	96.0
39.	77127-VIINDT10-1-B-B(Wh)	3	100.0	23	26.1	17	100.0
40.	77127-VIINDT10-1-B-B(Br)	5	60.0	18	5.6	17	100.0
41.	77123-VINDT2-1-1-B	9	100.0	23	39.1	14	92.9
42.	77128-VINDT9-3-3-B	4	100.0	34	20.6	27	100.0
43.	77125-VINDT2-4-2-B	23	0.0	24	0.0	24	100.0
44.	77125-VINDT2-4-3-B	23	43.0	30	10.0	27	100.0

Table 133. Contd.

1	2	3	4	5	6	7	8
45.	77125-VINDT6-3-1-B	19	36.8	33	3.0	32	81.3
46.	77125-VINDT6-5-4-B	14	50.0	32	12.5	28	100.0
47.	77125-VINDT7-3-3-B	24	8.3	36	11.1	32	84.4
48.	77125-VINDT7-4-1-B	15	6.7	29	10.3	26	73.1
49.	77125-VINDT7-4-2-B	24	33.3	33	18.2	27	59.3
50.	77125-VINDT8-4-2-B	24	100.0	37	18.9	30	53.3
51.	77125-VINDT8-4-5-B	21	57.1	26	11.5	23	27.1
52.	77125-VINDT3-1-1-B	29	6.9	38	2.6	37	81.1
53.	77127-VIINDT1-2-VINDT5-B	6	100.0	26	19.2	21	95.3
54.	77127-VIINDT10-1-VINDT4-B	12	100.0	29	6.9	27	92.6
55.	77127-VIINDT10-1-VINDT7-B	9	88.9	22	22.7	17	94.1
56.	77127-VIINDT15-4-VINDT1-B	10	100.0	23	0.0	23	91.3
57.	77127-VIINDT34-1-VINDT7-B	24	100.0	44	25.0	33	63.6
58.	77128-VIINDT11-3-VINDT7-B	13	100.0	36	8.3	33	100.0
59.	77129-VIINDT3-1-VINDT5-B	3	100.0	28	10.7	25	96.0
60.	77125-VINDT8-1-2-B	19	10.5	42	14.3	36	88.9
61.	77125-VIINDT31-2-VIINDT3-B	13	61.5	20	5.0	19	84.2
62.	77125-VIINDT31-2-VIINDT5-B	15	26.7	38	18.4	31	93.5
63.	77128-VINDT17-2-B-B	12	100.0	25	16.0	21	95.2
64.	77128-VINDT19-2-B-B	8	100.0	29	6.9	27	100.0
65.	77125-VINDT31-1-VINDTB-B	12	83.3	35	34.3	23	82.6
66.	77125-VINDT31-4-VINDTB-B	9	55.6	18	11.1	16	81.3
67.	77128-VIINDT32-4-VINDTB-B	17	100.0	31	12.9	27	100.0
68.	77125-VIINDT31-1-VINDTB-B	5	40.0	17	17.6	14	85.7
69.	77125-VIINDT31-4-VINDTB-B	17	47.1	21	4.8	20	65.0
70.	77125-VIINDT34-5-VINDTB-B	5	100.0	29	13.8	25	100.0
71.	73067-25-1-VINDT4-3-4-3-B	3	100.0	33	39.4	20	100.0
72.	73067-53-9-VINDT2-1-4-1-B	6	100.0	24	16.7	20	100.0
73.	74247-22-VINDT4[illegible]-4-4-2-B	7	100.0	29	31.0	20	95.0
74.	74270-27-VINDT2-1-3-1-B	11	90.0	34	11.8	30	90.0
75.	74270-27-VINDT2-5-1-2-B	14	85.7	36	25.0	27	100.0
76.	74332-30-VINDT5[illegible]-55-3-B	2	100.0	20	40.0	12	100.0
77.	75033-52-VINDT23-3-4-3-B	3	33.3	32	40.6	19	100.0
78.	75059-62-VINDT1-2-1-2-B	16	100.0	39	30.8	27	96.3

Table 133. Contd.

1	2	3	4	5	6	7	8
79.	75059-62-VINDT1-2-1-3-B	19	78.9	24	8.3	22	90.9
80.	75048-35-IXNDTVI-G5-2-VINDT1-B	7	14.3	20	20.0	16	100.0
81.	75048-35-IXNDTVI-G5-DSMP Test	9	88.9	24	41.7	14	35.7
82.	MSP1-VNDT29-B	7	100.0	34	32.4	23	95.7
83.	MSP1-VINDT31-B	8	100.0	32	25.0	24	95.8
84.	MSP2-VINDT6-13	4	100.0	26	46.2	14	100.0
85.	MSP2-VNDT11-B	3	100.0	31	45.2	17	100.0
86.	SMP15-VINDT9-B	9	100.0	32	37.5	20	100.0
87.	MSP3-VINDT45-B	10	90.0	40	32.5	27	92.6
88.	MSP5-VNDT10-B	18	100.0	36	25.0	27	85.2
89.	MSP5-VNDT19-B	17	100.0	40	37.5	25	96.0
90.	MSP6-VNDT9-B	22	86.4	29	10.3	26	30.8
91.	MSP8-VNDT31-B	28	32.1	38	15.8	32	50.0
92.	MSP10-VNDT3-B	13	100.0	30	16.7	25	80.0
93.	MSP10-VNDT4-B	6	100.0	30	63.3	11	100.0
94.	MSP10-VNDT28-B	20	25.0	34	17.6	28	71.4
95.	MSP10-VNDT39-B	20	70.0	32	21.9	25	72.0
96.	SMP7-VNDT25-B	11	66.7	33	36.4	21	76.2
97.	SMP7-VNDT27-B	7	100.0	26	38.5	16	100.0
98.	SMP7-VNDT38-B	8	62.5	20	25.0	15	60.0
99.	SMP7-VNDT44-B	7	100.0	29	31.0	20	95.0
100.	SMP14-VNDT23-B	10	100.0	32	15.6	27	100.0
101.	SMP14-VNDT25-B	4	100.0	36	52.8	17	100.0
102.	SMP14-VNDT39-B	2	100.0	26	26.9	19	100.0
103.	SMP14-VNDT47-B	5	100.0	18	38.9	11	100.0
104.	SMP15-VNDT8-B	9	100.0	15	33.3	10	50.0
105.	SMP22-VNDT30-B	7	71.4	34	23.5	26	100.0
106.	SMP29-VNDT20-B	3	100.0	34	32.4	23	100.0
107.	MSP1-VNDT26-B	22	95.5	34	14.7	29	86.2
108.	MSP6-VNDT17-B	8	100.0	40	12.5	35	85.7
109.	MSP6-VNDT18-8	15	100.0	37	8.1	34	79.4
110.	MSP10-VNDT24-B	12	100.0	43	18.6	35	100.0
111.	MSP5-VNDT38-B (SPD)	12	75.0	45	17.8	37	81.1
112.	MSP14-VNDT32-B	9	100.0	41	36.6	26	96.2

Table 133. Contd.

1	2	3	4	5	6	7	8
113.	MSP2-VNDT34-B	17	100.0	41	4.9	39	97.4
114.	SMP14-VNDT10-B	10	90.0	53	18.9	43	95.3
115.	VNDT25-B	10	60.0	50	14.0	43	93.0
116.	MSP4-VNDT31-B	15	100.0	40	10.0	36	88.9
117.	MSP5-VINDT6-B	12	100.0	35	11.4	31	93.5
118.	MSP5-VINDT-B	9	100.0	35	31.4	24	91.7
119.	MSP6-VINDT23-B	2	0.0	40	42.5	23	100.0
120.	MSP7-VINDT49-B	10	100.0	44	20.5	35	100.0
121.	MSP9-VINDT15-B	14	57.1	38	18.4	31	87.1
122.	MSP9-VINDT16-B	5	100.0	36	11.1	32	96.9
123.	SMP22-VINDT9-B	13	100.0	35	31.4	24	91.7
124.	SMP22-VINDT10-B	15	100.0	26	30.8	18	66.7
125.	SMP39-VINDT9-B	15	86.7	23	26.1	17	76.5
126.	MSP5-VINDT47-B (SPD)	15	6.7	21	14.3	18	83.3
127.	MSP10-VINDT4-B (SPD)	31	100.0	36	8.3	33	33.3
128.	SMP15-VINDT20-B	16	87.5	27	37.0	17	70.6
129.	MSP1-VINDT3-B	17	47.1	33	0.0	33	90.9
130.	SMP2-VINDT29-B	28	75.0	33	0.0	35	34.3
131.	SMP15-VINDT10-B	29	58.6	30	13.3	26	80.8
132.	SMP15-VINDT15-B	15	80.0	28	28.6	20	70.0
133.	SMP15-VINDT12-B	29	89.7	40	2.5	39	64.1
134.	SMP39-VINDT5-B	17	17.6	30	16.7	25	92.0
135.	SMP39-VINDT5-B	8	100.0	24	25.0	18	100.0
136.	SMP39-VINDT34-B	14	42.9	30	13.3	26	88.5
137.	SMP39-VINDT37-B	3	0.0	28	25.0	21	100.0
138.	SMP39-VINDT38-B	1	100.0	22	40.9	13	100.0
139.	MSP2-VINDT44-B (SPD)	11	100.0	17	11.8	15	46.7
140.	MSP4-VINDT11-B (SPD)	11	18.2	34	35.3	22	68.2
141.	MSP4-VINDT41-B (SPD)	8	37.5	30	26.7	22	77.3
142.	MSP10-VINDT39-B (SPD)	20	90.0	39	2.6	38	71.1
143.	76093F_4B-4-B	6	66.7	42	42.9	24	95.8
144.	76004F_4B-8-B	5	20.0	34	8.8	31	96.8
145.	76002F_4B-2-B	1	0.0	40	55.0	18	100.0

Table 133. Contd.

1	2	3	4	5	6	7	8
146.	76004F$_4$B-9-B	3	100.0	30	36.7	19	94.7
147.	76008F$_4$B-5-B	1	100.0	37	27.0	27	100.0
148.	76088F$_4$B-1-B	14	100.0	39	41.0	23	60.9
149.	76088F$_4$B-6-B	5	100.0	42	4.8	40	100.0
150.	76088F$_4$B-3-B	17	100.0	32	21.9	25	80.0
151.	76098F$_4$B-3-B	9	77.8	33	36.4	21	95.2
152.	76004F$_4$B-1-B	9	88.9	23	13.0	20	95.0
153.	76089F$_4$B-9-B	2	100.0	26	11.5	23	95.7
154.	76093F$_4$B-2-B	16	62.5	35	11.4	31	90.3
155.	76093F$_4$B-3-B	14	78.7	40	20.0	32	93.5
156.	76008F$_4$B-2-B	21	90.5	36	2.8	37	59.5
157.	76008F$_4$B-3-B	19	21.1	34	8.8	31	77.4
158.	76104F$_4$B-6-B	22	59.1	33	12.1	29	51.7
159.	76089F$_4$B-3-B	29	48.3	43	11.6	38	34.2
160.	76089F$_4$B-10-B	18	72.2	32	34.4	21	47.6
161.	76008F$_4$B-1-B	23	91.3	31	25.8	23	26.1
162.	76089F$_4$B-1-B	20	75.0	28	7.1	26	19.2
163.	76089F$_4$B-4-B	16	87.5	30	10.0	27	37.0
164.	76008F$_4$B-4-B	24	91.7	43	16.3	36	66.7
165.	76004F$_4$B-3-B	17	88.2	36	16.7	30	80.0
166.	76098F$_4$B-1-B	24	41.7	39	20.5	31	38.7

Table 134. Results of screening of SM plus wilt resistant lines in the multiple disease nursery during the 1982-83 season

S.No.	Particulars	Total plants	% SM	Total plants	% blight	Total plants	% wilt
1.	ICP-4866-1-53[illegible]-P1[illegible]-SWP1[illegible]-SWPB[illegible]-SWP1[illegible]	34	0.0	54	33.3(0.0)	36	25.0
2.	ICP-4866-1-53[illegible]-P1[illegible]-SWP1[illegible]-SWPB[illegible]-SWP2[illegible]	2	0.0	2	0.0(0.0)	2	0.0
3.	ICP-4866-1-53[illegible]-P1[illegible]-SWP1[illegible]-SWPB[illegible]-SWP3[illegible]	10	0.0	22	54.5(0.0)	10	40.0
4.	ICP-4866-1-53[illegible]-P1[illegible]-SWP1[illegible]-SWPB[illegible]-SWP4[illegible]	44	0.0	62	32.3(0.0)	42	16.7
5.	ICP-7203-1-45[illegible]-SWP2[illegible] (PBT)	4	50.0	5	20.0	4	0.0
6.	ICP-8221-2-51[illegible]-SWP1[illegible]	23	0.0	44	27.3	32	100.0
7.	ICP-8221-2-51[illegible]-SWP3[illegible]	17	0.0	46	34.8	30	100.0
8.	ICP-8221-2-51[illegible]-SWP4[illegible] (PBT)	26	0.0	51	11.8	45	97.8

APPENDIX-I

TOUR REPORTS

REPORT ON TRIP TO PANTNAGAR, LUDHIANA, HISSAR AND DELHI

(26 September to 6 October 1982)

S.P.S. Beniwal

Objective

To observe ICAR-ICRISAT Uniform trials on pigeonpea sterility mosaic and Phytophthora blight, to assess disease situation in the early-maturity pigeonpea in western Uttar Pradesh, Punjab and Haryana, and to attend the Rabi Pulses Workshop.

Itinerary

26-9-1982	Hyderabad	Delhi
27-9-1982	Delhi	Pantnagar
29-9-1982	Pantnagar	Ludhiana
1-10-1982	Ludhiana	Hissar
2-10-1982	Hissar	Delhi
6-10-1982	Delhi	Hyderabad

Summary

I visited Pantnagar, Ludhiana, Hissar and Delhi during September 26 to October 6, 1982 to observe ICAR-ICRISAT uniform trials on sterility mosaic and Phytophthora blight of pigeonpea, to assess disease situation in the early-maturity pigeonpea in the areas visited, and to attend the All India Rabi Pulses Workshop at IARI, New Delhi.

The uniform trial for sterility mosaic resistance at Pantnagar was in good shape and will give useful results. Contrarily, the trial on Phytophthora blight, planted in an upland field, will not provide any useful data. Observations recorded on entries in a set of pigeonpea differentials for sterility mosaic will be useful. At Ludhiana, the sterility mosaic trial was not staple-inoculated and, therefore, even the susceptible check (BDN-1) did not show any infection. They were advised to immediately inoculate the trial to get some useful data. At Hissar, the pigeonpea experiments of Dr. Gupta looked very impressive with no incidence of sterility mosaic, wilt or Phytophthora blight. The bacterial stem canker incidence was high but it would not cause any appreciable damage. The field for chickpea stunt nursery was ready for planting. At IARI, New Delhi, the entries in the Phytophthora blight trial were inoculated on 4 October and, therefore, were not ready for recording observations.

I attended the All India Rabi Pulses Workshop and presented a paper "International efforts on breeding for resistance against Botrytis gray mold" in the Joint Session on "*Ascochyta* and *Botrytis*".

Sterility mosaic was the most important disease of early-maturity pigeonpea in western Uttar Pradesh where no wilt or Phytophthora blight could be seen in farmers' fields. In parts of the Punjab visited, Phytophthora blight was the most important disease followed by very low incidence of wilt. No sterility mosaic or *Heliothis* was observed though termite damage to the extent of 3% was observed in some fields. In parts of Haryana visited, most of the pigeonpea fields were free from all these three diseases though wilt (8%) and Phytophthora blight (5%) were observed only in one field at Mundhal, Dist. Hissar. No *Heliothis* was observed though termite damage was a common problem.

REPORT ON TRIP TO BANGALORE, MYSORE, COIMBATORE, AND VAMBAN

(19-28 December 1982)

S.P.S. Beniwal

Objective

To see performance of entries in ICAR-ICRISAT Uniform Trial on Pigeonpea Sterility Mosaic Resistance (IIUTPSMR-82) and a set of pigeonpea differentials at Bangalore and Vamban, and to assess disease situation in the areas to be visited.

Itinerary

19-12-1982	Hyderabad	-	Bangalore
20-12-1982	Bangalore		
21-12-1982	Bangalore	-	Mysore
22-12-1982	Mysore		
23-12-1982	Mysore	-	Coimbatore
24-12-1982	Coimbatore		
25-12-1982	Coimbatore	-	Pudukkottai
26-12-1982	Vamban		
27-12-1982	Pudukkottai - Bangalore - Hyderabad		

Summary

I went to see performance of entries in ICAR-ICRISAT Uniform Trial for Pigeonpea Sterility Mosaic Resistance (IIUTPSMR)-82 and in a set of pigeonpea differentials at Bangalore and Vamban, and to assess disease situation in the areas visited. Throughout the tour, I was accompanied by Dr. Umaid Singh of Biochemistry.

At Bangalore, the results obtained in IIUTPSMR will be useful though results from a set of 10 differentials were erratic. Another set of differentials is to be sent there for retesting against sterility mosaic. Phyllody disease was commonly observed in pigeonpea in the experiment station plots of UAS, and also in farmer's field around Bangalore. In Karnataka, they needed early-to medium-maturity var. with SMD and pod borer resistance for planting in July as intercrop with groundnut and cowpea. Therefore, there is a need for testing of ICRISAT lines under those conditions. A visit of their new Pulse Pathologist to ICRISAT will be very useful. At Mysore, I visited Dr. Safeeulla's Applied Sciences Laboratory and discussed on some seed-borne diseases of crop plants including legumes. At Coimbatore experimental plots, both SMD and wilt are a problem to reckon with. However, the latter is not a problem in farmers' fields. They require extra early (< 100 days)- and medium-maturity pigeonpea with resistance to SMD and pod borer. I advised them to follow the infector-hedge technique for field screening of pigeonpea for SMD resistance. On their request, I presented a seminar on 'Sterility mosaic of pigeonpea' for the students and staff of the Plant Pathology Department. We shall include Coimbatore as one of the centres for IIUTPSMR- and IIUTPWR-83. A visit of their Pulse Pathologist to ICRISAT will be very useful. At Vamban (Pudukkottai), the National Pulses Research Center of TNAU, SMD nursery was very impressove. Five entries in IIUTPSMR including four from ICRISAT did not show any infection. Results on 10 differentials for SMD will be very useful. Wilt is not a problem at Vamban. In the SMR yield test ICPL-341, which showed only 15% SMD (mild mosaic), looked impressive. Sterility mosaic is the most important disease problem of pigeonpea in whole of that part of Tamil Nadu as we could see farmers' fields with more than 90% SMD. In the areas I visited, I could see pigeonpea only as an intercrop, therefore there is a strong need for development of extra-early-, early- and medium-maturity pigeonpea varieties with resistance to SMD and pod borer for planting under intercrop situations.

REPORT ON TRIP TO KANPUR, FAIZABAD, DHOLI, VARANASI AND DELHI

(20 February - 1 March 1983)

J. Kannaiyan

Objective

To observe pigeonpea wilt, sterility mosaic, Phytophthora blight and Alternaria blight nurseries at Kanpur, Faizabad, Dholi, Varanasi and Delhi.

Itinerary

20-2-1983	Hyderabad	Delhi
21-2-1983	Delhi	Kanpur
22-2-1983	Kanpur	
23-2-1983	Kanpur	Faizabad
24-2-1983	Faizabad	Dholi
25-2-1983	Dholi	
26-2-1983	Dholi	Varanasi
27-2-1983	Varanasi	Kanpur
28-2-1983	Kanpur	Delhi
01-3-1983	Delhi	Hyderabad

Dr. Mahendra Pal, Plant Pathologist (Pulses), IARI, New Delhi, accompanied me during this trip.

Summary

At the Agricultural University Kanpur, the wilt susceptible ICP-2376 showed more than 90% wilt in the wilt-sick plot. In the ICAR-ICRISAT Uniform Trial for Pigeonpea Wilt Resistance (IIUTPWR), several ICRISAT entries including ICP-8863 appeared quite promising. In ICAR-ICRISAT Uniform Trial for Pigeonpea Sterility Mosaic Resistance (IIUTPSMR), the susceptible BDN-1 showed only a little incidence of sterility mosaic. A new symptom - in the form of initial ringspot - was noticed for the first time in the Alternaria blight of pigeonpea.

At the Project Directorate (Pulses), the infector-hedge' screening technique, developed at ICRISAT, was followed to screen the entries in IIUTPSMR and other breeding material. BDN-1 showed almost 100% infection. Phytophthora blight was prevalent in most of their pigeonpea trials. The possibility of large scale screening of ICRISAT pigeonpea germplasm was discussed with Mr. Gurha. Alternaria blight was observed at this station for the first time.

At the Agricultural University, Faizabad, the SM infection appeared late in the season on BDN-1 and other entries in IIUTPSMR. ICP-2376 showed a severe mosaic infection. SM differential test failed due to water-logging. Alternaria blight was also observed in No.1258 at this center. A shot-hole symptom was also seen in this disease.

At the Agricultural University, Dholi (Bihar), ICP-2376, a susceptible pigeonpea, showed only moderate wilt and most of the ICRISAT lines were resistant. In IIUTPSMR, BDN-1 showed 100% SM infection. ICP-2376 also showed 100% severe SM infection. ICP-7867 and -11049 were free from the disease. In the differential test ICP-7035 and -8854 were free from the disease. In ICAR-ICRISAT Pigeonpea Leaf Blight Nursery (IIPLBN), a severe Alternaria blight appeared in No.1258 and other susceptible entries. The lines found resistant in glasshouse screening at ICRISAT Center showed a similar rating here also. DA-10, a selection from ICP-5372, was resistant in a field test. Their Pulses Breeder crossed No.1258 with NP(WR)-15 x PS-66 (ICRISAT material) and selected DA-2, -11, and -16 lines which were resistant to Alternaria blight and SM in the field screenings.

At Banaras Hindu University, Varanasi, our 'infector-hedge' technique was adopted to screen pigeonpeas against the SM, BDN-1 showed 100% infection. ICP-7867, -10976, -11049, BSMR-1 and BSMR-2 were free from SM. In IIPLBN, No.1258 showed moderate Alternaria blight incidence. The lines found resistant at ICRISAT Center showed a similar reaction here also. In IIPPBN, ICP-7119 showed a good Phytophthora blight incidence.

Between Varanasi and Delhi, SM was the most common disease of pigeonpea. At IARI, New Delhi, ICP-2376 showed a low wilt incidence in the IIUTPWR. The IIPPBN entries were screened in pots by following the 'leaf-scar' technique. ICP-1950 and -2153 were free from Phytophthora blight.

APPENDIX-II

LIST OF PUBLICATIONS

JOURNAL APTICLES

1. BENIWAL, S.P.S., DEENA, E., and NENE, Y.L. 1983. Effect of yellow mosaic on yield and it's components in postrainy-season pigeonpea. International Pigeonpea Newsletter 2:48.

2. JAIN, K.C., KANNAIYAN, J., and FARIS, D.G. 1983. ICRISAT breeding lines show promise to Fusarium wilt resistance. International Pigeonpea Newsletter 2:43.

3. KANNAIYAN, J., RAJU, T.N., and NENE, Y.L. 1983. Survival of Pigeonpea Phytophthora blight fungus in infected stubble. International Pigeonpea Newsletter 2:49-50.

4. KANNAIYAN, J., JAIN, K.C., RAJU, T.N., and NENE. Y.L. 1983. Wilt resistance sources in vegetable pigeonpea. International Pigeonpea Newsletter 2:42-43.

5. KANNAIYAN, J., JAIN, K.C., RAJU, T.N., and NENE, Y.L. 1983. Sclerotium blight of pigeonpea. International Pigeonpea Newsletter 2:51-52.

6. SHEILA, V.K., NENE, Y.L., and KANNAIYAN, J 1982. A single culture medium for *Phytophthora drechsleri* f. sp. *cajani*. Indian Phytopath. 36:152-154.

CONFERENCE PAPERS

1. BENIWAL, S.P.S. 1983. Diseases of pigeonpea and their control. A key note paper presented at the Symposium on Diseases of Pulses organized by the Indian Society of Mycology and Plant Pathology, 19 April 1983, UAS, Bangalore.

2. NENE, Y.L., and SINCLAIR, J.B. 1983. Fungicide use and selectivity in the control of grain legume diseases in the tropics. Paper presented at the International Workshop on Integrated Pest Control for Grain Legumes, 4-9 April 1983, Goiania, Brazil.

SPSB:ks